

Bio Factsheet



Absorption in the Small Intestine

This topic appears regularly in exams of all the Boards. This is not because it is particularly difficult – in fact it's pretty straightforward - but because:

1. it can be used to illustrate the fundamental principle of the adaptation of structure to function;
2. Students keep confusing folds of the intestine with villi and microvilli. Some even refer to cilia!!

This Factsheet explains the basic principles underlying absorption and describes the commonest Questions and student errors.

Large food molecules such as proteins cannot be absorbed; they are too big and they are insoluble. Thus, digestion breaks them down into smaller and soluble molecules which can be absorbed.

90% of all absorption occurs in the small intestine, the remaining 10% occurs in the stomach and large intestine.

The first thing to do is to get an overview of what is going on. The products of digestion are absorbed across the epithelial cells of the small intestine. Substances such as **glucose** and **amino acids** then pass into the capillaries in the villi. From there they are passed to the mesenteric veins and then the hepatic portal vein which delivers them to the liver. The liver converts excess glucose into glycogen and breaks down or deaminates excess amino acids. The amine groups pass to the kidney for excretion.

Chylomicrons (triglycerides combined with cholesterol and phospholipid) leave the epithelial cells and pass into lacteals rather than blood vessels. The lacteals eventually empty into blood vessels and once there the chylomicrons are broken back down into fatty acids and glycerol which can then enter cells for lipid synthesis.

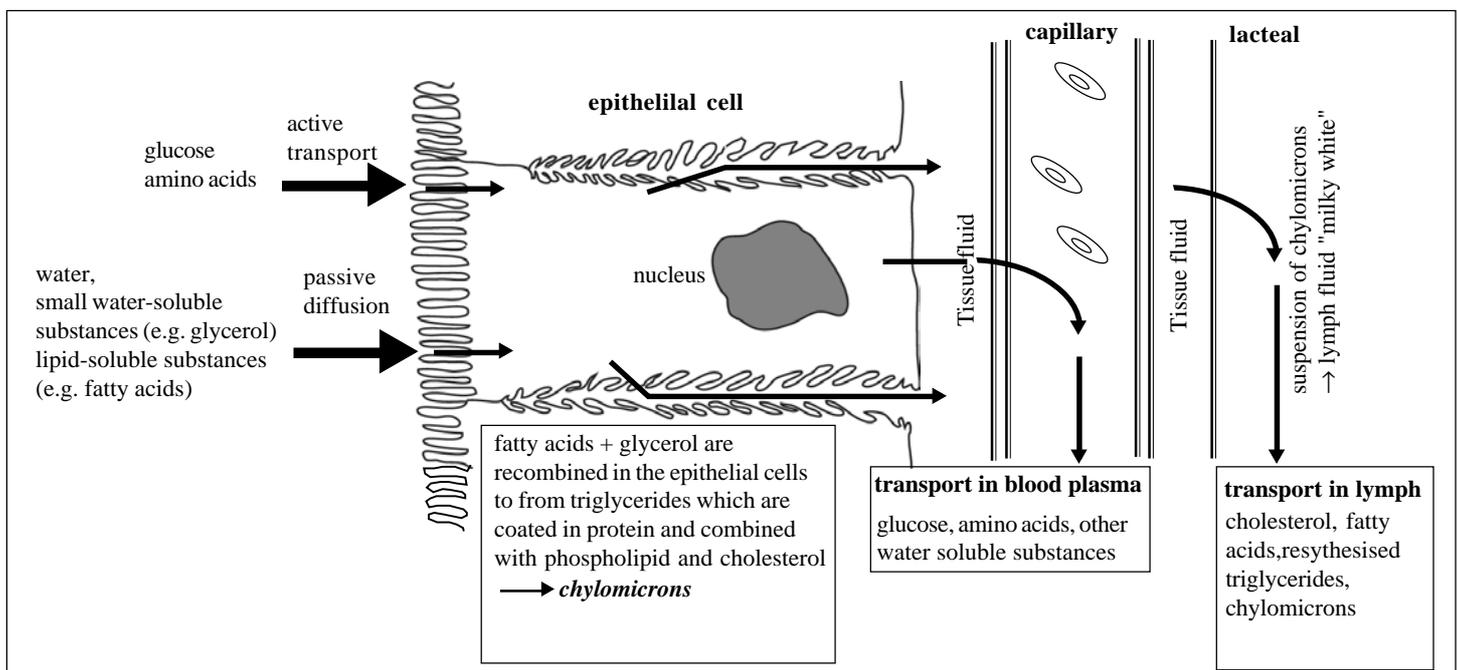
These processes are summarised in Table 1 and Fig 2.

