

Accepted Abstracts

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Conversion of Lignocellulose including biosolids and Green waste to Biogas

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Lignocellulosic biomass is the most abundantly available raw material on the Earth for the production of biofuels. The conversion of lignocellulose into renewable energy and more valuable chemicals has been limited. Several methods for increasing the conversion of lignocellulose into energy by pretreating the feedstock have been developed, but all of the existing methods have large economic penalties, e.g. disposal of toxic wastes and greatly increased capital and operating costs. The discovery and characterization of Caldicellulosiruptor microbes; extremophilic organisms capable of solubilizing lignocellulose, suggested a possible solution to the economic problem of pretreatment. Beginning in 2014, recognizing the potential for anaerobic digestion of lignocellulose for biogas production, a multidisciplinary team including a biochemist, chemist, microbiologist and agricultural engineer, from Brigham Young and Utah State Universities has been conducting experiments to determine if we could break down lignocellulose feedstocks for later

anaerobic digestion. The definition of breakdown in this case means conversion of organic solids in a high temperature vessel (175°C) containing *Caldicellulosiruptor bescii* into a type of tea that contains mostly acetate and lactate in water. Results to date indicate nearly 90% breakdown in 18 – 24 hrs. of certain plant materials including grass and leaves collected at municipal sanitary landfills. Perhaps the most significant results were that brewery waste that is somewhat refractory to anaerobic treatment could be partially broken down (50%) and even aerobic sludge from a wastewater treatment plant that was previously anaerobically digested in a mesophilic process and sun dried could be further broken down (additional nearly 40% destruction). This presentation will report the results of work we have done to take the process from the lab to the market; the hurdles to scaling and commercializing the anaerobic digestion of lignocellulose in an economically viable way.

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Global Food sustainability: An integrated policy approach to eliminate the hunger of over 815 million people by 2030

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This research paper presentation is to bring the awareness of the biggest challenges in eliminating the world hunger of 815 million people. The focus is to explain existing challenges faced by 500 million small farms depending on the mercy of rain and related natural blessings to make their ends meet from traditional farming methods. The issues of vulnerability of these farms in facing frequent natural calamities are further aggravated by climate change caused by increasing global warming. The study indicates that seventy five percent of crop diversity were lost in these farms mainly attributed to resource constraints to protect the crops and frequent natural calamities. The study also found that over 4 billion people in the world still do not have access to clean water for drinking and irrigation, with no access to electricity either, most of them living in rural areas depending their livelihood on traditional farming methods. The increasing rate of water and energy poverty are found in those 500 million small

farms, mostly in Southern Asia and Sub-Saharan Africa, which have further aggravated the growing problems of hunger and malnutrition among all ages of 815 million people. UN reports indicate that in 2016-2017, 281 million people in Southern Asia and 23 percent population in entire Sub-Saharan Africa suffer from undernourishment. The same reports added that 45% of child mortality under age 5 worldwide are caused by malnutrition, which is about over 3 million deaths per year, of which 66 million children in developing nations go to schools hungry. In order to achieve food sustainability by achieving zero hunger policy initiative by the UN Sustainable Development Goals by 2030, this research study has explored an integrated approach of policy strategy to provide adequate technological, financial and management resources to these 500 million small farms.

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Biological pretreatment of lignocellulosic material for increased biogas production by Anaerobic digestion

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Without pretreatment, anaerobic digestion of lignocellulosic material typically converts only one-third of the carbon into biogas which is typically only 60% methane. Physical and chemical pretreatments to increase biogas production from biomass have proven to be uneconomical. The anaerobic thermophile, *Caldicellulosiruptor bescii*, has been shown to be capable of solubilizing up to 90% of lignocellulose, thus making the carbon accessible for anaerobic digestion. Preliminary experiments show *C. bescii* is capable of solubilizing a wide range of lignocellulosic materials. Anaerobic digestion readily and rapidly converts the soluble products into biogas

with 70-80% methane. Isothermal microcalorimetry measurements have provided a thermodynamic understanding of the process. We have applied the pretreatment/anaerobic digestion process to giant king grass, corn mash, corn stover, waste activated sludge (WAS), almond shells and algae and found the biogas yield significantly improved. Results from experiments conducted using isothermal microcalorimetry as well as larger-scale 30L and 60L reactor pretreatment/anaerobic digestion experiments will be presented.

