Mathematical Modeling of Ischaemic Liver Injury and its Effects.

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Ischaemic Hepatitis (IH) or Hypoxic Hepatitis (HH) also known as centrilobular liver cell necrosis is an acute liver injury characterized by a rapid increase in serum aminotransferase. The liver injury typically results from another underlying medical conditions like cardiac failure, respiratory failure and septic shock in which the liver becomes damaged due to deprivation of either blood or oxygen. IH is a potentially lethal condition which is often preventable if diagnosed properly. Unfortunately, IH is not well understood, making it difficult to diagnose. In most cases, the only way to determine a case of IH is to rule out all other possible conditions. A better understanding of the liver's response to IH is necessary to aid in diagnosis and improve outcomes. We aim to develop a mathematical model of hepatocyte death and the rise and fall of associated liver enzymes aspartate transaminase (AST), alanine transaminase (ALT) and lactate dehydrogenase (LDH) in cases of IH. This model studies liver cell death in response to IH caused by chronic heart failure and cardiovascular shock. We use case data from patients afflicted with this form of IH and validate the model. This model may aid physicians in their diagnosis of IH and lead to patients receiving faster treatment. It may also allow physicians to estimate the extent of liver damage in a IH patient based on their enzyme levels.