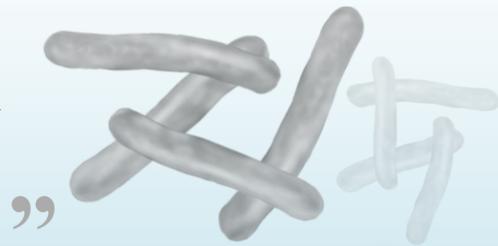


8 Antibiotic-Resistant Bacteria of Global Priority: IIDR Research, Discovery, & Antibiotic Development

1 *Mycobacterium tuberculosis* Priority 1: **Critical**

“To address resistance, there must also be better prevention of infections and appropriate use of existing antibiotics in humans and animals, as well as rational use of any new antibiotics that are developed in future.”
- World Health Organization



IIDR Research Highlight

The high incidence of multi-drug resistant *Mycobacterium tuberculosis* has allowed tuberculosis to remain the top infectious killer of people, second only to HIV. Through the study of anti-microbial respiratory mucosal immunity and TB vaccination strategies, **Dr. Zhou Xing** and **Dr. Fiona Smail** may be the first in Canada - and amongst the first in the world - to have developed an effective new vaccine, currently entering clinical trials.



5 *Klebsiella pneumoniae* Enterobacteriaceae - Priority 1: **Critical**

“New antibiotics targeting this priority list of pathogens will help to reduce deaths due to resistant infections around the world.”



- Prof. Evelina Tacconelli
Head of the Division of Infectious Diseases at the University of Tübingen

IIDR Research Highlight

Dr. Eric Brown's research group applies a biochemical approach towards understanding and combatting antibiotic resistance. His lab is working to explore largely uncharted aspects of complex biology in bacteria that underlie bacterial survival, such as the mechanisms of resistance within drug-resistant strains of *Klebsiella pneumoniae*. The ultimate goal of their studies is to contribute fresh directions for new antibacterial therapies.



2 *Pseudomonas aeruginosa* Priority 1: **Critical**

“The most critical group of all includes multidrug resistant bacteria that pose a particular threat in hospitals, nursing homes, and among patients whose care requires devices such as ventilators and blood catheters.”
- World Health Organization



IIDR Research Highlight

Dr. Lori Burrows' lab examines the type IV pili and type II secretion systems of *Pseudomonas aeruginosa* in the context of drug development. Her lab also studies the pathways that lead to the formation of biofilms - an assemblage of surface-associated microbial cells enclosed in an extracellular polymeric substance matrix, which increase the resistance of bacteria to antibiotics.



6 *Salmonella species* Priority 2: **High**

“Diseases once easily treated with antibiotics are spreading across the globe, threatening the lives of millions, producing chronic health conditions, and costing the healthcare industry billions.”
- The Canadian Anti-infective Innovation Network (CAIN)



IIDR Research Highlight

Just as bacteria can become resistant to antibiotics, they can also evolve resistance to our immune system. **Dr. Brian Coombes'** lab is on a mission to find alternative ways to tackle drug-resistant *Salmonella* by sensitizing them to the power of our innate immune system. This effort will generate new bacteria-targeted immune adjuvants to restore the potency of innate immunity even against drug-resistant organisms.



3 *Acinetobacter baumannii* Priority 1: **Critical**

“Vaccines and antibiotics have made many infectious diseases a thing of the past; we've come to expect that public health and modern science can conquer all microbes. But nature is a formidable adversary.”
- Tom Frieden
Former Director of the Centers for Disease Control and Prevention (CDC)



IIDR Research Highlight

Dr. Andrew McArthur's lab is dedicated to genomic, bioinformatic, and analytic approaches to antimicrobial resistance threat assessment and surveillance. In collaboration with Dr. Gerry Wright, Dr. McArthur designed and developed the Comprehensive Antibiotic Resistance Database (CARD) - a bioinformatic database of resistance genes, their products and associated phenotypes. This technology has allowed antibiotic resistant genes to be identified in multidrug resistant bacteria such as *Acinetobacter baumannii*.



7 *Streptococcus pneumoniae* Priority 3: **Medium**

“We need effective antibiotics for our health systems. We have to take joint action today for a healthier tomorrow.”



- Mr Hermann Gröhe
Federal Minister of Health, Germany

IIDR Research Highlight

Although vaccination for *Streptococcus pneumoniae* reduces infections in children, it is not very effective in reducing disease in older adults or vulnerable patients. **Dr. Dawn Bowdish** is investigating how changes in the aging immune system leave us vulnerable to infection and whether we can manipulate the microbial communities in our respiratory tract to keep pathogens like *Streptococcus pneumoniae* from infecting us in the first place.



4 *Escherichia coli* Enterobacteriaceae - Priority 1: **Critical**

“Antibiotic resistance is growing, and we are fast running out of treatment options. If we leave it to market forces alone, the new antibiotics we most urgently need are not going to be developed in time.”
- Dr Marie-Paule Kieny
WHO's Assistant Director-General for Health Systems and Innovation



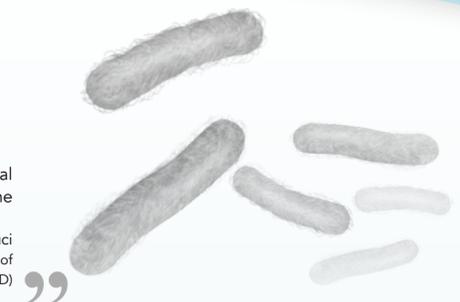
IIDR Research Highlight

Dr. Gerry Wright's research group is engaged in efforts to discover new antibiotics and antibiotic alternatives such as adjuvants, as well as exploring the mechanism, diversity and evolution of antibiotic resistance. Researchers in the Wright lab have discovered the first potent inhibitors of carbapenem-resistance in multidrug resistant bacteria such as *Escherichia coli*.



8 *Shigella species* Priority 3: **Medium**

“We have to fight continued resistance with a continual pipeline of new antibiotics and continue with the perpetual challenge.”



- Anthony Fauci
Head of the National Institute of Allergy and Infectious Diseases (NIAID)

IIDR Research Highlight

One of **Dr. Jeffrey Pernica's** interests is the diagnosis and management of enteric infections in children. In past studies, Pernica looked at of *Shigella* infection in children with diarrhoea - a leading cause of death among children in low- and middle-income countries. Currently, Pernica is conducting a clinical trial in Botswana to investigate the association between rapid enteric diagnostic testing and/or probiotic treatment of children with severe gastroenteritis.

