APPENDIX 1 (Pacific STEP-UP Student Abstracts 2017, 2018, 2019, 2021, 2022)

2017 Abstracts

- Order:
  - Hawai'i
  - American Samoa
  - Guam
  - CNMI
  - FSM
  - RMI
  - Palau

Exosomes: A Potential Flavivirus Vaccine

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ABSTRACT

The ongoing Zika virus, dengue, and West Nile virus, members of the genus Flavivirus, epidemic and unexpected linked with various diseases such as Guillain-Barree syndrome and congenital disabilities, dengue hemorrhagic shock syndrome, and neuronal damages necessitates the urgent need for the development of vaccines. Flavivirus destroys the host dermis cells and reaches the immature dendritic cells (DCs) to spread. The infected DCs secreted membrane vesicles known as exosomes that have the potential to facilitate high immunostimulatory responses for virus clearance. Therefore, the objective of this project is to identify which virus proteins naturally assemble in exosomes released during flavivirus infection. If the virus proteins of interest are not found to be present, they will be engineered to assemble correctly in the exosomes. These engineered exosomes can act as excellent vehicles for disseminating viral antigens to immune cells and serve as a potential vaccine candidate. In this study, the exosomes will be biochemically purified from human HEK293T cells infected with flaviviruses or from cells expressing flavivirus proteins. The viral proteins contained in the purified exosomes will be determined using immunostaining assays such as Western blotting and immunofluorescence. These vaccine candidates will be suitable for future testing in mice for protection against flavivirus infection.

Key Words: exosomes, flavivirus, virus proteins, vaccine

Investigation of Hypothalamic Selenoprotein M in Energy Metabolism

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ABSTRACT

Selenoproteins represent a unique class of proteins that play a critical role in maintaining proper redox balance essential to health. They are characterized by the co-translational incorporation of selenium (Se) in the form of the 21st amino acid, selenocysteine. Selenoprotein M (SelenoM) is a relatively uncharacterized protein that is highly expressed in the brain. Recent studies have shown that SelenoM is highly expressed in hypothalamic regions involved in energy metabolism and that SelenoM deletion in mice causes obesity. We performed microarray analysis on hypothalamic tissue from wild-type and SelenoM KO mice to identify genes affected by SelenoM deletion. Two key genes implicated in energy metabolism and cell cycle control, Peroxisome Proliferator-Activated Receptor Gamma Coactivator 1 Alpha (PGC-1 alpha) and Cyclin Dependent Kinase Inhibitor 1A (Cdkn1a), were identified and verified by quantitative PCR. Further qPCR analysis showed that these genes were also significantly altered in immortalized hypothalamic cells where SelenoM was disabled using CrispR/CAS9 technology. These preliminary studies suggest a potential relationship between SelenoM, energy metabolism and cell cycle control.

Key words: Selenoprotein, Hypothalamus, Energy Metabolism

Investigating Defects in Epithelial Cell-Cell Contacts in a Mouse Model of Congenital Obstructive Nephropathy

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ABSTRACT

Congenital obstructive nephropathy (CON) is the most common cause of chronic kidney disease (CKD) and end-stage renal disease (ESRD) in children. CON occurs in 1-2% of pregnancies and 51% of childhood CKD cases in North America. CON most commonly occurs when there is an obstruction in the upper ureter at the ureteropelvic junction (UPJ). Despite what is known, we lack knowledge of what causes this disease and there are no genetic models to study CON. The eight-protein exocyst complex regulates polarized exocytosis of intracellular vesicles for numerous cell types. Our laboratory recently reported a mutant mouse model where inactivation of Sec10 in ureteric bud-derived epithelial cells resulted in severe bilateral hydronephrosis, complete anuria, and death occurring less than 24 hours after birth. Without Sec10, the epithelial cells lining the ureter fail to differentiate and stratify into a mature urothelium, indicated by the absence of uroplakin hydrophobic plaques at the apical surface. The maturation of the ureter critically coincides with the beginning of urine production from the kidney and the cells within the urothelium must maintain tight cell-cell contacts. We have shown that without Sec10, these urothelial cells fail to maintain cell-cell adhesion during stratification, which is possibly the underlying cause of the UPJ obstructions. Here, we focus on embryonic stage 16.5 (E16.5) Sec10 knockout (CKO) mice and wild type littermate controls, and analyze differences in transmembrane proteins crucial to maintaining tight cell-cell junctions.

Key Words: Ureteropelvic Junction, Cell Contact, Urothelial, Sec10

Evaluation of Newly Developed Taro (Colocasia esculenta) Cultivars for Taro Leaf Blight Resistance, Corm Weight, Nutritional Content, and Eating Quality

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ABSTRACT

Taro, Colocasia esculenta, is the most important food crop in American Samoa. In 1993, taro leaf blight (TLB) caused by the fungus Phytophthora colocasiae resulted in the complete loss of taro production in American Samoa. In the late 1990s, several TLB resistant taro cultivars from Asia and the Pacific were introduced to American Samoa. To improve taro production and ensure food security, a taro improvement program was developed at American Samoa Community College-Agriculture, Community and Natural Resources (ASCC-ACNR) in 2013.

The objective of this project is to evaluate three new taro cultivars developed at ASCC-ACNR for TLB resistance, corm weight, nutritional content, and eating quality. A Randomized Complete Block Design field trial with four treatments and three replications was conducted. Treatments were ACNR A, ACNR B, ACNR C, and as a control, SAM2, which is a high yielding, TLB resistance variety preferred by taro farmers. Each treatment was assessed by measuring the percentage of the plant affected by TLB and measuring corm weights. Corm samples were analyzed for nutritional content and a taste test was conducted to evaluate eating quality. The results will be used to inform American Samoan farmers about which cultivars of taro are TLB resistant and high yielding.

Key Words: Taro, Evaluation, Food Security, TLB, Cultivar Improvement

Giant Clam (Tridacna gigas) Variations based on Size and Density at Different Underwater Depths

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ABSTRACT

The Tridacnae family, locally known as Faisua, are bivalve mollusks that thrive in tropical coral reef ecosystems. Faisua harbor photosynthetic zooxanthellae that provide the majority of their energy through photosynthesis. They are typically found in shallow water where they get the most sunlight. Faisua are considered a delicacy in American Samoa and populations are diminishing due to overfishing, especially in depths accessible to free divers (1-10m).

The National Park of American Samoa (NPSA) is interested in learning more about what drives giant clam distributions in NPSA waters, and one day hopes to outplant farmed Faisua to help increase population levels. Surveys were conducted to assess Faisua population density and analyze correlations with depth. With this data NPSA will be able to make more informed resource management decisions

Three 50m transects were conducted on the reef flat of Fagasa to assess Faisua density. Size and location of each clam was recorded to the nearest cm. This data was then compared to Faisua surveys conducted by NPSA divers at 10, 20, and 30 m depths. It was hypothesized that there would be higher density and larger clam size in shallower depths, because there is more light available for photosynthesis.

Key Words: Tridacnae Family, Giant Clam (Faisua), Transect, National Park of American Samoa (NPSA), Population analysis

The Effect of Ant Mutualism on the Harm Caused by the Soft Scale Insect Pulvinaria urbicola to its Host Plants

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ABSTRACT

Pisonia grandis, a large, woody shrub tree, provides important habitat for seabirds and even sea turtles. Pisonia forests are currently declining on many islands in the Pacific and Indian Oceans including American Samoa's Rose Atoll. One possible reason for the declines is damage from the invasive scale insect Pulvinaria urbicola. Mutualistic ants tend and protect the scales from predatory harm and fungal diseases in return for the honeydew the scales produce. The attendance of ants may benefit the scale insects and thereby increase the harm to the host tree.

In order to learn more about this ant-scale mutualism and its effect on the host plant, we experimentally tested the hypothesis that ant attendance increases the impact of scale insects on the host plant. In the experiment we used Capsicum annuum as the host for P. urbicola.

Four treatments were applied to measure the effect of the scales on their host plant with and without the presence of mutualistic ants: plants with scales with and without ants and plants without scales but with and without ants. Over the course of the experiment we recorded scale insect survival, ant abundance, and several plant growth parameters. A greater reduction in plant growth due to scale insect feeding when ants are present would support the hypothesis that the ant mutualism increases the effect of these scales on their host. Better understanding of the ant-scale-plant relationship can help protect the wildlife that depends on Pisonia.

Key Words: Pulvinaria urbicola, Pisonia grandis, honeydew

In-Vitro Screening Methodology for Salt Tolerance in Taro (Colocasia esculenta)

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ABSTRACT

Sea level rising can lead to saltwater intrusion of agricultural areas on low-lying Pacific Islands. In American Samoa, on the island of Aunu'u, increased salinity in the wetland taro (Colocasia esculenta) production areas presents a major threat to the island's top food crop and food security. Evaluation of newly developed taro varieties for salt tolerance using traditional field methods can take several years. The purpose of this study is to identify an in-vitro method to rapidly screen newly developed taro varieties while at the seedling stage for salt tolerance. This will greatly reduce the time and effort required to identify salt tolerant taro varieties.

Salt tolerance of three taro varieties was evaluated by growing in-vitro taro plantlets (Sam-19, Sam-20 and Sam-2) on full Murasjige and Skoog (MS) media supplemented with Sodium chloride (NaCl) 0%, 0.25%, 0.5 %, 1%, and 2% concentration. Plantlet fresh weight, height, number of leaves and roots were measured to determine plant growth at different NaCl concentrations.

Results showed that plantlets of variety Sam-19 had significantly greater plant fresh weight, height and number of leaves at 0.25% and 0.5% NaCl than the other two varieties. All varieties showed no growth at 1% and 2% NaCl.

This methodology was useful in determining differences in salt tolerance of the three varieties tested. To improve it, replacement of full strength MS medium (Electrical Conductivity (EC) 3.5 mS/cm) with ¼ strength MS medium (EC .87 mS/cm), will reduce the influence of the in-vitro media on the EC values at different NaCl concentrations.

Key Words: Taro (Colocasia esculenta), Electrical conductivity, NaCl, salinity

The Effect of Trash and Piggeries on the Health of Mangrove Forests in American Samoa

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ABSTRACT

Mangrove forests are an integral aspect of the Samoan culture and a pertinent resource to American Samoa. In addition to acting as a pollutant filter, mangrove forests are a source of coastline protection from erosion, support for marine life, and produce timber and other resources. Previous research suggested that the rapid loss of mangrove forests in American Samoa (up to five acres per year) has been exacerbated by the dumping of trash into mangrove sites. Additionally, it has been noted that piggeries may influence the survival of seedlings in mangrove forests.

This field study was done to assess the influence of trash and piggeries on the health of mangrove forests. It was hypothesized that trash and piggeries would have adverse effects on the mangrove health. The Masefau mangrove wetland forest was selected as the site for this study. The mangrove forest was mapped in a geographic information system and trash sites and piggeries were georeferenced on the map. Random sites were selected from areas near and far from trash and piggery locations to examine the influence of trash and piggeries on the health of the mangroves.

The health of the mangrove sites was evaluated based on several parameters including canopy cover, seedling and sapling counts, and basal area. The evidence on impacts of trash and piggeries provides a more coherent understanding of the mangrove ecosystems in American Samoa as well as direction for future management of those ecosystems.

Key Words: mangrove forests, trash, piggeries, Masefau, Geographic information system

Children's Food Knowledge and Preferences and their Effect on Early Childhood Obesity

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ABSTRACT

Being overweight is unfortunately common in the islands of American Samoa, affecting people of all ages. Having a dangerously heavy body weight, especially as a child, can lead to non-communicable diseases (NCDs) like diabetes and heart disease later in life. What children eat contributes to their health and body weight. This project focused on child food knowledge and preferences as an indicator of the types of food and drink they consume often, and compares results between healthy and overweight young American Samoan children.

The purpose of this project was to increase knowledge about the link between child food knowledge and preferences and prevalence of childhood obesity in American Samoa. Children 3.5-5 and 5.5-7 years of age were assessed for their food knowledge and preferences using visuals of healthy and unhealthy foods. The hypothesis was that food preferences, but not necessarily food knowledge (i.e. knowing the name of the food), effects what children eat and drink, and that preference for unhealthy, calorie rich, but nutritional poor foods (i.e. junk food) would be more prevalent in overweight/obese children than in healthy weight children. Differences in food knowledge and preferences between overweight children and children of normal weight indicate that these factors may be important contributors to overweight and obesity and that modifying them may help alleviate the epidemic of overweight and NCDs in American Samoa.

Key Words: Overweight, Obesity, Food Knowledge, Food Preference, non-communicable disease

Determination of Antigenotoxicity in Guam's Noni Fruit (Morinda citrifolia) and Avocado Seed (Persea americana)

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ABSTRACT

Cancer is a leading cause of mortality in the world, with oral cancer being the fourth most prevalent. Oral submucous fibrosis leading to oral cancer is frequent in areca nut chewers. Areca nut, commonly known as betel nut, is chewed by approximately 600 million people primarily in Southeast Asia and the Pacific Islands including Guam. Arecoline, the major alkaloid of areca nuts, provides the addictive euphoric sensation and causes genotoxic effects in bacterial and human oral cell lines.

Much research has been done to find bioactive plant compounds that will combat cancer. Morinda citrifolia (noni) fruit is used in traditional medicinal remedies and has shown promising beneficial effects in cancer treatment. Persea americana (avocado) is also known to have anticancer properties. Although tea made from avocado seed is suggested to have anticancer benefits, to our knowledge no specific research has demonstrated such. Plant extracts were evaluated with the Ames Salmonella microsome test, which determines the genotoxicity of potential carcinogens. Extracts of fresh and fermented noni juice and avocado seed tea brewed with hot or room temperature water were tested for antagonistic effects against known mutagens: sodium azide, 4-nitroquinoline N-oxide, and arecoline. Protection against base-pair substitution mutations will be evaluated with Salmonella typhimurium TA100 and frameshift mutations with S. typhimurium TA98 strain. The hypothesis to be tested is that noni fruit juice and avocado seed tea reduces mutagenicity of carcinogens. We aim to broaden the understanding of local produce used in traditional medicine as an anticancer treatment.

Key words: oral cancer, areca nut, antigenotoxicity, noni fruit (Morinda citrifolia), avocado seed (Persea americana)

Testing Recruitment Strategies to Improve Enrollment in a Cardiometabolic Study in Guam

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ABSTRACT

Globally, cardiometabolic diseases pose a significant health risk. Some of the highest mortality rates occur among Pacific Islanders, though this minority population remains relatively underrepresented in epidemiological studies. According to the Guam Office of Vital Statistics, diabetes and heart disease accounted for about 35.7% of deaths (301 total) in 2011. The Pacific Islands Cohort on Cardiometabolic Health (PICCAH) was launched in Guam in 2016 to better understand cardiometabolic diseases in Pacific Islanders. Approximately 500 parent-children dyads (or 1000 participants) will be randomly selected to participate in the PICCAH by the end of 2019. The initial recruitment strategy – a mass mail-out – resulted in a low response rate of <1%. The purpose of this project was to test different recruitment strategies to improve enrollment in the PICCAH. Two type of recruitment were compared. For passive recruitment, a Facebook page was organized so that information relating to PICCAH was published over a period of 5 days, raising awareness of the study and encouraging parents to contact PICCAH. For active recruitment, parents with children within the targeted age range (3-8yrs old) were approached at local summer camps, workshops, and activity centers in Guam over a period of 5 days as well. It was hypothesized that active recruitment would yield a significantly greater recruitment turnout, because the recruitment style directly engages an individual, creating interest. This study offers unique information to better understand the application of different recruitment methods for biomedical research targeting Pacific Islanders.

Key Words: Cardiometabolic Health, Recruitment, underrepresented minorities, Guam

One Year Mortality Comparison between Chamorros and the other Ethnic Groups with End Stage Renal Disease

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ABSTRACT

High blood pressure and diabetes commonly results in end stage renal disease (ESRD). Mortality from ESRD varies among different ethnic groups. Over 11% of the population on Guam is diagnosed with diabetes and Chamorros compose a majority of diabetes population on Guam. While not assessed in this study, it is thought that genetic and numerous socio-cultural factors contribute to increased mortality among minority populations. It is unclear if Chamorros experience a higher rate of mortality from ESRD. Therefore, one year mortality was assessed through a retrospective analysis of patients at a renal care facility on Guam between June 2016 to June 2017 between Chamorros and the other ethnic groups. Chamorros were hypothesized to have a higher rate of mortality when compared to other ethnic groups. It is important to understand the difference between the ethnic groups so that we can further investigate what factors contribute to their diagnosis of end stage renal disease and identify strategies to reduce mortalities and improve the health of local Pacific Islanders on Guam.

Key words: end stage renal disease, mortality, diabetes, Chamorros, retrospective analysis

Investigating the Future State of Chamorro Healing Practices

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ABSTRACT

As an alternative healthcare, traditional Chamorro healing provides an all-natural, community-based approach to treatments, such as herbal medicine and massage therapy, to a wide range of health conditions. Today, the practice of modern-day Chamorro healers, or yo'åmte, is threatened by extinction due to the lack of family interest, economic struggles, and foreseen conflict among Chamorro values. Preservation of traditional healing methods is crucial to the understanding of types of care that Chamorros can have access to. Similar to traditional Chinese medicine, traditional Chamorro healing practices can provide new research and options to counter the excessive rate of noncommunicable diseases for Chamorros on Guam and the Northern Marianas. The purpose of this study is to investigate the future state of Chamorro healing practices and whether they can impact the reduction of noncommunicable diseases. For this study, it was hypothesized that Chamorro healing practices can help reduce the rate of noncommunicable diseases as people are seeking out their care.

To support this theory, we used a phenomenological approach by interviewing participants who met the given criteria with a uniform guide of 22 questions. To further support that people were seeking out the care of a traditional healer, Lizama (2011), found the following: 1) both children and adults were being treated for ailments, 2) women were seeking out options for fertility, and 3) people were seeking out massage and/or spiritual help. Participants shared that they sought help for hypertension, diabetes, kidney disease, flu, sprains, and numerous other issues.

Key Words: alternative healthcare, traditional Chamorro healing, yo'åmte, phenomenology, interview(s)

Culturing Brachionus rotundiformis with Different Treatments of Microalga to Determine the Best Feed Combination

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ABSTRACT

The effects of omega-3 fatty acids in a human diet have many benefits to the body. With the evident decrease of marine life in our oceans, it has become more necessary than ever to culture fish to meet the demand of the market. Fish are being cultured in simulated environments all over the world including places like Tahiti, Philippines, and Hawai'i. To ensure a healthy culture of fish it is important to start from the smallest component, what is being fed to the larvae. Zooplankton are a common food source for fish larvae and are needed to ensure healthy larval development. In an attempt to find the optimal amount of nutrients to feed zooplankton different doses of nutrients were fed to a species of zooplankton specifically Brachionus rotundiformis or Brachionus rotifers and were cultured in a 250 ml flask in order to decipher what treatments would create the most dense population. Rotifers generally feed on microalgae and the nutrients used consisted of three different components: Instant Algae Nannochloropsis paste, Instant Algae Isochrysis paste, and locally cultured live Isochrysis. The treatments varied in amounts of a combination of both Nannochloropsis paste and Isochrysis paste and a stand-alone treatment of live Isochrysis. In this study, hypothesis was that the treatment with 75% Nannochloropsis paste and 25% Isochrysis paste will create the densest population of rotifers.

Key words: Zooplankton, Brachionus rotundiformis, Nannochloropsis paste, Isochrysis, treatments

Observation of the Productivity of Isochrysis galbana Cultures with Exposure to Different Light Intensities

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ABSTRACT

In the culturing of many marine fish species, methodology for reliable, live food sources is often preferable. Harvesting species for feeding where they naturally occur is unreliable, as external factors are not adjustable. Optimal conditions are needed to maximize the population density and composition in a controllable environment. With microalgae, a commonly cultured aquacultural food source, many factors affect population growth, such as light, aeration, and nutrient dosage.

Isochrysis galbana cultures were separately exposed to three types of artificial light sources to determine the optimal intensity for culture growth. Previous studies show that phytoplankton productivity increases exponentially until a certain light intensity, at which their rates decline or stabilize. Another study found Cool White lights as ideal.

Cultures of Isochrysis g. were exposed to a type of light, LED, Daylight, or Cool White light, for five days and counted on days one and five. Because microalgae receive direct sunlight through water, it was hypothesized that population growth will be greatest in the cultures exposed to the closest simulation of that, which was provided by Daylight lights. Data collected shows that LED lights were the greatest facilitators of efficiency in the Isochrysis g. cultures of the lights tested. As aquaculturing is becoming more widespread, the use of sustainable light is more practical. Further research can be done with a different or wider array of lights and on the effect of the lights on other aspects of the culture, such as nutrient composition.

Key Words: Isochrysis galbana, ideal light intensity, aquaculture

The Antimicrobial Effects of Allium Sativum on Escherichia Coli

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ABSTRACT

Allium sativum (Garlic) is an herb that is grown all over the world, and can be found in the homes of many people. This herb has many medicinal properties, but is mainly known for its antimicrobial properties. Fresh garlic contains enzymes called "alliinase" and "alliin". When garlic is crushed or cut into the alliinase converts the alliin into allicin. Allicin is what gives the garlic its antimicrobial properties and odor.

The antimicrobial activity of the Allium sativum extract was tested on Escherichia coli, a gram-negative bacteria, using the agar-well diffusion method. A test tube containing only Escherichia coli was used as the control group. Another test tube containing Escherichia coli and the Allium sativum extract was used as the test group. It was hypothesized that the Allium sativum extract would prevent the growth of the Escherichia coli.

With the rising costs of today's society finding cheap and effective alternative treatments, will be helpful by providing medical help for those who can't afford regular healthcare treatments.

Key words: Alliinase, Alliin, Allicin, Allium sativum, Escherichia coli

Are Purple Hermit Crabs (Coenobita brevimanus) Seed Dispersers or Predators?

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ABSTRACT

Vertebrate frugivores play an important role in forests by dispersing seeds and helping improve germination through gut passage. Some frugivores may also be seed predators, where the seed is destroyed through gut passage. On the island of Saipan, the native frugivores are birds, bats, and crabs. This experiment focused on purple hermit crabs, Coenobita brevimanus, which are known to consume fruits, but it is unknown whether purple hermit crabs disperse or predate the seeds they consume. A maximum of ten purple hermit crabs, ranging in size from medium to large individuals, were captured from the forest and kept in captivity. In captivity, they were fed native fruits including Premna (Premna mariannarum or Premna paulobarbata), Ficus (Ficus prolixa), Aglaia (Lansium parasiticum), and Guamia (Guamia mariannae) and non-native fruits including papaya (Carica papaya) collected in the wild. The cage was inspected to see if fruits were consumed but the seeds were not ingested, and the fecal matter was searched for damaged seeds (crushed or in pieces) or undamaged seeds (whole or intact). Analysis of predation or dispersal was done using logistic regression. It was hypothesized that purple hermit crabs are beneficial seed dispersers, passing most seeds unharmed for both native and non-native fruiting tree species. As beneficial frugivores, purple hermit crabs could play a significant role in dispersing seeds in the forests of Saipan.

Key words: frugivores, seed dispersers, karst forest, hermit crab

The Effect of an Extended Growing Period on the Yield and Taste of Cassava (Manihot esculenta) Varieties Grown in Pohnpei Island, Micronesia

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ABSTRACT

With high incidence of diabetes in Pohnpei, there is an urgent need to replace highly processed, imported foods with locally grown sources. Manihot esculenta commonly called cassava could be a better alternative to wheat flour as cassava is gluten-free and lower in glycemic index.

The objective of this study was to compare the effect of an extended growing period on the yield and taste of the nine cassava varieties grown in Pohnpei. It was hypothesized that the effect of an extended growing period on the yield and taste of cassava would differ between varieties. Three main methods were used to test our hypothesis: 1) literature search, 2) local interviews, and 3) field experiment where the nine cassava varieties were planted (on 1/19/16), harvested (first on 1/12/17, and second on 6/10/17) and cooked, and taste-tested.

Results of the literature search and local interviews tend to indicate that the effect of an extended growing period on cassava yield and taste differ between varieties. Data from the field experiment was analyzed and shows the quantified differences between varieties. Further research is needed to determine the best growth duration for the best yield and taste for the individual varieties of cassava.

Key words: Pohnpei, Micronesia, cassava varieties, cassava yield, cassava taste, Manihot

Natural and Artificial Rehabilitation of Degraded Soils (Mal) of Pohnpei island, FSM

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ABSTRACT

"Mal" is the Pohnpeian word for barren or degraded soil, too poor to support crop growth and occupying at least 15% of land in Pohnpei. It has been controversial whether these mal soils could be made productive. This study aimed at determining whether there has been some rehabilitation of mal soils. It was hypothesized that some mal of Pohnpei have been transformed both naturally and artificially into productive soils.

Six methods were employed in the study: 1) literature search, 2) local interviews, 3) studying photographs of lands taken different years, 4) field visit to mal lands, 5) greenhouse studies to assess fertility of mal and non-mal soils, and 6) laboratory analyses of the soils. Literature search showed degraded soils being rehabilitated while local interviews showed mixed results. Nevertheless, there are locals who confirmed that Pohnpeian mal soils have been made productive by natural and artificial means, which is supported by photographic evidence. Field visits also show mal land in transition – changing from a fern, to a grass/fern, then a grass, and finally a forest area. Greenhouse studies confirmed that the mal (fern) area is less fertile and productive than a forest area that was previously a mal. Soil analyses are ongoing to support findings from the greenhouse study.

Awareness campaigns are now needed to inform the villagers to prepare them on how to transform their mal to productive soils.

Key Words: "Mal", land rehabilitation, Pohnpei, Micronesia

Effectiveness of Compost Application on Growing Spoon Cabbage (Brassica rapa) in Salt Treated Soil

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ABSTRACT

Vegetable farming in the Marshall Islands faces many challenges due to limited amounts of nutrients available in the soil. Salt stress is another major problem in most atolls that are regularly experiencing inundation and salt spray. Spoon cabbage (Brassica napa) is one of the most popular green leafy vegetables on the island, a common ingredient in soups and stir-fried vegetables.

Composting is a sustainable way of utilizing organic materials available on the island. In this experiment, the effectiveness of using compost in alleviating the effect of salt stress in the growth performance of spoon cabbage was explored. It was hypothesize that compost application on soil would result in a higher salt tolerance threshold level.

The compost used was a mixture of coconut husk, seaweeds, and dry leaves of breadfruit and banana. Both soils (compost mix and topsoil) were potted in 1-gallon polybags and the plants were allowed to grow for 21 days with fertilization. They were exposed to different concentrations (0, 15, 30, 60, 120 and 240 mM) of salt stress by daily irrigation for 14 days. Growth performance was compared to the control group. Treatments were distributed in 3 replicates using Randomized Complete Block Design (RCBD). All data gathered was analyzed using Analysis of Variance (ANOVA) and treatment means were evaluated using Duncan's Multiple Range Test (DMRT) at 5% level of significance. The result of this study could also be applied to other plants and be useful in climate change adaptation.

Key words: Compost, salt stress, organic materials, climate change adaptation

The Impact of Over-Population to the Water Quality (Drinking Water) of Rita and Delap

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ABSTRACT

This research is based on the Water Quality on Majuro Atoll, the capitol city of the RMI, specifically the most populated villages, Rita and Delap. Rita (7,397) and Delap (7,729) are the most populated villages, according to the Majuro Population Projection FY 2011-2017 Report of the RMI EPPSO, which makes up approximately 52% of the population on Majuro.

