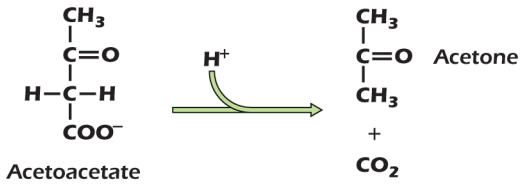
Chapter 13

Web Text Box 2

Diabetes, starvation, ketone bodies and the Odor of Sanctity

During starvation the only source of glucose is gluconeogenesis, which must use body protein amino acids as a source of precursors. It is clearly far better to use fat reserves than to degrade body protein, so those tissues that can shift to using ketone bodies (book page 215) as their main fuel source do so. Even the brain changes over to get three quarters of its energy needs from ketone bodies. Fat stores can keep a starving human being going for weeks.

Diabetes mellitus is characterized by a similar shift to using ketone bodies. Diabetes arises when either no insulin is produced (Type 1) or when cells are unable to respond to this hormone (Type 2). In both cases the body switches to a starvation type metabolism and the ketone bodies 3-hydroxybutyrate and acetoacetate are made to excess. Acetoacetate is chemically unstable and slowly loses carbon dioxide to form acetone, as shown in the figure below. When ketone bodies are at a high concentration sufficient acetone is present to give the breath the fruity smell of acetone. This pathological condition is described as ketosis and is characteristic of untreated diabetes.



Medieval saints were given to mortification of the body by voluntary starvation. In 1986 Barbara Sommerville, David Gee and June Averill (New Scientist 10th July 1986 p 41) suggested that the so-called "odor of sanctity" might have been acetone on the breath of starving and thus ketotic saints.