

Veterinary Bioscience: Metabolism



WEEK 1 – THE LIVER IN HEALTH

LECTURER: DR NICK BAMFORD

Nick received his veterinary degree from the University of Melbourne and worked for several years in mixed-animal and equine practices in Australia and the UK. He then returned to Melbourne to complete a PhD in equine endocrinology, followed by a residency training program in large animal internal medicine. Nick is a Senior Lecturer in Veterinary Biosciences and a Diplomate of the American College of Veterinary Internal Medicine. He is also DVM 1 Year Coordinator and the Coordinator of the Veterinary Bioscience Major at BSc 3 level. Nick's research interests cover various aspects of equine health, including endocrinology, metabolism and clinical nutrition.



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INTENDED LEARNING OUTCOMES

At the end of this lecture, you should be able to:

- describe the processes by which energy is derived from carbohydrates, fats and proteins
- outline the key biochemical processes that occur in the liver
- relate the regulatory effects of insulin and glucagon to what occurs in post-prandial and fasted states
- describe the metabolic fates of acetyl-CoA.

KEYWORDS

carbohydrates, fatty acids, amino acids, glucose, glycogen, glycolysis, tricarboxylic acid (TCA) cycle, electron transport, acetyl-CoA, ketone bodies, insulin, glucagon, post-prandial, gluconeogenesis

LECTURE 3 – THE ROLE OF THE LIVER IN FATTY ACID, AMINO ACID AND CARBOHYDRATE METABOLISM

The maintenance of living processes in multicellular organisms is a complex series of processes. Despite changes in the internal and external environment, animals must sustain adequate stores of energy to engage in growth and maintain health. The release of energy in the form of ATP from sugars, fats and amino acids involves complex metabolic pathways. This lecture will not concentrate on the complexity and detail of the individual pathways but rather the overall strategy of energy generation by cells. We will deal with the major stages of the processes, picking out major landmark metabolites only, and view the strategies on a broad basis. The focus of this lecture is the integration of the major metabolic processes in mammals; the liver is a major contributor to the metabolic well-being of the organism, along with tissues such as the small intestine, skeletal muscle, adipose tissue, the brain and kidneys. We will review metabolism in the context of the feeding-fasting cycle, which illustrates several important control mechanisms.

FURTHER READING

Alberts *et al.*, *Molecular Biology of the Cell*, 6th ed., Taylor and Francis (2015) (eBook available through University Library)

Klein, *Cunningham's Textbook of Veterinary Physiology*, 6th ed., Elsevier (2020)

Nelson and Cox, *Lehninger's Principles of Biochemistry*, 7th ed., Freeman (2017)