

SER's 2023 Annual Meeting Symposium Proposal Application

The application of novel epidemiological methods/concepts to study human health: using liver cancer as an example

This symposium will demonstrate three novel methods/concepts and discuss their applications to epidemiologic studies of human health using liver cancer as an example. The novel epidemiological methods/concepts are as follows:

1. Circadian rhythm disrupting lifestyle: Emerging risk factors for cancer

The circadian system in humans coordinates our life from gene expression and cellular functions to metabolism and hormone secretion and to behaviors such as sleep-wake and eating-fasting within an approximately 24-hour period. Emerging evidence suggests that chronic disruption in circadian rhythms by shifting a light-dark cycle or meal timing leads to the manifestation of obesity, diabetes, metabolic syndrome, and nonalcoholic fatty liver disease, which increase liver cancer susceptibility. In this symposium, we will discuss circadian rhythm disrupting lifestyle factors, such as light at night, social jetlag, eating time, and activity time, as potential non-viral risk factors for liver cancer.

2. Locus-specific repetitive element DNA methylation in cancer

Repetitive elements (RE), including long interspersed element-1 (LINE-1) and Alu element (Alu), are the two most abundant types of RE sequences that can mobilize in the human genome and activate oncogenic pathways in liver cancer. DNA methylation is a key regulatory mechanism of RE mobilization in the host genome, helping maintain genomic integrity. The role of RE DNA methylation in cancer is largely unknown due to the challenges in current methylation profiling technology that have poor coverage of RE regions. To overcome the limitations, we have developed a novel bioinformatic method, REMP, which enables researchers to access high-quality locus-specific methylation data by utilizing existing RE-poor DNA methylation data (e.g., Illumina array or short-read sequencing). In this symposium, we will introduce this methodology and its applications in liver cancer.

3. The application of proteomics to epidemiological studies

Innovative, high-throughput analytical platforms measuring a significant slice of the proteome have recently emerged as new tools to discover biomarkers at low concentrations in blood. The most comprehensive among those next generation proteomics platforms, SomaScan, an aptamer-based immuno-like biomarker

discovery technology, simultaneously measures 7,000 different proteins across the entire dynamic range (> 10 logs) with high sensitivity, accuracy, and reproducibility. This new technology has offered unprecedented opportunities to study disease etiology, progression, and inform early detection. But the application of proteomics to large scale, epidemiological studies and decades-old, archived samples is in the early phase. In this symposium, we will introduce this methodology and its applications for liver cancer.

In this symposium, we will use liver cancer as an example to show how these novel methodology/concepts are utilized to inform disease etiology, risk stratification, and early detection. Liver cancer incidence is on the rise worldwide and has significant global health disparities with much higher incidence in low-to-middle income countries such as Africa. However, liver cancer incidence has also been tripled since the 1980s with unclear underlying causes in developed countries such as US. Additionally, liver cancer is often fatal due to a delay in cancer diagnosis and no effective early screening. This symposium will highlight how novel methodology/concepts can be used to improve knowledge on liver cancer etiology, in particular non-viral risk factors such as non-alcoholic fatty liver disease, and biomarkers of liver cancer progression and early detection. Symposium attendees will learn how to use innovative methods/concepts and further advance these concepts when applying them to their studies. Discussion with the speakers and attendees will center on opportunities for research, including methodological advances that can strengthen future studies to close gaps in disease etiology and early biomarkers.