To narrow it down further, the research mainly focused on drinking water. It was done by collecting water samples from each village to determine which village has the worst or poor water quality. It was hypothesized that there is higher likelihood that water catchments will be contaminated in areas that are overpopulated with poor infrastructures. The villages the research based its information on were broken into smaller sections. Rita was broken into 4 sub-sections and Delap into 5 sub-sections making it 9 water samples being tested.

The process of testing these waters was simple. There are presently several ways to test water quality conducted by the EPA Water Quality Control Division; however this research used a testing reagent called Pathoscreen (H2S). It is a powder that is used to determine whether or not the water is detected with the Presence/Absence of pathogens. After the testing, the water samples were incubated for at least 24 hours. For more accurate results, they were incubated for an additional 24 hours making it 2 days of incubation.

After they were incubated, 8 out of the 9 water samples collected were detected with the Presence of pathogens.

Key Words: Pathogens, Pathoscreen (H2S), RMI EPPSO, Majuro Atoll, Rita & Delap, Overpopulation

Comparative Growth Assessment of Papaya (Carica papaya) and Tomato (Solanum lycopersicum) Plants in Saline Soil Condition

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ABSTRACT

Papaya (Carica papaya) and tomato (Solanum lycopersicum) are popular agricultural crops that Marshallese people eat and often have planted in their backyard. Eating more fruits and vegetables promotes health and prevents diabetes and other NCDs that are prevalent in the Marshall Islands. However, challenges like salt spray and inundation make planting these crops difficult. This study aims to determine the concentration of salt these two plants can tolerate. It was hypothesized that each plant would have a different salt tolerance threshold levels as compared to the control groups.

7 week old seedlings of both plants were planted and fertilized in a one-gallon polybags, and exposed to salt stress by daily watering with 0,15, 30, 60, 120, and 240 mM solution of NaCl for 14 days. Treatments were distributed in 3 replicates using Randomized Complete Block Design. Growth parameters of mortality, root and stem length, and plant height were compared and analyzed using Analysis of Variance (ANOVA) and treatment means were evaluated using Duncan's Multiple Range Test (DMRT) at 5% level of significance. The results of this study will be helpful to farmers in understanding how different plants react to saline stress. Further study is needed to investigate and screen more plants for salt tolerance and be prepared for the effects of climate change.

Key Words: Saline soil, growth parameters, salt tolerance threshold, papaya (Carica papaya), tomato (Solanum lycopersicum)

Coconut Rhinoceros Beetle

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ABSTRACT

The Coconut Rhinoceros Beetle (CRB), a.k.a. Oryctes rhinoceros, is an invasive insect that kills coconut trees and other palm species by feeding on the plant's crown. Two biotypes of the CRB are in Palau: CRB & CRB-G. Damage Assessment Surveys were conducted on coconut trees in several locations in all of the 16 states in Palau during May through July, 2016.

These surveys were done to determine the amount of damage done by the beetles to the trees and record the percentage of damaged or missing fronds on each of the trees surveyed. In order to find out the number of the beetles in Palau are either CRB or CRB-G, specialized traps were set and used to collect live specimens of the Coconut Rhinoceros Beetle for the lab. The results of the Damage Assessment Surveys, done last year, showed that an average coconut tree in Palau had about 1%-29% of its leaves missing due to CRB damage. This year, we return to all of the survey sites and recording the amount of CRB damage on the trees. Comparing the results of last year's survey and this year's survey will show us whether the CRB problem has decreased or increased. The preliminary assessments have shown variable increases in damage and another genetics review is required to see if the CRB-G has increased.

Key words: Coconut Rhinoceros Beetle (Oryctes rhinoceros), Awareness, Prevention

Beta-Cell Lines and Insulin Stimulation of Local Palauan Tea

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Coordinating Center: University of Hawai'i at Manoa
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ABSTRACT

Non-Communicable Diseases (NCDs) and Diabetes Type II mellitus are prominent in Palau and the Pacific Islands. In order to reduce dependence on outside drugs, local products need to be found as replacements. Here we study local tea and its major compound for effective insulin secretion in mouse cell lines (M1N6). Mangiferin, a c-glycosylated xanthone, is a compound found in Ongael, a Palauan traditional medicine. The mangiferin used was extracted from dried ongael leaves and purified to >99% at University of Geneva, Switzerland; and dried ongael leaves were extracted in heated water under reflux for three hours, three times and lyophilized at Chongbuk University, South Korea. This compound is wide-spread and has been shown to have anti-diabetic effects and here we look to develop cell lines for the first time in Palau in order to study the in vitro effects of the plant extract itself versus mangiferin. We added 50 mg of mangiferin into the cells and compared it to our positive control, glipizide. In this experiment, concentrations of mangiferin and Ongael leaves were tested on MIN6 cells to test their efficiency of stimulating insulin production. Preliminary results show fast- acting insulin secretion at 15 minutes that reduces after 60 minutes. Cell lines can be used to look at other possible local, cost-effective treatments for Diabetes Type II mellitus. In addition, Ongael and/or magniferin can be looked at as natural replacement/adjustment therapies. The next step in this work is in-vivo trials and product development.

Key Words: Palau, Diabetes Type II mellitus, magniferin

Food Habits and Source Assessment in Palau

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ABSTRACT

Palau has been introduced to different food sources and lifestyles within a single generation resulting in increased disease. In order to understand these food sources, we surveyed dispersed locations throughout Palau to provide us with necessary samples size. This data was used to see how and where food in households comes from, both imported and local. Initial interviews looked at general habits and then pamphlets were designed to audit meals for seven days; surveys were conducted at each hamlet in all 16 states of Palau aimed at a total of 20 households per state. The pamphlets also contained basic information and fun facts such as: normal health standards of blood pressure, Body Mass Index (BMI), HbA1C, Random Blood Glucose, and Cholesterol. It also contained Glucose and Diabetes Statistics in Palau and a diagram displaying recommended measurement times for eating in order to give respondents an idea of what they would be recording. Household map developed by PALARIS were used to survey the residential areas. Preliminary results show more than 70% reliance on outside foods and 50% reduced activity, included but not limited to farming and fishing.

These results will allow for a data driven assessment of food habits and effective measurement that will be provided to relevant government and non-governmental agencies to base policy making and national projects on sustainable development.

Key Words: Palau, Food Security, Sustainable Development, Health

Invertebrate Biodiversity in Palau

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Palau Community College, and Larry Wakakoro, Palau Community College, Upward Bound Program
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ABSTRACT

Palau is a biodiversity hotspot. The economy is based on tourism that is dependent on this biodiversity culture. In order to assess and understand this biodiversity, many specimens have been collected from coral rubble for genetic analysis. Rubble samples were collected, at multiple sites throughout Palau, and specimens were photographed and categorized and stored in jars with 70% ethanol. These specimens were dissected and DNA was extracted. The samples were sent of for sequencing and to date more than 7000 specimens have been collected; 3000 of which have been extracted and approximately 800 have been properly identified from 5 different Genus. Our results show increased species diversity for Palau's site based invertebrate populations. Future surveys for the biodiversity will be conducted to measure changes over time and the majority of samples should be completed by 2018. This work is important to understanding biodiversity by measuring biodiversity of non-migratory species in order to gauge the health of the oceans and may act as another was to measure effects of severe weather and climate change.

Key Words: Palau, Biodiversity, Invertebrates

2018 Abstracts

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Determining How Sec10 and the Exocyst Complex Regulate Ureter Development

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ABSTRACT

The exocyst trafficking complex is used to direct polarized exocytosis of certain intracellular vesicles to the plasma membrane and the establishment of epithelial cell polarity. The Sec10 protein is a central component of the exocyst complex and loss of Sec10 results in degradation of the entire exocyst complex. Our lab has shown that Sec10 knockout in mouse ureter epithelial cells during embryonic development causes an obstruction in the ureteropelvic junction (UPJ), where the kidney transitions into the ureter. This obstructions prevents the outflow of urine from the kidney and is neonatal lethal in these mice. We have also shown that the first microscopic sign of these UPJ obstructions in Sec10 knockout mice occur when the ureter epithelium shows widespread cell death at embryonic stage 17.5 (E16.5), although we hypothesize that molecular changes occur earlier. The purpose of this study is to follow up genomic analysis by performing qPCR gene expression measurement in Sec10 knockout and control ureters at E16.5 to identify abnormal cell signaling which may underlie the observed cell death. We have measured abnormal expression of several genes associated with epithelial cell stress in mutant ureters, which could represent candidate genes in the analogous human disease. This work has clinical significance because UPJ obstructions occur in approximately 1 in 2,000 births and are the leading causes of hydronephrosis (kidney swelling due to urine accumulation) and congenital obstructive nephropathy (CON) in infants.

Keywords: Sec10, exocyst complex, ureteropelvic junction obstructions, epithelial cells

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Protective Effects of Insulin in Cardiomyocytes Against Iron-mediated Cell Death

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ABSTRACT

When an acute myocardial infarction (MI) occurs, the heart becomes ischemic. Medical treatments such as stents have improved the recovery process after a MI, but there is still a high risk for heart failure. Due to the resulting intramyocardial hemorrhage, residual hemoglobin with excess iron compromises cardiomyocyte (CM) survival. Previous studies suggest that the magnitude of CM cell death is directly proportional to the level of adverse left ventricular (LV) remodeling. Mechanistic target of rapamycin (mTOR) is a key downstream signaling pathway that is sufficient for CM cell survival against iron and responds to insulin, a cardioprotective growth factor. However, the effect of insulin in excess iron-induced cell death in CMs is not well characterized. Using H9c2 cardiomyoblasts, originally derived from embryonic rat ventricle cells, the effects of insulin in CM cell survival against excess iron were examined. The cells were pre-treated with varying dosages of insulin before applying iron(III) citrate. Cell viability was assessed by Live/Dead Assay, in which live cells stain with calcein AM (green) and nuclei of dead cells stain with ethidium homodimer-1 (red). In comparison to the amount of cell death caused by iron alone, insulin decreased dead cell count substantially. The greatest concentration of 1μM of insulin with iron resulted in a statistical significance of $p<0.02$ ($n=3$-4). The results indicate that insulin has the potential to mediate iron-induced CM death. Understanding the effect of insulin as a combatant of iron-induced cell death with an intramyocardial approach would lead to better therapeutic preventions of heart failure.

Key words: Myocardial infarction, LV remodeling, Intramyocardial hemorrhage, Cardiomyocyte, mTOR, Insulin

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Exosomes: A Novel Zika Virus Vaccine Candidate

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ABSTRACT

With the recent emergence of Zika virus (ZIKV) diseases, increasing global concern has driven the demand for a vaccine. One promising vaccine platform has presented itself in the form of exosomes: a subgroup of extracellular vesicles released by many human cell types that facilitate intercellular communication. The objective of this study is to engineer exosomes that incorporate ZIKV structural proteins into its phospholipid bilayer. Previous studies indicate that CD9 and CD63 proteins are highly enriched in exosomal membranes. From this, it was hypothesized that attaching ZIKV genes to CD9 or CD63 to produce a gene fusion may enable exosomes to act as antigen-presenting vesicles. These engineered exosomes may potentially stimulate T-cells to mount a strong immune response. The cDNA of the CD9, CD63, and the highly immunogenic ZIKV genes (envelope, precursor membrane, and NS1) were generated using RT-PCR. These products were used as a template for regular PCR, and cloned into pcDNA3.1/V5 vector. The chimeric gene fusion was assembled using the Gibson assembly kit, and transfected into human embryonic kidney epithelial (HEK293T) cells for expression. The exosomes were purified from the supernatant and subjected to immunoblotting and immunofluorescence assays to confirm the presence of ZIKV proteins.

The results of this study are pending at the time of this abstract submission. A future study will be conducted using an in vitro activation assay to determine if the engineered exosomes induce T-cell activation. The potential candidates will be used in an animal study for immunity against ZIKV infection.

Key Words: Zika Virus, Vaccines, Exosomes, Antigen-presenting vesicles

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Species Richness of Native Plants in Protected Areas

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ABSTRACT

Non-native species (NNS) are species introduced into a new ecosystem by deliberate or accidental transportation. NNS can alter fundamental ecological properties, such as the dominant species in a community, an ecosystem's physical features, nutrient cycling, and plant productivity. In some cases, NNS are serious and ongoing causes of species decline and habitat degradation. NNS often thrive with the help of human disturbance and, minimal or no predator or parasite impacts in their introduced range. Because humans (via farming, grazing, logging, etc.) have not heavily altered the wet plant forest community within the National Park of American Samoa (NPSA) we expect native species to exceed non-native species richness on average within the park.

To test this hypothesis we measured spices richness of native and non-native plants in standard quadrants randomly placed throughout the park on the islands of Tutuila and Ta'u. A total of 29 plots were sampled on Tutuila and 12 plots on Ta'u Island. All species within each 50m x 20m plot were enumerated and identified as native or non-native. This years' sampling is ongoing, so the data analyzed here is from 2013 sample.

The plots surveyed back in 2013 on Ta'u formed 29.3% of the NPSA plots. While Tutuila formed 70.7% of the plots surveyed. The survey on Tau showed the area is dominated by 89.4% (474) native species, 8.9% (47) non-native species and 1.7% (9) unknown species. While the survey on Tutuila showed that the area is dominated by 89.1% (1,334) native species, 9.3% (140) non-native species, and 1.6% (23) unknown species. The data supports the hypothesis that areas not heavily altered by humans are rich in native species.

Key words: Non-native species, species richness, human disturbance

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Causes to the Decreased Population of Fruit Bats on Tutuila

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ABSTRACT

The Pteropus samoensis and Pteropus tonganus are the only two native flying foxes found in the tropical pacific U.S territory of American Samoa. Flying foxes are considered valuable species in tropical ecosystem because of their role as important pollinators and seed dispersers. Previous research suggests possible causes of population decline of these species is possibly caused by over hunting, habitat destruction, and natural disasters.

Historically, surveys have been conducted to monitor the population of flying foxes on the island of Tutuila. The populations decline is being assessed using roosts counts that are conducted around the island. Several roost sites on Tutuila Island that are traditionally monitored by the Department of Marine and Wildlife Resources were selected for this study. Roost count observations were conducted to count bats of each roost with binoculars used for identification. The behavior of nocturnal native fruit bats has changed significantly including being seen in greater numbers during the day opposed to the night.

The population of the two flying foxes was evaluated based on surveys of roosts on roosts sites conducted in several parts of the island including different native trees. Future surveys should focus on using different tools of monitoring, time of day, and interviews of local villagers. The study is still ongoing and the results will be discussed and presented at a further date, however there is preliminary evidence of impact from hunting pressures, habitat destruction, and effect of natural disasters that provides a clearer understanding of the decline of fruit bat populations in American Samoa as well as direction of future management of protection of fruit bats from extinction.

Key words: Pteropus samoensis, Pteropus tonganus, flying foxes, habitat destruction

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Smart Irrigation Scheduling for the Conservation of Water in American Samoa

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Abstract

One of the projected effects of climate change in American Samoa is decreased rainfall during the dry season. Irrigation of vegetable crops will become more important during these low rainfall periods. Currently, due to inefficient irrigation scheduling, crops either do not receive enough water for optimum growth or excess water is lost to evaporation, or percolation below the rootzone. This project will provide information that will be used to develop a web-based smart irrigation schedule program for pak choi in American Samoa. Smart irrigation scheduling will reduce water waste and leaching of fertilizers into ground water, while optimizing yield.

Five crops of drip tape irrigated pak choi were grown in American Samoa. Data on root depth and canopy coverage were collected two times every week while data on weather was collected on a daily basis. Using this data, and information about soil and crop type, the amount of water needed by this crop at each stage of it growth for optimum growth was calculated. This is the objective of our project. The study is ongoing and results will be presented at a further date when ready.

This information along with daily weather station information of rainfall and evaporation will be used by our partners at the University of Hawai'i to develop a web-based program that will advise farmers on how much water should be applied daily depending on the weather and crop growth stage to obtain optimum yield and reduce waste of water or loss of nutrients to the environment.

Key words: Water, conservation, smart irrigation

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Removal of Harmful Bubble Algae and the Determination of Its Cause at Ofu Island's Southern Reef Flats

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ABSTRACT

In August 2017, the National Park of American Samoa discovered a growth of harmful bubble algae, later found to be Valonia fastigiata, within Ofu island's pristine reef flats, possibly caused by high nutrient levels within the reef. This project is aimed at determining the source of these nutrients, and determining if our removal method is effective against the algae bloom. We hypothesize that the nutrients emanating from the shores of Vaoto Poolmay originate from the Airport, Vaoto Lodge, or the Ranger Station. We also believe that our method will be effective to control the algae outbreak.

The algae impacted areas will be mapped. So far, this algae has been found in in the Vaoto Pool, Pool 300, and Pool 400 on the south side of Ofu Island. To determine the source of the nutrients, a CTD will be pulled from Vaoto Pool to Pool 400 to establish where the feshwater inputs are occurring. At these sites, water samples will be collected and tested for nitrate, ammonium, and phosphorus. Before removing V. fastigiata from Ofu, six test sites will be created at Olosega (three on each side of the ava), to test our removal strategy. At each site, two temperature loggers will be installed, water quality samples will be collected, and photoquadrats will be taken. These test plots will assess three main points: (1) how long it will take to remove the algae, (2) how fast it will grow back, and (3) how effective our method is. Depending on rate of algae regrowth, this method may then be implemented on Ofu's coral reefs.

Results are pending at the moment. Since there are very few studies done on V. fastigiata, our results will benefit not only our island's "bubble algae" outbreak response, but also assist other neighboring areas with similar problems.

KEY WORDS: coral reefs, Ofu, harmful bubble algae, nutrient enrichment

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Determination of Total Phenolics and Antioxidant Activity in Colocasia esculenta

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ABSTRACT

Medications, both pharmaceutical and herbal, are used to treat many health problems from minor headaches to lethal cancer. Much research is to find bioactive plant compounds to replace pharmaceutical drugs. Colocasia esculenta (taro) leaves are used in traditional medicinal remedies with abating degenerative diseases and beneficial properties, such as preventing cancer, reducing cholesterol levels, and lowering high blood pressure. The hypothesis of this study is that taro leaves have high level of antioxidants that quench free-radicals that cause degenerative diseases.

The objective of this study is to determine the phenolic spectrum of taro leaves and indicate that they contribute to antioxidant activity. The taro leaves were collected on Guam, lyophilized, and pulverized into powder. The leave powder (2 g) were extracted with 20 ml of methanol. The total phenolic content and antioxidant capacity were determined using spectrophotometric methods. Gallic acid was used to determine a standard curve for total phenolic acid content. These results would exhibit a positive linear correlation and identify Colocasia esculenta as a natural source of antioxidants with potential value for medicinal use. We aim to expand the knowledge of local foliage used in traditional remedies as a replacement for pharmaceutical medicine.

KEY WORDS: total phenolics, antioxidant activity, free-radicals, degenerative processes

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Substance Use Among Participants in the Pacific Islands Cohort of College Students (PICCS), 2016

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ABSTRACT

Substance use remains a concern amongst young adults. The national prevalence of substance use among college students is 5% for marijuana use, 32% for binge-drinking, and 41% for intoxication in the past month. The purpose of this project is to estimate the prevalence of substance use among college students in Guam, and to determine if differences exist by gender, student level, and stress level.

Secondary analysis was performed on data gathered from the 2016 Pacific Islands Cohort of College Students (PICCS), which was approved by an ethics review committee (CHRS #16-83). The Guam PICCS measures a variety of health indicators among a cross-section of students enrolled at the University of Guam. For this analysis, the data collected from 417 college students included the following health indicators (and measurement method and unit of analysis): stress (20-question tool: high stress versus average/low stress), areca/betel nut and tobacco use (Guam BRFSS tool: chewers versus non-chewers), smoking (Guam BRFSS tool: smokers versus non-smokers), medical marijuana and e-cigarette use (Guam BRFSS tool: users versus non-users), and alcohol use (Guam BRFSS tool: drinkers versus non-drinkers, number of drinks).Ongoing analysis of the selected health indicators will include estimates of prevalence and mean, as well as comparisons by gender, grade level and stress levels.

The findings will provide an increased awareness of stress and substance use among college students in Guam. Planned awareness campaigns may be targeted to current college students and high school students entering the university.

KEY WORDS: Pacific Islands Cohort of College Students, substance use, betel nut use, tobacco use, alcohol use, e-cigarette use, medical marijuana use, stress level, mean.

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Painting the Pacific: A Comparative Analysis of the Lightfastness of Watercolors Made from Indigenous Plants in the Pacific Region

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ABSTRACT

Pacific Islanders have traditionally used plants and other natural resources to craft paints, dyes, and other colorants. However, much of society today has transitioned to more accessible, inexpensive colorants, which oftentimes contain toxic pigments and harmful solvents that can be detrimental to human health and the environment. This study will explore using phytochemicals of plants indigenous to the Pacific as safe, natural watercolor paints. The objective of this study is to test the lightfastness of watercolors made from roots of the langiti (Ochrosia mariannensis), roots of the ladda (Morinda citrifolia), cambium of the binalo (Thespesia populnea), and aerial roots of the kaffo' (Pandanus tectorius).

In this experiment, water-soluble pigments were extracted from the plant materials through solvent extraction, rotary evaporation, and freeze-drying. The extracted compounds were then bonded to a colorless mordant, potassium aluminum sulfate, through chemical precipitation. The resulting lake pigment was then dried and made into traditional natural watercolors using a mixture of gum arabic and honey. To test for lightfastness, natural watercolors and name-brand ASTM compliant watercolors were subjected to an accelerated UVA exposure test for 14 days. Furthermore, sections of the color swatches were covered to analyze color intensity without exposure to UVA light. Color differences were measured in CIE L*a*b* coordinates in two-day intervals using a spectrocolorimeter. Data obtained from the triplicated samples were compared by analysis of variance and mean and standard deviation were calculated.

Research is currently being conducted and results will be examined and published at a later date.

KEY WORDS: Pacific, pigment, watercolor, Ochrosia mariannensis, Morinda citrifolia, Thespesia populnea, Pandanus tectorius, lake pigment, lightfastness

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The Use of Areca Nut on Saipan and its Correlation to Oral Cancer

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ABSTRACT

Betel Nut, also known as the Areca Nut, is the seed of an Areca Palm that is grown and consumed all over the Western Pacific Islands. Betel Nut is believed to be a cultural tradition that continues to be adopted by the youth, often wrapped in Piperaceae and chewed with tobacco and crushed limestone (lime). The World Health Organization has classified Betel Nut as a carcinogen, therefore making it a threat to the health of the community, especially when chewed with tobacco. An upsurge in the usage of Betel Nut and tobacco in the Western Pacific has deemed oral cancer an evolving epidemic. The Commonwealth Healthcare Corporation and other community organizations in the CNMI have established outreach programs through the Non-Communicable Disease Bureau to combat the intensification of Betel Nut usage and bring awareness towards this issue. In addition, they have taken steps to begin training individuals to conduct Brief Tobacco Interventions. However, these trainings can only be implemented if Betel Nut and tobacco users are willing to accept change. Through this study, Community Readiness for Change Assessments will be conducted on Saipan to evaluate the level of readiness that community members and leadership possess in regards to Betel Nut use with tobacco, lime, and Piperaceae among the ages 14-18. The results from the assessment will then be compared to data gathered from the Public School System (PSS) on how many referrals/infractions for Betel Nut usage exists in the high schools, and from the CHCC Dental Clinic on how many students received oral cancer screenings and have been found with lesions. All qualitative and quantitative data gathered will be used to inform community members and leaders on how big an impact Betel Nut use is between the ages of 14-18. The data will also assess where the Saipan community is in terms of available services and education, form suggestions on how to reduce the burden of oral cancer through primary prevention, and establish possible interventions at an island-wide level.

KEY WORDS: Betel-Nut, tobacco, Community Readiness Assessments

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Determining the relationship between green sea turtle nest depth and their hatching success rate in the CNMI

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ABSTRACT

Green sea turtles are an endangered marine species. Every year, green sea turtles visit the CNMI to lay their eggs. Before they lay, however, they must dig a nest for their eggs. One turtle can create anywhere between 2-9 nests per season. The CNMI's Sea Turtle Program monitors turtle nest sites and takes an inventory for every nest they find within the season. The nest inventory data collection began in 2006 and is ongoing. This study will analyze the nest inventory data collected from the islands of Saipan, Tinian, and Rota from 2009 until early July of 2018.

This study will determine the relationship between the depth of the nest and the hatching success rate of green sea turtles in the CNMI. In examining the type of relationship between the depth and the hatching success rate of the nest, it is hypothesized that a linear model will best represent the association between the two variables. A linear, logarithmic, polynomial, and exponential regression will be tried on the data to determine the line of best fit.

The study and research are ongoing. The results and conclusion will be discussed and exhibited at a later date.

KEY WORDS: Green sea turtle, nest, regression analyses

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Common Eradication Techniques Used in the Pacific Islands for Coconut Rhinoceros Beetle

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

The coconut rhinoceros beetle, Oryctes rhinoceros, is a pest discovered in Samoa in 1909 and has spread to the islands of Palau, Fiji, Tonga, Guam and Rota. This pest has become an enormous threat to coconut trees, oil palms, and also attacks other palm species. The damage it causes in many of the coconut trees when it bores in the center of the crown and feed on the sap and/or coconut leaves has led to the increasingly amount of trees that had to be cut down or trimmed. Because it has spread to more islands, eradication techniques are crucial. We focused more on discovering which of the two common eradication techniques is most efficient on containing the coconut rhinoceros beetle pest.

Two techniques that have been used in the Pacific Islands is the Tree Bow Tie method and Tekken Netting traps. We tested both methods by assembling a total of 14 Tree Bow Tie traps and 16 Tekken Netting traps. We hypothesize that the Tekken Netting traps would be a more effective eradication technique because these traps contain pheromones and bright LED bulbs that could lure in the coconut rhinoceros beetle. At the conclusion of this study, our goal is to obliterate the continuance of the coconut rhinoceros beetle or see a successful progress on the containment of this pest.

KEY WORDS: Oryctes rhinoceros, Eradication Techniques, Tree Bow Tie, Tekken Netting, Pheromone

ACKNOWLEDGEMENTS

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Investigating the Effect of Air Conditioning on Radon

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ABSTRACT

Radon is an invisible and dangerous noble gas that seeps up from the ground. Breathing in too much radon may cause lung cancer. When a room is not ventilated properly and closed up for a long time, it can lead to dangerous amounts of radon filling up. Radon is everywhere around us, and any amount of radon may be dangerous. In order to lower the threats from radon, rooms must recirculate fresh air. The average radon level outside is 0.4 pCi/L (picocuries per liter). the recommended radon level in a room is under 4.0 pCi/L. As the use of air conditioning increases, the need to open windows is no longer a necessity. The aim of this study is to justify whether or not air conditioning lowers radon level. The study's hypothesis is that air conditioning will lower the radon level.

This study will conduct two rounds of experiments at Marianas Baptist Academy. The radon in the rooms will be measured by a tool called the E-PERM. Electrets that collect ions and act as an ion sensor will be placed in three rooms for four days. Doors must remain shut during the four days. The first round will be managed in an environment where no air is entered into the room. The second round will be in an environment where air conditioning occurs. After each round, the electrets will be placed on a SPER reader to measure the voltage. The voltage will then be used to calculate the radon concentration in units of pCi/L.

