Institute of Neuroscience Seminar

Janis Weeks

University of Oregon

Host: Bill Roberts

"Using high technology and electrophysiology to combat ancient parasitic diseases"

April 7, 2016, Thursday, 4:00pm

110 Willamette

Parasitic worm infections cause debilitating health problems, especially in poor, tropical regions of the world. Worms stunt cognitive and physical development, especially in children, by stealing vital calories and nutrients from their hosts. However, because worms cause chronic illness but rarely death, they are neglected compared to other infections such as malaria, tuberculosis and HIV/AIDS. Currently-available anthelmintics (anti-nematode drugs) have significant limitations including the ever-increasing development of drug resistance in the parasites. Thus, there is a tremendous need for new anthelmintics. Most anthelmintics on the market target ion channels and neurotransmitter receptors, but no methods existed for assaying electrophysiological actions of candidate compounds during drug discovery and development. We (including the inventor, Shawn Lockery) integrated the fields of microfluidics (the precise control of fluids and samples at sub-millimeter scales) and electrophysiology to develop a semi-automated, medium-throughput, screening platform that reads out the electrical activity of nematode muscles and neurons. The microfluidic devices (chips) record signals generated by rhythmic contraction of a nematode's pharynx, termed an electropharyngeogram (EPG). Originally validated for the non-parasitic nematode C. elegans, funding from The Bill & Melinda Gates Foundation enabled modification of the EPG platform to accommodate human parasites (hookworm and roundworm), which have key differences from C. elegans and are among the species that new drugs need to target. Using hookworm, we validated the EPG platform for existing anthelmintics and a natural product used traditionally in Haiti for worming. In another project, we screened FDA-approved drugs in C. elegans followed by hookworms, with the goal of 're-purposing' approved drugs as anthelmintics. Several promising hits were identified. Other applications include aging research and 'humanized' C. elegans expressing beta-amyloid peptides implicated in Alzheimer's disease. The EPG platform for C. elegans ('ScreenChip') is now available to researchers via a UO spin-off company, NemaMetrix Inc., founded by Janis Weeks & Shawn Lockery.

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