Award ID:
RP170295

Project Title:
Developing Effective Epigenetic Biomarkers to Identify Individuals with High Risk of Cancer

Award Mechanism:
Individual Investigator Research Awards for Prevention and Early Detection

Principal Investigator:
Waterland, Robert

Entity:
Baylor College of Medicine

Lay Summary:

In addition to family history, lifestyle, and genetics, stable mechanisms that regulate gene expression – termed epigenetics – hold promise for cancer risk assessment. In particular, DNA methylation is a stable epigenetic mark important in cancer. However, because DNA methylation can vary across different cell types, studying easily obtainable cells like blood is not always useful. To overcome this obstacle we pioneered the discovery of human genomic regions called 'metastable epialleles', at which individual variation in DNA methylation is stable across different cell types. We have identified a subset of human metastable epialleles involved in cancer, and our preliminary data show that we can use DNA methylation at these genomic regions – in peripheral blood of healthy adults – to predict risk of later cancer. The goals of the proposed project are to identify new human metastable epialleles associated with cancer and test the ability of specific combinations of these to predict later cancer. For our risk models, we will utilize existing DNA methylation data from the Melbourne Collaborative Cohort Study. In addition to family history and lifestyle information, peripheral blood was collected at enrollment (prior to any cancer diagnosis) from over 40,000 healthy adults. Now, over 20 years later, 'cases' (who were diagnosed with a specific type of cancer) have been matched with 'controls' (who remained cancer-free). Our predictive models will focus on breast, colorectal, prostate, lung, and kidney cancer, as well as urothelial cell carcinoma, and mature B-cell neoplasms (including B-cell lymphoma). We expect to discover new epigenetic biomarkers to identify individuals at high risk for these cancers, enabling effective targeting of cancer screening and preventive interventions.