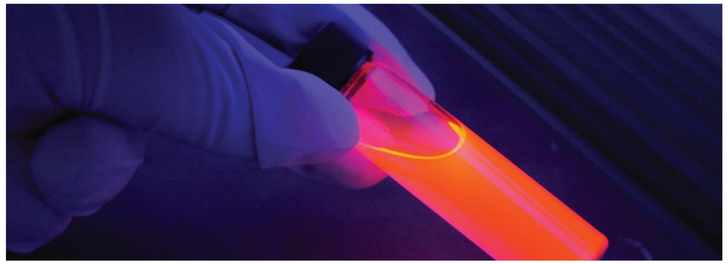
DEVELOPING NEW DRUGS



NEW MATERIAL IMPROVES DRUG DELIVERY

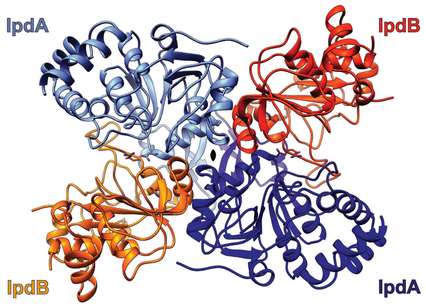
Researchers from Western University developed a material that could eventually improve the way drugs are administered to patients, by allowing doctors to "see" exactly whether drugs are reaching their targets and working properly. By combining a material already used to deliver medication to specific sites in the body with another that glows in the dark, the team created a composite that can be used to track the path of a drug carrier through the human body. In the short term, the new approach could be used to monitor medication used for cancer and bone diseases, and could eventually have a wide range of other therapeutic applications.

DOI: 10.1039/D2PY01472J

SCIENTISTS INTERPRET TUBERCULOSIS STRUCTURE

Every year in Canada there are around 1,600 new cases of the bacterial infection tuberculosis reported. Scientists from the University of British Columbia are researching how the bacteria grows in the lungs, to better understand how to treat it. They found that the tuberculosis bacteria can grow on cholesterol, unlike other bacteria that needs glucose to grow. The group was also able to determine the structure of the enzyme that helps the bacteria break down the cholesterol molecule. Being able to understand the structure of enzymes and how they work is a key step in developing drugs to treat diseases like tuberculosis.

DOI:10.1073/pnas.1719331115



HOW HIV EVADES THE IMMUNE SYSTEM

About 42 million people have died from AIDS-related illnesses and approximately 40 million people globally are living with HIV, according to the World Health Organization in 2024. Researchers from the University of Toronto investigated key proteins on the HIV virus that are crucial to developing an effective vaccine. Using the CMCF beamline, the research team analyzed the outer proteins on the HIV virus. They discovered that an area of one protein acts as a decoy– diverting the immune system's response towards a false target. The team hopes that their research will provide a strategy for future vaccine design that will avoid this region, allowing for a better immune response and a more effective vaccine.

DOI: 10.1038/s41893-023-01233-w.

NEW HOPE FOR FIGHTING MALARIA

Using the CLS, researchers from The Hospital for Sick Children (SickKids) decoded how human antibodies protect us from the malaria parasite, which kills more than 600,000 people worldwide annually, according to the U.S. Centers for Disease Control and Prevention. The CMCF beamline enabled the team to identify the precise structures involved in identifying and fighting off the disease. They were able to see that protective antibodies lock on to a vulnerable point on the malaria parasite in a specific form, making it easier to neutralize the infection. The results could inform development of better treatments and vaccines.

DOI: 10.1016/j.celrep.2023.113230

IMPROVING ANTIVIRAL MEDICATION FOR COVID-19

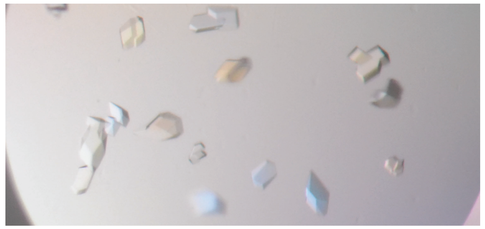
Researchers from the University of Alberta used the CLS to improve Paxlovid so it can be used by people who are immunocompromised or have other chronic conditions. The COVID antiviral uses a second drug as a metabolic booster to keep the active drug in the bloodstream longer. However, this additive can interact with other medications. The U of A team modified a specific area of the molecule in the active drug so it stays in the system – meaning an additional "booster" drug is not necessary. The team is now working to expand what they learned to design drugs to help fight other viruses.

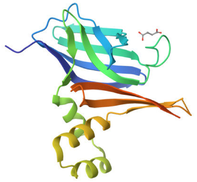
DOI: 10.1021/acsinfecdis.3c00019

NEW TARGET IN ANTIBIOTIC-RESISTANT BACTERIA

Antimicrobial resistance poses a growing threat to public health. Using our CMCF beamline, researchers from the University of British Columbia and McMaster University generated an atomic level "blueprint" of a protein called TarL that's located within methicillin-resistant Staphylococcus aureus (MRSA). It produces an acid that helps bacteria cells evade our immune system and continue to spread. Membrane proteins like TarL are notoriously tough to characterize. By deepening our understanding of TarL, this research can help inform development of drugs that precisely target and block the mechanisms that allow bacteria to proliferate.

DOI: 10.7554/eLife.68964





Left: protein crystal structures imaged at the CLS. Right: the TarL protein blueprint generated by the researchers at the CLS.

UNDERMINING THE FOUNDATIONS OF BACTERIAL RESISTANCE

Scientists from the University of Guelph have used the Canadian Light Source (CLS) at the University of Saskatchewan to better understand how several infectious bacteria, including *E. coli*., build a protective sugar-based barrier that helps cloak their cells. The study provides very early steps toward new treatments for *E. coli* and a whole range of bacteria. The researchers are focused on strains of *E. coli* that cause urinary tract and bloodstream infections, particularly those that are antibiotic resistant. They are working to understand the enzyme that many infectious bacteria use to build the foundations of their protective capsule, which helps shield the bacterium from attack by the human immune system. This foundation could serve as a common point of attack, allowing a single treatment for several key pathogens infecting humans and livestock.

DOI: 10.1016/j.jbc.2022.102609