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**Understanding Metal - Microbe Interactions towards
producing metal-based antimicrobials**

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My interest has been in metal/ metalloid ion interactions with bacteria for ~30 years, with an interest in a fundamental understanding of such processes in geomicrobiology, bioremediation, clinical microbiology, biofouling, and microbial physiology. The use of inorganics, particularly the coinage metals, of gold, silver, and copper, have been around since antiquity. In the past decade metal-based antimicrobials (MBAs) are being rediscovered for control of infectious diseases. There is considerable understanding now the genetics of MBA mechanisms of resistance. However, we have a poor understanding of how metal ions are toxic to bacteria which is key to develop effective MBAs. Thus we are seeing a recognition that we need a more system view of the biochemistry to understand the relationship of 'toxic' metal(loid) ions with microbes.

To address the knowledge gaps my group has used a multidisciplinary approach starting with evaluating of toxicology with element physicochemical properties. This was followed up this targeted biochemistry and microbial physiology explorations. Further work through using studies of proteomics, metabolomics, transcriptomics and toxicogenomics, we are trying to understand the sensitivity and tolerance mechanisms of different metals? To advance our understanding surrounding the antimicrobial action of the three most used/studied MBAs (Ag, Ga, and Cu), we performed a chemical genetic screen in order to identify genes mediating sensitivity or tolerance. The data demonstrate that the activity of these metals to bacteria is more extensive than previously considered providing genes not previously considered to be involved in metal action. I will conclude with a summary of novel ways to deliver metal mixture formulations as antimicrobials.

Biosketch:

Raymond J. Turner is a multi-ethnic multi-generational Canadian. Academic career began with a B.Sc. in Biochemistry / Chemistry followed by a Ph.D. (1990) in Biophysical Chemistry. Post-Doctoral training was obtained in Microbiology and Molecular Biochemistry. In 1998, was recruited to the University of Calgary to the Biochemistry unit and is presently appointed as Faculty Professor of Science.

Has held the post as Department Head and Graduate program director and chair of various research cluster units. He has also served on Dean's and vice-presidents' advisory committees.

Research funding from the Canadian funding councils of NSERC, CIHR, Genome Canada, and MITACS as well as a number of industrial partners.

He has received awards of excellence in research and excellence in graduate student supervision from the University of Calgary. Awarded the Western Universities Speaker Lectureship from the Canadian society of Chemistry in 2015. Recent service activity is participating in a cross Canada MOOC for new professors to learn how to be better supervisors. He is also a lecturer for an international course on OneHealth approaches to AMR. Research interests are multidisciplinary from metal ion interactions with bacteria, to biofilm physiology and biochemistry, to protein transporters and translocases This knowledge is applied to biotechnology approaches for Bioremediation, nanomaterials and antimicrobials.