



David MacLennan, PhD

Have you ever wondered how thought leads to muscle movement? To answer this question, in 1969, Dr. David H MacLennan began studies of the SR – this is a calcium storage and release compartment inside muscle cells. A thought generates electrical activity in the brain, which is sent by a nerve to the outer surface of a muscle cell to change its structure. A calcium release channel linking the inner surface of the cell to the SR is activated and calcium released from the SR triggers muscle contraction. To relax the muscle, calcium is pumped back into the SR. Dr. MacLennan described how calcium release channels and calcium pumps work and how mutations in these proteins cause inherited muscle diseases.

Dr. MacLennan obtained a BSA from the University of Manitoba in 1959, followed by MSc and PhD degrees in Biological Sciences from Purdue University. He was a postdoctoral fellow and then Assistant Professor in the Institute for Enzyme Research at the University of Wisconsin before returning to Canada in 1969 to become an Associate Professor in the Banting and Best Department of Medical Research at the University of Toronto. Subsequently, he was appointed as a University Professor, the University's highest academic rank, and was Chair of his Department for 12 years.

As a newly independent investigator in 1969, Dr MacLennan embarked on the isolation and characterization of a Ca²⁺ ATPase from a then obscure membrane system, the sarcoplasmic reticulum. His first paper describing this work in the Journal of Biological Chemistry was named a “classic JBC paper” on the 100th anniversary of that journal. In more than 300 subsequent papers, he described the mechanism of action of the Ca²⁺ pump, the structure and function of many other muscle proteins involved in Ca²⁺ signalling in muscle, the genes encoding these proteins, and the genetic basis for muscle diseases caused by mutations in these genes.

Dr. MacLennan's studies of the genes encoding the Ca²⁺ release channels of both skeletal and cardiac muscle made it possible to identify patients who are susceptible to malignant hyperthermia (MH) or to exercise-induced sudden cardiac death. MH Patients are at risk of fatal reactions to anaesthetics – if identified, they can be treated with safe anaesthetics. With millions of anaesthetics given each year, MH reactions are a worldwide health concern. An MH mutation in swine also caused stress-induced death and lowered meat quality. By identifying the causal mutation and developing a diagnostic test for this disorder, Dr. MacLennan made it possible to eradicate the disease from herds, with substantial economic benefit to the swine industry.

Dr. MacLennan's research had been supported by the Canadian Institutes of Health Research, the Canadian Genetic Diseases Network of Centers of Excellence, the Heart and Stroke Foundation, the Muscular Dystrophy Association of Canada and the USA and the US National Institutes of Health. He was also recognized as an outstanding educator, overseeing the advanced research training of over 70 postdoctoral fellows, graduate students and visiting professors.

For his tireless efforts and dedication, Dr. MacLennan received prestigious awards and honours such as the Gairdner Foundation International Award and election or appointment as a Fellow of both the Royal Society of Canada and the Royal Society of London UK, a Foreign Associate of the National Academy of Sciences USA, an Officer of the Order of Canada, and a Member of the Order of Ontario.