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Behavioral and Brain mechanisms underlying sleep disruption-induced Obesity

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Obesity and inadequate sleep are public health problems that increase risk for chronic disease. Inadequate sleep has emerged as a key contributor to obesity. Thus, obesity interventions aimed at improving sleep in parallel to reducing calorie intake and or increasing energy expenditure (EE) may be more effective at mitigating obesity than interventions that do not address sleep loss. Understanding brain mechanisms that promote positive energy balance through modulation of sleep, energy intake and expenditure may also lead to novel targets for obesity interventions. We developed a rodent model of sleep disruption-induced obesity in male and female rats that is ideal for testing obesity treatments and identifying brain mechanisms underlying sleep disruption induced weight gain. In this model, we show that exposure to pre-recorded environmental noise causes weight gain and hyperphagia in noise-exposed rats relative to rats that slept undisturbed independent of sex and weight gain was exacerbated among rats when sleep disruption

was combined with access to a palatable cafeteria-style diet. Moreover, weight gain in response to sleep disruption alone was paralleled by reductions in physical activity and EE. Next, we investigated whether low brain orexin signaling in the ventrolateral preoptic area (VLPO), a known sleep center in the brain, contributed to weight gain due to inadequate sleep by reducing total EE and physical activity since elevated orexin signaling promotes negative energy balance. In contrast to the response to orexin infusion in the VLPO before sleep disruption, orexin in the VLPO was ineffective after chronic sleep disruption. These data suggest that sleep loss may reduce orexin signaling in the VLPO to in turn stimulate weight gain in response to sleep disruption by reducing physical activity and the rate of energy expended during physical activity. These data have implications for reversing treating individuals who are have obesity and are sleep deprived.

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Hidden hunger - A few examples of contemporary challenges

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According to Sustainable Development Goals (SDGs) of the United Nations, zero hunger should be realized by 2030. While this promises the intake of macronutrients (carbohydrates, protein and fat), inadequate/insufficient intake or bioavailability of micronutrients (vitamins and minerals) which is called hidden hunger, may be improved or unnecessarily improved consequently. Hidden hunger is caused by established risk factors, and can be worsened by emerging factors that are specifically highlighted in this presentation. First, air pollution has become as a public health threat globally, as inhalation of airborne pollutants provokes body's pathophysiology including oxidative stress and inflammatory response. Investigation showed that although the nutrition intake profiles were almost indistinguishable - so was presumably the vitamin E intake, those who exposed to air pollution was with reduced circulating level of vitamin E (alpha-tocopherol) than those without. The vitamin E depletion phenomenon was because more alpha-tocopherol was consumed to counteract reactive oxygen species and chronic inflammation, and was corrected

after the subjects received vitamin E and C supplementation. Second, carbon dioxide (CO₂) represents the most significant long-lived greenhouse gas in Earth's atmosphere. Increased CO₂ emission was accompanied by decreased contents of micronutrients including Zn, Fe, and B vitamins in the crops, making the nutritional values of these crops compromised. Third, the world has been continuously facing the threat of reduced population of pollinators that are not only important for agriculture output, but for the contents of micronutrients in the crops. If animal pollinators were completely lost, there would be additional 71 million people at risk for vitamin A deficiency and addition 173 million for folate deficiency. These few examples reflect the contemporary challenges for the efforts in the fight against hidden hunger. Given the irreplaceable roles of micronutrients in health and well-being as well as in the pathogenesis of non-communicable diseases (NCDs), it is warranted to understand the landscape of hidden hunger, to analyze all potential causes, and to take preventive actions accordingly from public health perspective.

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Sustainable agriculture impacts on Food, economy and climate change

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Agriculture is the backbone on which many developing states thrive. Whether it is the production of goods or service. Sustainable Agriculture is the method or practice of producing food and textile to supply our social needs in the present without compromising the ability of future generations to meet their own needs. Getting it right with Agriculture will ensure tremendous opportunities in areas not limited to long term employment, safer food, healthier population, economic growth and most importantly getting it right with climate change. Healthy environment, economic profitability and social and economic equity are three main areas that Sustainable Agriculture tries to integrate into society. Every individual who is involved in the food system—growers, food processors, distributors, retailers, consumers, and waste managers can play a role in ensuring a sustainable agricultural system. As this creates and maintains the platform for more research in food production practices (Animal husbandry and Agronomy), food security and value added products. As we are aware, climate change is a certainty and it affects many economic sectors, including

agriculture. It would affect production, such as crop and livestock, differently. Vast regional differences are expected for various parts of the world. Trade patterns may change, and the entire supply chains may require reorganization. Overall, the economic fortunes of producers in different parts of the world would be affected. These distributive effects could even threaten food security in certain parts of the world. Agricultural sustainability may be especially threatened by climate extremes, such as heat waves, droughts, and floods. However, not all changes induced by climate change would be negative; some may even be positive. Undoubtedly, there would be gainers and losers within a nation, as well as among countries. Gains and losses would also change with time, depending on the various climate thresholds reached, for example. Achieving sustainability would require changes in the way we manage agriculture. Therefore, equally important in this discourse is to find solutions to achieve sustainability in the wake of climate change, one of the major threats to sustainability.

