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University of Bridgeport

Member Presentation Abstracts

1. Red Oak Seedling Survival at Alley Pond Park, Queens County, New York

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The objective of this study was to document Red Oak (Quercus rubra L.) seedling survival at Alley Pond Park, New York, 2018-2023. The study was initiated at 3Red Oak dominated sites in Alley Pond Park in 2018. Red Oak seedling stems were marked with white paint and yearly survival was recorded from November, 2019 to November, 2023. One year survival was high at all 3 sites ranging from 90 % to 98%. Yearly survival declined precipitously in the second year, and significantly by the 5th year. Light intensity may be the key to seedling survival as no surviving Red Oak saplings were observed near site 1, a low light intensity site burned 20 years ago.

2. Helping Departments to Transform Undergraduate Education

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Higher Education is on a trajectory that will focus more on recognizing how well institutions educate students rather than an institution's name recognition, Carnegie classification, or history. This value-based shift has the ability to level the playing field for all institutions by recognizing how well faculty engage in pedagogical best-practices and lead educational innovations that support learner outcomes and student success. The Partnership for Undergraduate Life Sciences Education (PULSE) is a lever of change that is helping drive the transformation of higher education in life sciences. Through its tools (PULSE Rubrics and Faculty Attitudes and Readiness Survey) and programs (Ambassadors Workshops, Recognition Program and Regional Networks), PULSE provides academic departments with resources, skills, and processes to align their undergraduate programs with national education initiatives to develop inclusive, student-centered, evidence-based teaching and learning practices, while removing barriers to access, equity, and inclusion. The PULSE Ambassadors Program deploys teams of trained facilitators to guide a department in crafting a shared vision and action plan for change. Using PULSE tools, the Recognition Program provides a process for departmental review and self-assessment and includes site visits to departments, detailed feedback reports, and follow-up support. Data from PULSE programs highlight common goals and areas for growth among departments nationwide. Visit our poster to learn how PULSE's Recognition and Ambassadors programs can be a lever of change for your institution.

3. Optimism Toward a Full Classification of Ecotype Diversity within Bacterial Species

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Background. We explore how genomic approaches bring within reach a completionist agenda for bacterial systematics, enabling systematists to discover and classify all bacteria at the species level, as well as all the infraspecific ecotypes within species. Ecotypes are defined to be ecologically distinct from one another and thereby able to coexist indefinitely into the future; also, they are each cohesive through periodic selection events that purge the diversity within ecotypes. Hypothesis. We test using genomic evidence whether there may be very few ecotype lineages within a species that can coexist into the indefinite future. Methods. We have isolated strains of three species of Bacillus from soil in Death Valley National Park, from various distinct habitats along an elevational gradient. We used the algorithm Ecotype Simulation to demarcate the strains into ecotypes, through falling into distinct sequence clusters based on the full core genome. We used a rarefaction approach to determine whether the number of ecotypes demarcated depended on the number of genes sampled. Results. We found that the ecotypes we demarcated are ecologically distinct from one another, based on differences in their habitat associations. Based on the rarefaction analysis, whether 1 or 500 genes were used, the number of ecotypes remained the same (e.g., 6 ecotypes in the case of B. spizizenii). That is, the small number of ecotypes is not an artifact of low molecular resolution. Although there are thousands of ecologically distinct lineages within the demarcated ecotypes, the number of lineages that can coexist as ecotypes is small. Conclusion. If Bacillus is typical for ecotype dynamics, the number of ecotypes within species taxa is not the infinitude suggested by the number of ecologically distinct lineages, but rather it is the limited (and manageable) number of lineages subject to cohesion under periodic selection.

4. PLD1 gene duplication in 36% of human lung squamous cell carcinomas (TCGA)

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The major hallmarks of cancer are uncontrolled cell growth, division and survival, sustained by altered metabolism. Phospholipase D (PLD) controls all these cellular functions, therefore we hypothesized that PLD genomic alteration leads to cancer development.

To test our hypothesis, we searched for PLD1/2 genomic alterations in The Cancer Genome Atlas (TCGA) dataset. TCGA was a joint effort between The National Human Genome Institute and The National Cancer Institute of the National Institutes of Health between 2005 and 2018. The dataset of TCGA has genome sequences of 20,000 human samples from cancer and matching normal tissue, including 32 different types of cancer.

