The liver

The liver has been mentioned several times in connection with the digestion, use and storage of food. This is only one aspect of its many important functions, some of which are listed below. It is a large, reddish-brown organ which lies just beneath the diaphragm and partly overlaps the stomach. All the blood from the blood vessels of the alimentary canal passes through the liver, which adjusts the composition of the blood before releasing it into the general circulation (Figure 11.13).

Regulation of blood sugar

After a meal, the liver removes excess glucose from the blood and stores it as glycogen. In the periods between meals, when the glucose concentration in the blood starts to fall, the liver converts some of its stored glycogen into glucose and releases it into the bloodstream. In this way, the concentration of sugar in the blood is kept at a fairly steady level.

The concentration of glucose in the blood of a person who has not eaten for 8 hours is usually between 90 and 100 mg/100 cm^3 blood. After a meal containing carbohydrate, the blood sugar level may rise to 140 mg/100 cm^3 but 2 hours later, the level returns to about 95 mg as the liver has converted the excess glucose to glycogen.

About 100 g glycogen is stored in the liver of a healthy man. If the concentration of glucose in the blood falls below about 80 mg/100 cm^3 blood, some of the glycogen stored in the liver is converted by enzyme action into glucose, which enters the circulation. If the blood sugar level rises above 160 mg/100cm^3, glucose is excreted by the kidneys. A blood glucose level below 40 mg/100 cm^3 affects the brain cells adversely, leading to convulsions and coma. By helping to keep the glucose concentration between 80 and 150 mg, the liver prevents these undesirable effects and so contributes to the homeostasis (see below) of the body. (See Figure 12.11 on p. 112 for the circulatory supply to liver.)

Production of bile

Cells in the liver make bile continuously and this is stored in the gall-bladder until it is discharged through the bile duct into the duodenum. The green colour of the bile results from a pigment, **bilirubin**, which comes from the breakdown of haemoglobin from worn-out red blood cells.

The bile also contains bile salts which assist the digestion of fats as described on p. 100.

A large proportion of the bile salts is reabsorbed in the ileum along with the fats they have helped to emulsify. Bile salts are also absorbed in the colon.

Deamination

The amino acids not needed for making proteins are converted to glycogen in the liver. During this process, the nitrogen-containing, amino part (NH_2) of the amino acid is removed and changed to **urea**, which is later excreted by the kidneys (see p. 131).

When the $-NH_2$ group is removed from certain amino acids it forms ammonia, NH_3 (or, more strictly, the ammonium ion $-NH_4^+$). Ammonia is very poisonous to the body cells, and the liver converts it at once to urea, $(NH_2)_2CO$, which is a comparatively harmless substance.