The study is ongoing and the results will be discussed and presented at a further date.

KEY WORDS: Picocuries per liter, E-PERM, electret, SPER reader, and radon concentration

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Effect of Food Consumption on Electrocardiogram Response (EKG) in Young Adults

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ABSTRACT

Electrocardiography is used to measure and record electrical and rhythmic activity of the heart through the utilization of electrodes. Electrocardiograms (ECG or EKG) are studied in order to determine sign of heart enlargement. This method has been of severe importance in the medical field, as it provides indicators of heart abnormalities. In studying the effect of food consumption on the ECG, it is hypothesized that a noticeable change in ECG levels, specifically T-waves, will be evident upon food intake. This would allow further insight of the effect of certain tasks, such as eating, on the ECG and will aid in the identification of heart behavioral patterns.

The study is designed to have obtained data at different time periods, with the population centered around young adults. The 20 subjects of this experiment, 10 male and 10 female, are to have fasted 8 hours before the provided standardized meal. In the 4.5 hours after, data was to be collected using the Vernier LabQuest EKG Sensor every 1.5 hours. Upon data retrieval, the results will be portrayed through statistical analysis which will be provided at a later time.

It is expected that upon food consumption, each individual would have exhibited a noticeable and indentifiable change in ECG levels during the post-meal investigation. It is predicted that there would be no significant difference in the comparison between both genders portrayed in the study. The study is ongoing and the results will be discussed and presented at a further date. The work is still in progress.

KEY WORDS: Electrocardiogram, food consumption

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Gonococcal Isolate Surveillance Project

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ABSTRACT

Gonorrhea (Neisseria gonorrhoeae) is the second most reported notifiable disease in the United States and the Commonwealth of the Northern Marianas Islands (CNMI). Infections from gonorrhea (NG) are major causes of Pelvic Inflammatory Disease (PID) in the U.S. PID can lead to serious outcomes in women, such as tubal infertility, ectopic pregnancy, and chronic pelvic pain. In addition, epidemiologic and biologic studies provide evidence that Gonococcal infections facilitate the transmission of the Human Immunodeficiency Virus (HIV) infection. NG has progressively developed resistance to each of the antimicrobials used for the treatment of gonorrhea, such as Cefixime (an oral Cephalosporin antibiotic). Ceftriaxone (an injectable Cephalosporin) and Azithromycin are now the only dual therapy treatments recommended by the Communicable Diseases Center since 2015. The emerging threat of Cephalosporin resistance highlights the need for continued surveillance of NG antimicrobial susceptibility. The threat of Cephalosporin-resistant gonorrhea reinforces the need to better understand the epidemiology of gonorrhea. This project will focus on researching online scholarly articles and interviews about why antibiotic-resistant NG is a problem, experience in developing standard operating procedures, hands-on laboratory experience in sample collection and culture, and possibly testing a culture of gonorrhea specimen that has already been collected and kept viable in the Commonwealth Health Center Laboratory to explore antibiotic-resistance in the CNMI.

KEY WORDS: Neisseria Gonorrhoeae, Pelvic Inflammatory Disease, Antibiotic Resistant

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Coconut Production for Food Security, Economic Development, and Health: A Comparative Study of two communities in Pohnpei, Federated States of Micronesia

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ABSTRACT

Coconuts (Cocos nucifera) have been beneficial on many Pacific islands for centuries, including the island of Pohnpei. There is a current effort in Pohnpei to more fully explore the potential of coconuts in raising living standards of the local people. This study explores the status of coconut production in two communities of Pohnpei - a community on the main island of Pohnpei and one on the outer atoll of Ngatik. It is hypothesized that coconut-related activities are less intensive on the outer islands due to a lack of marketing opportunities.

This study involves interviewing community members and 40 households that grow coconuts - 20 from the main island community and 20 from the outer island community. In addition, coconut trees and nuts in the two communities will be characterized according to internationally recognized procedures. Data will also be collected to assess the importance of coconuts for food security, economic development, and health.

Data collected so far clearly indicates that coconut indeed plays a significant role in the livelihood of the two communities. However, these data show that it is not true to say that coconut plays a more significant role on the main island. Hence, the hypothesis is rejected.

In conclusion, even though there is less sale of coconut in the outer island, the local outer islanders use a substantial amount of it in other ways especially as human food and drink, and animal feed. This shows that they should also be seriously engaged in coconut development activities.

KEY WORDS: Coconuts, food security, economic development, health, Pohnpei, Federated States of Micronesia

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An Assessment of the Level of Awareness among Adults in Pohnpei, Federated States of Micronesia Concerning Skin Cancer

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ABSTRACT

Skin cancer is a cancer that arises from the skin due to the development of abnormal cells that have the ability to invade or spread to other parts of the body. The leading cause is too much exposure to ultraviolent (UV) radiation from sunlight. UV can penetrate and change skin texture causing the skin to age prematurely and can lead to skin cancer. There are three most common types of skin cancer; basal cell carcinoma, squamous cell carcinoma, and melanoma. Basal and squamous cell carcinomas are highly curable but treatment is expensive. Melanoma is a more dangerous type and it is the cause of most skin cancer deaths. Pohnpeian people have much exposure to sunlight and may not aware of the risk of developing skin cancer. The aim of this study then is to assess the level of awareness among adults in Pohnpeians on skin cancer. This study hypothesize that Pohnpeian people have limited awareness on the causes of skin cancer. Data is collected from a randomized survey of a minimum of 50 young adult participants of ages 18 to 60 to assess the level of awareness on the causes of skin cancer. The survey is on-going and results will be analyzed at the end of the study. The outcome expected should demonstrate the little awareness on the causes of skin cancer among the adults in Pohnpei and that are at risk of getting skin cancer. The findings will be used by the Pohnpei Public Health outreach programs.

KEY WORDS: Basal cell carcinoma, melanoma, skin cancer, ultraviolet (UV)

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A Study on the Relation of Acanthosis Nigricans with Type 2 Diabetes Mellitus and its Potential Screening Tool Use Among Diabetics in Pohnpei FSM

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ABSTRACT

In less than 50 years, the population of Pohnpei in the Federated States of Micronesia [FSM] has gone from having no diabetes a prevalence of 43%, according to a WHO survey. It is therefore not surprising that type 2 Diabetes Mellitus [T2DM] and its complications account for considerable use of the state's meager resources. Given this burden of disease, a sensitive, safe, and inexpensive screening test is needed so that interventions can be instituted earlier. Acanthosis nigricans (AN) has been recommended as a suitable tool for such screening, as its association with T2DM, insulin resistance and obesity is well established. However, the prevalence of AN varies greatly in different ethnic groups and any recommendation for its use must be relevant to the population for which this is intended.

The objective of this study is to evaluate the association between AN and T2DM and to determine the role of AN as screening tool for T2DM with anthropometry and other risk factors in the Pohnpei State, FSM. One hundred consecutive subjects with T2DM attending the diabetes clinic at Pohnpei Division of Public Health were considered as cases and 100 age and sex matched healthy attendants of non-diabetic subjects as controls. All the cases and controls were screened for the presence of AN and its severity. Anthropometric measurements of all of them were measured in standard method.

The study is ongoing and the results will be discussed and presented at further date. The work is still in progress. Acanthosis nigricans has been associated with increase insulin resistance, hyperinsulinemia, and obesity. Initial data gathered shows a correlation between AN and T2DM and the potential for AN to be used as a screening tool for T2DM

KEY WORDS: Acanthosis Nigricans, Type 2 Diabetes Mellitus, insulin resistance

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Pacific Islands Cohort on Cardiometabolic Health

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ABSTRACT

Pacific Islanders experience some of the highest mortality rates resulting from non-communicable diseases (NCD) in the world. Cardiovascular disease [CVD] and diabetes are among the leading causes of NCD deaths. Published works on CVD and diabetes in the Pacific have been limited to the assessment of programs and systems. While the determinants of CVD and diabetes, including cardiovascular risk [CR] factors, have been studied extensively elsewhere. The objective of this study is to collect data on NCD lifestyle determinants from two generations, child and parent [n=100] of families living in Pohnpei. From the data collected, we aim to estimate the prevalence of NCD lifestyle determinants among study participants. Children will be randomly selected from the different communities in Pohnpei. Children with a willing parent, to form a dyad, will be invited to participate. We hypothesize that the prevalence of NCD lifestyle determinants will be different (better or worse) across generations. We also hypothesize that children's behaviors will be more like their parent's behaviors than those of other adults. This research will adopt the protocols for assessing cardiometabolic risk recommended by the Cardiometabolic Risk Working Group. A screening will be done to assess cardiometabolic risk factors, including waist circumference, body mass index [BMI], blood pressure and basic medical markers such as random blood glucose, glycated hemoglobin (HbA_1C), Total Cholesterol [TC], High Density Lipoprotein [HDL], and Low Density Lipoprotein [LDL] using Cobas c311. Blood pressures will be assessed in a routine prescribed manner with ADC sphygmomanometers. The significant contribution of the study is the baseline of an epidemiologic cohort of Micronesian populations, an underrepresented and understudied group in population health research. The data collected will be among the first to look at health indicators across generations of USAPI populations, will provide critical information on biometric thresholds among USAPI populations, and provide the information needed to identify (or not) Pacific Islanders as a screening criterion for dyslipidemia and dysglycemia.

KEY WORDS: Cardiometabolic Health, Non-communicable diseases, dyads

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An Assessment of the Level of Awareness among Adults in Pohnpei, Federated States of Micronesia Concerning Leukemia

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ABSTRACT

Leukemia is a cancer of the bone marrow and blood with common symptoms of weight loss, fever, feeling tired, loss of appetite and bleeding. There are 4 types of leukemia: acute lymphocytic leukemia (ALL), acute myelogenous leukemia (AML), chronic myelogenous (CML), and chronic lymphocytic leukemia (CLL). In Pohnpei, people are often unaware of having leukemia until they are diagnosed at a very advance stage. It has become one of the most serious health problems in Pohnpei. US Affiliated Pacific Islands (USAPI) database reports that during the years 2007-2012, there were 124 leukemia cases registered. 4 out of 124 of these cases were from Pohnpei. While Pohnpei Public Health shared that reported cases of leukemia are on the rise since 2012, assessment on adult awareness has not been conducted in Pohnpei. This study will examine the level of awareness among adults of Pohnpei to demonstrate the need for education and awareness on leukemia. The study's hypothesis is that young adults in Pohnpei have very limited knowledge on leukemia as compared to older adults.

Responses from a randomized survey of a minimum of 50 participants will be used to assess the level of awareness from among at least 25 from each gender with ages ranging from 18 to 60 years old. This study is on-going and the expected outcome will come from analyzing the surveys in the future. It is expected that the findings will be used as a basis of information to assist the Pohnpei Public Health intervention and outreach programs.

KEY WORDS: Leukemia

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Effect of Supplementary Feeding on the Growth and Survival of Sandfish Sea Cucumber (Holothuria scabra) Juveniles in Floating Hapa Nursery System

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ABSTRACT

The US-Affiliated Pacific Islands of the Federated States of Micronesia, Republic of the Marshall Islands, and the Republic of Palau are homes to several commercially important species of sea cucumbers, including the Sandfish sea cucumber Holothuria scabra. Due to their commercial importance, they have been widely exploited and are in the danger of being extinct. The College of Micronesia Land Grant Program has undertaken the development of hatchery-based sea cucumber farming technology for local community-based economic development, future commercialization and aiming at restocking this depleted species in the wild.

In this regard, an experiment was conducted in ocean floating Hapa net enclosures to find out if there is any significant difference in the growth (length and wet weight) and survival of hatchery produced sandfish sea cucumber Holothuria scabra juveniles daily fed a mixture of seaweed, mud, fish meal, and Spirulina in addition to the natural food (algae) growing on the Hapa net enclosures. The control juveniles grazed on algae naturally grown on Hapa net enclosures (nursery system II). Pre-measured and weighed sandfish juveniles were stocked at 50 pieces in 4 Hapa net enclosures, 2 for each treatment. Specific water quality measurements (i.e. temperature, pH, and salinity) were taken on a daily basis to monitor the physiochemical properties of the rearing water.

The experiment was set for a time span of 45 days, results of which are pending at the time of abstract submission. Findings will be tabulated, analyzed, and discussed at the end of July, where surviving juveniles will be collected for their final data.

KEY WORDS: Holothuria scabra, sandfish sea cucumbers, over exploitation, marine life, aquaculture, nursery, juvenile

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Preliminary Assessment of Growing Oyster Mushroom, Pleurotus sajor-caju, on Coconut Husk Substrate Supplemented with Different Amounts of Copra Cake

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ABSTRACT

Mushroom cultivation is a newly introduced technology in the Marshall Islands to promote food security and community health due to its soluble fiber content and nutritive values. Mushroom is also known to have naturally occurring beta-glucans that could prevent high cholesterol and some other non-communicable disease (NCDs). Majuro Atoll has an ample amount of coconut husk and copra cake, a by-product from Tobolar Copra Processing Plant. The study aimed to assess the possibility of using copra cake for mushroom cultivation.

The capability of oyster mushroom in utilizing coconut by-product was assessed in terms of mycelial growth, number of fruiting body, cap diameter and biological efficiency conversion (BEC). The mushroom growing media used for this study were composed of shredded coconut husk, dolomitic lime, brown sugar and varying amounts (0%, 5%, 10%, 15%, 20%, 25%) of copra cake with 45-60% moisture content. It was hypothesized that copra cake supplementation will increase production yield. Treatments were distributed in 10 replications and data were analyzed using the Duncan's Multiple Test Range at 5% level of significance.

Mycelial growth occurred in all treatments in the following order: 10%> 0%, 5%, 15% >20% >25%. Thin mycelial growth occurred at 0%, and slowest growth was observed for 25%. Fruiting bodies did not take place for treatment without copra cake supplementation (0%). The overall growth performance was observed to be very favorable at 10% copra cake supplementation. This result suggests that coconut husk supplemented with the right amount of copra cake could be utilized effectively as locally available materials for mushroom cultivation.

KEY WORDS: mycelial growth, supplementation, mushroom cultivation, copra cake

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Growth Performance of Kangkong, Ipomoea aquatica, on Spent Mushroom Compost and Other Soil Amendments

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ABSTRACT

Marshall Islands relies mostly on imported vegetables. This situation creates a problem by limiting fiber intake that could lead to the acquiring of non-communicable diseases (NCDs). Enriching atoll soil with additives could increase local vegetable production. Kangkong is one of the most common green vegetables in the Island. The study aimed to assess the effect of spent mushroom compost (SMC) on the growth performance of Kangkong in comparison with other soil additives. It was hypothesized that SMC will be as effective as commercially available fertilizer and soil additives.

There were five treatments used for this research, namely: atoll soil (control), atoll soil (AS) with NPK (16-16-16) fertilizer and 3:1 proportions of AS + chicken manure, AS + potting mix, and AS + SMC. To compare the effectiveness of each soil treated with different additives, growth of Kangkong was assessed in terms of plant height, leaf width and marketable weight. Kangkong plants were grown in pots for 30 days. Treatments were distributed in 10 replications using Randomized Complete Block Design. Mean values were statistically analyzed at 5% level of significance.

The overall pattern of growth showed SMC has the highest growth performance followed by NPK chicken manure and commercial potting soil. Poor growth was observed in atoll soil with no soil amendment. Significant difference was found in using SMC compared to amending atoll soil with NPK, chicken manure or commercial potting mix. Results suggest that waste material from mushroom cultivation could be utilized effectively as compost fertilizer to grow vegetables.

KEY WORDS: spent mushroom compost, growth performance, soil amendment sustainability

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What is Impeding Diabetic Health Outcomes in the Marshall Islands

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ABSTRACT

Diabetes is a serious but manageable disease. It is one of the most common, chronic diseases in the world. Diabetes in the Marshall Islands affects a shockingly high number of people. There are two main types of diabetes: Type I diabetes and type II diabetes mellitus (DM). In this project, researchers focus on type II diabetes mellitus, the leading cause of premature death in the Marshall Islands. The prevalence rates range from 20%-50% of the population of adults in the Marshall Islands.

This research will analyze the internal and physical health barriers encountered by Marshallese adults with type II diabetes. The team hopes to find out what specific problems are faced by Marshallese adults with type II diabetes. The researchers hypothesize that there will be some easy solutions as to why Marshallese adults with type II diabetes are facing internal and physical barriers to diabetic self-management, and that there will be some findings that have much more complicated solutions. The team hypothesizes findings will show some of the barriers to better quality of life with diabetes facing this population to be related to dietary changes and lack of transportation to the hospital for check-ups. Methods are 6 focus groups of adults aged 18 and over from 3 neighborhoods in Majuro Atoll (n= 60). Each focus group consists of 10 males or females answering specific questions in Marshallese, which will then be translated into English for data analysis. The team will disclose the results of this research study later on.

KEY WORDS: Marshall Islands, type II diabetes (DM), diabetic self-management.

ACKNOWLEDGMENTS

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Food Habit Changes in the Republic of Palau

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ABSTRACT

Palau, along with the rest of the Pacific, has undergone a lifestyle transition that has resulted in great change. As a result of globalization, Palau has adapted different lifestyles and eating habits that have caused a rising level of obesity and diet related Non-Communicable Diseases. Changes in food habits over time have led to dependence on western foods and reduced physical activity leading to health issues in Palau.

In order to understand a person's eating habits and lifestyle, we conducted a survey in all 16 states of Palau using a geo-referenced household map developed by PALARIS. Our survey teams visited each household and the head of household had to fill out a questionnaire. The questionnaire information was used to rate how often they perform physical activity as well as where they acquire their food, whether local or imported. With this data, we did a Pairwise and Analysis of variance (ANOVA) between states from years 2014, 2017 and our current data to see if there are any changes.

The results of the Food Habits and Source Assessment Surveys concluded that more than 70% reliance on outside food and 50% reduced activity, which included food gathering activities such as farming and fishing. The questionnaires showed a slight increase in dependency, but also slight increase in activity in Palau. The surveys will provide a long-term guideline for change in lifestyle in Palau as well as give us effective measurements tool to develop policies and projects that promote healthy lifestyle and sustainable development.

KEY WORDS: Palau, Food Habits, Non-Communicable Diseases, Health

ACKNOWLEDGEMENTS

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Assessment of Coconut Rhinoceros Beetle Damage and Resistance in the Palau Archipelago

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ABSTRACT

The Coconut Rhinoceros Beetle (CRB), a.k.a. Oryctes rhinoceros, is an invasive insect that kills coconut trees and other palm species by feeding on the plant's crown. There is a confirmed presence of at least two biotypes of the CRB in Palau, Nudivirus (OrNV) resistant CRB-G versus all other CRB types. The resistant CRB-G has caused the devastation of palm trees throughout Southeastern Asia and Pacific. Multiple institutions across the globe have been working to help control and eradicate CRB.

In Palau, Damage Assessment Surveys were conducted on coconut trees at representative locations throughout all states in 2016, 2017, and 2018. Specialized traps were used along with manual searches through debris to collect samples as well. DNA analysis was used to determine distribution of CRB-G as well as incidence of Nudivirus infection in each sample.

The results of the Damage Assessment Surveys show slow recovery/reduced damage in coconut tree fronds. Furthermore, analysis of biotype and viral detection show a very high rate of infection of all CRB with the Nudivirus (CRB: 92%; CRB-G: 83%).

These findings lead to the preliminary conclusion that the OrNV in Palau's CRB is virulent. This is one of the largest collections and assessment in the region and the first sites where the resistant strain was found infected by the Nudivirus. Further assessment is necessary but immediate focus of all parties should be made to identify and test virulence of OrNV in Palau in order to control CRB for the region.

KEY WORDS: CRB, Palau, OrNV, Oryctes rhinoceros

ACKNOWLEDGMENTS

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Urothelial Cell Death in a Novel Mouse Model of Prenatal Congenital Obstructive Nephropathy

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ABSTRACT

Obstructions of the urinary tract during fetal development can cause congenital obstructive nephropathy (CON), which is the primary cause of chronic kidney disease and end-stage renal disease in children. The obstruction is commonly located at the ureteropelvic junction (UPJ), where the renal pelvis transitions into the upper ureter, and causes hydronephrosis. Severe cases of CON warrant surgical intervention and the underlying mechanisms are poorly understood. We have characterized a unique mouse model of prenatal CON that presents with severe bilateral UPJ obstructions, hydronephrosis, and anuria. Our mouse model genetically inactivates Sec10, the central subunit of the exocyst trafficking complex, in the developing urothelium. The urothelium is a stratified epithelium with a hydrophobic barrier that lines the kidney pelvis and lower urinary tract to prevent urine leakage into the interstitium. Based on previous studies, we hypothesized that in our mutant mouse ureters, the degradation of the urothelial barrier allows urinary damage to the underlying mesenchyme, inducing a fibroproliferative response that blocked the lumen. To test if the observed blockage can be caused by urothelial cell death alone, we ablated urothelial cells at embryonic day 16.5 in an inducible Cre driven diphtheria toxin transgenic mouse, and we histologically evaluated the kidney and ureters. We also administered potential therapeutic molecules in the Sec10-CKO timed mated pregnant female at E16.5 to test if we can improve the phenotype by preventing urothelial cell death or the fibroproliferative response. This work will give us more insight on CON and may lead to beneficial therapies.

KEY WORDS: congenital obstructive nephropathy, hydronephrosis, urothelium, ureteropelvic junction obstruction

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A Novel NanoLuc Split Luciferase Reporter Reveals Protein Interactions' Importance for Flavivirus Propagation

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ABSTRACT

Flaviviruses, such as West Nile Virus (WNV) and Zika Virus (ZIKV) are mosquito-borne RNA viruses that exploit the ER membranes of its host cell for the generation of unique compartments known as replication organelles (RO), which are used as sites for virus RNA synthesis and assembly. The localization of the viral non-structural (NS) proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, and NS5) to the RO are essential for virus propagation. Studies have shown that NS3 and NS5 must associate with the RO to promote efficient virus replication. How NS3 and NS5 are recruited to these compartments remain unclear. Thus, we intend to use the NanoBiT structural complementation reporter assay to characterize NS protein interactions. The NanoBiT® system is composed of two subunits, Large (Lg) BiT and Small (Sm) BiT, that are expressed as fusions to viral proteins of interest. ZIKV NS genes were cloned into plasmid vectors composed of LgBiT and SmBiT subunits and expressed in human epithelial cells, which mimic the primary target cells of ZIKV. The NS proteins that interact in vitro will allow the SmBiT and LgBiT subunits to form an active luciferase enzyme and generate a luminescent signal that will be monitored over time in live cells. The results from this study, that are currently pending, will identify which viral proteins bind to NS3 and NS5 to promote the association of these key viral proteins to the RO. Future studies will utilize this robust reporter assay to screen for inhibitors that disrupt the NS protein-protein interactions.

KEY WORDS: Flavivirus propagation, Replication organelles, Non-structural protein interactions, NanoBiT® system

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Gestational Weight Gain and Gestational Diabetes in American Samoa

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ABSTRACT

Gestational Diabetes (GDM) is a type of diabetes which only occurs during pregnancy around the second trimester (24 to 28 weeks gestation). A routine GDM screening test is an oral glucose tolerance test (OGTT). Several studies have shown excessive gestational weight gain to be associated with gestational diabetes. To determine whether there is a relationship between gestational weight gain (GWG) and gestational diabetes, we hypothesize that pregnant women with high GWG will most likely be diagnosed with gestational diabetes.

From June to August 2009, a total of about 600 electronic health records of pregnant women in American Samoa were reviewed and had documented weights, date of visits and GDM screening test results. Weight measurements from first, second, and third trimesters will be used to assess GWG. Participants with incomplete weight measurements from the three time points will not be included in the analysis. High GWG was defined as not following recommended gestational weight gain set forth by the American College of Obstetricians and Gynecologists. Chi-square tests will describe socio-demographic differences between pregnant women with "high" GWG and pregnant women with "normal" GWG, and to assess the relationship between GWG and GDM.

KEY WORDS: Gestational weight gain, gestational diabetes

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Indirect Effects of Little Fire Ants on Important Crops in American Samoa: Economic Damage from a Trophobiotic Mutualism

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ABSTRACT

The little fire ant, Wasmannia auropunctata, has been increasing in importance as an exotic pest in the tropics. It is native to South and Central America but has invaded many other areas including the Solomon Islands, Hawai'i, Vanuatu, and most recently, American Samoa. The little fire ant is known to form mutualistic relationships with sap-sucking herbivorous insects in which the ants protect these insects from their natural enemies in exchange for the honeydew they secrete. As a result, the presence of little fire ants may result in increased damage to these insects' host plants due to higher populations of the sap-sucking insects. The melon aphid, Aphis gossypii, and the taro planthopper, Tarophagus proserpina, are sap-sucking pests of important crops in American Samoa, including cucumber and taro. We here test the hypothesis that the little fire ant's invasion of American Samoa could harm taro and cucumber production due to the ant's tending and protecting melon aphids and taro planthoppers on these crops.

To test our hypothesis we planted cucumber and taro in a little fire ant infested area and excluded ants from half of the plants. By comparing pest numbers and plant growth under the two treatments (with and without little fire ants) we can assess the indirect effect of the ants on plant growth via the ants' trophobiotic relationship with these two sap-sucking plant pests.

The results of this study may be useful to farmers managing these taro and cucumber pests in little fire ant infested areas of American Samoa.

KEY WORDS: Tarophagus proserpina, Aphis gossypii, Wasmannia auropunctata, trophobiosis, mutualism, taro, cucumber

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Septic Tanks as a Possible Source of Disease-Carrying Mosquito Species in American Samoa

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ABSTRACT

Since the early 1900s, American Samoa has experienced outbreaks of mosquito-borne virus diseases. The frequency of these outbreaks has increased in recent years. Since 2014 American Samoa has suffered one chikungunya, one Zika, and two dengue outbreaks. During the 2015 dengue outbreak four dengue-caused deaths were confirmed and two more were suspected. Of American Samoa's 12 species of mosquitoes, two of them (Aedes aegypti and Aedes polynesiensis) are known to carry dengue and possibly chikungunya and Zika viruses.

The American Samoa Department of Health and other agencies educate the public to eliminate the water-holding containers that are the larval habitats for Ae. polynesiensis and Ae. aegypti. While most of the focus has been on these containers, one potentially important habitat has not been studied in American Samoa: septic tanks. We investigated septic tanks as a possible source of vectors by placing emergence traps on the vents of septic tanks to capture any emerging mosquitoes then determine whether any of those mosquitoes are Ae. aegypti or Ae. polynesiensis.

We hypothesize that some, but not all, septic tanks in American Samoa may produce Ae. aegypti or Ae. polynesiensis. Septic tanks designs have changed over the years as the regulations changed. The older designs with cracks in the concrete or short, open vent pipes may provide ready access to ovipositing mosquitoes and so many constitute a greater threat than the newer designs. The results of this study may provide important information for arbovirus prevention by guiding efforts to mitigate cryptic vector breeding sites.

KEY WORDS: Aedes aegypti, Aedes polynesiensis, dengue, chikungunya, Zika virus, septic tanks

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Mikania micrantha, the Mile-a-Minute Vine

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ABSTRACT

The rapid growth of Mikania Micrantha vines is well known throughout its native and non-native domains. Mile-a-minute vines are abundant throughout the island of American Samoa. My research project mainly focuses on monitoring the growth of this specific type of vine to examine its speed of growth, average length/size, biomass-attraction, and where they would most likely seem to grow.