In this study, we found that the alteration landscape of PLD1 and PLD2 genes is very different. PLD1 is altered in 8% of TCGA cancer patients, while PLD2 is altered in 2%. The main PLD1 genomic alteration is amplification (gene duplication), while the main PLD2 alteration is single-base mutation. Crucially, PLD1 gene duplication is present in 36% of lung squamous cell carcinomas. PLD1 genomic alterations reduce patient median survival by 20 months (almost 2 years). PLD2 had no impact on patient survival.

Some PLD1 point mutations, such as E780K/Q, warrant further investigation since there is a critical switch in amino acid side chain charge in a catalytic domain of the enzyme.

This study provides the first attempt at determining the prevalence of PLD genomic alteration in human cancer. Because PLD controls cellular physiology as part of signaling pathways, future studies will evaluate the relationship between PLD and other gene alterations in the same pathway, and how that contributes to cancer development.

5. Cancer Chemopreventive Action of Dithiolethiones

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Cancer chemoprevention involves the use of natural or synthetic compounds to reduce the risk of developing cancer or potentially inhibit the carcinogenic process. We are engaged to understand the molecular basis or mechanism of the cancer chemopreventive action of dithiolethiones (1.2-dithiole-3-thiones). Oltipraz 1, is a member of a class of compounds called dithiolethiones and has been in phase II clinical trials for the prevention of aflatoxin-induced hepatocellular carcinoma. Dithiolethiones are believed to afford protection from electrophilic and oxidative stress because they raise the labels of many phase 2 enzymes such as glutathione S-transferases (GSTs), and NAD(P)H, quinone oxidoreductase (NQO1). These enzymes trap reactive electrophiles and reactive oxygen species and conjugates that prepare metabolites for export. The induction of phase 2 enzymes by dithiolethiones is mediated, at least in part, by antioxidant response element (ARE) that is found in the upstream regulatory region of many phase 2 genes. The transcription factor Nrf2 which binds to the ARE, appears to be essential for the induction of prototypical phase 2 enzymes.

Oltipraz, 1 is extensively metabolized, mainly to the dimethylated metabolite, 2, which is not an inducer of phase 2 enzymes. It has been shown that the major unmethylated metabolite, 4 is a phase 2 enzyme inducer with a potency on par with oltipraz itself. It was suggested that monomethylated metabolites, 5 and 6 that can be found under subsequent enzymatic methylation of biologically active, 4, as other alternate metabolites prior to form the dimethylated metabolite, 2.

Therefore, our interests are focused to the synthesis of prodrugs 8 and 11, to serve as alternative precursors to the monomethylated metabolites, 5 and 6, of the cancer chemopreventive oltipraz, 1, to test whether they possess similar biological activities. In this presentation, we will discuss the synthetic strategy, structure elucidation, thiolytic chemistry, and the quinone-oxidoreductase (NQO1) activity of the monomethylated metabolites, 5 and 6, of the oltipraz.

6. A WORKSHOP: The Human Explorer,- guided by EVOLUTION Exploring Genes, Culture, and AI in the Pursuit of Happiness

Haque Nasreen S.
New York City College of Technology in partnership with Genomic Observatory

"The Human Explorer - Guided by Evolution" is an immersive workshop that embarks on a transformative journey into the intricate realms of genes, culture, and artificial intelligence (AI) within the context of well-being and happiness.

Today, there is a deeply troubling upsurge in young individuals who are withdrawing from society, experiencing deteriorating mental health, and even contemplating self-harm or suicide as they struggle to make sense of their situation.

This workshop aims to empower participants, especially students, with the tools and insights needed to navigate the complexities of modern life. Through a blend of interactive session and group discussions,

participants explore evolutionary insights into human behavior, the impact of culture on individual identity and well-being, and the transformative potential of AI. They are guided to develop essential skills of awareness, curiosity, and empathy, enabling them to enhance their daily interactions and problem-solving capabilities. Furthermore, participants are encouraged to define their personal purpose and align it with their actions, fostering a sense of fulfillment and purpose in their lives. The workshop also aims to create a supportive community of Human Explorers, dedicated to ongoing learning and growth in the NY metropolitan area.

