Session B

Blood Based Lipoarabinomannan Detection in Tuberculosis Patients: Results from a Double-blinded Clinical Cohort in Uganda

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Almost one-third of the world's population is infected with tuberculosis (TB), the leading cause of death worldwide from single infectious agent ranking above HIV/AIDS. About 10% of those infected have a potential risk to develop active TB at some point in their life. Alarmingly, 40% of TB cases are either not diagnosed, or not notified to TB control programs, highlighting the limitations of current diagnostic platforms, which are either inaccurate or inaccessible. A simple blood-based diagnostic would alleviate this problem, developing which is the goal of our work. Our team has determined that Lipoarabinomannan (LAM), an amphiphilic tuberculosis biomarker, is carried by lipoprotein molecules such as HDL in blood. To detect presence of LAM in blood, we have developed a modified sandwich assay termed lipoprotein capture assay, which utilizes the association of LAM with HDL to achieve rapid biodetection.We have evaluated performance of the Lipoprotein capture assay in a blinded cohort of TB patients from Uganda (n=48), and demonstrate performance in patients presenting with pulmonary and extra-pulmonary variants of the disease. The measurements were made using an ultra-sensitive biosensor platform developed at the Los Alamos National Laboratory. The results indicate the feasibility of developing a simple, blood-based diagnostic for active tuberculosis. In addition, they also indicate the dependence of assay performance on co-morbidities such as HIV which impact outcomes, thereby providing some valuable information on disease manifestation that can guide the development of intervention strategies.

Keywords: Tuberculosis, LAM, Diagnostic Testing

Session B

Fire and Submerged Aquatic Plants: Are Changes To Key Nutrients Lurking Below the Surface?

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It is often assumed that fire does not affect aquatic organisms given that they are not directly burned in fires that pass through the area. However, this assumption may be incorrect. Fire in the southwestern US and beyond is a rapidly growing problem in the face of climate change, and while wildfire impacts can be immediate, including loss of life, structures, and vegetation, other impacts can be delayed but still create significant disturbance to the ecosystem. Although fire impacts on terrestrial vegetation that can be burned are well studied, little is known about fire impacts on submerged aquatic macrophytes (SAMs), which are plants that conduct their whole life cycle underwater. Previously, we found that fire-related nutrient inputs to a nutrient-limited stream created a significant increase in SAM biomass accumulation compared to pre-fire levels of biomass. To investigate the mechanisms behind this increase in biomass post-fire, we asked whether the concentrations of three key nutrients in the SAM tissues changed after the fire. We analyzed pre- and post-fire SAM tissue samples for carbon (C), nitrogen (N) and phosphorous (P) content and used multivariate statistics to test for statistically significant differences among pre- and post-fire tissues. Compared to pre-fire tissue nutrient content, we found a significant reduction in these key nutrients in SAM tissues when biomasses peaked after the fire-related nutrient inputs. This was a surprise, as we expected concentrations of these nutrients would be higher in post-fire tissues. These results highlight the notable impacts that fire can have on SAMs despite a lack of visible initial impact directly from the fire. Reductions in SAM nutrient content and consequently, quality as a food source could have detrimental effects on other organisms dependent on them, magnifying impacts on local biota and food webs.

Keywords: Fire, Aquatic Ecosystems, Nutrient Content, Aquatic Plants

Session B

Exploring Biochemical Reactions Involved in Taurine Biosynthesis

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Taurine (2-aminoethanesulfonic acid) is a highly abundant, amino-acid derived molecule in humans and various animals. Deficiency for taurine is associated with numerous physiological and health problems. The identities and characteristics of reactions involved in taurine biosynthesis are not fully understood, including those that involve reactive oxygen species. Recent analytical and biochemical experiments will be presented that provide details as to the mechanisms and kinetics by which taurine is synthesized.

Keywords: Biochemistry, Kinetics, Taurine

Session B

Wolves, Coyotes, Dogs, and Dingoes: The Evolution and Subspeciation of Canis lupus

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This research discusses the evolution of the grey wolf (*Canis lupus*) and its various subspecies. The study seeks to find the time and place at which various subspecies diverged from the main branch of *Canis lupus*. The genetic and archeological history of the golden jackal (*Canis aureus*), coyote (*Canis latrans*), dingo (*Canis lupus dingo*), and domestic dog (*Canis lupus familiaris*) are all examined. There has been fairly extensive research on genetic relations between the different subspecies. Findings of this research show that coyotes (*Canis latrans*) did not diverge from wolves at all, but rather from a common ancestor, *Canis leophagans,* in North America. Golden jackals *(Canis aureus)* also diverged from a common ancestor, albeit a much more distant one. Domestic dogs (*Canis lupus familiaris*) diverged from grey wolves roughly 15,000 years ago in the area of Central-Eastern Europe, while dingoes (*Canis lupus dingo*) diverged from domestic dogs roughly 8,000 years ago. This means that dingoes diverged from domestic dogs before their arrival in Australia, and that the divergence must have taken place while dingoes were still in Southeast Asia.

Keywords: Canidae, Evolution, Speciation