This data is collected based on an assessment of a total of 15 plots of which are divided equally into 3 blocks. These plots were all established on a field heavily infested by mile-a-minute vines and each monitored based on 3 categories: the removed, controlled, and restored sections. The removed section of plots is completely cleared to the surface of the topsoil ground; the controlled section is only established then left undisturbed, and the restored section is cleared of vines but restored with a native plant in each.

According to the data I have collected so far, the restored plots with native plants seem to have already attracted a few invasive species. The controlled plots are constantly monitored, but the undisturbed vines have only shown a slight increase in length and growth. The cleared plots have shown signs of plants in initial growth sprouting. As my experiment proceeds into further insights of a general conclusion, I can state that at this point, the Mikania micrantha vines are one of the biggest threats to our native forests and could go to extreme lengths of invasion if they are not properly removed.

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An Analysis of Valonia fastigiata Growth Rate and effective Removal Methods

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ABSTRACT

Coral reefs of American Samoa are known for their cultural, ecological, and scientific value. Harmful algal blooms of invasive bubble algae (Valonia fastigiata) however, threaten these reefs by overgrowing coral colonies. These algal blooms have been documented on the island of Tutuila in 2015 and Ofu in 2017. Current research efforts are focused on identifying the spatial extent of the algae and factors stimulating the blooms.. The purpose of this study was to examine the growth rate of this alga and evaluate removal methods to support management efforts in controlling these algal blooms.

In the field, 5 treatment and 5 control plots of a branching coral (Porites clyindrica) infested by V. fastigiata were mapped at Faga'alu. In the treatment plots, algae were manually removed, collected, and effort documented. Water measurements were also taken in each plot. Collected algae were weighed using a standardized wet weight method. The number of people involved, removal time period, and algae weight were used to calculate the removal per unit effort. All plots were photographically monitored weekly. At the end of three weeks, any algae present were removed from treatment plots and weighed to estimate growth rate. In the lab, five tanks were set up and stabilized for two days. Approximately equal weights of algae were added to each tank and treated using several methods, including the introduction of herbivores, to reduce algal biomass. Algae samples were weighed at the conclusion of each two day run to determine the effectiveness of each removal method.

KEY WORDS: coral reefs, harmful bubble algae, growth rate, removal method

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A Comparison of Data Sources on Health Indicators from Adults Surveyed in Guam

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ABSTRACT

In response to the Non-Communicable Disease (NCD) epidemic, stakeholders in Guam developed the Guam NCD Strategic Plan focused on improving smoking, nutrition, alcohol, physical inactivity, and obesity (SNAPO) risk factors. Two data sources have been used to monitor adult SNAPO indicators: the Guam Behavioral Risk Factor Surveillance System (BRFSS) and the Pacific Islands Cohort of College Students (PICCS). The objective of this study is to compare the data sources in order to establish whether they capture data from a similar and representative sample of the adult population on Guam; it is hypothesized that the data sources differ on demographic and SNAPO variables. Selected variables from the 2017 BRFSS (n = 253) and PICCS (n = 391) datasets were combined into one dataset using IBM SPSS Statistics software. Of the demographic variables, BRFSS and PICCS differed respectively in mean age [22.7 (SD: 2.8) vs. 21.8 (SD: 2.1) years], race [predominantly Pacific Islander vs. Asian], employment [54.5% vs. 47.1% employed], and marital status [17.0% vs. 1.0% married]. Of the SNAPO variables, BRFSS and PICCS differed respectively in smoking [9.9% vs. 1.8% smoked daily], e-cigarette use [4.7% vs. 4.3% used daily], alcohol [45.8% vs. 46.8% consumed ≥1 in the past month], and obesity [21.7% vs. 19.7% obese]. Nutrition and physical inactivity variables were not compared due to differences in how data was measured. The findings of the study suggest that the data sources do differ on selected variables, supporting the hypothesis. The data sources may complement and supplement each other when used together.

KEY WORDS: Smoking, Alcohol, Obesity, Guam, Survey

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Kidney Disease on Guam

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ABSTRACT

Chronic Kidney Disease (CKD) is an ever-growing island-wide epidemic. National-Local data comparison, evaluation of local factors, and testimonials by local medical professionals and patients may help explain the reasons for its prevalence and the toll it takes on the island's people.

Studies show the greatest causes of End Stage Renal Disease (ESRD) are Diabetes and Hypertension (HTN). A particular study found the highest causes of ESRD in the U.S. to be Diabetes and HTN, with rates being 43.7% and 28.4% respectively (72.1% combined). Analyzing local health center data, evident worsening trends such as: patients with Diabetes and HTN, patients with uncontrolled Diabetes (HbA1c<9% or no test) and uncontrolled HTN (BP<140/90 mmHg) all over a 3-year period (2015-2017), and CKD, HTN, and Diabetes' complicative rankings in societal health issues over a 10-year period (2007-2017) may all be compared to national data to gain a better understanding of reasons for prevalence. Examining Environmental and Cultural factors' contribution to CKD provides reasons for the disease's unique statistics on Guam. Findings from a community survey of patients and practitioners are compared with Guam's previous baseline data to gain a more personal understanding of the disease.

Rampant HTN and Diabetes rates along with other CKD causing factors such as Environmental and Cultural aspects all urge stronger preventative measures to improve the quality of life of Guamanians with CKD and overall betterment of the island society.

KEY WORDS: Guam, Chronic Kidney Disease, Diabetes, Hypertension, Survey

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Efficacy of Hot Pepper (Capsicum spp.) Extracts as a Pesticide on Invasive Coconut Rhinoceros Beetle (Oryctes rhinoceros) Larvae

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ABSTRACT

Synthetic pesticides can induce harmful effects on human respiratory, nervous and reproductive systems. The use of naturally occurring compounds as pesticides may be a safer substitute over synthetic ones. Previous studies show that capsaicin, an active constituent found in all hot peppers, can act as an irritant against several agricultural pests. On the island of Guam, hot peppers are a major crop and a common household delicacy and are therefore abundant for pesticide synthesis. We evaluated the efficiency of locally-grown pepper extracts on coconut rhinoceros beetles (CRB), an invasive pest of the island's economically important coconut trees.

High Performance Liquid Chromatography (HPLC) was used to measure capsaicin levels of 5 hot peppers, in which 2 were local and had no reported capsaicin content. Extracts were then derived from these peppers and applied to 1st instar larvae of CRB. After 6 hrs, no mortality was observed in any treatments. After 24 hrs, 36.4% mortality was measured in larvae exposed to the extract with a low capsaicin content, 9.1% mortality was measured for the extract with a high capsaicin content, and no mortality was observed for the control. Chi-square test showed significantly higher mortality in larvae exposed to low capsaicin extracts ($p < 0.05$).The pepper extract with a high capsaicin ($p = 0.31$) level did not result in a significantly higher mortality rate compared to control.

Pepper extracts may be a safe method to control CRB; however, capsaicin content cannot be correlated to higher mortality rate.

KEY WORDS: Capsaicin, coconut rhinoceros beetle, pesticides

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Exploring culturally appropriate interventions for CHamoru and Chuukese Suicide on Guam

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ABSTRACT

Suicide is the number six leading cause of death on Guam. In 2018, there was 1 suicide death every 8 days with the Chuukese (103/100,000) having the highest rate of suicide on Guam followed by the CHamorus (32.5/100,000). Deaths by suicide on Guam are predominately male with the primary method of hanging.

A review of the literature on the topic of suicide amongst the CHamoru and Chuukese in Micronesia describes trends, methods use, age factors, precipitating factors; however, data is limited in exploring ethnic, social and cultural factors of suicide. This research will use key informant interviews to explore these factors, specifically asking "What are protective factors in your culture that can be used to develop culturally appropriate interventions to decrease suicide?".

Qualitative in-depth interviews will be collected from six key informants- three CHamoru and three Chuukese. These six key informants will be selected based on the following criteria: 1) that they are community experts with knowledge of their respective culture 2) and have knowledge on the topic of suicide. These six interviews will be a combination of face-to-face and telephone interviews.

Based on the high rates of suicide among the CHamoru and Chuukese people, ethnic and socio-cultural factors need to be explored and cannot be dismissed as they significantly contribute to the incidence of death by suicide. By understanding these factors in the modern CHamoru and Chuukese society, the focus can be on developing culturally appropriate interventions to help decrease the number of suicides and saving lives.

KEY WORDS: Chamoru, CHamoru, Chuukese, Truk, Guam, Micronesia, suicide

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Evaluation of Coconut (Cocos nucifera) Oil as an Alternative Fabric Softener

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ABSTRACT

Cationic surfactants are active ingredients in fabric softeners. One such surfactant, di-tallow dimethyl ammonium chloride (DTDAC), is derived from cow fat. The thick consistency builds up between a fabric and affects components of fabrics such as its flammability. Additionally, DTDAC originates from cow fat, causing consumers of commercial fabric softeners having a possibility of skin problems, like skin irritation. Coconut oil is a probable alternative to commercial fabric softeners because it resembles the properties of cationic surfactants. It has been implemented in many treatments for the skin, since it contains rich nutrients to help keep the skin healthy. Furthermore, coconut oil is an abundant, locally produced item on Pacific islands like Guam. In this study, we compared the differences in flammability, color fading and softness between DTDAC - containing fabric softeners and a natural coconut oil - derived softener.

100% cotton sheets washed with natural fabric softener were significantly less flammable than sheets washed with fabric softener A ($p < 0.05$) and marginally less flammable than sheets washed with fabric softener B ($p = 0.052$). On 100% polyester sheets, there was no difference in flammability rates between natural and commercial fabric softeners. For both fabric types, natural fabric softener resulted in greater color fading ($p < 0.05$), but had no difference in softness compared to commercial softeners (cotton, $p = 0.51$, polyester, $p= 0.20$).

A natural coconut oil-derived fabric softener can be an equally efficient and less flammable alternative to commercial fabric softeners. However, there is a risk of color fading.

KEY WORDS: Flammability, di-tallow dimethyl ammonium chloride, coconut (Cocos nucifera) oil

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Time of Day and its Effects on Depressed Individuals

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ABSTRACT

Depression is a mood disorder that can be characterized by feelings of persistent hopelessness, irritability, and loss of interest in hobbies. The individuals that experience depression often has varying levels of participation and feelings of isolation that can affect a person's day to day life negatively. These behaviors and moods exhibited by depressed patients can change during different times of the day.

As such, the aim of this study is to observe the changes in interactions and behavior throughout different hours of the day in depressed patients residing in the Commonwealth Healthcare Corporation psych ward and in the Transitional Living Center on Saipan. The behaviors expressed by the residents will be observed and categorized using a table to gather the data at different times of the day. In addition to categorizing the behavior, qualitative data and comments will be used to further synthesize the information gathered by the charts as to make a conclusion to determine how different times of the day affects human interaction in depressed patients. The results from the study may have implications on human behavior and how the time of day affects the moods of people with mood disorders.

KEY WORDS: Mood disorder, depression, time of day, psych ward, behavior, interaction

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Evaluating Root Nodulation and Nitrogen Fixation in Legume Crops

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ABSTRACT

Cover crops is a sustainable practice where crops are planted to provide benefits to a farm. Leguminous cover crops, in this study which includes Black Eyed Beans, Black Beans, Mung Beans, and Sunhemp, play a crucial role in replenishing the nutrients in a cropping system, which is evident in root nodulation. Nitrogen fixation is a process that enables nitrogen in the air to be converted into ammonia or related nitrogenous compounds that is usable for plants. When cover crops are planted, not only is it able to fix nitrogen, but also to increase biomass by adding organic matter in poor soils.

However, root nodulation may not develop in all cover crops. Therefore, this study aims to identify whether or not root nodulation and nitrogen fixation are occurring in legume crops tested. By noting the amount of redly-pigmented swellings present in the taproot and branch root of each type of legume cover crop, we will be able to identify if nitrogen fixation is occurring and which crop is most ideal for providing multi-purpose features. The crops were planted on May 24, 2019, and have reached their state of maturity. Therefore, being able to observe the amount of nodulation per species will provide some conclusion. The study is still ongoing and the results will be discussed and presented at a further date.

KEY WORDS: Cover crops, legumes, nitrogen fixation, organic matter, root nodulation

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Effects of Shade Cloth on Cucumber Growth in the CNMI

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ABSTRACT

The Commonwealth of the Northern Mariana Islands (CNMI) are made up of 14 islands. Three of which are mostly inhabited on or populated: Rota, Tinian, and Saipan. The islands are situated in the Tropic of Cancer, in the Pacific Ocean. The capital of the CNMI, Saipan, is about 1,049 miles north of the equator. The CNMI is exposed to high temperatures which makes some agricultural activities challenging and sometimes impossible.

The cucumber (Cucumis sativus) is a "full-sun" plant able to withstand temperatures ranging between 60 degrees to 80 degrees Fahrenheit, not exceeding 90 degrees Fahrenheit. Considering the temperature in the CNMI can reach 100 degrees Fahrenheit during the dry season, alternatives must be applied to compromise with the plant growth necessities of cucumber and other crops. One available option to limit the amount of heat on cucumbers is using a shade cloth. Shade cloths are used to reduce the sun's heat and rays, and are also used for farming and other recreational purposes. This study investigates the effects of different shade cloths on cucumber plant growth. Cucumber plants will be grown at a variety of different shade conditions – 0%, 30%, 50%, 70% and 90% shade, in order to identify which shade condition is best for cucumber development and growth. Considering many farmers are applying the 70% shade cloths on their fields, there is a possibility that the cucumbers will produce more in the 70% shade cloth trial than the rest.

KEY WORDS: cucumber, plant, temperature, Fahrenheit, heat, alternative, shade cloth

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Knowledge, Attitude, And Practice (KAP) on Hygiene and Sanitation Among Households in Pohnpei, Federated States of Micronesia (FSM) June and July 2019

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ABSTRACT

Pacific Island Countries and Territories (PICTs) experience some of the lowest levels of improved water, sanitation and hygiene (WASH) on Earth (WHO 2016). Low level of WASH is often directly related to experiences of poverty and/or conflict. In PICTs, only one-third of people have access to basic sanitation facilities and half to basic water sources (WHO & UNICEF 2017).

Water quality has been a major issue in FSM. In April 2000, an outbreak of cholera on Pohnpei, affected approximately 3,500 persons and caused 20 deaths, was the result of poor waste water control. Sanitation is another major issue in FSM, even communities with good access to clean water have less than adequate sources of sanitation services. Those communities with poor water supply have large proportion of households that commonly use unsanitary pit latrines or other unimproved sanitary disposal methods (SPREP, 2010).

This study will determine a baseline KAP related to sanitation by doing a household survey across communities adopting the UNICEF WASH questionnaire and will provide data to measure sanitation knowledge, attitude, and practice at household level and improve sanitation practices, through targeted behavioral change communication and will demand creation and access to safe drinking water, sanitation marketing, solid waste, waste water and drainage management. The study is ongoing and the results will be discussed and presented at a further date.

KEY WORDS: Water, Sanitation, Hygiene (WASH), health outcomes, pit latrine

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The Effectiveness of Morinda citrifolia (noni) in Controlling Chronic Elevated Blood Pressure, among adults in Pohnpei, Micronesia

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ABSTRACT

Chronic elevated blood pressure is becoming a common health issue leading to major Non-Communicable Diseases (NCD) such as cardiovascular diseases among the people of Pohnpei in the Federated States of Micronesia (FSM). The major factor associated with an increase in this health issue is the lack of proper medication due to financial difficulties facing many local people. Costs of medicines and health care services are often not affordable by the majority of Pohnpeian people. Therefore, alternative means of medical treatments is most preferable. It is with this in heart that the purpose of this study is to examine the effectiveness of Morinda citrifolia (noni) as a possible alternative means to manage and control high blood pressure. We hypothesize that noni juice normalizes both systolic and diastolic blood pressure.

Morinda citrifolia or noni grows abundantly in the Pacific. It has been widely used medicinally by Pacific islanders. In examining noni and its effectiveness for high blood pressure, we will compare readings of at least 10 volunteer adult participants with high blood pressure. At least 5 of whom are taking noni juice and at least 5 who do not take noni at all. Systolic and diastolic readings will be taken and compared. To prove the hypothesis, we aim to see the result that blood pressure readings of those that taking noni juice are relatively better than those not taking noni. We intend the findings to be useful where appropriate to supplement the Pohnpei Public Health intervention and outreach programs to combat NCD.

KEY WORDS: high blood pressure, Morinda citrifolia, Non-Communicable Diseases (NCD), noni

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Effect of Stocking Density on the Growth and Survival of Sandfish Sea Cucumber (Holothuria scabra) Juvenile in an Ocean Grow-out System

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ABSTRACT

The US Affiliated Pacific Islands of Federated States of Micronesia and Republic of Palau have several commercially important species of sea cucumbers in their waters including the Sandfish sea cucumber, Holothuria scabra. Due to their commercial Importance, they have been widely exploited and are in the danger of being extinct. The College of Micronesia Land Grant Program has undertaken the development Hatchery based Sandfish sea cucumber farming technology for local community based economic development, future commercialization and aiming at restocking the depleted stocks in the wild. In this regard, an experiment was conducted to find out the effect of two stocking densities on the growth, survival of Sandfish sea cucumber, Holothuria scabra juveniles in an Ocean Grow-out system. Sandfish sea cucumber juveniles (~ 20g) were stocked at 1 and 2 pieces per meter square in 6 m square enclosures in duplicates. The experiment was run for 30 days at the end of which growth (length and wet weight) and survival was tabulated for each treatment by measuring and weighing all surviving animals. The experiment aims to find out if there is any significant difference in the growth and survival of juvenile Sandfish sea cucumbers stocked at different stocking densities and the experiment would be the first steps in finding out what is the ideal stocking density for farming grow-out of Sandfish sea cucumber juveniles.

KEY WORDS: Holothuria scabra, sea cucumber

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College of Micronesia-FSM (COM-FSM) Student Cohort on Cardiometabolic Health

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ABSTRACT

College students are an at-risk population for many health issues. These acute and chronic medical problems begin as a new event in the 18-24 age group encountered on a regular basis in student health facilities. Risk factors of poor diet, lack of physical activity, and lifestyle behaviors leading to overweight and obesity are common among college students. The objective/s of this research is to estimate the prevalence of health indicators among COM-FSM students and determine if health outcomes are associated with health indicators. Anthropometry will be done according to standard procedures with the same brand of equipment (Perspective Enterprise Stadiometer model PE-AIM-101, SECA scale Model 876, SECA 2001 measuring tape). Blood pressure will be obtained with a manual sphygmomanometer. Physical activity will be measured with accelerometers designed to monitor physical activity and energy expenditure using the Philips Actical and ActiReader (Respironics, INC). Questionnaires regarding demographics and health status will be administered. Questions will include dietary, medical, personal and social history. Questionnaires were adopted from established studies such as the Multiethnic Cohort (MEC) the Children Healthy Living Program (CHL).

This research project is to establish a baseline health assessment of COM-FSM students, and to investigate their health behaviors and health outcomes to develop control measures and health promotion activities to prevent health issues among college students. The study is ongoing and the results will be discussed and presented at a further date.

KEY WORDS: At-risk population, risk factors, prevalence, health indicators, anthropometry, health outcome

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Cultivation and Growth Performance of Three Tropical Mushroom Species on Coconut Husk and Copra Cake

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ABSTRACT

Mushroom cultivation using coconut husk and copra cake as substrate is a new farming method in the Marshall Islands that needs more exploration to find out the most suitable idea that farmers can apply in the future. Three tropical edible mushrooms were assessed in this experiment namely: oyster mushroom (Pleurotus florida), straw mushroom (Volvariella volvacea), and milky mushroom (Calocybe indica). The study will provide basic and valuable information on mycelial growth rates and biological efficiency conversion of three tropical mushrooms in a given place to grow. It was hypothesized that growth performance would be affected differently in a given time and environment. The mushroom growing media used for this experiment were composed of coconut husk (88%), copra cake (10%), sugar (1%), calcium carbonate (1%), and 55% moisture content. Treatments were distributed in 12 replications and data were analyzed using ANOVA ($p \leq 0.05$).

Mycelial growth occurred in all mushroom species in the following order: oyster mushroom (172.38mm) > straw mushroom (134mm) > milky mushrooms (87.31mm). They were all found to be significantly different from each other. Data on biological efficiency conversion will be collected in the next following weeks with a probability of fruiting body development on oyster and straw mushrooms due to thickness and hardening of spawn bags. Thin mycelial growth was observed on milky mushroom, which would most likely not produce fruiting body. Results suggest that different mushroom species required particular substrate and environment to grow. Modification on temperature, moisture content, and substrate formulation should be explored further.

KEY WORDS: biological efficiency conversion, mushroom growing media, mycelia

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Fungal Endophytes of Ten Commonly Grown Crops in the Marshall Islands

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ABSTRACT

Fungal endophytes are a mixed population of microorganisms that live within plant roots and leaves but do not cause any symptoms of disease. The presence of endophytes has been linked to improved crop yield and increased potential to fight the effects of drought, salinity, and the presence of pests and diseases which are the most common problems of farmers in the Marshall Islands. The study aimed to assess the endophytic diversity in five traditional fruit trees and five commonly grown annual crops. It was hypothesized that diversity would be higher on older plants. Healthy leaves were collected, and sterilized using 95% ethanol and bleach (NAOCl, 5.25% by weight) at different time intervals. Each leaf collected was cut into disc and placed into a Malt Extract Agar (MEA) plates and then incubated for 3-7 days. Out of 150 leaf samples from 10 plants, 78 showed fragments of fungal growth and 42 endophytes were randomly selected for isolation into pure, uncontaminated culture on MEA for identification. A total of 15 different endophytes were isolated. In terms of diversity, endophytes occurred in all leaves in the following order: breadfruit (9), pandanus (7), lime and coconut (5), banana (4), cabbage, okra, and sweet potatoes (3), melon (2), and the lowest found in bush bean (1). Results suggest the higher diversity found in older leaves as hypothesized. It was also noted that these traditional fruit trees are the most resilient in the island. Further study can be employed on the use endophytes as natural pesticides for crop protection.

KEY WORDS: endophytes, diversity, incubate, crop protection, ethanol, natural pesticide

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Importance of Plant Tissue Culture

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ABSTRACT

Palau imports more than 60% of food products consumed. Palau is a popular sightseeing destination and rich in culture and because of focus on tourism and because its dependence on imports, potential complications will arise if global markets collapse. The percentage of locally grown food has decreased significantly and has been a national focus for more than 20 years. A focus has been made to increase local products such as taro. Furthermore, other economically and culturally important crops, including traditional medicines and ornamentals have been identified for culture. Using tissue culture techniques for increasing crop availability and selection of ideal variants that are climate resistant has been an ongoing project in Palau. In this experiment we look at methodology for tissue culture of endemic orchids, agroforestry (bananas) and salt water resistant taro. Variable conditions have been used and most effective techniques for low technology and cost development have been identified and will be utilized to expand crop germination and distribution to the local community to help alleviate health stress due to lack of local production. With early experiments showing promise, these methods can change diet and consumption by providing more local options of economically valuable species that are also culturally important; including increase the number of medicinal plants in use for therapy in Palau for lifestyle diseases.

KEY WORDS: Tissue culture, Food production, lifestyle disease reduction

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Control of Fruit Fly Population in Palau

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ABSTRACT

Fruit flies have caused major damage in fruit trees across the Pacific and in Palau. They have caused 90% of fruit loss on the island. There are four known species of fruit flies; mango fruit fly (Bactrocera frauenfeldi), oriental fruit flies (Bactrocera dorsalis), breadfruit flies (Bactrocera umbrosa), and Bactrocera calophylli. The female flies damage non-ripened fruits by injecting their larvae into the fruits by their stinger. As the larvae grow they devour the fruit from the inside out. The fruit fly species has affected more than 75% of fruits in Palau and has decimated economic markets. There has been very little success with past eradication methods in Palau that have only trapped the male fruit fly. A new cost-effective method is being tested in this experiment that has produced promising results; the capture of female fruit fly for the first time. Implementation of traps made of yeast waste, papaya extract and organic solvents have been carried out in small bottles hung on trees have proved effective in trapping 40 female B. dorsalis, 12 D. melanogaster, as well as 3 unidentified female flies. Future plans in expanding the methods and traps used are under way to trap and control fruit flies on a larger scale.

KEY WORDS: Fruit fly, Palau

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Coconut Rhinoceros Beetle

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ABSTRACT

For centuries, Palau has depended on coconuts as a source of nourishment, income, and supply. Palauans use them for hydration, food, oil, brooms, and so much more, on outlying atolls and islands with no water table coconuts are the only source of hydration during severe drought. Coconut Rhinoceros Beetle's (CRB) in large quantities cause coconut tree mortality by feeding on their crowns. After World War II a large population of CRBs was able to propagate due to availability of breeding sites (downed trees) and through efforts a nudivirus (OrNV) was introduced that controlled the populations in Palau and the rest of the Pacific. However, recently a resistant strain was found and has proliferated through the region (CRB-G), causing great damage to the palm trees in Palau and throughout southeast Asia and the pacific, e.g. 75% coconut tree mortality in Guam. Damage Assessment Surveys were conducted on coconut trees at representative locations throughout all the states of Palau in 2016, 2017, 2018 and 2019. Samples collected DNA analysis was used to determine distribution of CRB-G as well as incidence of Nudivirus (OrNV) infection in each sample. Based on the data collected this year of 2019 compared to last year 2018, there hasn't been a sign of increased damages, but there is a sign that the resistance to the Nudivirus is virulent. Further tissue stains have shown virulence. This virus will be isolated and distributed to outlying islands to preserve coconuts and assure food and hydration.

KEY WORDS: Coconut Rhinoceros Beetle, Survival, Oryctes Rhinoceros Nudivirus (OrNV), Prevent

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Epigenetics and Genetics of Diabetes – "Thrifty Genes"

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ABSTRACT

A high percentage of the Palau population has high blood glucose level tolerance and diabetes; 78% of deaths in Palau are associated with Non Communicable Diseases (NCDs). There are 3 out of 4 Palauan adults who are overweight or obese. In this experiment we look at the, "thrifty gene" theory associated with recent hunter and gatherer populations. Palauans have been hunters and gatherers up until two generations and activity of genes associated with storing starches and fats may be the reason for the weight problem facing the population today. Although having the "thrifty gene" was once a great advantage to our ancestors, it is now a problem to our people. However, the Palauan way of life is different, now, and Palau relies heavily on imports high in sugars/carbohydrates and fats, which has greatly promoted our change in lifestyle. Analysis of historical data on blood sugar has been used to look at outliers with hyperglycemia and look at familial relations compared with other populations. Ongoing collection and comparison of HbA1c levels have shown significantly higher levels in our people compared to other places in the world. Although the gene allowed us to survive in periods of famine, this change currently has a negative impact on our health. Genetic analysis is ongoing to identify specific genes in the Palauan population and will be used to assess therapies.

