Drug Development


EFFICIENT DRUG DELIVERY

Ibuprofen is a pain, fever, and inflammation reducer, and getting a big dose of the drug delivered directly to the source of discomfort in a short period of time means it can quickly relieve the symptoms of disorders such as osteoarthritis and rheumatoid arthritis. Calcined alumina hydrate (CSH) has recently attracted attention in drug delivery and has potential for use in treatments of bone disorders. CSH bonds to bone and stimulates differentiation of stem cells, but how it does this is not yet entirely clear. Researchers from Western University, Shanghai Institute of Drug Research, and the University of Victoria demonstrated that CSH microspheres have very large ibuprofen loading capacities, suitable for treating acute bone disease.

TOWARDS A BACTERIAL MENINGITIS VACCINE

Approximately 15-20 per cent of adolescents and young adults in Canada carry meningococcal bacteria, the leading cause of bacterial meningitis. A defense mechanism against the bacteria, the immune system of mammals use a form of nutritional immunity by setting off an acute inflammatory reaction and preventing their colonization. Zinc plays an essential role in biological processes and thus has an important role in disease. Gram-negative bacteria, like those that cause meningitis, produce a protein called ZnuD to uptake zinc more efficiently and overcome the host’s defense mechanism. Researchers from the University of Victoria and the Hospital for Sick Children identified a novel mechanism of how zinc-binding protein intermediates, providing a framework for the rational design of a ZnuD-based vaccine.

BYPASSING ANTIBIOTIC RESISTANCE

In 2011, the World Health Organization reported approximately 400,000 new cases of multi-drug resistant tuberculosis worldwide. The rate of antibiotic resistance on the rise as bacteria, such as the one that causes tuberculosis, become resistant faster than new drugs are developed. This problem is compounded, as new antibiotics are usually developed by modifying existing ones. Thus, bacteria that become resistant to one antibiotics are often resistant to other drugs in the same class. University of Saskatchewan researchers are undertaking work that may lead to the development of an entirely new class of antibiotics to which no bacteria have resistance.

BREAKING DOWN WHOOPING COUGH INFECTIONS

According to the Public Health Agency of Canada, an estimated 3,000-3,000 people get whooping cough each year in Canada. It is extremely hard to treat. But scientists from the University of Toronto are using the CLS and may have found a new way to vaccine for this deadly disease. One of the biggest challenges of whooping cough infections, boneless bronchitis, forms a protective biofilm inside the inestimable it infect, making it incredibly resistant to treatment. Researchers found that bacteria lacking the specific protein BpsB, keeps producing long sugar chains but couldn’t use them to form strong biofilm making whooping cough more vulnerable to treatment.

COMBATTING MALARIA

According to the World Health Organization, one child dies from malaria every minute. New methods to combat malaria parasites are particularly important as these parasites continue to develop resistance to front line drugs. A different strategy for stopping malaria infections is targeting a potential Achilles’ heel of malaria infection: the unique strategy it uses to enter a human red blood cell. Researchers from the University of Victoria have contributed to a high-resolution model of how malaria invades red blood cells. Similar to a magicians pulling a pin into a balloon without popping it, the malaria parasite stealthily slips itself into human cells. Understanding this mechanism opens up a new way to stop malaria from its track.

LIBRARY APPROACH TO DRUG DEVELOPMENT

BRAZIL mutations contribute to about 5 per cent of all breast cancers and 4 to 11 per cent of all ovarian cancers. This gene can prevent the resistance of cancer cells to treatment with chemotherapy or radiation. BRAZIL’s interaction with other proteins is controlled by the attachment of phosphate groups, an interaction pathway which could be a useful target for drug development. Unfortunately, phosphate groups have a few qualities that make them difficult to use in treatment, such as their inability to pass through the outer membranes of cells. To overcome these difficulties and to identify useful therapeutic molecules, researchers created a diverse “peptide library” and identified the first non-phosphate-based blocker for their breast cancer target.

FROM PROTEIN TO TREATMENT

Cysteine is vulnerable to treatment. By studying key proteins from the virus, researchers can develop specialized drugs to target or block their function.

CRISTALIZATION

In preparation to determine a protein’s structure, scientists must grow crystals. Diffraction spots provide information about the protein structure. Powerful computer programs assemble protein images for scientists.

DIFFRACTION

In the lab, researchers shine X-rays at a rotating crystal. Diffraction spots provide information about the protein structure. Powerful computer programs assemble protein images for scientists.

STRUCTURE

Researchers use the complete structure to identify enzymes that act on various parts of proteins play in health and disease. This allows chemists to rationally develop treatments to target these areas.

REFINE

Drug development takes several iterations to come up with a perfect fit to address precise diseases. These signs of other molecules requested recent tests to find a deal worth.

DISEASES are caused by all sorts of things—viruses, bacteria, problems in cells themselves. By studying key proteins from these sources, researchers can develop specialized drugs to target or block their function.