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Dietary assessment and education improve body composition and diet in NCAA female volleyball players

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Intercollegiate volleyball is a powerful sport that consists of two to three-hour matches; therefore, optimal physical condition is critical for top performance. This study assessed nutrition and anthropometric parameters at the start and conclusion of both the spring 2009 (no intervention) and spring 2010 (intervention off-seasons as well as additional measurements four months after the intervention). The subjects' body composition, total energy, carbohydrate and protein needs were calculated, and intakes were assessed. The intervention consisted of monthly individual nutrition counseling sessions based on analysis of intake from three-day food records. Food records were analyzed using Nutrient Data Systems for Research software verified by interview. Dependent T-tests were conducted on anthropometric and

dietary measurements. The results revealed that during the 2009 off-season, there were no significant change in any parameters and 89% of subjects were not within recommended anthropometric and dietary guidelines. During 2010, body composition significantly decreased to optimal levels for the sport. In addition, energy and macronutrient intake significantly improved toward recommended guidelines. Four months later, the subjects' intakes and body composition were assessed, and results were compared to the spring 2010 results with no significant changes. These results indicate the providing nutrition assessment and intervention plays a critical role in physical conditioning of athletes.

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Zero waste sustainable Food systems: Scenarios for the cities of the future

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Wastes at household level constitute 53% of total losses in EU and 60% in the USA. It is clear that that people living in towns and large cities tend to produce more waste. Prevention of food losses and bio-waste valorization are quite inefficiently managed. Urban bio-waste, despite their high nutriment value, are marginally recycled and returned to farm soil and therefore, does not contribute to closing biogas- chemical cycles and to supporting sustainable food production. A foresight approach was used to i) identify high potential socio-technological innovations in food waste prevention and valorization and ii) extract research questions contributing to fostering and accompanying cities' breakthrough strategies towards zero waste sustainable food systems, specific to different urban settings worldwide. The

exploration of three "food systems scenarios" in the context of "three urban scenarios" allows to highlight requirements and questions for the research which were grouped into five broad categories related to issues or types of impacts expected: i) society, ii) industries, food cycles and systems, iii) health and the environment (animal health, health public, safety and nutrition, environment), iv) technological processes, looping cycles and associated business models and finally v) the information and communications technologies (ICT), data processing and applied mathematics. High potential key measures and generic questions and perspectives for research on the link between cities and Zero waste sustainable food systems are discussed.

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Novel detection protocol for radical scavenging and antioxidant activity of lipophilic antioxidants

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Statement of the problem: Lipophilic antioxidants are an important class of chemical species of natural antioxidants that can increase the oxidative stability of food matrices. Common methods to determine the antioxidant activity or oxidative stress of lipophilic antioxidants require time consuming protocols, although those are not vigorously reliable. This work proposes a fast, simple and direct method based on cyclic voltammetry to monitor oxidation in lipid samples.

Methodology & Theoretical Orientation: The oxidative stress during the reaction of AIBN (2, 2'-azobis (2-methylpropionitrile)) with lipid soluble antioxidants, such as α -tocopherol, catechin, retinyl acetate, caffeic acid and 3-hydroxytyrosol was evaluated. 1-propanol was used as a unique solvent, which allowed direct dissolution of a wide range of lipid soluble redox species. Electron transfer (ET) capacity was evaluated by the peak current (ip) and

peak potential (E). The kinetic rate of the reactions between laboratory antioxidants and AIBN were measured at 60 °C. Finally, same procedure was also applied to measure the antioxidant activity and oxidative stress of different commercial edible oils: extra virgin olive oil (EVOO), virgin olive oil (VOO) and, olive by product; sansa olive oil (SOO).

Findings: The methods demonstrated that antioxidant activity was positively correlated with increased concentrations among the laboratory antioxidants and EVOO, VOO and SOO samples. On the other hand, oxidative stresses were negatively correlated with the duration of reaction periods.

Conclusion & Significance: This method can be the alternative of traditional methods to test lipid soluble antioxidants in lipid matrices rapidly and straight.

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Effect of music therapy to the pain and anxiety level experienced during labor

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Background: Childbirth is a painful process especially to primipara. When the body is out of equilibrium, stress occurs. Anxiety is a response of the body when put into new situation or perceived change. Music provides relaxation to the body, however music therapy as pain management has very limited study in the Philippines. Thus, this study examines the significant effect of music therapy to the pain and anxiety level during active phase of labor.

Methods: This is a quasi-experiment which utilized purposive sampling. Participants (n=20) were assigned to control (n=10) and experimental (n=10) groups respectively. Pre-test and post test on pain and anxiety level were assessed to both group during their active phase of labor. Pain level was measured using Numerical Pain Scale and State Trait Anxiety Inventory translated in Filipino by Cada for the anxiety level. The experimental group received the routine nursing care and were exposed to music therapy (piano classical music by Beethoven) for two hours duration, while the control group received only routine nursing care.

