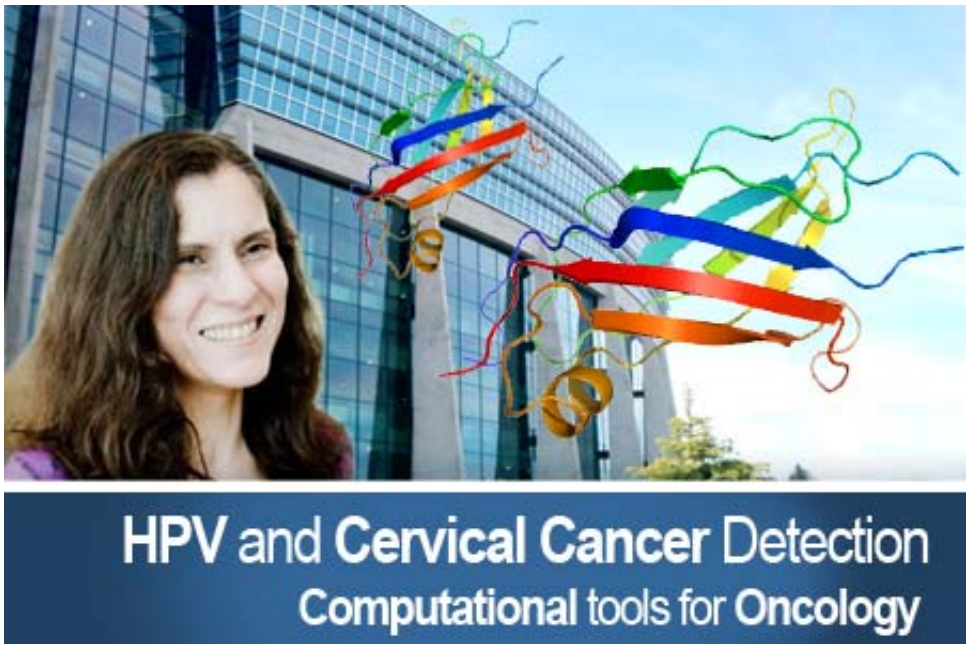
Research Profiles



Computer Technology Helps Break Ground in Cancer Prevention

Helping doctors assess if some patients have a higher risk of developing cervical cancer is the goal of a new research project at Lakehead University.

Dr. Wely Floriano, a member of the Biorefining Research Initiative and Thunder Bay Regional Research Initiative, is working through SHARCNET to use computational tools to study proteins related to the human papilloma virus (HPV). This virus infects the skin and genital areas, and can eventually lead to cervical cancer in some women.

The ultimate goal of Floriano's work is to discover an optical imaging probe that will allow doctors to detect cervical cancer before the disease fully develops. The probe is a fluorescent compound that could detect a protein produced by HPV, which acts as a biomarker for cervical cancer. Imaging the cervix after a local application of the probe with, for example, a low-light or high resolution digital camera attached to a colposcopy, will allow for the identification of tissue at high risk of developing cancer.

"Using the probe to identify high-risk areas prior to development of the cancer will be important for improving the prognosis for treatment, and will allow doctors to preventatively treat patients," says Floriano.

Her first step is to find a fluorescent chemical compound that can detect certain variants of the protein E6, a protein produced by HPV which could indicate the probability of cervical cancer developing. To this end, Floriano is using a computer program to screen a large database of chemical compounds against the target protein. The process uses computer-generated three-dimensional structures for the chemical compounds and an experimentally determined structure of the protein.

The computational tools used in this process simulate the interactions of each chemical compound with the HPV-related protein. The computer is able to estimate the energy of these interactions, and determine the chemical compounds that interact most effectively with the E6 protein. Compounds that are successful in this process are then tested experimentally to confirm target protein binding. Using a combination of computational and lab work, an experimentally confirmed "hit" can then be developed into an imaging probe.

An optical imaging probe that could detect cervical cancer would be a major advancement in preventing HPV-related cervical cancer. Doctors would be able to use the probe to assess the probability of cancer developing in patients diagnosed with HPV.

Because various strains of HPV exist -- and some indicate a higher risk of cancer development than others -- tissue from a patient's cervix can be screened to determine which types of HPV proteins are present. If this assessment shows a patient has a high risk type of HPV, doctors can use the imaging probe to map the cervix and identify regions at risk.

In turn, they will be able to provide the patient with preventative treatment specific to cervical cancer.

Floriano's research projects uniquely focus on developing and applying computational tools in oncology. Her professional team uses many sophisticated computer programs to learn more about chemical compounds and how they can be applied to advance modern medicine.

"Starting research projects with a computational approach is fast and efficient," says Floriano. "Initial lab work can be time consuming, but with computer technology, only the most promising compounds need to be tested experimentally."

Floriano credits SHARCNET for making many of her biomedical projects possible. SHARCNET provides researchers with access to sophisticated computational resources typical to large pharmaceutical companies, so she and others are able to tackle major medical projects significant to society, such as making a non-invasive risk assessment test for cervical cancer in HPV patients a reality.

Funding for this project is currently provided by the Thunder Bay Regional Research Initiative. Dr. Floriano is also a SHARCNET Research Chair, with funding provided by SHARCNET's vendor partners, HP and SGI.

For more information about Dr. Floriano or her research, please visit http://www.tbrri.com/article/wely-b-floriano-phd-140.asp