Simon Silver

Professor 1986-2007; Professor Emeritus 2007-
Ph,D., Massachusetts Institute of Technology, 1962.

Previously Editor in Chief *Journal of Bacteriology* 10 years and *Antonie van Leeuwenhoek 3 years.* Editorial Board or Editor about 10 additional journals over 40 years time. Currently Editor, *FEMS Microbiology Letters* and *BioMetals.* Author of over 200 publications and editor of 10 scientific monographs.

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Toxic Heavy Metal Resistance in Bacteria

Our laboratory has studied the molecular genetics, physiology and biochemistry of how bacterial cells cope with toxic inorganic cations and anions. The genes for most of the resistance systems that we have studied reside on bacterial plasmids and transposons, including arsenic, mercury, and silver resistances in a wide range of Gram negative and Gram positive bacteria.

Identification of new genes has been key and frequent. Approaches include genomic sequencing, *in silico* DNA sequence analysis, DNA sequencing, and the usual wide range of molecular microbiology methods and membrane transport studies. Currently, experimental work is in collaboration with laboratories in other universities.

The relatively new silver resistance system was first found on a plasmid in hospital-exposed bacteria; mercury resistance determinants came from hospital isolates as well as from mercury polluted environments such as Minamata Bay, Japan. Arsenic resistance is wide-spread and involves oxidation and reduction of inorganic arsenite and arsenate and transport across the cell membrane, both inward and efflux. The cadmium resistance efflux ATPase is closely homologous to those defective in the human hereditary copper diseases, Menkes' syndrome and Wilson's disease.

We have collaborated with biotechnology startup companies concerned with microbial genomics, bioremediation and biomining.

These studies have been useful in providing a basic understanding of systems that are shared by microorganisms and are causes of human disease, as well as those found in the environment. In some cases, metal-resistance genes directly affect bacterial pathogenesis. The plasmid resistance systems also have been of general interest in revealing novel regulatory genes, and enzymatic and membrane transport systems, for which homologous examples are found elsewhere in bacteria and eukaryotes.

Selected publications from the last 5 years:

S. Silver and L.T. Phung. 2011. Novel expansion of living chemistry or just a serious mistake? *FEMS Microbiol Lett.* 315: 79-80.

S. Silver. 2011. BioMetals: a historical and personal perspective. *BioMetals,* 24: 379-390.

M-C Lett, D. Muller, D. Lièvremont, S. Silver, and J. Santini. 2012. Unified nomenclature for genes involved in prokaryotic aerobic arsenite oxidation. *J. Bacteriol.* 194, 207-208.

L.T. Phung, S. Silver, W.Trimble, and J.A. Gilbert. 2012. Draft genome of *Halomonas* strain GFAJ-1 (ATCC BAA-2256). *J. Bacteriol.* 194: 1835-1836.

K. Mijnendonckx, N. Leys, J. Mahillon, S. Silver and R. Van Houdt. 2013. Antimicrobial silver: uses, toxicity and potential for resistance. Biometals 26:609–621.

S. Silver. 2013. *Bacillus cereus* sensu lato genomes: basis for identifying anthrax disease strain sources. Genome Announcements 1(5): e00790-13.

S. Silver. 2014. Beyond the fringe: when scientific reports move from innovative to nonsense. *FEMS Microbiol. Letters* 350:2-8.

S. Silver. 2015. Laboratory-acquired lethal infections by potential bioweapons pathogens including Ebola in 2014. *FEMS Microbiol. Letters* 362:1–6.

K. Matsui S. Yoshinami , M. Narita, M.-F. Chien , L.T. Phung, S. Silver, and G. Endo 2016. Tn*MERI1*-like mercury resistance transposons in Bacilli from different geographical regions. *FEMS Microbiol. Letters*. FEMSLE-15-11-094.