FIGHTING CANCER

DEVELOPING BETTER CANCER TREATMENTS

A research team from the University of Manitoba used the CLS to find new, cutting-edge ways to battle cancer. The team researched how netrin-1, a common molecule related to cell migration in the body, creates filaments that bind to receptors in cells. The next step in their work is determining how to derail this process, in order to kill in cancer cells.

DOI: 10.1038/s41467-023-36492-w.

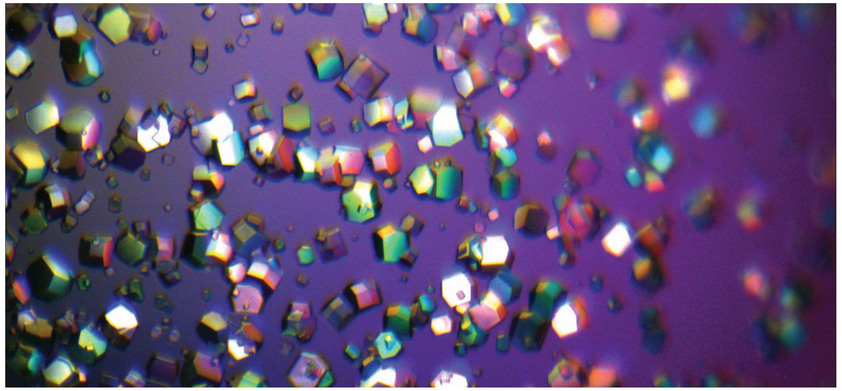
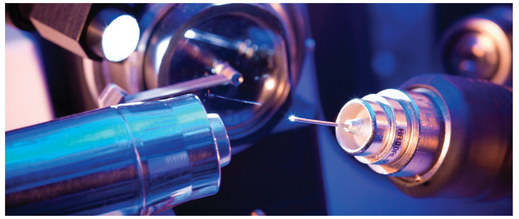


Image of crystal protein structures from the CMCF beamline at the CLS.

TINY PROTEINS PLAY A ROLE IN CANCER SPREAD

The mystery of phosphatases of regenerating liver (PRLs) was unravelled by a team from McGill University using beamlines at the CLS. PRLs, which are found in all kinds of animals and insects from humans to fruit flies, play a role in the growth of cancer tumours and the spread of cancer in the body. Their research confirmed that PRLs bind to magnesium transporters, which furthers our understanding of how these proteins influence human disease. This knowledge creates a pathway to targeting PRLs with drug treatments that prevent cancer progression.

DOI: 10.1074/jbc.2023.103813



The CMCF beamline at the CLS. This beamline is used to examine protein structures on a molecular level.

A VACCINE AGAINST GASTRIC CANCER

H. pylori is one of the most common disease-causing bacteria. More than half of the world's population have the bacteria in their body. Using the CLS researchers from Quebec's National Institute of Scientific Research (INRS) have solved the structure of the protein that plays a key role in helping H. pylori stick to the lining of our stomach. It is the bacteria's ability to bind to the inside of the stomach that helps it survive and cause health problems -- including gastric cancer and peptic ulcers. This research paves the way for developing a vaccine against the infection.

DOI: 10.1126/sciadv.ADH12-23

PROTEIN COULD HELP FIGHT COLON CANCER

Researchers from the University of British Columbia have identified a new protein that helps bacterium common in the human mouth thrive in other locations around the body. Most notably, the bacteria is prevalent in the tumors of people with colorectal cancer. The presence of the bacteria can contribute to tumor growth, spread of cancer to other sites in the body, and resistance to chemotherapy. With the help of the CMCF beamline, the research team determined that the new protein they identified enables the bacteria to take essential nutrients, such as iron, from our blood cells. This newly identified protein may prove to be a good target for drugs designed to attack the bacterium.

DOI: 10.1016/j.jbc.2023.104982

TARGETING "UNDRUGGABLE" CANCER

A cancer-causing protein long thought to be resistant to medication could soon be the target of new drugs, thanks to the work of Quebec researchers. Scientists from the Institut national de la recherche scientifique (INRS) studied a protein called Ras, which is associated with cancers of the head, neck, and urinary tract. Ras proteins play a critical role in cell signaling and growth regulation and are often mutated in cancers. Using the CLS, the group gathered atomic-level, 3D information about the protein. They discovered a "pocket" in it that appears to be an ideal target for molecular drug treatment.

DOI: DOI: 10.1021/acsomega.3c10493.

ATTACKING CANCER CELLS FROM THE INSIDE OUT

Researchers from the University of Toronto are harnessing the power of proteins to stop cancer cells in their tracks. The team is especially interested in proteases, enzymes that chew up old or misfolded proteins and act as cellular quality control. Using our CMCF beamline, the researchers identified compounds that hyperactivate proteases, thereby causing cell disfunction and ultimately, cell death. By targeting the cell's self-destruct button, the work points the way to the design of a new approach to cancer therapy.

DOI: 10.1016/j.ab.2022.113.003

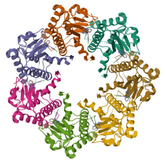


Image of the ClpP protease, taken at the CLS.

HIJACKING CELLS TO HELP TREAT DISEASES

When the proteins in our body are too active or don't work properly, it can lead to diseases like cancer. Researchers from the University of Toronto used the CLS to study a small molecule that acts as a "molecular glue," sticking together two proteins to inactivate one of them. Molecular glues typically bind two proteins that would not normally interact, marking one of them for destruction. The discovery of this alternate mechanism could potentially be leveraged to control some forms of breast cancer. This research points to the possibility of one day treating diseases by controlling the activity of harmful proteins.

DOI: 10.1038/s41589-024-02783-x