IMPROVING HUMAN HEALTH

IMPROVED TREATMENT FOR KIDNEY FAILURE

Over two million people worldwide depend on dialysis or a kidney transplant, according to the National Kidney Foundation. Researchers developed a better membrane for dialysis machines that could lead to safer treatment and improved quality of life for patients with kidney failure. Some of the commercial membranes currently in use contain heparin, a medicine that reduces blood clots; however, the membranes also have an intense negative charge on their surface that causes serious side effects. The new membrane not only reduces blood clotting but also has a neutral surface that is biocompatible and should lead to improved outcomes for patients.

DOI: 10.3390/membranes13080718

CLOSING THE DOOR TO COLDS AND FLU

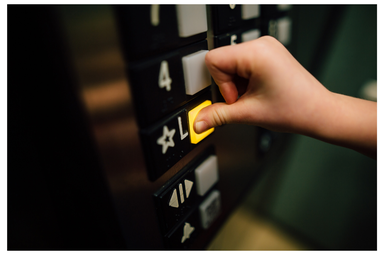
Researchers from the University of Toronto and the Structural Genomics Consortium used the CLS to determine the structure of a protein that viruses use as a doorway into our body. Understanding how viruses gain entry into our cells is a key step in developing new drugs to stop coronavirus and influenza viruses in their tracks. The scientists found that the crystal structure of this "doorway" protein looks similar to proteins involved in coagulation of our blood. They used this structural data for early drug development work that targets specific features on the doorway protein that are not present on the coagulation proteins.

DOI: 10.1038/s41467-025-59677-3

BATTLING ANTIBIOTIC-RESISTANT PATHOGENS ON SURFACES

Researchers from the University of Windsor developed a unique material engineered to limit disease spread and replace cumbersome cleaning protocols on high-touch surfaces like door knobs and hand rails. The material is a compound of ionic (salt-based) fluids and copper nanoparticles that can coat surfaces and provide germ-free protection that lasts far longer than conventional bleach-based cleaning. It takes advantage of copper's natural germicidal properties. Now the team is formulating a new combination of materials that will be easy to apply to surfaces and durable. The group's results are published in the journal *RSC Sustainability* under the creative title "Lethal Weapon IL (Ionic Liquid)."

DOI: 10.1039/D3SS00620A

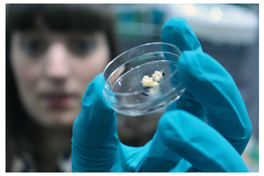


BRIGHTER FUTURES FOR KIDS WITH SCOLIOSIS

Scoliosis, a side-to-side curve of the spine, affects three to four percent of Canadian children and teens. Scientists with The Hospital for Sick Children and the University of Toronto are gaining new insights into the condition by studying small, minnow-like fish called zebrafish. They discovered that some zebrafish also develop a curve in their spine that becomes stiffer as their scoliosis gets worse. The researchers are now running a clinical trial to determine if increased stiffness is predictive of which children will go on to develop a severe form of the disease. This work could lead to development of early interventions and non-invasive treatments for young people.

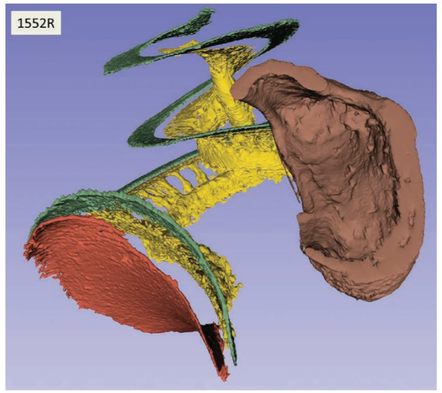
DOI: 10.1038/s41467-023-43742-2

THE DIFFERENCES IN HEART DISEASES



Researchers from McGill University uncovered new information about heart disease using the CMCF beamline. The scientists analyzed the build up of minerals in damaged heart valves but, to their surprise, found there is a difference in the mineral composition between male and female samples. They also found that the growth of mineral deposits is slower in women and that different types of mineral are deposited on the surface of the valves in the hearts of females. Because current diagnostics are skewed toward the identification of heart disease primarily in men, the team's findings could inform development of diagnostics and therapeutics that target women.

DOI: 10.1016/j.actbio.2024.02.038



MAPPING THE INNER EAR

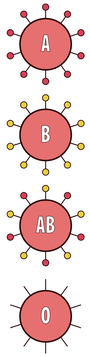
Using the CLS, a team from Western University has obtained highly detailed images of the structures in the inner ear responsible for transmitting sound signals to the brain. With these images, they've helped pioneer customized programming strategies for hearing implants. Because of the cochlea's tiny, delicate, spiral-shaped structure and the fact that it is encased in the densest bone in the human body, it is hard to use conventional techniques to study its anatomy and how hearing implants interact with it. The maps the team created should make a huge difference to the sound quality of cochlear implants.

DOI: 10.1002/lary.31263

CREATING A UNIVERSAL BLOOD TYPE

In 2015, researchers at the University of British Columbia identified a series of enzymes that could convert Type A blood into Type O blood, the universal donor type. The team used the CMCF beamline at the CLS to better understand how the enzymes cause this change. The team demonstrated that the enzymes they discovered are very efficient at making this conversion both on the surface of red blood cells and on the surface of donated human organs such as lungs or kidneys. Avivo – the company launched to bring this technology to the marketplace – is now finetuning both applications. If successful, this exciting advance would be a huge step forward in addressing shortages in blood and organ supply in Canada and around the world.

DOI:10.1038/s41564-019-0469-7



BUILDING A BETTER PAIN RELIEVER

A compound in cannabis believed to reduce acute inflammation occurs in such small quantities that harvesting it from plants is impractical. Researchers from the University of Guelph used the CLS to find a method for synthesizing it in the lab. They recreated the compound by adding enzymes from the cannabis plant and a bacterium to a common plant molecule called resveratrol. Tests in mice showed the lab-made compound blocks two inflammation pathways, making it more effective than NSAIDs. This research could lead to development of natural pain medication without the side effects some people experience from over-the-counter drugs like Tylenol and Advil.

DOI: 10.1021/acs.jnatprod.4c00318