Fig 3. overleaf summaries all of the ways in which the small intestine is adapted for absorption. - this is the most common exam question in this topic - learn it!

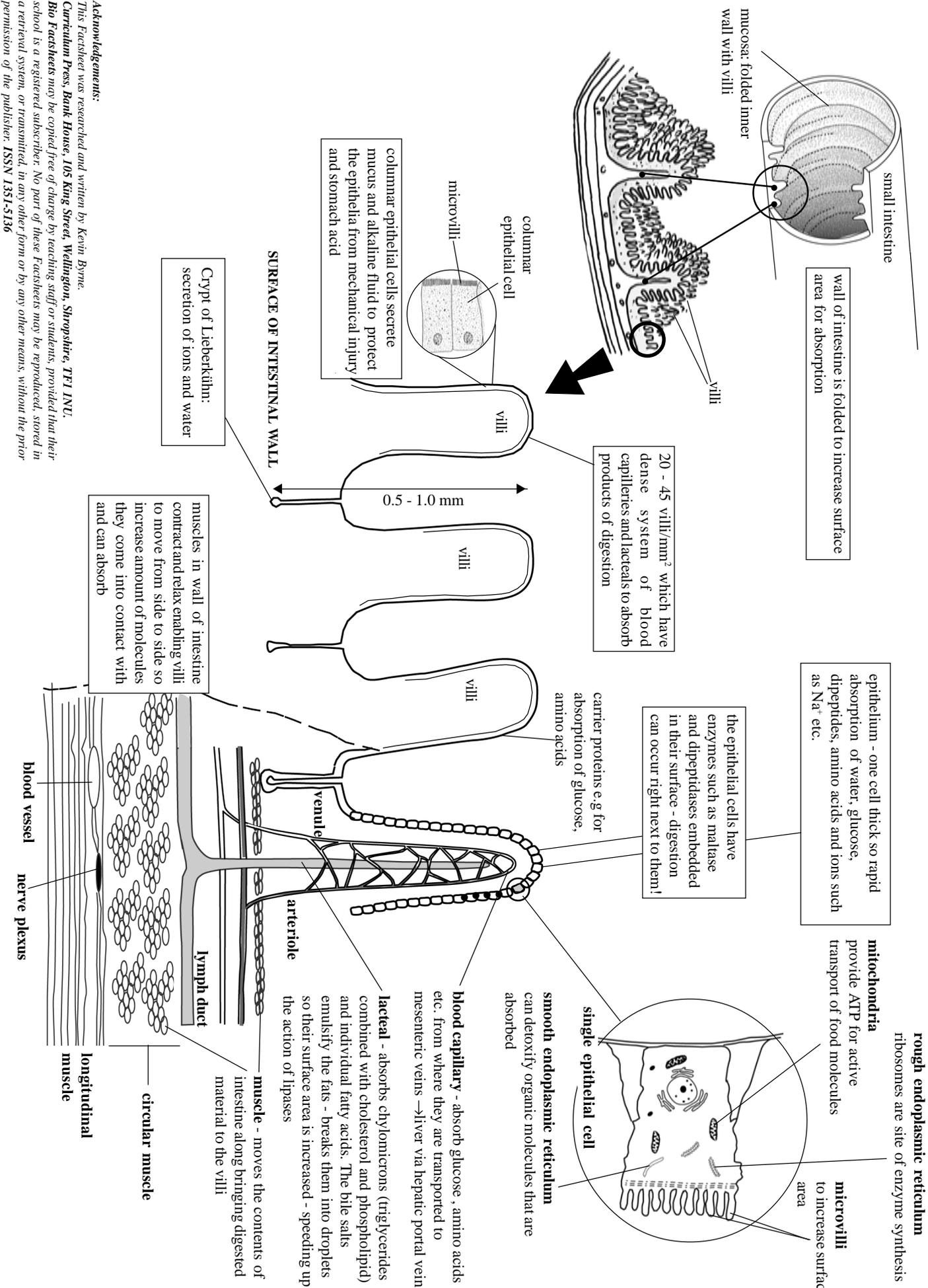
Table 1

Food substance	Absorption into epithelial cell	Absorption into blood capillary	Absorption into lacteal
Glucose	Binds to sodium and is pulled in across a carrier protein	Facilitated diffusion	
Amino acids	Binds to sodium and is pulled in across a carrier protein	Facilitated diffusion	
Short fatty acids	Diffusion	N/a	Diffusion
Long fatty acids and glycerol	Diffusion	N/a	3 fatty acids plus a glycerol molecule combine to form a triglyceride. Triglycerides combine with cholesterol and phospholipid to form chylomicrons which pass into lacteals by exocytosis

Fig 2. Absorption across epithelial cells



Structure to function: absorption in the ileum



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