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CURRICULUM VITAE

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At McGill University

Director, Artificial Cells & Organs Research Centre
Emeritus Professor, Departments of Physiology
Emeritus Professor, Department of Medicine
Emeritus Professor, Department Biomedical Engineering
Faculty of Medicine, McGill University, Montreal, Quebec, Canada

International

Director, "TMS Chang Artificial Cell Translation Research Institute" (containing 4 artificial cells related research centers) at Shenzhen University's new 1500 bed Medical Hospital Complex. Shenzhen is China's well-known high technology zone " www.artcell.mcgill.ca/academy.pdf
Director, "Academician TMS Chang Research station" (Chang with 3 STU full professors) STU - Shantou University Medical School.
Honorary Professor, Peking Union Medical College, Chinese Academy of Medical Sciences, China
Honorary Professor, Blood Transfusion Institute, Chinese Academy Medical Sciences, China
Honorary Professor, Nankai University, China
Honorary Professor, Shantou University Medical College

Honorary President, Artificial Cells, Blood Substitutes & Biotechnology (an international network) www.artcell.mcgill.ca/centrechart.pdf www.artcell.mcgill.ca/ISABI.pdf
Editor in Chief, Artificial Cells, Nanomedicine & Biotechnology, an international Journal, Taylor & Francis Publisher
Editor in Chief, Regenerative Medicine, Artificial Cells & Nanomedicine, Book Series, World Publisher/Imperial College Press,

ARTIFICIAL CELLS: EXECUTIVE SUMMARY

The name of "Father of Artificial Cells" has been given to the originator. While an honor B.Sc. student at McGill University, no one took Chang's proposal for artificial cells seriously. He prepared some preliminary artificial cells on his own in his dormitory room and was then allowed to complete this in the teaching laboratory for his required honor research project (Chang, Hon B.Sc. research report, 1957). He continued this research in medical school then Ph.D. (Chang Science 1964, Nature 1971, Nature 1978. Artificial Cells Monograph 1972) and for the rest of his research career to the present with 560 full papers. (references and full texts available at www.medicine.mcgill.ca/artcell)

Invited Monograph on Artificial Cells (Chang 1972) (Charles C Thomas Publisher). he stated that: "Artificial Cell" is not a specific physical entity. It is an idea involving the preparation of artificial structures of cellular dimensions for possible replacement or supplement of deficient cell functions. It is clear that different approaches can be used to demonstrate this idea. My initial attempts were to model the simplest of biological cells, red blood cells. Each of the artificial cells consists of a spherical ultrathin polymer membrane enveloping a microdroplet of hemoglobin and enzymes from hemolysate. The potential of artificial cells in biomedical research and clinical application is only limited by one's imagination. An entirely new horizon is waiting impatiently to be explored"

For a practical demonstration of its potentials he analyzed the effect of the ultrathin membrane and large total surface area of a small handful of microscopic artificial cells. He found to his surprise that the mass transfer is many times that of a standard hemodialysis machine. Based on this he applied ultrathin membrane to microscopic absorbent and designed a small hemoperfusion device. After his in vitro studies and animal safety and efficiency studies. he personally carried out clinical trials at McGill's RVH, then help a Montreal company to scale up and personally carrying out clinical trials leading to FDA approval and a successful blood purification device. A large US dialysis company

bought the company and removed the product from the market. He had no vote against this since for ethical reason he did not want stocks and no stock no vote.

Jafron Co. One of his past trainees, late Professor YU YT, helped a Jafron Co in China, <http://en.jafron.com> using Chang's published method. It now has around 200 researchers and 1800 employees. It is the 3rd largest medical device company in China. Their clinical results support Chang's earlier clinical finding in acute poisoning, kidney failure, liver failure etc. Their products has since been used routinely in patients in China and 25 other countries. This success has stimulated extensive interest on artificial cells.

PERSPECTIVES

"Thomas Ming Swi Chang Artificial Cell Translational Research Institute" with 4 artificial cells related research centres. This is part of Shenzhen University's large 1500 bed new hospital complex and research facilities. Shenzhen is the high technology zone in China. www.artcell.mcgill.ca/academy2p.pdf

"Academician TMS Chang Artificial Cell Research station" in Shantou University Medical School with research already ongoing.

Artificial cell, Nanomedicine and Biotechnology, an international journal (Chang Editor in Chief) (Taylor & Francis Publisher)

Recent explosive interest in these areas has also led to the annual submission increasing from the usual around 500, to 1,389 in 2018 and 2,400 before the end of 2019. Despite the usual acceptance of 36%, the publisher could not handle this and had to stop new submission until they have reorganized how to manage the large number of required external reviewers.

2019 review (Chang)

This has been viewed >3,000 times in less than 1 year. This review shows that progress in this area has now progressed well beyond his 1972 predictions. ARTIFICIAL CELL has evolved into nanomedicine, biotherapeutics, blood substitutes, drug delivery, enzyme/gene therapy, cancer therapy, cell/stem cell therapy, nanoparticles, liposomes, bioencapsulation, synthetic cells, cell encapsulation/scaffold, biosorbent/immunosorbent hemoperfusion/plasmapheresis, regenerative medicine, encapsulated microbe, nanobiotechnology, nanotechnology <https://www.tandfonline.com/doi/full/10.1080/21691401.2019.1577885>

Nature (Sept 2018) published a special issue on synthetic cells

<https://www.nature.com/articles/d41586-018-07285-1>

The editorial included "...urges bottom-up biologists to set their sights on definite applications, such as artificial blood"(own note: indeed, Chang's research has resulted in a simple polyhemoglobin artificial blood approved for use in South Africa and Russia for use to avoid HIV contaminated blood. His group is working from bottom up and just completed a soluble nanobiotechnology complex with enhancement of all 3 red cell functions)

In 2017, researchers from 17 laboratories in the Netherlands formed the group "Building a Synthetic Cell" with €18.8 million (US\$21 million) Dutch Gravitation grant. In September, the US National Science Foundation (NSF) announced its first program on synthetic cells, of \$10 million. European investigators have proposed synthetic cell as one of the European Commission's Future and Emerging Technologies Flagship Scheme that has funding of €1 billion.

