Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

POSTER SESSION 2

Balcony, Easel 106

1:00 PM to 2:30 PM

Probing Amyloid Aggregation Using Designed Peptides

Timothy Bi, Junior, Bioengineering
Mentor: Valerie Daggett, Bioengineering
Mentor: Nathan Maris, Bioengineering

The beta-amyloid (Aβ) peptide, implicated in Alzheimer's Disease, forms toxic aggregates known as oligomers that cause brain degeneration. This aggregation process can be inhibited by designed peptides that have a novel structure, known as the alpha-sheet. This structure is similar to a beta-sheet except that the carbonyls all point in one direction and the amine groups in the other, generating a molecular dipole moment. The Daggett group hypothesizes that at some point, Aβ undergoes a conformational change that gives it this alpha-sheet character and the resulting molecular dipole causes Aβ monomers to be attracted to each other and form oligomers. There is also evidence to suggest from simulation that this structure occurs in many other amyloid-related diseases. As such, designed peptide inhibitors from the Daggett group all target this structure. One of the control designs, AP3, aggregates much more rapidly than Aβ does under acidic conditions. My project involves using AP3 to probe the reasons for Aβ toxicity as well as its aggregation mechanism – both of which are not understood. The residues involved in the turn sequence of AP3, which is hairpin peptide, are of particular interest due to their propensity to display β-sheet character. After synthesizing these "turn sequence" peptides, I found that the presence of these turn sequence peptides can increase the speed of AP3 aggregation, which is an analogue to the seeding of amyloids. I am characterizing these turn sequence peptides using circular dichroism to observe their secondary structure. In addition, I along with other undergraduates in the lab have optimized ELISA to quantify the interactions between our designed peptides and another peptide of interest. The behaviors of these turn sequence peptides as shown by characterization and various assays prove enlightening in understanding the pathology of amyloidogenic diseases.

POSTER SESSION 3

Commons East, Easel 44

2:30 PM to 4:00 PM

"Beyond Appetite": Examining Identities and Motivations of Foodies through Food Visuals on Instagram

Napatsorn (Pam) Thanarugchok, Senior, Communication
Mary Gates Scholar, UW Honors Program
Mentor: Anita Crofts, Communication
Mentor: Valerie Manusov, Communication

Food has long been recognized as the way that people assign identities to themselves and others. We interpret the type of food individuals consume as a factor that constructs their biological, sociological, and psychological images. As social media grows more pervasive, foodie culture and new methods of self-expression through food visuals have been introduced. For example, today there is a trend for social media users to share pictures of food and meals they consume online. The goal of this study is to examine behaviors, identities, and motivations of 18-30 years old foodies through the food visuals they choose to post on Instagram. The study aims to seek answers to the following questions: What motivates young foodies to post different kinds of food visuals; Is there a relationship between identities and food photos; and, Why food has become such a popular subject to share online? Multiple data collection methods, including surveys and direct observation, are used in this research. The study anticipates that young foodies use food visuals as a tool to create emotional connections in their own network and to put forward a visual version of their personalities and values. Food visuals can be many things: demonstrations of social status, reflections of self, replicate togetherness, and create community, to name just a few. The findings of this research are useful for understanding what motivates people to post food photos on social media, and what those photos represent about their sense of self, their values, and their sense of community. The findings can be a stepping stone for future research exploring the relationship between food, humans, and social media in a wider perspective.

POSTER SESSION 4

Balcony, Easel 97

4:00 PM to 6:00 PM

Peptide-Based Therapeutic for Type II Diabetes Mellitus

Steven Hsu, Senior, Bioengineering
Mary Gates Scholar
Mentor: Valerie Daggett, Bioengineering

Type II diabetes mellitus (T2DM) is a prevalent disease that relates to pancreatic islet beta-cell failure. With no cure and numerous secondary complications - blindness, kidney failure, heart attack, and stroke - T2DM places an enormous burden on our society and healthcare system today; the disease is projected to be the seventh leading cause of death by 2030. Within approximately 90% of T2DM cases, the majority of the amyloid deposits is made up of amylin, also known as islet amyloid polypeptide (IAPP). Unlike other organisms, human IAPP is capable of self-aggregating and forming amyloid fibers or beta-sheet plaques through its unique chemical properties. Our group's previous findings suggest that T2DM and other amyloid diseases contain misfolded protein aggregates and form toxic oligomers through a non-standard alpha-sheet secondary structure. We propose a peptide-based therapeutic to combat T2DM via utilizing synthetic alpha-sheet compounds complementary to the amyloid-associated alpha-sheet structure to target the toxic oligomer form of IAPP. In this study, the efficacy of this peptide-based therapeutic is assessed through inhibitory and toxicity reduction effects of designed peptides on IAPP aggregation and oligomer cytotoxicity. The designed peptides are co-incubated with IAPP and their aggregation is monitored via a Thioflavin-T assay. The preliminary results on IAPP suggest that our peptides are effective in reducing IAPP aggregation and allow us to conduct cytotoxicity experiments. Effects of our compounds on cell viability are currently being conducted on a human-derived neuroblastoma cell line (SH-SY5Y). The cytotoxicity of oligomer determined using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) cell viability assay. MTT is a yellow compound that will be reduced to purple formazan only in living cells. The cells are plated in a 96-well plate with $15x10^4$ cells/mL.The IAPP is co-incubated with designed peptides and applied to cells. The results of the MTT assay provide the relationship between inhibition of oligomer formation and reduction of oligomer toxicity. The alpha-sheet platform provides a novel potential therapeutic for treating T2DM and other amyloid diseases.