KEY WORDS: Non Communicable Diseases (NCDs), thrifty genes, genetics

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Evaluating the Mechanism of Uptake of 10 nm Iron Oxide Nanoparticles by Bone Marrow-Derived Dendritic Cells

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Since the transition from empirical vaccine development to rational design, subunit vaccines have become prominent for their improved safety compared to whole-cell vaccines. The use of components rather than entire pathogens reduces reactogenicity, however, subunit vaccines alone often lack in immunogenicity and long-term effectiveness. To better induce protective immune responses, adjuvants and vaccine delivery systems should be rationally developed. Our laboratory has used iron oxide nanoparticles (IO NPs) as a delivery vehicle and found that they also have adjuvant-like properties, with the ability to activate bone marrow-derived dendritic cells (BMDCs) in-vitro. Nanoparticles are advantageous as they are customizable and similar in shape and size to many pathogens, while dendritic cells are of interest given their role in bridging innate and adaptive immunity. The purpose of this research is to determine the mechanism of uptake and intracellular localization of IO NPs in BMDCs. 8-day-old BMDCs were treated with cellular receptor and trafficking inhibitors to evaluate particle uptake through macropinocytosis, receptor-mediated endocytosis, and intracellular localization within endosomes prior to stimulation with 10nm-Cyanine3 conjugated IO NPs. Cells that took up IO NPs under each condition were quantified using the CTL S6 Universal Analyzer. Verifying inhibitor treatment data, cells were imaged using indirect immunofluorescence to identify cellular receptor and intracellular structure colocalization with IO NPs. Inhibitor experiments revealed that uptake of 10 nm IO NPs may involve macropinocytosis, scavenger receptors, endosomes, GPCRs, F-actin, and clathrin. These insights into the cellular entry mechanisms will enhance understanding of IO NPs as a self-adjuvanted vaccine delivery vehicle.

KEY WORDS: iron oxide nanoparticles, dendritic cells, adjuvants

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Expression of SARS-CoV-2 Spike Proteins Using Drosophila S2 Cells

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ABSTRACT

Declared a pandemic in March 2020, COVID-19 is a disease caused by the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2), a positive-sense single-stranded RNA virus distantly related to SARS-CoV-1, the virus that caused the 2002–2004 SARS outbreak. SARS-CoV-2 poses a more serious global health threat as it is highly transmissible, and causes not only mild to severe symptoms but also asymptomatic infections which makes detection difficult. The spike glycoprotein, on the outer surface of the virus, mediates entry into the host cell through binding to human angiotensin-converting enzyme 2 (hACE2) and is the target for neutralizing antibodies which facilitates viral clearance. In this project, we aim to establish a production system for SARS-CoV-2 spike antigens by using Drosophila melanogaster S2 insect cells.

Using a synthetic, codon-optimized gene encoding the Wuhan-Human-1 spike, we conducted targeted polymerase chain reaction amplification and site-directed mutagenesis to produce the receptor-binding domain and full-length spike protein of the initial SARS-CoV2 strain and Beta variant. After transfecting genes into Drosophila S2 cells, we established stably-expressing cell lines through antibiotic selection and purified the proteins using monoclonal antibody CR3022 and hACE2 affinity. The production of SARS-CoV-2 antigens in Drosophila S2 cells followed by affinity chromatography yields highly pure proteins reactive to both COVID-19 convalescent human and non-human primate sera. This indicates that insect cell-expressed antigens can be used as a diagnostic tool or incorporated into a recombinant subunit protein vaccine with a suitable adjuvant.

KEY WORDS: SARS-CoV-2, Recombinant protein vaccine, protein expression

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Evaluating the Role of the Fn14 Cytokine Receptor in Renal Pathophysiology Using a Mouse Model of Chronic Kidney Disease

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Chronic kidney disease (CKD) is characterized by gradual loss of kidney function, and is estimated to affect 15% of people living in the United States. Published literature showed that the TWEAK/Fn14 signaling pathway plays a role in the pathogenesis of acute kidney injury (AKI), but its role in CKD has not been tested. Fn14 is a transmembrane receptor of the TNF receptor superfamily and has a single known ligand, TWEAK. Fn14 is usually expressed in tissues at low levels, but is highly induced upon tissue stress or injury, and TWEAK/Fn14 signaling can promote inflammatory stress response, fibrosis, or even cell death. We hypothesize that Fn14 signaling contributes to renal tubular cell death and renal fibrosis in CKD, and blocking this pathway would benefit CKD patients. Our laboratory has generated a novel global Fn14-knockout (KO) mouse using Crispr/Cas9 technology. To model CKD, we employed a well-established model with a three dose schedule of cisplatin (CP) - a chemotherapy agent known to be nephrotoxic. We treated adult 3-6 month old male and female mice and analyzed their renal physiology. The four groups were wild-type mice and Fn14-KO mice, either treated with CP or vehicle control. We analyzed blood biomarkers, kidney fibrosis by histology, and inflammatory cytokines by quantitative PCR. We hypothesize that the Fn14-KO mice will have reduced kidney inflammation and fibrosis from the CP when compared to the CP-treated wild-type mice. These data will determine if Fn14 signaling plays a significant functional role in the pathophysiology of CKD.

KEY WORDS: kidney, CKD, Fn14, inflammation

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West Nile Virus NS4A and NS4B Proteins and their role in Immune Evasion

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ABSTRACT

West Nile Virus (WNV), a neurotropic virus is a single-stranded positive RNA virus. WNV, a member of the genus Flavivirus, is one of the fastest-growing members of arthropod-transmitted diseases in the world. WNV has killed over 2000 Americans since 1999 and has no approved vaccine or specific antiviral treatment options. WNV polyprotein can be broken down into three structural proteins and seven non-structural (NS) proteins. The NS proteins play necessary roles in the virus's replication cycle, with some of them also having key roles in inhibiting the cellular type I IFN pathway, allowing for immune evasion. In examining this relationship, NS4A and NS4B may play an important role in downregulating the interferon pathway via IKKe and TBK1. However, the specific functions of NS4A and NS4B are still unknown. To determine the degree to which NS4A and NS4B inhibit IFN production in mammalian cells, we will utilize immunofluorescence assay (IFA) of HEK293T cells transfected with treatments of WNV viral proteins in addition to IKKe/TBK1 proteins. Quantitative analysis of IFA images will be done to calculate Pearson correlations so that the strength of association between different proteins may be quantified. This research is precious towards identifying key targets for the development of WNV antiviral therapies.

KEY WORDS: flavivirus, West Nile Virus, NS4, NS4A; NS4B

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Detection of Neuroangiostrongyliasis (Rat Lungworm Disease) in Peripheral Blood of Definitive and Accidental Hosts

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ABSTRACT

Neuroangiostrongyliasis, commonly known as rat lungworm disease, is caused by Angiostrongylus cantonensis, the parasitic nematode that primarily targets the central nervous system in humans and vertebrates like horses, dogs, and some birds. Currently, the Centers for Disease Control and Prevention diagnose neuroangiostrongyliasis using a species-specific quantitative polymerase chain reaction (qPCR) assay which targets the ribosomal DNA ITS1 region of A. cantonensis (AcITS1) in cerebrospinal fluid (CSF) samples. The clinical sensitivity of the AcITS1 assay on peripheral blood samples is appears low (detecting ~20% in animals thought to have neuroangiostrongyliasis), however a new qPCR assay targeting a tandem repeat section of the genome (AcR3990) is 100-1,000 times more sensitive, and this increased analytical sensitivity may correspond to increased clinical sensitivity for blood samples. Our objective is to test peripheral blood samples of definitive and accidental hosts to better understand the clinical sensitivity of the AcR3990 assay. In addition to qPCR, we are also testing an enzyme-linked immunosorbent assay (ELISA) that detects host antibodies. The ELISA assay uses antigen isolated from A. cantonensis from Hawai'i and could be used as a blood diagnostic in conjunction with clinical symptoms for A. cantonensis infections. A peripheral blood diagnostic would be less invasive, more cost effective, and more frequently used with clinical sensitivity equivalent to or better than the current AcITS1 qPCR diagnostic of CSF, which estimated at ~70-80%.

KEY WORDS: Angiostrongylus cantonensis, Neuroangiostrongyliasis, qPCR

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A Comparison of Coral Transplantation Methods for Attracting Fish

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ABSTRACT

Coral reefs around the world are in decline and serve as an important habitat for reef fish species. Coral transplantation methods can restore reef habitat for fish and other marine animals. However, the coral transplantation method that will best restore reef habitat is unknown. In which the 2 methods are the tree structure nurseries and the cement block nurseries. We hypothesize that the tree structure will recruit more fish than the block method due to the greater vertical relief allowing fish to settle at different heights in the water column rather than being limited to the bottom. Both structures have similar overall surface areas. To test this hypothesis, we randomly deployed 9 PVC tree structures over sand, each anchored with a cement block at a depth of 2.5 meters and suspended with a float. Nine cement blocks were randomly placed on the sand at the same depth and the same spacing intervals as the tree structures. Three treatments (live Acropora muricata coral fragments, dead A. muricata coral fragments, and blank controls) were applied to each of the 2 coral transplantation methods. Four fragments were suspended on each tree and 4 fragments were cemented to each block. Cost and construction time were also documented for each method to examine cost effectiveness. Twice a week for 4 weeks, present fish species and their abundance were quantified within 0.5 m of each structure. The goal of this experiment is to determine the preferential coral transplantation method for increasing fish species richness and abundance.

KEY WORDS: fish recruitment, coral transplantation, Acropora muricata, PVC tree, cement block, species richness, abundance

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Reducing Reliance on Imported Peat: Utilizing Locally Sourced Organic Materials

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ABSTRACT

In American Samoa, agriculture industries rely on sphagnum peat moss in systems such as vegetable seedling transplant for vegetable production. Peat is used for its relatively consistent quality and ideal physical and chemical properties that aid plant growth, however, it is a nonrenewable resource, expensive, and is becoming scarce. This has stimulated our search for alternatives that possess adequate physical and chemical properties, and are sustainable. We used the locally sourced organic materials, coconut coir, thermophilic compost and fish meal to produce different soilless media to be evaluated for their use in vegetable seedling production. We conducted the trial as a Completely Randomized Design experiment with 5 treatments and 3 replications. The 5 treatments we used were: Miracle Gro potting mix as control= MG; thermophilic compost= CM; coconut coir= CO; MG:CM:CO (1:1:1 v:v:v) +10 g/L of fishmeal; and CM:CO (1:1 v:v) +10g/L of fishmeal. We evaluated the physical properties (water and air porosity) and chemical properties (electrical conductivity, pH, nitrate, sodium) of the different media. Growth parameters (fresh weight, dry weight, and leaf surface area) of joi choi (Brassica oleraceae var. chinensis) and eggplant ('Farmer's Long' Solanum melongena) seedlings produced in each of the media were also evaluated. Upon testing the chemical properties of the media, we found the electrical conductivity of the thermophilic compost to be significantly high at 9.5 mS/cm compared to the electrical conductivity of the control Miracle Gro at 1.8 mS/cm.

KEYWORDS: Peat, organic, compost, seedling production

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An Analogy Between Coral Restoration Methods by Evaluating Overall Effectiveness and Survivorship

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ABSTRACT

While up to 50% of coral reefs worldwide have been severely degraded, American Samoa's coral reefs are still classified as "good". Still, overfishing, land-based pollution, and climate change are stressors that are currently impacting American Samoa's coral reefs. To stabilize reef health and enhance resilience, local management agencies have developed a Territorial Restoration Plan to conduct reef restoration. Transplanting corals is one of the main techniques used in reef restoration. Because active reef restoration is locally new, a pilot study is being conducted in the village of Aua to evaluate which techniques are appropriate for American Samoa. For this study, we will evaluate two methods of coral transplantation by looking at survivorship and overall effectiveness. We hypothesize that the tree method will have a higher rate of survivorship, but will fall short in effectiveness due to its strenuous/time-consuming setup. To test this hypothesis, three tree structures were created; and three cement blocks were purchased. These were placed at the restoration site. Next, 12 fragments of opportunity were collected from the surrounding substrate (species: Acropora muricata) and attached (4 per structure). The overall effectiveness will be measured by the time, cost, and manpower to carry out each method; while survivorship will be recorded by the condition of the nurseries and coral fragments. Though still in the early stages, we have already noted signs of coral mortality, marine life interaction, and algae development on the fixtures. Continuous monitoring and data collection will be done for the remaining weeks of the project.

KEY WORDS: reef restoration, coral fragments, survivorship, overall effectiveness, tree method, cement block method, Acropora Muricata

ACKNOWLEDGEMENTS:

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Screen Time and Obesity Among Guam's College Students

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ABSTRACT

Screen time devices are becoming more accessible in Guam. The Guam Behavioral Risk Factor Surveillance System has shown a gradual increase in obesity. The Pacific Islands Cohort of College Students (PICCS) has been measuring behaviors and obesity of college students in Guam. The purpose here is to test the association between screen time and obesity in the PICCS, hypothesizing that screen time and obesity are associated among college students.

Data collected from the 2018 cross-sectional PICCS study were used for this analysis. Trained researchers interviewed 259 students at the University of Guam, including age, gender, screen time (≤2 hours versus >2 hours), sleep time (≥7 hours versus <7 hours) and height and weight to calculate body mass index. A statistical software was used to perform statistical analyses and adjust for covariates gender and sleep.

The students' mean age was 21.5 (SD = 2.46) years comprising females (49%), males (46%), and unspecified (5%). Of the 259 participants, 34% were normal/underweight, 42% were overweight/obese, and 24% were unrecorded. Screen time recommendation was met by 75% (≤2 hours), but not by the 16% (>2 hours) or the 9% (missing) of participants. Screen time was not statistically associated with obesity (P = .757) even after adjustment for gender and sleep.

The null hypothesis (screen time = obesity) was not rejected; screen time was not associated with obesity in the 2018 PICCS. This study was limited by its cross-sectional design. A longitudinal study is encouraged to further explore the screen time and obesity relationship.

KEY WORDS: college student, Guam, obesity, Pacific Islands, PICCS, screen time

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Determining Total Phenolic and Anthocyanin Content in Guam Cultivars of Capsicum annuum (Hot Pepper)

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Phenolics are phytochemicals that are commonly associated with the antioxidative properties of plants. Flavonoids are a class of phenolics, and anthocyanins, a subgroup of flavonoids, are responsible for the orange, red, and purple color of fruits and flowers. Research interest has increased in the use of these phytochemicals as a natural food colorant and utilization of their antioxidative properties on human health. Hot pepper (Capsicum annuum L.) is a common vegetable used in local cuisine in Guam; however, there have been no records on the total phenolics and anthocyanin content of local cultivars. In determining the anthocyanins and total phenolic contents of pepper fruits, we hypothesize that five local cultivars have the same concentration of the total phenolics and anthocyanins.

Fresh fruit samples of five cultivars, 'Guafi Triton,' 'Barcinas,' 'Saipan,' 'Toves,' and 'Hachon' were freeze-dried and ground. The total phenolics and anthocyanins were extracted with acidified methanol.

Anthocyanins were detected using High-Performance Liquid Chromatography (HPLC) at 520 nm. The total phenolic concentration will be examined by the Folin-Ciocalteu method using U-V Spectroscopy. The color of fruits of each cultivar was also measured by a colorimeter to express the color as L*, a*, and b* coordinates.

In preliminary studies, there were three anthocyanins detected. Cyanidin-3-glucoside was present more in red fruit cultivar 'Saipan' (0.806 mg/kg of fresh weight) than 'Hachon' with yellow fruits (0.058 mg/kg of fresh weight). Further study will be continued to determine other anthocyanins and the total phenolics.

KEY WORDS: Capsicum annuum, Hot Pepper, Anthocyanin, Phenolics, Fruit Color

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Total Phenolics and Antioxidant Activity of Gummy Confection Infused with Dragon Fruit (Hylocereus Costaricensis)

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

The dragon fruit is a plant derived from the climbing Cactaceae family. The red/purple-fleshed and skinned dragon fruits (H. Costaricensis) possess an attractive pigment, betalains, and phytochemicals such as phenolics and antioxidants. The dragon fruit puree, juice, or extract is a potential ingredient for foods and confections like gummy to provide health benefits.

The objectives of this project are to develop a dragon fruit gummy recipe with good sensory quality and health benefits for consumers; determine the total phenolics and antioxidant activity of dragon fruit gummy; and evaluate the shelf life of the dragon fruit gummies.

The dragon fruit was obtained from farmers on Guam and stored in refrigerators. The dragon fruit juice was made by a juicer and pasteurized at 85°C for 15 minutes. Dragon fruit juice (20-30%), gelatin (4.5-9.0%), sugar (25-36%), corn syrup (24-37%) citric acid (1-1.5%), water (1.5%), and flavor (optional) were used to make gummies. The color and quality of gummies were determined by colorimetric meter and sensory evaluation. Total phenolics and antioxidant activities of gummies were spectrophotometrically analyzed with Folin-Ciocalteu (FC) reagents and 2,2-diphenyl-1-picrylhydrazy (DPPH) free radicals, respectively.

Dragon fruit gummy made of 30% juice and 6.0% gelatin showed rose coloring, tangy taste, and, good gummy texture. It exhibited good total phenolic content and antioxidant activity (expected results). The dragon fruit gummies possess a natural attractive color, antioxidant benefits, and give a unique taste comparable to sour gummies.

KEY WORDS: Dragon fruit, gummy confection, total phenolics, antioxidant activity

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Youth go Local (YoLo): A study to promote local fruits & vegetables to improve diet quality and prevent disease among teens in Guam

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Childhood obesity remains a global epidemic and teens in Guam are no exception where prevalence has increased in recent years and is higher than that of the U.S. in 2019. Unhealthy dietary habits, like not eating the recommended daily intake of fruits and vegetables (F&V) contribute to obesity and other non-communicable diseases. Teens in Guam, who report not eating fruits or vegetables are increasing, despite the abundance of tropical F&V that grow on the island. In another Pacific Island, promoting local produce improved F&V intake and diet quality in the community. Effective strategies to improve F&V intake among teens have shown to address nutrition education, taste preference, cultural and social influences, and role modeling; however, this is not documented for teens in Guam. This study aims to identify teens' perceptions, beliefs, and attitudes about local produce consumption, access, and availability; examine the community strengths and problems; and develop community maps to inform a youth-driven community action plan for improving local F&V intake among teens in Guam. Using the youth participatory action research approach, three (3) focus groups will be conducted including community mapping. Each consisting of 8-10 teens,14-18 years old, representing all ethnic groups of Guam. Results from this study will support community-driven change using evidence-based strategies that cut across multiple levels of the socio-ecological model to improve diet quality and prevent chronic disease in teens. The potential impact of this study will promote local produce to create a more food secure and sustainable food system in Guam.

KEY WORDS: Childhood obesity, diet quality, survey

ACKNOWLEDGEMENTS:

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Investigating the Potential of Capsaicin as a Bioinsecticide and Impact on Plant Growth

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ABSTRACT

Soft-bodied insects such as aphids and mites are the most common and damaging plant insects and have become a great concern for the farmers in Northern Mariana Islands. To control these insects, there is a growing interest among local communities to identify and use plant-based natural insecticides. These plant-based are desirable because they do not release toxins as they decompose and can be formulated with the locally available resources. Capsaicin is a naturally occurring alkaloid found in chili peppers (Capsicum annuum L.). It is a biochemical irritant and known to cause damage to cell membranes and disrupt the nervous system of insects.

This study focuses on exploring the potential of capsaicin as a bioinsecticide, and objectives of this study are to investigate: 1) the effect of capsaicin on controlling aphids (Aphis aurantii Boyer) and spider mites (Tetranychus urticae Koch), which have infested the plants; and 2) the effect of capsaicin on the plant growth.

Ethyl alcohol will be used to extract capsaicin from red chili peppers. Treatments of three different concentrations of capsaicin extract will be sprayed along with water as a control on the insect-infested plants in the field, and also on the healthy seedlings which will be grown in the nursery. Data related to effectiveness of capsaicin as an insecticide will be measured by the percentage of insects remaining after the treatments as compared to the control. The plant growth will be measured by counting the number of leaves and measuring the length of shoot, and dry mass.

KEY WORDS: capsaicin; botanical insecticides; Capsicum annuum, soft-bodied insects

ACKNOWLEDGEMENTS:

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Measure of Turbidity Level of Popular Beach Sites in Saipan

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ABSTRACT

Turbidity, measured in nephelometric turbidity units (NTU), is the measure of a fluid’s haziness caused by the number of particles, such as sediment, algae, and phytoplankton. It is an important indicator of the quality of water and aquatic life, as the lack of light penetration inhibits the growth of aquatic plants. The turbidity level increases when light reflects off of more particles in the water; accordingly, water with a high NTU appears cloudy and opaque because of the large number of individual particles, while water with low turbidity is transparent.

As clear, aquamarine waters are vital to islanders’ lifestyle and are a key tourist attraction to Saipan, ensuring the water quality and the appearance of the ocean is critical for the cultural and economic wellbeing. In this experiment, we will measure the turbidity levels of popular beach sites and examine if there is a significant difference between them. We collected water samples from Sugar Dock, where recreational activities—which stir up sand—are commonly done, and Garapan Fishing Base and Smiling Cove, where many commercial boats dock, throughout July 2021 from approximately 6:00 AM to 7:00 AM. The nine samples from the three sites are carefully tested using a turbidity sensor. In addition, salinity(ppt), tide levels(ft), rain, and specific activities at the locations are monitored to examine potential correlations between the factors and the change in turbidity level. The results of the study will indicate if immediate actions must take place to improve the quality of water.

KEY WORDS: Turbidity, Nephelometric Turbidity Units (NTU), Sediments, Algae, Phytoplankton, Tide

ACKNOWLEDGEMENTS:

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An Island in Crisis: The Relationship Between Community Disasters and Admissions into a Psychiatric Ward

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ABSTRACT

As one of the risk factors surrounding the onset of mental illness, psychological stress can increase especially during a community crisis. Community resources are restricted, social relationships are strained, and with the decreased stability in financial security that often succeeds a disaster, many people have an increased risk of developing certain mental illnesses. Furthermore, for those already suffering from a mental illness, a community disaster can exacerbate and make the illness harder to cope with.

As such, this study aims to investigate the potential correlation between the number of admissions into the Commonwealth Healthcare Psychiatric Ward and time periods of significant community crisis on Saipan (the years 2015, 2018, and 2020 correlating to the disasters Super Typhoon Soudelor, Yutu, and the Covid Pandemic respectively). Gathering information from the paper and digital records in the Commonwealth Healthcare Corporation, we will focus on patient population data such as age, sex, admission status, and diagnosis when admitted to determine a relationship between times of community crisis and the population admitted into a psychiatric ward. The results of this study may help predict whether a person will be admitted into a psychiatric ward, when a community should advocate for resources regarding mental health to minimize such admissions, and which demographics are especially susceptible to developing a mental illness following a community crisis.

KEY WORDS: Patient Population Data, Psychiatric Ward, Community Disaster, Crisis, Risk Factor, Mental Illness

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Optimizing Tetracycline Systems through Directed Mutagenesis

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ABSTRACT

Tetracycline inducible vectors are an integral tool in functional genomics. These lentiviral vectors are routinely used to regulate gene expression through the tetracycline response element (TRE) promoter and reverse tetracycline transactivator (rtTA). Although this expression system allows for controlled target gene transcription, it has a tendency to trigger transcription even in the absence of the intended catalyst (e.g. tetracycline). This leads to genes being expressed at inappropriate levels (e.g. leakiness); causing problems within experimental models that require precision such as the chromatin modifying gene and SWI/SNF complex member, SMARCB1.

Previous studies have shown that changing glycine into different amino acids with alterations in rtTA at residue 72 could suppress unintended transcription. We assessed various amino acids in a lentiviral Tet-ON vector harboring SMARCB1. Specifically, we introduced G72V, G72A, and G72P mutations in rtTA using site directed mutagenesis and transduced the mutants carrying SMARCB1 into SMARCB1-deficient cells. Following this, we characterized the consequences of these mutant vectors by examining the expression of SMARCB1 at the transcriptional level using qRT-PCR and protein level with immunoblotting. We then assessed how these mutations in rtTA affected the functional effects of SMARCB1 re-expression.

KEY WORDS: Tetracycline inducible vectors, mutagenesis, SMARCB1, SWI/SNF complex

ACKNOWLEDGEMENTS:

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Exploring the Status of and Issues with the Coconut (Cocos nucifera) Industry in Pohnpei and the Way Forward

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ABSTRACT

The coconut is primarily a smallholders' crop with a recorded history of cultivation going back for more than 3,000 years and now thriving throughout the humid tropics. At present, the coconut industry is beset with many problems that negatively affects the productivity and income of coconut farmers. There is a current effort to more fully explore the factors limiting coconut production in Pohnpei.

The state of Pohnpei consists of the (main) high, volcanic island of Pohnpei (with its nearby/surrounding islets) and eight outer atolls, 21-423 miles from the main island. The island of Pohnpei is roughly circular in shape, is approximately 13 miles long and has a land area of 133.3 square miles, and it's the largest island in the FSM.

This study aims at getting an update on the status of coconut industry and exploring issues faced by various stakeholders. It is hypothesized that coconut farmers are facing some key issues that are limiting production. This study involves interviewing various coconut stakeholders in Pohnpei with emphasis on coconut farmers in three communities.

Data collected confirms that the supply of coconuts does not meet demand by coconut markets in Kolonia, the capital city of Pohnpei. Interviews with farmers in the first community have indicated some key issues particularly, the inadequate cultural management of coconut trees. Results of this study should identify key issues in the coconut industry and recommend ways of addressing them.

KEY WORDS: smallholders, coconut industry, Pohnpei, management practices

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Growth and Survival of Sandfish Sea Cucumber (Holothuria scabra) Juveniles in Hapa Nursery System – II in Polyculture with Forktail Rabbit Fish (Siganus argenteus) Fingerlings

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

The College of Micronesia Land Grant Program has undertaken the development Hatchery based Sandfish sea cucumber, Holothuria scabra farming technology for local community based economic development, future commercialization and aiming at restocking the depleted stocks in the wild.

In this regard, an experiment was conducted to find out the effect of polyculture on the growth, survival of Sandfish sea cucumber, juveniles in floating Ocean Nursery Hapa Net System – II with and without Forktail Rabbitfish (Siganus argenteus) fingerlings in a polyculture system. The experiment aims to find out if any significant improvements in the growth and survival of juvenile Sandfish sea cucumbers can be achieved by polyculturing them with Rabbit fish fingerlings. Sandfish sea cucumber juveniles will be stocked at 20 pieces per floating hapas in duplicates as controls and a second treatment batch of 20 juveniles would be grown in poly culture with 100 Rabbitfish fingerlings in duplicates.

The experiment will run for 60 days at the end of which time the growth (length and wet weight) and survival will tabulated for each treatment by measuring all surviving animals of fish and sea cucumbers. The Rabbitfish will be fed daily a commercial feed in both the treatments while the control animals of sea cucumber juveniles will only graze on algae from the hapa net enclosures. Daily water quality measurements of temperature, pH, salinity and dissolved oxygen will be recorded twice, morning and late afternoon, to monitor the physio chemical properties of the ocean-rearing water.

KEY WORDS: Hapa Nursery System; polyculture; juvenile; Holothuria scabra

ACKNOWLEDGEMENTS:

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Effect of Substratum on the Growth and Survival of Sandfish Sea Cucumber (Holothuria scabra) Juveniles in Floating and Bottom-Set Hapa Nursery System - II

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ABSTRACT

The College of Micronesia Land Grant Program has undertaken the Development Hatchery based Sandfish sea cucumber, Holothuria scabra farming technology for local community based economic development, future commercialization and aiming at restocking the depleted stocks in the wild. In this regard, an experiment was conducted to observe the effects and impacts of whether or not having a sandy substratum, during the early juvenile stages of Sandfish sea cucumbers, would enhance their growth and survival in floating and bottom set Ocean Nursery Hapa Net System – II.

