

**THE SIXTEENTH CARL G. HARTMAN AWARD
HENRY A. LARDY**

The Carl G. Hartman Award is given in recognition of a career of research and scholarly contributions in the field of reproductive biology. Since its inception, the award has been generously funded by Ortho Pharmaceutical Corporation.

The 1984 award is presented to Professor Henry A. Lardy for outstanding contributions to research, teaching, and leadership in reproductive biology. He is a man for all seasons and subjects.



He was born in 1917 in Roslyn, South Dakota where he grew up on the family farm. In this setting of the traditional midwestern values, steadfastness, diligence, common sense, rigorous honesty, and concern for his fellow human beings became deeply ingrained in his character. He developed abiding interests in biology, domestic animals, agriculture and conservation. His experiences on a farm during the years of the Great Depression may have developed a compelling need to contribute through science and humanitarian actions. In 1939 Henry Lardy received the B.S. degree, with a major in chemistry, from South Dakota University. He then moved to Madison, Wisconsin which has been home ever since. After receiving the M.S. and Ph.D. degrees in biochemistry from Wisconsin, he did post-graduate work at the Banting Institute. He joined the faculty at Wisconsin in 1945 and at the age of 33 became Professor of Chemistry in 1950.

In 1939 it was known that bull sperm could be used to inseminate cows artificially. However, this was not a matter of practicality because sperm could not be preserved for a sufficient period of time, despite the efforts of many investigators. In 1940 Lardy, at the age of 23, published with Phillips a trail-blazing investigation which demonstrated that an egg yolk-buffer medium would preserve the fertility of bull sperm for prolonged periods. Semen could now be shipped to various parts of the United States and Canada. This technical advance fostered the development of artificial insemination as an industry, and steadily led to the improvement of dairy herds throughout North America. Between 1940 and 1945 Lardy and Phillips published 11 papers on the metabolism of sperm that stand as classics. The principal findings were: 1) the phospholipid fraction of egg yolk is responsible for prolonged motility of sperm, 2) an interrelationship exists between the oxidative and glycolytic pathways, 3) motility depends on energy sources as demonstrated by metabolic inhibitors and uncouplers of oxidative phosphorylation, and 4) oxidation of sperm lipid resulted in the production of ATP. These contributions

marked the beginning of sperm metabolism as a field of biologic investigation.

These findings about spermatozoa had broad implications for general cellular metabolism in other tissues. They indicated, for the first time, that acetate and fats were oxidized through the citric acid cycle. Quite appropriately Lardy expanded his investigations to include muscle and visceral tissues such as liver and kidney. His fundamental contributions in general cellular metabolism are legion. Only a few of his fundamental contributions to mammalian cell physiology and metabolism are indicated here: 1) the role of inorganic phosphate and ADP in the control of the respiratory rate; 2) the carboxylation of propionate to form succinate; 3) solubilization of the fatty acid-oxidizing system of mitochondria; 4) systematic use of toxic antibiotics, including oligomycin and other inhibitors, to study oxidative phosphorylation and other metabolic events; 5) the critical roles of oxaloacetate, malate and aspartate in the gluconeogenic pathway from pyruvate; and 6) the regulation of gluconeogenesis by epinephrine and the α -adrenergic system.

Throughout these basic discoveries, Lardy and his co-workers regularly returned to the study of spermatozoa. They defined the differences in the metabolism of ejaculated and epididymal spermatozoa. The reactions of oxidative phosphorylation in spermatozoa were described. The stimulatory effects of methylxanthines and cyclic AMP on sperm motility were reported. Sperm cyclic AMP-dependent protein kinase activity was demonstrated. The role of pyruvate in the formation of acetyl carnitine, an energy source for motility, was elucidated. Through the use of a calcium ionophore, which he had previously developed, Lardy and his colleagues demonstrated that sperm accumulate Ca^{2+} during capacitation and that the influx of Ca^{2+} stimulates motility. Most recently a bovine seminal plasma calcium transport inhibitor protein was isolated and characterized. As colleagues in these endeavors he has had many graduate students, post-doctoral fellows, and collaborators among his peers.

Dr. Lardy is a member of the National Academy of Sciences and has served as President of the American Society of Biological Chemists. He has participated in numerous editorial boards and advisory committees and received prizes and distinguished lectureships.

The SSR recognizes Henry A. Lardy as a pioneering reproductive biologist of impressive breadth and depth who introduced and developed the field of sperm metabolism while establishing many of the ABCs of general biochemistry.

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