

STARVATION

1. What is the difference between starvation, fasting and cachexia?

- *Starvation* is a chronic state resulting from inadequate intake of energy
- *Fasting* is a state of energy deprivation lasting no more than several days
- *Cachexia* is the state resulting from a chronic deprivation of energy and nutrients irrespective of the adequacy of intake, e.g. in malignant cachexia, there is protein and energy malnutrition even when there is adequate intake of food

2. What is the basic difference between *marasmus* and *kwashiorkor*?

- *Marasmus* is characterised by inadequacy of all nutrients and energy sources
- *Kwashiorkor* is characterised by a lack of protein, but there is some intake of energy sources

3. During a period of fasting, from which source does the body obtain glucose?

From glycogen, found most abundantly in the liver and skeletal muscle.

4. How long does this supply last?

About 24 h.

5. When this supply is exhausted, why doesn't the body become hypoglycaemic?

Because, through gluconeogenesis, the liver is able to convert some molecules into glucose.

6. What are the substrates for gluconeogenesis?

- *Glycerol*: which is released from the breakdown of triglycerides
- *Amino acids*: from the so-called glucogenic amino acids, such as alanine

- *Lactate*: production of which is increased following fasting and starvation

7. What is the result of fasting on the body's store of protein and fat?

- In the early stages of fasting, because of the requirements for gluconeogenesis, there is a rapid breakdown of muscle to release amino acid, which is transported to the liver for conversion to glucose. This breakdown of muscle slows down the longer starvation proceeds
- Adipose tissue is continually broken down into free fatty acids and glycerol. This mobilisation of the adipose tissue becomes relatively more important the longer the period of starvation goes on

8. Summarise briefly the differences between fasting and prolonged starvation, in terms of the biochemical adaptation.

- During starvation, relatively more adipose tissue is being mobilised
- Also, there is relatively less muscle protein mobilisation
- There is increased generation of ketone bodies as a source of energy during starvation

9. Name the ketone bodies.

- Acetone
- Acetoacetate
- β -hydroxybutyrate

10. Which organ is particularly reliant on ketones during starvation?

The brain. This organ is usually heavily dependant on glucose as its energy source, but during starvation, adapts to using ketones.



11. How else does the body adapt to starvation?

There is a general reduction of energy requirement, which is partly due to a reduction in the BMR brought on through a fall in the secretion of triiodothyronine by the thyroid, and reduced peripheral conversion of T_4 .

12. Which hormones are the most important for the mediation of the body's adaptation to starvation?

- *Glucocorticoids*: these act to increase serum [glucose]
- *Catacholamines*: these cause a temporary increase in the serum [glucose]
- *Glucagon*
- *Thyroid hormone*: as mentioned above
- *Insulin*: a lack of the effects of this hormone triggers the adaptive response