Sandfish sea cucumber juveniles were stocked at 20 pieces per floating nylon net (hapas) in duplicates and their growth and survival were compared with similarly set up hapas with a sandy bottom within the Ocean Grow-out farm. The experiment was run for 60 days. Data for growth (length and wet weight) and survival were recorded every 15 days and were tabulated for each treatment replicate by measuring all surviving animals. Sandfish sea cucumbers control animals grazing on algae from the hapa net enclosures while the treatment animals feed in nature on a mixture of seagrass, mud and other organic matter in the sandy substratum. Daily water quality measurements of temperature, pH, salinity, dissolved oxygen were recorded twice; once in the morning and the other in the late afternoon to monitor the physicochemical properties of the ocean rearing water. Hopefully, this experiment will encourage more people to learn about the importance of sea cucumbers and the impact of substratum on their growth and survival.

KEY WORDS: Substratum, Sandfish sea cucumber juveniles, Ocean Nursery Hapa, growth and survival

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Water Quality in the Marshall Islands

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ABSTRACT

This report investigates water quality in Majuro, Marshall Islands and its relation to human health. The Republic of the Marshall Islands Environmental Protection Agency (RMI EPA) Laboratory utilizes the INDEXX Method, certified under US EPA and serves under Freely Associated States (FAS). The Drinking Water Quality Monitoring and Community Outreach Activities in Majuro, Marshall Islands, recently tested 100 water samples. Of the samples tested, 88 water samples were positive for total coliforms and 55 samples were positive for both total coliform and E.coli (TCEC). Although existence of TCEC in drinking water do not guarantee human disease, their presence indicates that serious pathogens could be in the water system. Following positive results, contamination sources must be identified and addressed. Most of the other parameters met standards suggested by the United States EPA except 5 samples with higher total dissolved solids (>500 mg/L), 54 samples with pH below 6.5, and 1 sample with pH above 8.5. For this project, 7 water catchments were sampled to check the quality of drinking water. Water was tested with the colilert-18 method. Samples were incubated for 18 hours. The next day, all samples were analyzed and returned positive, indicating poor water quality. The RMI EPA standard for safe drinking water is 0 Most Probable Number (MPN) for TCEC. Monitoring water catchment systems within the Marshall Islands is necessary to ensure the livelihoods and health of all citizens. Increasing access to clean and safe drinking water is vital for RMI citizens.

KEY WORDS: Republic of the Marshall Islands, water quality, total coliform, E. coli

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Water Quality in the Majuro Lagoon

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ABSTRACT

The Republic of the Marshall Islands Environmental Protection Agency (RMI EPA) measures enterococci concentration in Majuro Lagoon, which is a commonly used approach in water quality monitoring. Enterococci are a group of bacteria used as indicators of water quality because of their prevalence in human and animal waste. If a location has high concentration of enterococci from sewage or untreated wastewater inputs, it likely has other pathogenic microorganisms. Water samples were obtained from Alwal, R.E.S, Marshall Islands High School (MIHS), Jenrok Park, Uliga Dock, Delap Park, and Delap Dock. Enterococci concentration was high at Alwal, R.E.S., MIHS, Jenrok Park and Delap Dock and low at Uliga and Delap docks. The purpose of this report is to inform community members of high Enterococci levels. Community members are advised to avoid swimming, especially for children. To improve the levels of Enterococci in water sources, community efforts can be made to improve sanitation services such as trash collection and recycling. Increasing awareness of this problem will not only keep residents healthy, but improve the environment for future generations.

KEY WORDS: Water quality, Republic of the Marshall Islands, Majuro Lagoon, Enterococci

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The Role of Urban Home Gardening on Food Security

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ABSTRACT
Palau is a small island nation that has come to depend heavily on imported foods and goods. In the wake of the Covid-19 Pandemic, the reduced flights, lowered products and demand for these products. The heavy dependence was evident when a container ship was delayed a couple weeks and there was a food shortage on the island. This sparked a focused effort on looking at internal production, this study follows an assessment on Urban Gardening designs and capacity in Palau, especially in the young population. In this study, we conduct a survey that will assess different households to find the best way to help them if they were to request help to start their own gardens. The survey consists of a set of questions to see if a household has had experience with gardening, enough space in their house to garden, and how big of a garden they need to provide an access to healthy and locally grown foods at home. The results show capacity for gardening but the lack of basic skills for developing these gardens. This study will be provided to leadership to promote skill development programs within the young population for the food security and sustainable lifestyle.

KEY WORDS: Food Security, household garden production, sustainability

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Assessment of Coconut Rhinoceros Beetle Damage 2021

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

The Coconut Rhinoceros Beetle (CRB), also known as Oryctes Rhinoceros, is an invasive insect that kills coconut trees and other palm species by feeding on the plant's crown. There is a confirmed presence of at least two biotypes of the CRB in Palau, Nudivirus (OrNV) resistant CRB-G versus all other types. These invasive insects have caused devastating damage to many coconut/palm trees in the Pacific.

The study of these invasive species has been an ongoing process in which damage assessment surveys and beetle collections have been done. Damage assessments surveys were administered in representative sites throughout all states of Palau in the years of 2016-2021. To collect beetle and larvae samples, specialized traps were used along with manual searches through debris. To determine distribution of CRB-G and occurrence of Nudivirus infection in each sample, DNA analysis was conducted.

In 2018 , damage assessment results have shown slow recovery and reduced damage in tree fronds. Results from the analysis of biotypes and viral infection show a very high rate of infection of all CRB with the Nudivirus, and damage assessment and sample assessment will help determine virus types/variants as well as heterozygosity in CRB population. Comparing results from past damage assessments to the results of this year will show reduction in impact of CRB.

KEY WORDS: CRB, Coconut Rhinoceros Beetle, Tree Damage Assessment

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Attitudes towards Schizophrenia In Palau

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ABSTRACT

People who suffer from mental illnesses along with schizophrenia have a more difficult time assimilating to current societal norms. With not much known about schizophrenia, there is insufficient help provided and awareness spread to educate the community about this mental disorder. Schizophrenia is a long-term mental disorder that causes withdrawal from reality into delusions and hallucinations. As they are often referred to as "smecher el mekebelung", or "crazy", in the Palauan community; this simple word, for instance, has caused a more negative outlook towards schizophrenia and people with mental disabilities in general. The lack of better understanding and acceptance of mental health has caused people who suffer from schizophrenia and other mental illnesses to be looked at as people who do not belong in our communities. In order to set a baseline for concepts of the population on schizophrenia and mental illness an assessment survey was disseminated to various parts of Palau, in both rural and urban areas, in an attempt to gather more profound and unbiased results. The results indicated that the majority of society lacks basic knowledge of what schizophrenia results in as well as ways to incorporate them in to regular society. This study assesses both the level of awareness and viewpoints of schizophrenia to deduce what services are needed to improve the lives of people who are suffering from this illness.

KEY WORDS: schizophrenia, mental health, wellness, awareness, social tolerance

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Plant Tissue Culture in Palau

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ABSTRACT

Environmental factors such as Typhoons and insects are one of the major causes of reduced food supply of important food plants. There is a plethora of ongoing research in the Pacific to increase varieties of tissue cultured economically viable plants. Plant tissue culture offers a method of rapid, mass propagation of plants in a sterile environment to allow for a larger array and quantity of economically important plant species. To assess plant tissue culture, we collect varieties of economically plant species from the field; then grow them in an artificial media within a sterile environment; then move for grow out and assess strength/survival of these plants. Surviving plants are then moved to the field after samples are taken for increased tissue culture. In this study, we review plant species and their viability for tissue culture, with an increased focus on important those important in Palauan culture. From field experience, saltwater tolerance seems to be a trait in more than the formerly identified Taro plants. Understanding of this will require genetic and field experiments, which are underway. This study is important in identifying and increasing the production of important food species.

KEY WORDS: Plant Tissue, Culture, Salt Water Tolerance, Production

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A Correlation Between Food Habits and NCDs in Palau: Urban vs. Rural

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ABSTRACT

Non-Communicable Diseases or NCDs have rampantly increased on the small islands of Palau. They have been called NCDs as they are not passed on via direct contact, however, it is arguable that eating habits may be communicable via household food consumption patterns. The growth and consumption of imported foods has increased since colonialization of Palau and more so in more recent years with greatly increased access to retail stores.

The study is to determine the level of dependence on imported foods and level of daily activity and their correlation to the rise in NCDs such as Diabetes, Hypertension, High Cholesterol, and Obesity in Palau.To better understand food sources and eating habits in rural versus urban areas in Palau, we conducted the 'Food Habits Survey' in Ngarchelong State (rural) and Koror State (urban). The survey includes a seven-day meal audit, which will illustrate a better picture of Palauans' eating habits as well as main food sources. In surveys from 2015 to 2017, data showed that people were fishing and harvesting less traditional local food compared to ten years ago. Data collected this summer of 2021 indicated that there is a reduction in daily breakfast consumption and more interim snacking. Moreover, there is an increase in consumption of imported foods compared to ten years ago. The correlation between consumption patterns and obesity, diabetes and other NCDs is undeniable, and the study also looks to create wellness program focused on the prevention of, and mechanisms for positive change for youth against NCDs.

KEY WORDS: Non-Communicable Disease, Health and Wellness, Food Source

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Waste Prevalence in Koror State

Dillungil Suzuki

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ABSTRACT

On the small island of Palau, waste collection and handling is a state responsibility. Recent assessments have made the national landfill more focused on handling waste management. However, Koror, the most populated state of Palau, has a unique waste system, as it managed more than 90% of the waste due to population and tourism lodging location. With the development of the new compact road, commuting is now more plausible and only around 65% of Palau's population resides in Koror. With the new landfill opening in Aimeliik State, Koror State operations are focused mainly on enhancing segregation and recycling. Current conditions and practices of waste segregation stations in each of the hamlets within Koror State are not as effective environmentally and hygienically. A survey was deployed to ask the residents of various hamlets in Koror their viewpoints regarding the stations. The intent of this survey is to (1) find out if people are willing to segregate at household level (2) willing to get rid of waste segregation stations in each hamlet, and (3) willing to adapt a new design and policies on waste and redeemable collection systems (regulation and schedule). This survey was to better understand viewpoints on waste management, and look into solutions on engaging the youth to help mitigate socio-economic and environmental issues. The survey and assessment of capacity of the waste management facilities showed that the communities are ready for upgrades and youth interaction.

KEY WORDS: Waste, segregation, collection, environment

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Mutagenesis of Antibody VRC01 to Prevent Proteolysis During Production in a Mammalian Cell Culture

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ABSTRACT

Human Immunodeficiency Virus (HIV) was identified as the cause of AIDS in 1983. Despite studying the virus for almost 40 years, a cure has never been created. The laboratory of Dr. MacPherson is developing a vaccine that can be created with an immune complex consisting of three proteins: an antibody light and heavy chain, and gp120. The complex is attached to a protein cage, enabled by the spycatcher/spytag system. The protein cage includes the small spycatcher protein attached to the outside of the protein cage. Permanent tethering of the immune complex is accomplished by addition of a short sequence (Spytag) at the end of the heavy chain. However, the Spytag is partially cleaved due to the presence of proteases likely released from dying cells during protein expression. This causes the constant separation of the protein cage and the immune complex (proteolysis).

The goal of this project is to stop this proteolysis by introducing mutations, specifically deletions of unnecessary amino acids, into the end of the heavy chain of the antibody. During the production of the immune complex in mammalian cell culture, 50% of the Spytags experience proteolysis, which decreases the yield of usable immune complex. Based on sequence analysis of the heavy chain, the group has identified the likely point of proteolysis and intends to remove two to four amino acids which are unessential to the function of the antibody. Mutant heavy chains will be assessed for Spytag proteolysis using sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). By introducing a mutation at the point of the severing of the spy tag, proteolysis is halted and the yield of an immune complex will be available to the vaccine.

KEYWORDS: Human Immunodeficiency Virus, Immune Complex, Proteases, Proteolysis, Spy Catcher, Spy Tag

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The Role of Liver SCLY in Obesity

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ABSTRACT

Selenium (Se) is an essential trace element that is vital to normal physiological processes through its incorporation in selenoproteins. These selenoproteins include glutathione peroxidases (Gpxs) and thioredoxin reductases (TXNRDs) that have essential roles in functioning as antioxidants and maintaining redox homeostasis. To maintain these selenoproteins, a Se recycling mechanism triggers when Se levels are low in cells and tissues. This process mainly occurs in the liver and is mediated by the enzyme selenocysteine lyase (Scly), converting Sec into selenide which is then used in selenoprotein synthesis. Previous research demonstrated that whole-body Scly knockout (KO) mice develop obesity, especially when Se levels are limiting. We therefore hypothesized that the obesity phenotype was due to Scly loss in the liver.

To determine this, we generated liver-specific Scly KO mice using the Alb-Cre system. The liver tissues were harvested from Alb-Cre Scly KO and control (CON) mice, then processed in RIPA buffer containing protease/phosphatase inhibitors. Using Western blot, we examined the levels of the following proteins in the liver: Gpx1, Gpx4, TXNRD1, Scly, SelenoS, PPAR-γ, and SEPHS2 with Beta-actin as our loading control. Western blot revealed that Scly was absent in the liver of the Alb-Cre Scly KO mice. However, we did not see any differences in expression of Gpx1, Gpx4, and TXNRD1. We also found no differences in total Gpx activity. Together, these results demonstrate that loss of Scly in the liver alone does not lead to the obesity observed in the whole-body Scly KO mice and that selenoprotein levels are maintained even after loss of Scly. This work reveals the complexity of Se metabolism and provides additional insight into how the loss of a recycling mechanism in the liver impacts obesity.

Keywords: Selenium, liver, selenoproteins, glutathione peroxidase, selenocysteine lyase, obesity, thioredoxin reductase

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02.

Determining the Diversity and Abundance of Phytoplankton Relative to Stream Sources in Pago Harbor, American Samoa

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Phytoplankton play a vital role in the marine ecosystem. In addition to supplying half of the world's oxygen, they serve as the foundation of the ocean food web. Currently, there is limited knowledge about the distribution, abundance, and taxonomic composition of phytoplankton in American Samoa. The purpose of this research is to determine the abundance of phytoplankton relative to streams and nutrient sources, and is one of the first studies in American Samoa to characterize the assemblage. This information will elucidate which environment is most favorable for phytoplankton in Pago Pago harbor. Four sites were selected to gather samples: Pago Pago Boat Ramp (85 meters from Pago Stream), Malaloa (800 meters from Pago Stream), and Pago Pago Port (1,360 meters from Pago Stream). The fourth site, Auasi Harbor, served as the control due to minimal stream input and was therefore closest to open ocean conditions. We hypothesize that locations nearer to streams will have higher concentrations of phytoplankton. To test the hypothesis, three replicate plankton net samples were collected from each site over the duration of the study. Each sample was towed for three minutes per the NOAA phytoplankton monitoring protocol and later examined microscopically for relative abundance and taxonomic diversity. Concurrent water quality measurements were taken using a multiparameter sonde. Weekly sampling and analysis of phytoplankton was conducted in July 2022. The significance of this research is to provide baseline information on abundance and biological diversity of this ecologically valuable resource relative to stream proximity in American Samoa.

KEY WORDS: phytoplankton, taxonomic diversity, relative abundance, stream input, plankton net

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16. Field assistance included Tilali Scanlan, Alisha Gill, Valentine Vaeoso.

Effect of an Invasive Vine on Growth of a Native Forest Tree in American Samoa

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ABSTRACT

Invasive plants represent an important threat to American Samoa's forests. One of the invasive plants is the vine *Mikania micrantha*. In areas of American Samoa where trees have been cut, vines quickly cover the area. In the National Park of American Samoa, crews responsible for cutting and maintaining hiking trails and replanting native trees where invasive trees were removed spend much time manually clearing invasive vines to keep trails clear and to ensure the growth of the native trees. *Syzygium inophylloides* is a native tree common in Samoan forests. It is readily grown in a nursery for reforestation of areas where exotic invasive trees have been removed. This study sought to evaluate the ability of *S. inophylloides* to establish and grow in areas where *M. micrantha* is already established. Tree saplings were grown in a nursery to be planted in areas with vines and areas where vines had been cleared. Growth of *S. inophylloides* will be monitored and compared between the two treatment areas. Parameters to be measured include changes in height, stem diameter, branching, and number of leaves. If *S. inophylloides* can compete successfully with invasive vines, then reforestation efforts can be accelerated and labor previously spent clearing vines can be used instead for removing invasive trees, further increasing the regeneration of American Samoa's native forests.

KEY WORDS: Invasive trees; reforestation; native trees; *Micania micrantha*, *Syzygium inophylloides*, American Samoa

ACKNOWLEDGEMENTS:

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An Improved Insecticidal Bait to Control Invasive Fijian White-Footed Ants

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ABSTRACT

The Fijian white-footed ant, *Technomyrmex vitiensis*, native to Southeast Asia and some Pacific islands, has become a serious pest in American Samoa. They can reach high densities over large areas, invading homes, gardens, and farms. These ants indirectly harm plants by defending certain sap-sucking pests, including scale insects, mealybugs, and aphids, from their natural predators in exchange for the sugary honeydew these insects produce. Methods that are used to control other ant species are less effective for *T. vitiensis*. One common method uses an insecticidal bait with sugary carbohydrates as the bait matrix. However, with carbohydrates in the form of honeydew from sap-sucking insects already abundant, *T. vitiensis* may be more attracted to baits made from other nutrients that are scarcer in the environment.

To evaluate this alternative approach, we hypothesized that the ants will consume more of a noncarbohydrate bait than a carbohydrate bait. We placed 5 different baits—fishmeal, grape jam, liver powder, peanut butter, and Spam—at each of 20 stations in an area where *T. vitiensis* were abundant. After an hour, each bait was collected and the ants were counted. Spam attracted the most ants. A protein and fat containing food such as Spam, that is favored over a carbohydrate-based food, such as grape jam, could be the basis for a more efficient insecticidal bait. A bait that is more attractive to *T. vitiensis* would result in increased dose and longer duration of exposure of the ants to an insecticidal toxicant mixed with the bait.

KEY WORDS: Fijian white-footed ant, *Technomyrmex vitiensis*, American Samoa, honeydew, insecticidal bait

Acknowledgments: The STEP-UP High School program is supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16. Field assistance was provided by Metotagivale Meredith, Fa'avaoa Ielafi, and Niela Leifi.

Evaluating the Vulnerability of Guam's Water Production Wells Through a Solute Transport Model

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ABSTRACT
Protecting our water supply is imperative as contaminated water is detrimental to our health, and certain contaminants are known to increase the risk of kidney disease and other ailments. In Guam, 90 percent of island's potable water is drawn from a designated sole source, the Northern Guam Lens Aquifer (NGLA). However, continued urban growth over the water source and aging established residential areas have made the risks from wastewater sources and storm drainage systems a concern to the island's production wells and water source quality. Although the Guam Environmental Protection Agency (GEPA) has established a wellhead protection zone and residential density limits, its effectiveness has areas of uncertainty and is often questioned.
This project examines the vulnerability of our production wells with a high-resolution numerical solute transport model for investigating theoretical limits to the magnitudes of concentrations and rates of trends that might follow from known and estimated boundary conditions and parameters for aquifer properties, site hydrology, and contaminant fate and transport. The model simulations will examine rates, extent, and concentration gradients of contaminant plumes from a steady state groundwater flow, from sources to production wells. Results will provide insights for evaluating options for preventing or mitigating contamination and evaluating the relative merits of alternative wastewater management approaches. Furthermore, this project will serve as the pilot study for other areas of contaminant transport concerns on the island.

KEY WORDS: NGLA, vulnerability, contaminants, production wells, solute transport, wellhead protection zone

ACKNOWLEDGEMENTS
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An Ecological Study on Fast-Food Restaurants and Adult Obesity in Guam

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ABSTRACT

Adult obesity prevalence is high in Guam (34%), comparable to the prevalence in United States (32%). One of the factors that influences obesity is diet. Diets with high amounts of sugar, fats, and sodium are associated with obesity, and fast-food are known to be packed with these substances. We conducted an ecological study to examine the relationship between the proportion of fast-food restaurants and obesity in Guam. We hypothesized that the two variables were correlated.

Fast-food restaurants (FFR) in Guam were counted in each municipality, defining FFR as franchise establishments providing quick food services. FFR were located using resources available online, excluding solely sit-down establishments and food trucks. Data on adult obesity was taken from the 2019 Guam Behavioral Risk Factor Surveillance System (BRFSS) where obesity was measured using self-reported height and weight to calculate BMI in kg/m2, categorizing BMI ≥30 as obese. Obesity prevalence was stratified by municipalities to match FFR. Pearson Correlation was used to assess the relationship between FFR density, defined as number of FFR in a village divided by total number of FFR, and obesity. A total of 123 FFR were found in Guam, and FFR density ranged from zero in nine municipalities to 27.6% in a central municipality. Pearson Correlation between FFR density and obesity was statistically significant (r (18) = 0.664, p < .01), showing that the two variables are directly correlated. Findings from the aggregate data in this study should be used to strengthen regulations on factors that affect obesity in Guam population.

KEY WORDS: fast-food restaurants, fast-food, adult obesity, Guam

ACKNOWLEDGEMENTS:

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Leaf and Seed Powder of *Moringa oleifera* as a Potential Coagulant for Water Treatment

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Coordinating Center: University of Hawai'i at Manoa

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ABSTRACT

Runoff from natural and anthropogenic sources have the potential to pollute bodies of water. This is especially of concern to islands in the Pacific, including Guam, as aquifers, rivers, and reservoirs are the main sources of drinking water. Although inorganic chemicals are currently used to treat polluted waters, they can be limited or expensive for many island nations. *Moringa oleifera*, a plant native to tropical regions, has been extensively studied for its coagulation properties and potential use in facilitating the removal of suspended solids in water. In this study, we evaluated the efficacy of *M. oleifera* leaf and seed powders as a coagulant in the treatment of turbid water.

Seeds and leaves of *M. oleifera* were collected, cleaned, oven-dried and powdered. Standardized turbid water samples were prepared by mixing 3.5 g of soil into 350 mL of tap water and tested for levels of turbidity, pH, and conductivity. 0.5 g of *M. oleifera* leaf and seed powders were added to the turbid water samples, stirred thoroughly, and allowed to settle for 30 minutes. Untreated turbid water samples served as the control. After settling, turbid water samples were measured for changes in turbidity, pH, and conductivity, and a one way ANOVA was conducted to determine the effect of the leaf and seed powders on turbid water. This study will demonstrate the potential of *M. oleifera* as a sustainable and cheaper alternative to hazardous chemicals for water treatment.

KEY WORDS: Guam, *Moringa oleifera*, Seed, Leaf, Coagulant, Water, Runoff

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The Impact of Stressors on Guam's Farming Community

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ABSTRACT

Even before the outbreak of the COVID-19 pandemic, mental health has emerged as an increasing concern for our agricultural community, but factors impacting mental health in farmers are unfortunately overlooked. These stressors, such as financial issues, time constraints, and environmental conditions, have been further aggravated by social distancing, setting farmers even farther apart from their supportive social networks. Consequently, suicide rates among farmers have witnessed a hike both on the local and global scale.

A study with the Western Regional Agricultural Stress Assistance Program (WRASAP) seeks to identify the underlying factors that cause a notable increase in stress and prioritize the services that can be provided to promote healthier lifestyles for farmers. Stress levels were calibrated with the *Ten-Item Perceived Stress Scale (PSS)*. Based on the 83 responses received, the vast majority of local farmers are experiencing a medium level of stress (61%), with the top stressors being production costs (71%), pests (67%), and COVID-19 (65%). This research is successful in recognizing the key factors that contribute to a decline in mental health and responding with appropriate measures to address them.

KEY WORDS: Mental Health, Agriculture, Perceived Stress Scale, Farmers, Suicide, COVID-19

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Fast-Food Consumption and Metabolic Conditions Among College Students in Guam

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ABSTRACT

Metabolic conditions such as diabetes, hypertension, and obesity continue to be major health issues throughout the world. Although convenient, fast foods are often energy-dense and offer poor nutritional value. Frequent consumption of fast foods may contribute to the development of metabolic disorders. Considering the high prevalence of metabolic conditions in Guam, we used a cross sectional study design to analyze the relationship between fast food consumption and metabolic conditions. We hypothesized that fast food consumption is associated with metabolic conditions.

Data were obtained from participants surveyed (n = 324) in Fall 2021 through the Pacific Island Cohort of College Students Study at the University of Guam. A chi-square test was utilized to examine the relationship between frequency of fast-food consumption (never/almost never vs. sometimes/often/always) and metabolic conditions (having at least one of the following: diabetes, hypertension, or obesity). Diabetes and hypertension were both self-reported and physician-diagnosed conditions. Measured height and weight were used to calculate body mass index (BMI) in kg/m^2 to determine obesity status (BMI ≥30). Of the participants surveyed, 51.9% had at least one metabolic condition and 48.1% consumed fast food regularly. A significant association was found between frequent fast-food consumption and the presence of metabolic conditions ($\chi^2 = 4.061$, $p = .044$). These findings will give college students the necessary information to select healthier types of food services available on campus.

KEY WORDS: Fast Food, Metabolic disease

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Allelopathic Effects of *Vitex Parviflora* on Seed Germination of a Common Weed, Guam Daisy (*Bidens alba*), and Two Vegetable Crops, Eggplant (*Solanum melongena*) and Daikon (*Raphanus sativus*)

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ABSTRACT

Allelopathy is a biological interaction wherein one organism affects the growth, development, and survival of another organism by releasing biochemicals known as allelochemicals. *Vitex parviflora* is an invasive tree species in Guam suspected to have allelopathic interactions suppressing the growth of native and other plant species. A bioassay was conducted to evaluate the allelopathic effects of leaf and root extracts of *V. parviflora* on the seed germination of Guam daisy (*Bidens alba*), eggplant (*Solanum melongena*), and daikon (*Raphanus sativus*).

Fresh leaves and roots of *V. parviflora* were collected, oven-dried, and powdered. Leaf extracts of *V. parviflora* were prepared by cold extraction with distilled water. Root extracts of *V. parviflora* were prepared through Soxhlet extraction with ethanol. *V. parviflora* leaf and root extracts were diluted in water at concentrations of 5%, 10%, and 15% (v/v). For bioassay, 15 seeds of *B. alba, S. melongena,* and *R. sativus* were grown on filter paper in Petri dishes with extract solutions and distilled water as control with 4 replications. Seeds were incubated in a growth chamber for 14 days. Seed germination, signified by the emergence of the root radical, was recorded daily and germination rates were analyzed by regression and Cox proportional hazards models.

This experiment is ongoing and results are forthcoming. Based on previous studies, we suspect that 5% extract solution will stimulate germination while higher concentrations will suppress germination. Our results will be used to verify the allelopathic effects of *V. parviflora* on local flora to develop appropriate strategies for its management.

KEY WORDS: Allelopathy, *Vitex parviflora*, germination, invasive plant, Guam

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

The Addition of Calamansi Peels in Sausages for Antioxidant Activity

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Due to high lipid content, sausages are prone to oxidation that alter their quality and nutritional value. Calamansi (Citrus microcarpa) is a local citrus fruit in Guam that contains flavonoid compounds, which possess antioxidant properties. While synthetic antioxidants are commonly used to preserve food from lipid oxidation, they have adverse effects on health. Natural sources of antioxidants will be a healthier alternative to using synthetic antioxidants. By incorporating calamansi peels in sausage mixtures, we hypothesize an increase in antioxidant activity in the sausage mixtures.

