

Arnold W. Strauss, MD

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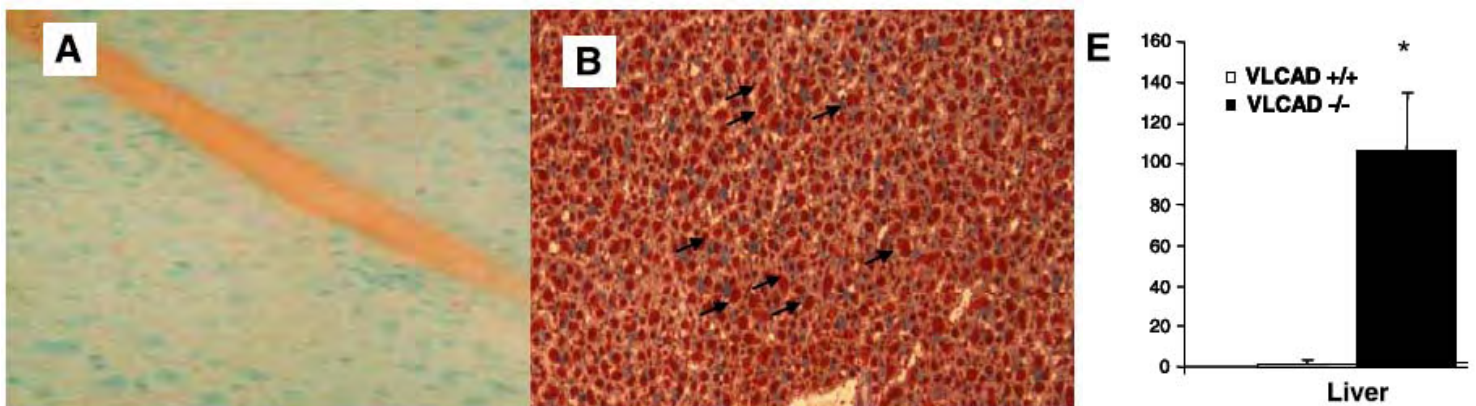
Description of Research:

Dr. Strauss' laboratory focuses on energy generation by mitochondria through fatty acid oxidation (FAO). Highly oxidative tissues such as heart, skeletal muscle, gut, and kidney rely upon FAO for energy. Intermediary metabolism of fatty acids in the liver is the major source of short chain fatty acids ("ketone bodies") that are important fuels in the brain. The fetal-maternal metabolic transition is a switch from glucose to fatty acids as the major energy source. Dr. Strauss has cloned and characterized mouse and human genes encoding five enzymes of the FAO pathway-medium chain acyl-CoA dehydrogenase (MCAD), very long chain acyl-CoA dehydrogenase (VLCAD), the two genes of the trifunctional protein (TFP) subunits, and medium and short chain 3-hydroxy-acyl-CoA dehydrogenase (SCHAD). Dr. Strauss is investigating the molecular genetics of infants and children with mutations in these genes causing sudden infant death syndrome, Reye's syndrome (hypoketotic hypoglycemia and acute liver failure), cardiomyopathy, and recurrent skeletal myopathy. Because newborn screening now detects these disorders, he is studying the specificity and sensitivity of this approach, and is defining many intriguing mutations in all of these genes in asymptomatic newborns picked up by tandem mass spectroscopy analyses. His data has demonstrated that fatty acid oxidation defects occur in about 1/4,000 newborns and that subsequent death and morbidity can be prevented. Additionally, Dr. Strauss is defining the relationship between fetal FAO defects and the development of severe maternal liver diseases, including acute fatty liver of pregnancy and the HELLP syndrome.

Collaborations:

Dr. Strauss is a new faculty member at Children's Hospital. He is developing a line of collaboration with Digestive Health Center members from the Chronic Liver Disease theme.

Representative Figure:



Fat accumulation in tissues of stressed very long chain acyl-CoA dehydrogenase (VLCAD)-deficient mice. Oil red O staining was performed in liver tissue (A and B). Hematoxylin-eosin counterstaining of representative 5-mm frozen tissue sections was performed 4 h after exposure to the stresses of fasting and cold. There was trivial fatty infiltration of the hepatocytes in VLCAD^{+/+} mouse liver (A). Intracellular lipid vacuoles (arrows target representative vacuoles) indicate macrovesicular hepatic steatosis in VLCAD^{-/-} mouse liver (B). E: quantitative estimate of the observed fat infiltration in liver and heart tissue for VLCAD^{+/+} and VLCAD^{-/-} mice, plotted as the number of fat droplets per field at X40 magnification. * $P < 0.004$, liver of VLCAD^{+/+} vs. VLCAD^{-/-} mice. Figure 3 from Am J Heart Circ Physiol, 2006; 290: H1289-1297.