Results: Both groups were similar in age bracket (20-25), no income and Roman Catholic, however, differ in marital status and educational attainment. Pre-test pain level in control group revealed severe pain (50%) and (90%) experimental group. Pre-test anxiety level in control group had a weighted mean of 42.8 and 44.2 in experimental group both under

moderate level. Post test pain level in control group had (70%) severe pain and (50%) both severe and worst in experimental group. Post anxiety level in control group had lowered its score by 0.6 from 42.8 to a weighted mean of 42.2 and experimental group had also lowered by 1.4 from pre-test to a weighted mean of 42.9, though both groups remained in moderate anxiety level. Pre-test (-1.223) and post test (-1.546) pain level between control and experimental group set at 0.01 significant level had no significant difference. Pre-test (-0.6715) and post test (-0.2916) anxiety level between control and experimental group set at 0.01 significant level had no significant difference.

Conclusion: Music therapy had no significant effect on the pain and anxiety level experienced during active phase of labor in primipara.

Recommendations: Effectiveness of relaxation brought by music therapy highly depends on how patients accept the intervention and cannot be possible when heard only once. Music therapy can result to relaxation of the body only through conditioning of the mind. Further studies are needed on music preferences during active phase of labor, pain threshold and correlation of pain and anxiety level and different setting such as private hospitals or lying-in clinics.

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Effect of hydrocolloid addition on properties of low-fat cheddar cheese

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Reduction in fat in low fat cheese (LFC) causes an adverse effect on the characteristics, such as texture, flavour, functional and sensory properties of cheese. Hence, fat replacers have been used improve the characteristics of LFC. Hydrocolloid was used as a fat replacer due to its ability to form gel particles in milk in situ in the presence of calcium ions.


Four levels of hydrocolloid were added to LFC: 0.12 (LFCH1), 0.17 (LFCH2), 0.18 (LFCH3) and 0.23% (w/w) (LFCH4), with up to 92% fat reduction; and control full fat cheese (CFFC) and control LFC were also prepared. Cheese samples were examined for physical, chemical and biochemical properties.

The yield of the cheeses ($P < 0.05$) was directly proportional to the fat and hydrocolloid level in milk, whereas the moisture and total protein were inversely proportional to the fat content ($P < 0.05$). The results of primary proteolysis (except pH 4.6 soluble nitrogen) showed that hydrocolloid added

LFCs demonstrated higher level of proteolysis compared to CLFC and CFFC, whereas arginine was found in highest level in hydrocolloid added LFCs. Volatile compounds were also varied with cheese treatment. TPA illustrated a significant improvement in texture of hydrocolloid added LFC ($P < 0.05$) compared to CLFC. The textural attributes of LFCH1 ripened for 30 days were comparable to CFFC ripened for 60 days and beyond. Scanning electron micrograph revealed that hydrocolloid added LFCs had smoother surfaces as compared to CFFC and CLFC. Confocal laser scanning microscopy suggested significant ($P < 0.05$) increase in fat globules' size, area and volume in CFFC as compared to LFCs during ripening. Hunter L, a and b values for hydrocolloid added LFCs indicated that they were whiter than CLFC and less yellowish than CFFC.

Addition of hydrocolloid significantly improved the textural and microstructural properties of LFCs, affirming its potential as a promising fat replacer.

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Salt content in Food provided by catering food sector in Saudi Arabia

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Background: Salt (sodium chloride) is vital molecules for human being. In diet, salt used widely and daily for preserving food, enhancing flavour. Also, in food industry, salt is essential additive for food processing and manufacturing because of its low cost and varied properties. Dietary salt is one of the main risk factors of non-communicable disease. Sodium reduction showed improvement in the health outcomes and lowering risk factors. In Saudi Arabia, there is a general paucity of research investigating population consumption and dietary content of salt. In term of food eaten out of home, there are worldwide limited published data on restaurant food content of salt. In Saudi Arabia, there are no data on restaurant food or fast food content of salt. This research aims to investigate and assess salt content in catering food sector in Saudi Arabia

Methods: Experimental study, using chemical lab analysis data of 1653 food items from 57 food catering serves providers. Data analysis includes mean salt content and the ratio percentage of salt content out of WHO recommended salt intake (5 g/day).

Results: The food groups with the highest average salt content (g/100g) were in dressing and condiments (1.54), extra and add-on (1.47). The lowest average value was in beverages (0.06) and dessert (0.34). The top ratio percentage of salt content per 100g were in dressing and condiments, extra and added-on, meats, and chicken with more than 30%, 29%, 25%, and 25% respectively. The ratio percentage of salt content per serving size were 230 % meals, 92% Pizza, 65% red meat and 64% chicken.

Conclusions: From public health prospect, this study importance is as a baseline study to monitor trends in salt levels over time, as well as provide a starting point to set potential future salt reduction targets for food providers sector.

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