Calamansi peels were hand-peeled from calamansi fruit at various maturity stages and dehydrated at 55°C for 6-8 hours. The dehydrated calamansi peels were pulverized and stored at -18°C until ready to be incorporated into the sausage mixture. Calamansi peel power (0-5%) will be added to a Guam local sausage recipe. Aqueous extracts will be obtained from sausages for further analysis. Free radical 2,2-diphenyl-picrylhydrazyl (DPPH) will be used to determine the antioxidant activity of the sausage extract. The absorbance will be measured at 515 nm and antioxidant activity will be expressed as inhibition percentage (%) or mg of ascorbic acid (AA) per 100g. The Folin-Ciocalteu (F-C) reagent will be used to determine the total phenolics of the sausage extract. The absorbance will be measured at 765 nm in a spectrophotometer and total phenolics will be expressed as mg GAE/100 g (gallic acid equivalents).

We expect to see an increase in antioxidant activity in sausages due to the added calamansi peel powder. Tropical calamansi fruit peel may be used as a natural antioxidant and as a safer replacement for synthetic antioxidants in meat products.

KEY WORDS: calamansi, flavonoid compounds, antioxidant activity

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A Comparison of “Adult Generation Z” and “Baby Boomer” Perceptions on Chamorro Traditional Healing

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Mentor: Prof. Kristina Sayama, MPA, University of Guam

Coordinating Center: University of Hawai’i at Manoa

ABSTRACT

Over the course of Guam’s history, the Chamorro people practiced traditional healing as a remedy for the community's ailments. “Yo'åmte” (CHamoru traditional healer) has been the official title given to the proficient healers of Guam. Traditional healing has been practiced for many years, employing medicinal plants and methods such as massaging and the grinding of herbs to help alleviate people’s ailments. However, due to the increasing presence of western medical practices, Guam’s traditional healing methods have been in a state of decline.

This study will examine the attitudes of "Adult Generation Z" and "Baby Boomer" Chamorros towards Guam’s alternative medicine in comparison to western biomedical practices to highlight generational beliefs and health-care preferences. With the use of material gathered from surveys of the target population (n = 50), depicting the perceptions of both generational age groups in addition to the literature review. The significance of comparing these age groups is to demonstrate the evolution of societal norms and cultural expectations of individuals on Guam. The results of this study’s narrative analysis will be used to contribute to Guam’s alternative medical literature.

KEY WORDS: Chamorro, CHamoru, Yo'åmte, Traditional healer, Guam, Generation Z, Baby Boomer, Alternative medicine

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Reciprocity Values of Donations for Healers' Services in Traditional Healing on Guam

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Coordinating Center: The University of Hawai'i at Manoa

ABSTRACT

On Guam, traditional healing has been practiced for over 4,000 years, improving the well-being of residents. Traditional healers go by the name Yo'åmte, which means "a proficient healer" or "CHamoru Traditional Healer." This healing comprises massaging and using herbs as remedies to provide treatments. However, due to current generations' lack of interest in becoming traditional healers, it may be challenging to sustain this practice.

Western healthcare and traditional healing are significantly different emphasizing the routine of payment. Patients may offer contributions such as food instead of monetary payment to healers in return for their services. Contributions are not consistent items and are generally determined by the patient. Currency may be accepted, though it is not an obligation. A survey will be conducted targeting 50 participants to conclude the common contribution and the reciprocity value of the healers' services. The results of this study will attract shift the attention of those that may not be able to afford the cost of western health care towards traditional healing and prevent the overall loss of this practice.

KEY WORDS: Yo'åmte, Traditional Healer, CHamoru, Reciprocity

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Extraction and Biological Activity Testing on Psidium Guajava Leaves

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Psidium guajava (common name guava) is a small tree that is native to tropical America and predominantly found in various tropical areas around the world. Guava is popularly used in traditional medicine to help in a number of ailments, such as stomach aches, diarrhea, and constipation. Guava is also widely consumed for its diverse medicinal purposes, which include antibacterial, antioxidant, anti-inflammatory, analgesic, anti-cancer, anti-hyperglycemic, and antidiabetic properties. Every part of the plant is used, particularly the leaves. Guava leaves are also an excellent source of Vitamin C and are rich in flavonoids, nutrients that help lower and manage blood sugar levels.

The phenolic compounds in medicinal plants were reported to present antioxidant, anti-inflammatory and antibacterial activities. The antioxidant capacity (AC) of natural plants has been shown to be related to polyphenols, flavonoids, tennis, etc. This study aims to extract bioactive components from local guava leaves and to determine the total phenolic content (TPC) and AC of guava leaves extracts and to further assess how AC of guava leaves could be correlated with the TPC. TPC and AC of the selected guava leaves extracts were determined spectrophotometrically using Folin-Ciocalteu (FC) assay and 2,2-diphenyl-picrylhydrazyl (DPPH) free radical scavenging assay, respectively. Results from this study could lead to significant discoveries on the anti-aging properties and protection against free radical-related diseases of guava leaves, with implications in inflammatory joint disease, senile dementia, degenerative eye disease, diabetes, and atherosclerosis.

KEYWORDS: guava (*Psidium guajava*), extract, antioxidant, total phenolic, traditional medicine

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Investigating Which Salinity Level is Best for Copepod (Apocyclops dengizicus) Survival and Production

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ABSTRACT

Apocyclops panamensis copepod is a zooplankton ranging from 0.1 - 0.04 mm in length and consumes microalgae as a food source. They are commonly found in saline and brackish water habitats. It is the basis of the marine food chain and serves as the primary consumption for fish larvae and filter feeders. Research was conducted to decipher which salinity range is most suitable for copepod production and survival. In this experiment, 2 L bottles were filled with water of differing salinity levels (15%, 20%, 25%) and 2,000 Copepods were added to each bottle. Copepod populations were surveyed on a daily basis through a 1 mL sample. The results indicated that the salinity levels had a major impact on the survival of the nauplii with the 20% salinity level water yielding the most amount of *A. panamensis* at the end of the experiment. These results will be of service to marine aquaculture where nauplii are the primary consumption of fish larvae in the process of larval rearing.

KEY WORDS: Copepods, Salinity, Larval Rearing

ACKNOWLEDGMENTS: The STEP-UP HS program is supported by the National Institutes of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant number: R25DK78386-16.

Accessing the Compatibility of Soil pH for Various Agricultural Crops in Saipan

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ABSTRACT

Productivity and healthy plant growth are directly linked to the pH level of soils. Soil pH is a measure of acidity or alkalinity within the soil that controls many chemical and biochemical processes operating in the soil. Soil pH affects the amount of organic and inorganic nutrients that are soluble in soil water thereby influencing the amount of nutrients available to plants. Although soil pH generally ranges from 3.5 to 10, agricultural crops require a specific optimum soil pH level for healthy crop growth and yield. Enhancements of agricultural yield in Saipan can be achieved by recognizing the local soil pH deviation from the ideal soil pH range for each crop.

This study focuses on accessing the compatibility of soil pH for agricultural crops in Saipan. The objectives of this study are to: 1) collect soil samples and crop data from selected farm plots; and 2) examine the suitability of soil pH for agricultural crops growing in these farms. Soil samples and agricultural crop data, such as plant health and yield, will be collected from 10 farm plots located in different areas of Saipan. The soil pH of each sample will be measured with a pH meter and compared to the ideal soil pH range for every agricultural crop. The results of this comparative pH analysis will be used to determine the suitability of soil pH for each crop. These findings will aid in identifying solutions to maintain optimal soil pH for maximum yield and plant growth in Saipan.

KEY WORDS: Soil pH, soil productivity, agricultural crops, plant health.

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Effects of Different Salinities on the Growth and Survival of Sandfish Sea Cucumber (*Holothuria scabra*) Larvae

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Sandfish sea cucumber, *Holothuria scabra,* is of high commercial importance. The College of Micronesia Land Grant Program has undertaken the development of Hatchery based Sandfish Sea cucumber farming technology for economic development as well as restocking depleted populations in the wild. Efforts are being made to significantly improve the early larval growth, and survival of *Holothuria scabra* larvae in the hatchery system. *Holothuria scabra* larvae were stocked at 0.5 larvae per mL in 20 L buckets in duplicates for the trials. The experiment ran for 15 days at the end of which survival was tabulated for each treatment by counting all surviving animals. As per general hatchery rearing protocols, larvae in different treatments were fed daily commercial concentrated algal feed, *Thalassosira psuedonana* (TP) every other day of the experimental trial. Different salinities of 25%, 30%, 35%, and 40% were prepared by mixing fresh rainwater and sea salt to ambient seawater salinity. Daily water quality parameters were recorded twice; morning and late afternoon to monitor the physicochemical properties of the rearing water. Daily monitoring and control of the salinity levels in each bucket were also conducted. The experiment aims to elucidate any significant difference in the growth and survival of *Holothuria scabra* larvae reared in different salinities. This experiment is important for the development of sea cucumber hatcheries; knowing how the early larval stages react to salinity will help planners recommend where to set up hatcheries when sea cucumber farming becomes commercial in Micronesia.

KEY WORDS: Sandfish sea cucumber (Holothuria Scabra), larvae, salinity, hatchery, growth, survival

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Growth, Survival of Sandfish Sea Cucumber (*Holothuria scabra*) Larvae in the Hatchery Fed on Different Concentrated Algal Diets

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ABSTRACT
Sandfish sea cucumber, *Holothuria scabra,* have been over-exploited due to their commercial importance and populations worldwide are becoming extinct. The College of Micronesia Land Grant Program has undertaken the development of hatchery-based Sandfish Sea cucumber farming technology for commercial-scale or local community-based economic development and for restocking. Traditionally, live microalgae have been used as feed for early *Holothuria scabra* larvae stages. Live feed cultures have many problems associated with their culturing. The cultures are unpredictable in growth and prone to contamination and thus affecting the growth and survival of the *Holothuria scabra* larvae. Hatcheries are now replacing live feeds with concentrated algal feeds. This experiment was conducted to investigate the growth and survival of *Holothuria scabra* larvae fed daily with different commercially available concentrated algal feeds. *Holothuria scabra* larvae were stocked at 0.5 larvae per mL in 20 L buckets in duplicates and fed four different feeds: *Thallasosira wessifolgia* (TW), *Thalassosira psuedonana* (TP) (control), Shellfish Diet -1(SD-1), Shellfish Diet -2 (SD-2) at amounts as per standard hatchery protocols. Twice daily, the water quality parameters of each rearing bucket were recorded. The experiment was run for 15 days at the end of which the entire larvae were counted in each treatment bucket to assess the survival, and stage of life cycle observed to understand their growth. The aim of this project is to significantly improve the early larval growth and survival of *Holothuria scabra* larvae in the hatchery system.

KEY WORDS: Compounded Algal Food, *Holothuria scabra*, Sandfish, Sea cucumber, Larvae, Hatchery

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Growth and Survival of Sandfish Sea Cucumber (*Holothuria scabra*) Juveniles in Hapa Nursery System–II Fed Different Feeds

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ABSTRACT

The College of Micronesia Land Grant Program has undertaken the development of Hatchery based Sandfish sea cucumber farming technology for local community-based economic development, future commercialization, and the restocking of depleted stocks in the wild. As deposit feeders, sea cucumbers play an important role in nutrient cycling. Their actions reduce organic loads and redistribute surface sediment, and the inorganic nitrogen and phosphorus they excrete enhances the benthic habitat. However, sandfishes are currently endangered due to water pollution and exploitation. In order to determine the best growth conditions for the replenishment of wild stocks, an experiment was conducted to reveal the effect of different feed combinations on the growth, survival, and settlement of sandfish sea cucumber, *Holothuria scabra* juveniles in Ocean Nursery Hapa Net System - II.

Sandfish sea cucumber juveniles were stocked at 50 pieces per floating hapas in duplicates. The experiment was run for 30 days. On day 15 and 30 the juveniles from each hapa treatment were counted and measured for their length and weight. Survival from each treatment was tabulated also. We aim to discover if there is any significant difference in the growth and survival of juvenile sandfish sea cucumbers fed different feed types, namely seagrass, fish feed, or a mixture of fish feed and seagrass. Daily water quality parameters were recorded twice; morning and late afternoon to monitor the physicochemical properties of the rearing water. Identification of optimal feeding conditions will allow us to grow more sandfish sea cucumbers in a safe environment for the restoration of wild stocks.

KEY WORDS: *Holothuria scabra*, Sandfish, Sea cucumber, Juveniles, Hapas, Seagrass, Ocean Nursery

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Effect of Hapa Mesh Size and Design on the Growth and Survival of Sandfish Sea Cucumber (*Holothuria Scabra*) Juveniles in Hapa Nursery System – II

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

The US Affiliated Pacific Islands of Federated States of Micronesia and Republic of Palau have several commercially important species of sea cucumbers in their waters including the sandfish sea cucumber, *Holothuria scabra*. Due to their commercial importance, they have been widely exploited and are in the danger of becoming extinct. The development of Hatchery based sandfish sea cucumber farming technology has been taken on by the College of Micronesia Land Grant Program with the goal of restoring the wild stocks that have been depleted as well as local community-based economic development. An experiment was conducted to reveal the effect of different mesh size and design on the growth and survival of sandfish sea cucumber, *Holothuria scabra* juveniles in Ocean Nursery Hapa Net System - II.

Sandfish sea cucumber juveniles were stocked at 50 pieces per each mesh type and designed floating hapas in duplicates. The experiment was run for 30 days. On day 15 and 30 the juveniles from each hapa treatment were counted and measured for their length and wet weight. Survival of each treatment was tabulated also. This study aims to discover if there is any significant difference in the growth and survival of juvenile sandfish sea cucumbers grown in different mesh sizes and designs of the hapa net enclosures. Daily water quality parameters were recorded twice; morning and late afternoon to monitor the physicochemical properties of the rearing water. As sandfish sea cucumbers are extensively exploited and endangered, this study will identify optimal breeding conditions needed for restoration efforts.

KEY WORDS: Holothuria scabra, Sandfish, Sea cucumber, Hapas, Mesh sizes, Juveniles, Ocean Nursery

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Association between Students' Diet and Academic Performance among Summer School Students at Marshall Islands High School

Ryback Domnick

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Coordinating Center: University of Hawai'i at Manoa

The Republic of the Marshall Islands Public School System mandated every public school on the island to serve healthy food for all students. Marshall Islands High School, the largest public secondary school in Majuro, benefitted from the government lunch program, which provides free lunch for all students daily. Although the program aimed to increase academic performance, student performance was lower than expected. This study aimed to determine the effect of students' food intake on the academic performance of summer school students at Marshall Islands High School. There are two driving questions for this research study. First, aim to investigate the extent of the students' food intake affects the students' academic performance. Second, aim to examine the association between students' food intake and their academic performance.

The study used a descriptive correlation design and convenience sampling techniques to select the 143 respondents from pre-9th to 11th. A survey questionnaire was administered to the student respondents to gather data. For statistical analysis, frequency distribution, weighted mean, Chi square test, and Five-point Likert scale to analyzed data. The results revealed that the imported food intake obtained the highest overall weighted mean of 2.74 (3-4 times a week), breakfast intake of 2.53 (1-2 times a week), and local food intake with a lowest weighted mean of 2.48(1-2 times a week). Furthermore, data revealed that there is a significant association between students' diet and their academic performance. The findings of this study provide a valuable tool for reviewing the school's lunch program. In addition, the school administrators, teachers, and parents can collaborate with various non-government organizations to seek additional funding in providing healthy breakfast.

Key Words: Academic Performance, Diet, GPA

Diabetes in the Marshall Islands

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

The Republic of the Marshall Islands has the third highest prevalence of diabetes in the world. Diabetes is one of the most common chronic diseases and affects approximately 27% of people in the Marshall Islands. There are three main types of diabetes: type I, type II, and gestational. The risk factors for diabetes include being over 45 years old, a family history of diabetes, a history of gestational diabetes, high cholesterol, high blood pressure, obesity (BMI>25). This project focuses on type II diabetes and ways to help prevent adults with type II diabetes from premature death.

This research will examine the physical and internal health barriers adults with type II diabetes experience. Patients were organized into groups by the patient's diabetic statuses and sex (male or female). Every Tuesday and Thursday, participants check their weight, height, body mass index (BMI) and diabetes status. The applicants with a high level of unmanaged type II diabetes are enrolled into an educational class to improve patient adherence to glucose control and self-management and to help reduce risk factors associated with type II diabetes. This project shows that self-management courses help reduce the risk of premature death from diabetes as evidenced by; decreased BMI, decreased blood sugar levels, decreased total cholesterol and triglycerides.

KEY WORDS: Gestational Diabetes (GDM), Blood Urea Nitrogen (BUN), Creatinine (CREA), Triglyceride (TRIG)

ACKNOWLEDGMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-16.

Assessment of Coconut Rhinoceros Beetle Damage in Palau in 2022

Lianna Marie Ramirez
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ABSTRACT
Coconut Rhinoceros Beetle (CRB), also known as the Orycetes Rhinoceros, is an invasive insect that feeds on the crown of the coconut and other species of palm trees, causing damage and in cases of heavy infestation death. Palau has multiple variants of the beetle, including the Nudivirus (OrNV) resistant CRB-G. This resistant biotype has caused heavy damage to the palm industry around the world especially in southeast Asia and the Pacific. Coconut tree damage assessments from CRB started in 2016 and have been ongoing. These assessments, including this year's assessment, of coconut tree damage in Palau have shown varying rates of damage throughout the years. Furthermore, collection of beetles and larvae have shown varying populations of biotypes that have been shown to have relative resistance to OrNV. Comparing results from past years will show whether the impact of CRB has increased and what factors result in increased or decreased damage. Results from these surveys and genetic analysis have led to the conclusion that the varying damage is likely due to heavy heterozygosity in the beetle population leading to variable susceptibility of the OrNV as well as adaptation of the OrNV to this heterozygous population. In conclusion, collections of as many OrNV and testing them on populations in rearing cages may lead to a viral cocktail that can be used around the world to control CRB populations.

Keywords: Coconut, CRB, OrNV

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Control of Fruit Flies Population in Palau

Iyechad Sengebau

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Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Fruit flies have caused 90% of fruit loss in Palau. The reproductive potential of fruit flies is immense, as they can lay about 500 eggs and maturation to breeding age is one week. This reproduction rate compounded with non-harvested fruit has resulted in a population explosion in Palau. There are four known fruit fly species in Palau: mango fruit flies (*Bactrocera Frauenfeldi*), oriental fruit flies (*Bactrocera Dorsalis*), breadfruit flies (*Bactrocera Umbrosa*), and B*actrocera Calophylli*. The increased cost of shipping and low efficacy and danger of commercial fruit fly trapping materials has led to the demand for low cost, locally available methods for trapping.

There has been very limited success since the early 1990's of control techniques due to cost and availability of trapping materials. In our study, we investigate the effectiveness of a cost-effective method from locally sourced materials for fruit fly trapping. Traps were made by combining disposed yeast from a local brewery, crushed papaya leaves, and isopropyl which were then poured into a bottle and hung on fruit-bearing trees . Upon hanging the traps on fruit-bearing trees, we assess the fallen fruits to see whether there has been damage to the tree. The yeast and papain from the papaya leaves attract female and male fruit flies which are then killed by the isopropyl. Using this method, we have successfully trapped 53 fruit flies; 49 of which are *Bactrocera Frauenfeldi* and 4 are unidentified. This method has been introduced to the bureau of agriculture and shall be scaled up for large scale implementation along with commercial traps to maximize catch count.

KEY WORDS: fruit flies, *Bactrocera Frauenfeldi, Bactrocera Dorsalis*, *Bactrocera Umbrosa,* B*actrocera Calophylli*

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The Correlation Between Food habits in Palau in 2022: Urban vs Rural

Courtney Tervet

Christopher Kitalong PhD, Palau Community College, Aimie Oilouch, Leah Marie Bukurou, Pacific Academic Institute for Research

Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Approximately 85% of Palau's food products are imported. Due to the increased cost of shipping and impacts of COVID-19, food security has become an issue for Palau and many other Pacific island nations. Ongoing research on consumption patterns in Palau have found increased dependency on food and loss of practical food gathering and production practices on the small island of Palau. With the financial stress of the COVID-19 pandemic on the tourism sector as well as the increased price of fuel and therefore imported goods, households likely have shifted away from purchasing imported goods and towards purchasing local sources of food.

In our study, we utilize a survey tool with a ranking system to examine how habits have changed today versus in the past, collecting data from households from each state in Palau from urban to rural, to determine the 10-year difference in food consumption patterns. This data will be used to document the well-being of the Palauan population and how they are coping with these changes, with respect to food consumption within this transition period. The survey results indicated household struggle to purchase food but also increased activity in fishing and farming. in that it may allow for a mechanism of combating lifestyle-derived noncommunicable diseases (NCDs), which include diabetes, cholesterol and high blood pressure.

KEY WORDS: Food security, noncommunicable diseases, Palau

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Identifying New Regulators of Neuronal Amyloid-Beta Production in Alzheimer's Disease

Amara Martin

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Coordinating Center: University of Hawai'I at Manoa

ABSTRACT

While there is much debate about the cause and pathogenesis of Alzheimer's disease, one of the leading hypotheses is the amyloid cascade. This phenomenon is an imbalance between production and clearance of *β-amyloid* proteins (Aβ), resulting in the buildup of amyloid plaque. Aβ is generated from the β-amyloid precursor protein (APP). We hypothesize that the exocyst, an 8-part protein trafficking complex, plays a central role in the intracellular trafficking of APP and Aβ generation. The exocyst is also known to regulate insulin signaling in the body, leading us to also hypothesize that insulin will affect Aβ production. It has already been confirmed that the exocyst plays a role in APP trafficking and that the exocyst is responsive to insulin in two models of neurons, primary mouse hippocampal neuron cells and SH-SY5Y cells. It has also been found that insulin seemed to cause the exocyst to traffic Glute4+ vesicles, rather than APP+ vesicles. This summer we were able to further confirm these results through various assays. A greater understanding of how the exocyst is regulated in neurons may lead to new potential Alzheimer's therapeutics.

KEYWORDS: *β-amyloid* proteins, amyloid precursor protein, exocyst, insulin, neurons, Alzheimer's disease

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grand Number: R25DK78386-17

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Impact of fibroblast loss on airway remodeling in house dust mite-induced asthma model

Asthma is a condition that impacts the airway of the lungs, causing inflammation and narrowing of the airways along with excessive production of mucus, making it difficult for individuals to breathe. Asthma is the leading chronic disease in children and can have serious manifestations, leading to lung scarring, hypoxia, and even mortality in severe cases. Despite the importance of asthma, the role of fibroblast in the development of the disease is relatively unclear. This study aims to determine the effect of lung resident fibroblast loss on airway remodeling in house dust mite (HDM)-induced allergic asthma model.

PDGFRα^{+} fibroblasts are known as a resident fibroblast marker. PDGFRα^{+} fibroblasts were genetically ablated using the Cre Lox system in mice, leading to a significant reduction in the number of lung fibroblasts. To establish of HDM asthma model, fibroblast-ablated mice, and littermate controls were injected intranasally with 25 ugs of HDM over 5 weeks. RNA was extracted from lung tissues collected from mice, then quantitative real-time PCR was conducted to identify differences in the transcription of genes involved in tissue fibrosis and synthesis of ECM between control and fibroblast-ablated mice. Also, to examine collagen damage, denatured collagens were detected on the tissue sections by Collagen hybridizing peptides. This study provides a better knowledge of how fibroblasts influence airway fibrosis in asthma.

Key words: Asthma, Airway remodeling, Fibroblast, Extracellular matrix,

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Harley-Vaughn Kaawa

Mentor: Pakieli, Kaufusi, PhD, University of Hawai'i at Manoa, John A. Burns School of Medicine Coordinating Center: University of Hawai'i at Manoa

Potential Pharmacological Inhibitors for The Treatment of Flavi-Virus Infection

Flaviviruses, such as Zika virus (ZIKV), Dengue Fever (DENV), and West Nile Viruses (WNV), are mosquito-borne RNA viruses that have caused significant global health crises. With no specific antiviral treatments available, there is an urgent need to develop novel therapies. In recent years, the repurposing of FDA-approved drugs has emerged as a safe and speedy approach to drug development. In the lab, we assessed the inhibitory potential of 24 FDA-approved drugs and three showed significant inhibition on Flaviviruses using human embryonic kidney (HEK-293) cells. These three drugs are ivermectin, mycophenolate mofetil, and mycophenolic acid. This study will examine whether these three drugs could interrupt the replication cycle. Non-Structural (NS) proteins NS3 and NS4B are critical for viral replication. We then aimed to assess whether these three drugs, ivermectin, mycophenolate mofetil, and mycophenolic acid, could significantly reduce viral replication by disrupting the NS3 and NS4B proteins. Flaviviruses are known to manipulate the endoplasmic reticulum (ER) membranes inside the host cell's cytoplasm to synthesize and assemble viral RNA. Using an immunofluorescence assay (IFA) on transfected and stained HEK293 cells, we will determine whether these drugs will interfere with the NS3/NS4B connection between the membrane and the cytoplasm. This interference may close the doorway for viral protein production, disrupting the Flavivirus replication cycle and reducing surrounding cell infection. These findings represent a significant step towards developing effective therapeutics for Flavivirus infections. Furthermore, our study will showcase the potential of drug repurposing as a viable option for rapidly developing therapies for emerging viral diseases.

Key words: Flavivirus, NS3, NS4B, FDA-Approved Drugs, Therapeutics

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Other Authors: Francine Iopu, OlaGA Research Center American Samoa, Yale University; Nicola Hawley, Yale University

Barriers and Facilitators of Recruitment and Retention for Health Research Involving Adolescents in American Samoa

ABSTRACT

Recruiting adolescents to participate in research can be challenging in general, even more difficult in American Samoa. A United States territory located south of the equator, American Samoa holds a population of approximately 45,000 people with a strong culture that encompasses every aspect of life and learning. These cultural and environmental factors can play an important part in research and recruitment efforts for research participants. The Obesity, Lifestyle and Genetic Adaptations (OlaGA) Research Center is currently recruiting adolescents for a number of research projects focused on diabetes, nutrition, and mental health. This study will explore the unique challenges of recruiting American Samoa adolescents for research and assess new methods of retaining adolescents once enrolled in a study. Observations to date indicate that the most effective recruitment strategy is through personal networks, family, and community, leveraging personal and familial relationships to secure enrollment. Traditional media such as radio and TV coupled with social media yielded comparatively few participants. We hypothesize that adolescents will report both barriers and facilitators to research study participation that are related specifically to the American Samoan culture and context. As this is an ongoing effort to recruit participants for the above-mentioned research projects, recruitment results will be routinely reported and analyzed to inform strategies for effective recruitment retention. Focus groups with adolescents will be facilitated to discuss more creative ways to maintain adolescent participation throughout the study. The results of my study will help improve efforts to recruit and retain adolescents for future studies and research.

