John L. VandeBerg, Ph.D.

Professor
Department of Human Genetics
South Texas Diabetes and Obesity Institute
University of Texas Rio Grande Valley
School of Medicine

Contact Information

BROBL 1.109
One W. University Blvd,
Brownsville, Texas 78520
Phone: (956) 882-7491

MBMRF 2.220
1201 W. University Dr,
Edinburg, Texas 78539
(956) 665-6423
Email: john.vandeberg@utrgv.edu

Education & Training

University of Wisconsin, Madison, Wisconsin	B.S.	1969	Genetics
La Trobe University, Melbourne, Australia	B.Sc. Hons.	1970	Genetics
Macquarie University, Sydney, Australia	Ph.D.	1975	Genetics

Research Focus

Dr. VandeBerg has established the laboratory opossum as a unique research resource. Laboratory opossums are small marsupials, which are born at the developmental stage of a 6-week human embryo and weigh 60-150g as adults. The embryonic state at birth enables research that is not possible with other laboratory animals. The resource, which has a steady state of 1,200 animals comprising 20 genetic stocks and inbred strains, is used to model human diseases in many of the research initiatives in his laboratory and in collaboration with scientists from around the world.

A new initiative in his laboratory is the application of CRISPR/Cas9 gene editing to create knockout opossums for the purpose of investigating the function of genes that are of particular interest in the opossum model. This technology was successfully performed with opossums for the first time in 2021. Also in 2021, a collaboration with Dr. Satish Kumar has developed the first induced pluripotent stem cell (iPSC) lines from this species, which will be used in stem cell therapy experiments to treat or prevent hypercholesterolemia, non-alcoholic fatty liver disease, and

steatohepatitis is a susceptible strain.
Prior research in his laboratory has identified a mutant gene (allele 1 of ABCB4), which, when present in two copies (homozygous) in an individual, inhibits cholesterol secretion from the liver into the bile, causing susceptibility to those diseases. We are now working toward identifying an alternative pathway for eliminating cholesterol from the body of opossums, and variant genes that enable some ABCB4 1/1 homozygotes to evade hypercholesterolemia.
A collaboration with Dr. Mario Gil is focused on assessing the impact of experimental interventions applied to the exteriorized embryos and fetuses of opossums on brain development and on behavior later in life, as a model for autism spectrum disorder and other neurodevelopmental disorders.
Dr. VandeBerg and Dr. John Thomas are collaborating in research that uses the laboratory opossum as a model for research on the pathological sequelae of Zika virus infection of juveniles and adults, as well as of embryos and fetuses. Recent results indicate that some opossums that are infected at the embryonic or fetal stages develop pathologies of brain, testis, or other organs. Moreover, some female opossums infected as juveniles undergo massive cell death in the smooth muscle organs of their reproductive systems, leading to sterility. It is planned to extend this work to dengue virus.

Another focus of Dr. VandeBerg's research is Chagas disease, a parasitic disease (caused by Trypanosoma cruzi) that is endemic in Texas and other southern states. There is no vaccine for Chagas disease, a cardiac disease that often leads to death. A current project involves testing a novel vaccine in monkeys for efficacy in preventing infection by the parasites. Another project involves testing drug regimens for treating infected monkeys and identifying biomarkers that indicate whether any parasites remain in the body. This project will improve assessment of efficacy of novel drugs in clinical trials.
A collaboration with Dr. Williams-Blangero is investigating in human subjects the relationship and interactions between Chagas disease and type 2 diabetes. The investigators are determining whether becoming infected early in life with T. cruzi leads to increased risk of diabetes later in life, whether Chagas disease progression is accelerated in infected people who also have diabetes, and whether diabetes progression is accelerated in people who are infected with T. cruzi.

Publications

Theses:

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Articles and Book Chapters:

1. Cooper, D.W., VandeBerg, J.L., Sharman, G.B., and Poole, W.E. Phosphoglycerate kinase polymorphism in kangaroos provides further evidence for paternal X inactivation. Nature (Lond.) New Biol. 230:155-157, 1971.

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