Time: 45 Minutes

7. Combined Treatment Of Estrogen-Receptor Positive Breast Microtumors with 4-Hydroxytamoxifen and Novel Non-Steroidal Diethyl Stilbestrol-Like Analog Produces Enhanced Preclinical Treatment Response and Decreased Drug Resistance

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This research is a pre-clinical assessment of anti-cancer effects of novel non-steroidal diethyl stilbestrol-like estrogen analogs in estrogen-receptor positive/ progesterone-receptor positive human breast cancer microtumors of MCF 7 cell line. Tamoxifen analog formulation (Tam A1) was used as a single agent or in combination with therapeutic concentrations of 4-hydroxytamoxifen, currently used as a long-term treatment for the prevention of breast cancer recurrence in women with estrogen receptor positive/ progesterone receptor positive malignancies.

At concentrations ranging from 30-50 microM, Tam A1 induced microtumor disaggregation and cell death. Incremental cytotoxic effects correlated with increasing concentrations of Tam A1. Live tumor microscopy showed that microtumos displayed diffuse borders and substrate-attached cells were rounded-up and poorly adherent. A complete cytotoxic effect was observed using 40-50 microM Tam A1 with time course kinetics similar to 4-hydroxytamoxifen. Combined treatment with TamA1 (30-50 microM) and 4-hydroxytamoxifen (10-15 microM) induced a highly cytotoxic, synergistic combined treatment response that was more rapid and complete than using 4-hydroxytamoxifen as a single agent therapeutic. Microtumors completely dispersed or formed necrotic foci indicating a highly cytotoxic combined treatment response.

Moreover, breast cancer microtumors treated with both 4-hydroxytamoxifen and Tam A1 displayed lower levels of long-term post-treatment regrowth, a critical parameter of primary drug resistance, than observed for 4-hydroxytamoxifen when used as a single agent therapeutic. Tumor regrowth at 6 weeks post-treatment with either single agent 4-hydroxy tamoxifen, Tam A1 or a combined treatment was assessed for the development of drug resistance. Breast cancer cells treated with both 4-hydroxytamoxifen and Tam A1 displayed significantly lower levels of post-treatment regrowth, indicative of decreased drug resistance, than observed for either single treatment modality. The preclinical data suggest that combined treatment involving the use of tamoxifen analogs may be a novel clinical approach for long-term maintenance therapy in patients with estrogen-receptor positive/progesterone-receptor positive breast cancer receiving hormonal therapy to prevent disease recurrence. Detailed data on time-course, IC50 and tumor regrowth assays post- treatment as well as a proposed mechanism of action to account for observed synergistic drug effects will be presented.

8. Appending Viral Infiltration Tags onto Supercharged Coiled-coil Proteins to Empower Endosomal Escape

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Short-interfering RNA (siRNA) therapeutics display immense potential to combat diseases by suppressing faulty genes responsible for producing pathological proteins; however, the number of commercial siRNA products authorized by the FDA remains limited, with only four currently available. This dearth in technology stems from the broad array of extra-/intra-cellular hurdles that hinder efficient siRNA delivery. Consequently, large milligram dosing regiments are required to sustain high concentrations of intracellular siRNA over time. Boosting siRNA loading and delivery efficiency through vector engineering could amplify the potency of smaller siRNA doses, allowing for a reduction in the quantity of expensive siRNA needed to achieve the desired therapeutic effect. To this end, our lab has been developing non-viral lipoproteoplex (LPP) nanoparticles that rely on a positively supercharged coiled-coil protein called N8 to condense RNAs, facilitate endosomal escape, and improve delivery efficiency. Currently, the pH-responsive His10 tag of N8 is thought to passively sequester protons in acidified late endosomes, creating osmotic imbalances in these compartments that lead to endosomal rupture and payload release. We hypothesize that appending viral TAT and HA2 peptide sequences will further enhance cellular uptake and endosomal membrane disruption in a more active manner without compromising secondary structure or ability to bind siRNAs.

The resultant modified proteins were subjected to analytical characterization via sodium dodecyl-sulfate polyacrylamide gel electrophoresis, matrix-assisted laser desorption/ionization time-of-flight–time-of-flight mass spectrometry, and circular dichroism spectroscopy. Finally, LPP nanoparticles loaded with new proteins and siRNA were fabricated, revealing the addition of TAT and HA2 viral tags did not impact the proteins' abilities to form discrete electrostatic complexes.