KEY WORDS: American Samoa, Adolescents, Research, Recruitment, Barriers, Strategy, Retention

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Charles Tauiliili

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A Short-Term Study on Macroalgae Abundance in Proximity to Freshwater Input as an Indicator of Excess Land-Based Source of Nutrients (Total N, Total P, DIN), in Three Coral Reef Flat Habitats in American Samoa

ABSTRACT

Macroalgae serve as an important food source for most fish species in American Samoa's coral reefs. These species include striped surgeonfish (*Acanthurus lineatus*), dark-capped parrot fish (*Scarus oviceps*), and whitecheek surgeonfish (*Acanthurus nigricans*), which are important food sources for most people on the islands. But in recent years, sedimentation, pollution, and an increase in nutrient inputs in the ocean have caused excessive algal growth or algal blooms. Algal blooms consume most of the oxygen in the water and block sunlight for photosynthesizing organisms such as corals and phytoplankton, which are the foundation of the food chain.

This study will look at algal growth at various depth gradients in coral reef ecosystems as well as how terrestrial nutrient inputs may affect algal abundance. We hypothesized that sites with more sedimentation would have higher nutrient levels, less coral and more algae. Water samples to be tested for nutrient content (nitrogen, phosphorus, pH, dissolved inorganic nitrogen, and salinity) will be collected from three sites (Fagaalu, Fatu ma Futi, and Onesosopo). In addition, we will lay 50m transects at each site, take photos at 1m intervals, and upload those photos to CoralNet, an online tool for calculating algal percent coverage. Identifying areas of excess algal growth and determining which nutrients are most abundant in those areas can help in tracing nutrient sources and inputs. The findings from this study are thus valuable for developing mitigation strategies to protect American Samoa's coral reefs.

KEY WORDS: *Scarus oviceps*, *Acanthurus lineatus*, *Acanthurus nigricans*, transects, CoralNet, algal bloom, water quality, coral reef health

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Determining the Effects of Saltwater Infiltration on Taro *(Colocasia esculenta)* Production in American Samoa

ABSTRACT

Taro *(Colocasia esculenta)* is a root crop which serves as a staple food in American Samoa. Increasing salinity of coastal areas, due to rising sea levels, is negatively affecting taro production. The objectives of this research were to identify the salt tolerance threshold (maximum salt level a crop tolerates without losing productivity) for the most common locally grown taro cultivar ("Lalelei o Samoa") and to rate the salt tolerances of 3 different cultivars using a relatively quick, simple method. We anticipate the salt tolerance threshold for "Lalelei o Samoa" taro cultivar to be at approximately 30 mM NaCL solution. Among the cultivars, we expect "Lalelei o Samoa" to be the most salt tolerant. The salt tolerance threshold for "Lalelei o Samoa" will be determined by measuring plant dry weights of taro grown in pots in a greenhouse, for 5 weeks at 8 concentrations of NaCl (0, 10, 20, 30, 40, 50, 100, 150, mM). The method used for rating the relative salt tolerances of 3 taro cultivars will involve growing the cultivars in pots in a greenhouse for 5 weeks at two electrical conductivity (EC) levels. The formula [plant dry wt. at EC 4.5 / plant dry wt. at EC 0] x 100 will be used to determine the relative salt tolerance rating of each cultivar. Information from this research, will be useful for future evaluation of newly developed cultivars for salt tolerance in American Samoa.

KEY WORDS: Taro, *Colocasia esculenta*, Lalelei o Samoa, salinity, salt tolerance

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Coordinating Center: University of Hawai'i at Manoa

Impact of Little Fire Ant, *Wasmannia auropunctata*, on Litter Fauna in American Samoa Secondary Forests

ABSTRACT

The little fire ant, *Wasmannia auropunctata*, is native to South and Central America, but has invaded many countries and territories in the tropics where it can reach high densities over large areas and can have negative impacts on forest ecology. Many of the organisms that live in forest floor leaf litter are crucial to important ecological functions such as nutrient cycling. High densities of fire ants could disrupt these functions by preying on and reducing the abundance of these organisms. Currently, there is no knowledge about the effects of little fire ants on forest litter fauna in American Samoa. We hypothesize that forests infested with *W. auropunctata* will have lower densities of litter fauna than non-infested forests. To test the hypothesis, Berlese funnels will be used to extract the fauna from litter samples taken from little fire ant infested and non-infested sites in secondary forests in three villages on Tutuila Island. Extracted invertebrates will be sorted taxonomically and by ecological functional groups and their densities compared between infested and non-infested sites. A reduction in abundance and functional diversity of litter fauna due to the little fire ant invasion of American Samoa may have serious implications for the future health of American Samoa's forests.

KEY WORDS: *Wasmannia auropunctata*, little fire ant, Berlese funnel, litter fauna, secondary forest, invasive species

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-17.

Impact of Modern Culture on CHamoru Traditional Healing and Strategies for Restoration of Prevalence in Practices

Jaychelle Taitano

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Coordinating Center: University of Hawaii at Manoa

ABSTRACT

This study examines the influence of modern culture on CHamoru traditional healing practices and proposes strategies on the revival of prevalence in practices. Utilizing phenomenological research, qualitative data was gathered through audience analysis and semi-structured interviews conducted with local *yo'amte* (previously known as *suruhånana and suruhånu*), instructors and participants in the University of Guam's Introduction to CHamoru Indigenous Health and Healing class and extensive literature review. CHamoru traditional healing offers natural, cost-effective remedies, called *åmot*, for common ailments, benefiting individuals with limited access to conventional healthcare. Traditional healing takes a holistic approach, considering the physical, emotional, social, and spiritual well-being of individuals seeking treatment. This approach emphasizes not only symptom alleviation but also the cure of ailments at their root cause.

However, several factors contribute to the decline of CHamoru traditional healing practices. The availability of plants and herbs used for *åmot* has diminished due to habitat destruction caused by urban development and military presence. Additionally, societal shifts have led to a preference for western medicine over local *yo'amte*, resulting in skepticism towards traditional healing methods. Furthermore, the loss of cultural connection and a lack of interest among the descendants of *yo'amte* pose challenges to preserving and continuing this family legacy. Nowadays there is much struggle to live as a *yo'amte* due to the high costs of expenses without a stable income. Revival strategies involve conserving plants, raising awareness, fostering collaborations, and integrating traditional healing into mainstream healthcare. Preserving CHamoru traditional healing ensures cultural heritage and accessible holistic healthcare.

Keywords: Chamoru traditional healing, suruhånu/a, modern culture, CBPR, yo'amte, phenomenology, holistic healthcare, åmot, western medicine.

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Evaluating Antibacterial Properties of Alkaloids in *Ochrosia mariannensis*

Andria Leon Guerrero

Mentor: Dr. Mari Marutani, Ph.D., Michael Fernandez

Coordinating Center: University of Hawai'i at Manoa

ABSTRACT

Ochrosia mariannensis, also known as the "Lipstick Tree" or *langiti*, is a tropical evergreen shrub endemic to the Mariana Islands. Historically, the leaves, fruits, roots, and bark of this plant have been used by the native CHamorus for medicines and dyes. Previous studies of the genus *Ochrosia* have found the presence of alkaloids, including 9-methoxyellipticine, with antibacterial activity against *Escherichia coli, Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Bacillus cereus*. However, no studies have been conducted on the potential antibacterial properties of *O. mariannensis* grown in Guam.

In this experiment, alkaloids from the leaves and bark of *O. mariannensis* will be studied for their antibacterial activity against *E. coli* in a bioassay. Crude alkaloids from the leaves and bark will be extracted using cold maceration with methanol, vacuum filtration, and purification through rotary evaporation. Presence of alkaloids in plant extracts will be quantified using Wagner's Test. Antibacterial activity of each plant extract will be evaluated using the Kirby-Bauer disc diffusion method against *E. coli* at 1%, 5%, 10% concentrations. The size of the inhibition zone around paper discs containing the extracts will be measured and evaluated using Clinical Laboratory Standards Institute's (CLSI) susceptibility standards. There will be 5 replicates for each treatment. Treatments will be analyzed and compared using analysis of variance of means (ANOVA).

This study will provide valuable information addressing the gap in knowledge of native CHamoru plants and their potential uses in modern medicine.

KEYWORDS: *Ochrosia mariannensis,* antibacterial activity*, Escherichia coli,* Wagner's Test, Kirby-Bauer disc diffusion, alkaloids

ACKNOWLEDGEMENTS: The STEP-UP High School program is supported by the Nation Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health, Grant Number: R25DK78386-17.

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Lissachatina fulica (Giant African snails) and its Relation to *Erwinia Mallotiorva's* Infection of the *Carica papaya* on the Island of Guam

ABSTRACT

Erwinia mallotivora is a papaya plant bacterial pathogen that causes severe damage to the plant, such as water-soaked lesions on leaves, water-soaked cankers on stems, and the eventual death of the plant. *Lissachatina fucila* (giant African snails), an invasive species, are hypothesized to be a vector that spreads *E. mallotivora* from plant to plant via its excrement and mucopolysaccharide.

In this study, *E. fucila* were gathered and divided into 3 different groups – the first and second are the negative control and the third is the experimental group. The first negative control group will not be fed anything, and the second will be fed ordinary *C. papaya*. Then, the experimental group will be fed *C. papaya* inoculated with an isolated *E. mallotivora* strain. For the next few days, as they consume their *C. papaya*, samples of their stool and mucopolysaccharide will be collected and examined for the pathogen. The *C. papaya* utilized in this study have been sterilized in 70% ethanol for 5 minutes, then cut, and placed into 2 sterile containers.

This study is still ongoing, and the results are pending. The results of this study will be used to verify the involvement of L. fucila in the spread of E. mallotivora on the island of Guam. Moreover, the information from this study could be used to develop different strategies for combating the spread.

KEY WORDS: *Lissachatina fucila (Giant African Snails)*, *Erwinia Mallotivora*, Carica Papaya

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Coordinating Center: University of Hawai'i at Manoa

Erwinia mallotivora's **Infection of Papayas** ***(Carica papaya)*** **in Guam and its Relation to Cuban Slugs** ***(Veronicella cubensis)***

Erwinia mallotivora is a plant pathogen that is known to affect local papaya *(Carica papaya)* plants and crops, spread by the Giant African Snail *(Lissachatina fulica)*. The pathogen leaves plants with water-soaked, blackish, mushy cankers. The Cuban Slug *(Veronicella cubensis)* is an invasive species that was introduced to Guam, and are now commonly found around the island, along with *L. fulica*. We hypothesize that the *V. cubensis* spreads *E. mallotivora* through its excreta and mucopolysaccharide.

V. cubensis were collected and split into 3 groups including 2 negative controls, where the first group will not be fed *C. papaya*, and the second will be fed *C. papaya* not affected by *E. mallotivora*. The third, experimental group will be fed *C. papaya* inoculated with *E. mallotivora. C. papaya* fruits were surface sterilized with 70% ethanol, then cut and coated with 4 mL distilled water, with the experimental group having the additional isolated *E. mallotivoria* pathogen. Both sets were stored in sterilized glass jars and will incubate at 28°C for 72 hours. *C. papaya* will be given to their respective groups to feed on. *V. cubensis* will have their mucopolysaccharide and excreta collected and examined for the pathogen. *V. cubensis* from each group will be dissected to check for the pathogen in different parts of its digestive system.

This experiment is ongoing results are pending. The outcome of this research may help the management and growth *C. papaya* crops and boost its industry.

KEYWORDS: *Erwinia mallotivora,* papaya *(Carcia papaya)*, Cuban Slug *(Veronicella cubensis)*

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Culturing *Caulerpa sp.* with Varying Levels of Dissolved Oxygen

ABSTRACT

Caulerpa is a tropical alga that is Earth's largest single-celled organism. It is part of the *Caulerpaceae* family, which is a family of green algae. *Caulerpa* thrive in warm, shallow seas around the world. In an experiment done by Serapion, et al., it was shown that *Caulerpa* had the highest growth rate in the middle layer of water, around 3.75 meters below the surface. There are different species of *Caulerpa*; this research focuses on *Caulerpa sp* found in the near shore waters of Saipan, the capital of the Commonwealth of the Northern Mariana Islands.

This study involved observing the difference in the growth rate of the *Caulerpa sp* when they are given different levels of dissolved oxygen. The *Caulerpa sp* was cultured using a recirculating method, where water was circulated from a fish tank into different buckets. The buckets contained the same amount of *Caulerpa sp* at the beginning of the experiment. Each bucket has an aeration pump that was set to pump in different levels of dissolved oxygen for each bucket. We hypothesize that dissolved oxygen levels in water will affect the growth of the *Caulerpa*.

This project contributes information about culturing *Caulerpa sp* native to Saipan. With this knowledge, local farmers will be able to cultivate and sell *Caulerpa sp*. *Caulerpa* sea grapes have many benefits including antioxidants, diarrhea medicines, coughs, lowering blood pressure, and are believed to be "beauty foods" so they can be classified as economically valuable foodstuffs.

Key words: *Caulerpa sp*, dissolved oxygen, aeration pump

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Measuring the Toxicity Levels in Noni (*Morinda Citrifolia*)

Noni (*Morinda Citrifolia*) is a subtropical plant native to South-East Asia, significant for its medicinal and therapeutic qualities within its fruit, leaf and juice. They are commonly used within the pacific islands for claims such as immune enhancing, antibacterial, antiviral properties, and so much more. However, details pertaining to its toxin levels have yet to be underlined. I hypothesize that noni may contain harmful toxins, and therefore must be further assessed. A subchronic toxicity study was conducted in the early 2000's to assess safety concerns regarding *Morinda Citrifolia*. In this experiment, twenty rats have powdered noni incorporated into their diets at does levels of 2000 and 5000 mg/ kg body weight/ day for thirteen weeks. Observations recorded no toxicological significance. Through meta-analysis, I hope to determine and elucidate the toxicity levels in *Morinda Citrifolia*.

Key Words: *Morinda Citrifolia*, antibacterial, antiviral

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Evaluating Food Cost in Koblerville, Saipan

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Abstract

The United States Department of Agriculture (USDA) developed the Thrifty Food Plan (TFP) in 1975 to represent the cost of maintaining a healthy diet on a limited budget. This study aims to assess the affordability of specific imported fruits and vegetables in Saipan, Commonwealth of the Northern Marianas Islands, using the USDA TFP as a reference. In March 2014, the Children's Healthy Living Program for Remote Underserved Minority Populations in the Pacific Region (CHL) conducted a Food Cost Survey (FCS) in Saipan to address the association between childhood obesity, food security, and low-income households. The CHL FCS was based on the USDA TFP, revealing a monthly food cost of $771.80 for a family of four in Koblerville, Saipan.

The current study focuses on the Koblerville area, aiming to identify the current costs of specific imported fruits and vegetables using the CHL FCS. The objective is to estimate the monthly food budget required for a typical family of four to meet the recommended servings of fruits and vegetables, based on the USDA's nutritional standards and the Thrifty Food Plan. Findings will be compared to the national USDA Thrifty Food Plan budget. It is hypothesized that the cost of food in the Koblerville area will exceed both the 2014 CHL survey results and the budget plan set by the USDA ($973.10 as of May 2023). The outcomes of this study look to provide valuable insights into the affordability and accessibility of nutritious food, particularly among low-income families in Saipan.

Keywords: Thrifty Food Plan, USDA, food affordability, Children's Healthy Living Program, food cost survey, low-income households

Ye Sablan

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The Correlation Between Acquired Knowledge of the Cognitive Benefits of Green Tea and Self-Perceived Cognitive Benefits

Green tea is a commonly consumed beverage and has been for much of history. Research and traditional knowledge have both discovered that green tea increases mental clarity and improved cognitive function, along with other such benefits. Prior research has discovered that the non-proteinic amino acid present in green tea, L-theanine, when paired together with the tea's caffeine content increases attention levels and task performance. The purpose of this project is to determine whether an individual's degree of knowledge of green tea's effects influences how they perceive its benefits of mental clarity and cognitive function.

Three different classes of students attending summer school are each given a pre-test and post-test measuring their perceived levels of mental clarity and cognitive function. Groups A and B will be provided with green tea to consume prior to commencing the day's activities in summer school. Group A, however, is given an informational presentation on the benefits of green tea and how their consumption might influence their performance in class. Group B is not informed of the positive effects of green tea but will consume green tea over the data collection period. Group C is given neither green tea nor a presentation on its benefits, but will take a pre-test and post-test, acting as a control group for the purpose of comparison.

The results of this study will allow both educators to consider implementing different "brain foods" to increase students' academic performance and determine whether awareness impacts the effectiveness of implemented routines.

KEY WORDS: Green tea, mental clarity, cognitive function, performance

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Growth and Survival of Sandfish Sea Cucumber (*Holothuria scabra*) Juveniles in the Nursery System – II Reared Different Soil Type Substrates

ABSTRACT
The Sandfish Sea Cucumber, *Holothuria scabra*, are a significant species on the Island of Pohnpei and are presently taken advantage of and are in danger of extinction in the Pacific. In order to prevent sea cucumbers from being extinct in Pohnpei, the College of Micronesia Land Grant has undertaken the development of hatchery-based Sandfish Sea Cucumber farming technology. Consistent production, growth and survival of juvenile sea cucumbers is essential for sustainability of producing sea cucumbers commercially and to be able to restock the depleted stocks in the wild.

An experiment was conducted to determine the effects of three different types of soil substrate on the growth and survival of Sandfish Sea Cucumber juveniles. Fifty sea cucumbers were stocked in Hapax nets with soil substrates, namely: fine ocean sand, fine mangrove mud, or a 50/50 combination of both. All of these experimental treatments were performed in duplicate. The raceway tanks were filled in with different soil type, juvenile sea cucumbers, and sea water.

The significant impact of this project will determine the three types of soil substrate that are best suitable for the juvenile Sandfish Sea cucumber in Micronesia. As a result, it will incumbent upon the team to designate the most ideal locations to grow more Sandfish Sea cucumber in Micronesia.

Key words: *Holothuria Scabra* (Sea Cucumbers), fine ocean sand, fine mangrove mud, mixed ocean mud and ocean sand

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Effect of pH on The Growth and Survival of Sandfish Sea Cucumber (*Holothuria scabra*) Larvae in The Hatchery Phase

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ABSTRACT

The US Affiliated Pacific Islands of the Federated States of Micronesia and the Republic of Palau have several commercially important species of sea cucumbers in their waters, including the Sandfish Sea cucumber, *Holothuria scabra*, which have been widely exploited and are in danger of extinction. The College of Micronesia Land Grant Program has undertaken the development of hatchery-based Sandfish Sea Cucumber farming technology for local community-based economic development, future commercialization, and aiming at restocking the depleted stocks in the wild. The hatchery production of juveniles is challenging and mutable at times. Risks of global warming and sea water condition acidification are real threats to consistent hatchery production of juveniles. In this regard, an experiment was conducted to find out the effect of different pH on the growth and survival of Sandfish Sea cucumber larvae in the hatchery. The larvae were stocked in 5-gallon buckets in duplicates and exposed to pH treatments of 6, 7, 8 and 9. These were compared with controls of regular seawater pH. Each treatment bucket was individually drained out every other day, stage of larvae noted (growth), and total numbers recorded (survival). After 15 days, we have found which pH treatments are best for Sandfish Sea cucumber survival and growth. This research will improve the development of hatchery-based Sandfish Sea Cucumber farming technology for streamlining, commercialization, and the drained reserves in the wild.

KEY WORDS: *Holothuria scabra*, water pH, sandfish sea cucumber larvae, hatchery, growth, survival

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The Effectiveness of Fish Aggregating Devices in Majuro, Marshall Islands

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Abstract: Fish Aggregating Devices (FADs) are artificial objects strategically placed in the ocean to gather pelagic fish. The project's aim is to determine the FADs effectiveness to local fishermen in remote communities in Majuro regarding income, fuel usage, and whether or not FADs improve the catch rate in their designated locations. The Marshall Islands Marine Resources Authority (MIMRA) FAD team collaborated Local Governments to fabricate and deploy FADs in 20 different atolls. These man-made devices are constructed from various materials and are anchored to the seafloor. The ropes and lines encourage marine plants, small crustaceans, and mollusks to settle, which provides food and shelter for smaller fish. Overtime, bigger fishes such as tuna, billfish, dolphin fish, and other predatory fishes become more frequent and facilitate access to fish stocks; promoting food security for remote communities. Subsequently, this project will include interviews with local fishermen on where they fished, kinds of fishing gear(s) used, how much was caught, what sort of fishes were caught, and fuel usage. MIMRA will use to graphs, tables, and percentages from databases and Microsoft software to record their findings. Consequently, the data will be used to introduce and implement required modifications, monitor their success, and serve as a boon for remote islands with potential for further enhancements for fishing activities in the Marshall Islands.

Keyword: fish aggregating device, pelagic
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Self-Management Program Increasing Blood Sugar Control

Abstract

The Republic of the Marshall Islands is known to have the highest prevalence of diabetes in the world, where it afflicts almost one-third (31.4%) of all adults from age 18-99 years old. Diabetes is one of the most common chronic health diseases that people constantly suffer from. Diabetes affects approximately 23% of the people in the Marshall Islands. The three main types of diabetes are: Type I, Type II and Gestational. The most common risk factors include being overweight, family members with Type II diabetes, pre-diabetes, high blood pressure and being 45 years or older. This research will focus on Type II diabetes and ways to help reduce the percentage of diabetic patients and prevent premature death in the Marshall Islands.

The majority of people in the Marshall Islands have Type II diabetes, therefore this research will inspect the physical and internal health and activities regarding our diabetic patients (both in- and out- patients). Majuro Wellness Center (MWC) delivers the Pacific Islander Diabetes Prevention Program (PI-DPP) to promote community-wide lifestyle changes. PI-DPP is a year-long, evidence-based lifestyle change program and holds the highest level of achievement. Successful completion of the program can cut a person's risk for developing Type 2 diabetes by 58%(71% for the people over the age of 60) and can reduce the risk of non-communicable diseases(NCDs). Twice a week, the participants check their blood pressure, blood sugar, and weight. The applicants with a high blood sugar and blood pressure level are instructed to manage their diet with recommended foods, regular check-ups and daily exercise. This project indicates that RMI is improving on self-management and physical healthcare.

KEYWORDS: Type II diabetes, Gestational Diabetes, Blood Sugar, Blood Pressure, Self-Management, Healthcare

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Laura Groundwater Study in the Marshall Islands

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Abstract:

The Laura lens is a significant source of fresh water on Majuro atoll which has been negatively affected by over-pumping, drought, and sea level rise. It is a secondary water source for people living from Laura to the Amata Kabua International Airport. During periods of drought, when the major reservoir at the airport is insufficient to cater to the populated areas of Djarrit-Uliga-Delap (DUD), the Laura groundwater is utilized to cover the DUD area. Previous studies on the Laura lens have been conducted by the United States Geological Services (USGS), Japan International Research Center for Agricultural Sciences (JIRCAS), and the Pacific Community (SPC) on the effects of the 1998 drought and 2016 prolonged dry season and the effects of pumping from the lens which produced up-coning. The data used in this report will be from the previous studies mentioned, particularly the EC (Electrical Conductivity) measurements at a number of monitoring boreholes and the water levels at these boreholes. The monitoring and groundwater investigations using resistivity will be compared to other studies that have been conducted in the Laura area. This will determine if there are any significant changes to the resource due to human activities, climate change, or sea level rise. This is currently being done through the Managing Coastal Aquifer project, which SPC leads in collaboration with the Marshall Islands Environmental Protection Authority (RMIEPA).

Keywords: United States Geological Services (USGS), Djarrit-Uliga-Delap (DUD), Japan International Research Center for Agriculture Sciences (JIRCAS), Pacific Community (SPC), Climate Change, Sea Level Rise, Managing Coastal Aquifer project, Environmental Protection Authority (RMIEPA)

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PEST FRUIT FLIES AND GREEN WASTE IN PALAU

ABSTRACT

Invasive species can have negative effects on human food security, especially on an island. Three species of fruit flies are considered pests in Palau. They reproduce and develop by laying their eggs in ripened fruits and vegetables and have been observed congregating in drainages and garbage disposals. Fruit flies have caused over 70% fruit loss in Palau. The four species of fruit flies found in Palau are *Bactrocera frauenfeldi*, *Bactrocera dorsalis*, *Bactrocera umbrosa*, and *Bactrocera calophyll,* a non-pest species. Depending on the species, fruit flies can lay between 50 and 500 eggs, and take 12 to 28 days to develop into an adult.

Green waste, in combination with high precipitation, is believed to be a major vector in the successful spread and proliferation of pest fruit flies. This two-part study will assess a new trapping method, and determine if green waste increases the number of trapped flies. Palau Community College (PCC) has developed an efficient and affordable lure for fruit flies using disposed yeast collected from a local brewery.This study will compare two types of traps used with this locally made bait. The first trap is composed of a modified reused water bottle, filled with bait, and the second uses a 3D-printed attachment to the same type of water bottle. The study will compare the success of catching fruit flies of both traps, and give us solutions that may control the reproduction rate of fruit flies in Palau.

Keyword: Fruit flies, *Bactrocera frauenfeldi*, *Bactrocera dorsalis*, *Bactrocera umbrosa*, *Bactrocera calophyll, Green waste*
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Dengue Fever in Palau

ABSTRACT

Dengue fever is a significant global public health concern, affecting millions of individuals each year. Dengue fever is caused by the Dengue virus, transmitted primarily through the bite of infected *Aedes sp*. Mosquitoes. In Palau, the major concern is *Aedes aegypti*.

Dengue fever outbreaks are a prevalent public health concern in Palau posing a significant health burden, with a notable increase in cases during the rainy season when mosquito breeding sites are abundant. Prevention and control efforts in Palau focus on vector control measures, such as eliminating mosquito breeding sites, using larvicides and insecticides, and promoting community awareness about personal protection. This research project focuses on assessing public knowledge and using this information to promote public awareness through automated models in partnership with regional and international partners. This will be done through the utilization of weather information, mosquito and dengue collection data, and surveys within the local population in previously identified hotspot areas that have been affected by Dengue fever.

In conclusion, Dengue fever remains a significant health challenge not only in Palau, but globally with increasing incidence and geographic expansion. Public awareness and easy to use public awareness models are crucial for effective prevention and management of this disease.

KEY WORDS: Dengue fever, Aedes mosquitoes, Vector control, Epidemiology, Pathogenesis.

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Limei Orukei

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Coordinating Center: University of Hawai'i at Manoa,

Tissue Culture Models with a Focus on Salt Resistant Taro Development for Palau

ABSTRACT

Tissue culture growth refers to the cultivation of plant cells, tissues, or organs in a controlled laboratory environment. When it comes to studying salt resistance in tissue culture, researchers focus on the ability of plant cells to tolerate and thrive under high salinity conditions. Plant tissue culture techniques can be utilized to evaluate the salt tolerance of plant species by subjecting them to varying concentrations of salt in the growth medium.

In this study we observe the growth and development of tissue cultures in different salt concentrations; we will assess if Palau's rising sea level poses a major threat to taro production. With taro being a stable traditional food, we endeavour to find ways to identify which of the many types of taro are salt resistant or develop crosses of resistant taro with favourable traditional variants. These methods include gene expression analysis, enzyme activity assays, and metabolic profiling to identify specific genes and pathways involved in salt tolerance. The knowledge gained from tissue culture studies on salt resistance can contribute to the development of salt tolerant crop varieties through breeding or genetic engineering approaches. This information will also aid in the understanding of the physiological and molecular responses of plants to salinity stress, ultimately improving agricultural practices in areas affected by high soil salinity. This study shows varying degrees of saltwater tolerance and looking at increasing tolerance in-vitro will allow for the preservation of species.

KEY WORDS: salt resistant plants, sea level rise, adaptation to climate change

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