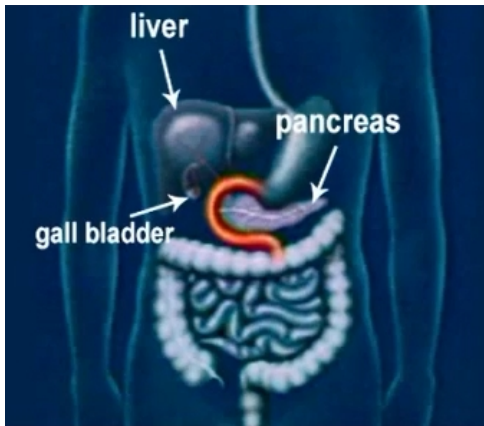


## The small intestine

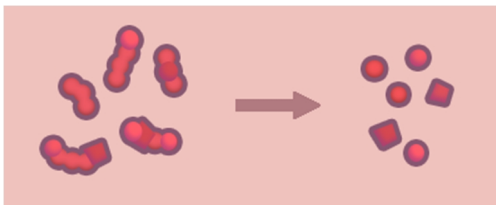
### THE DUODENUM

The duodenum is the first segment of the small intestine. It is an important segment because it receives **pancreatic juice** and **bile** at the same time.



Pancreatic juice comes from the **pancreas** and contains several digestive enzymes, mainly pancreatic amylase, chymotrypsin, trypsin and lipase.

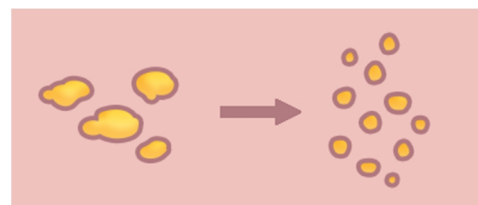
Pancreatic amylase continues to transform **complex carbohydrates** such as starch and glycogen. These substances are mainly transformed into **glucose** and **maltose**.



Protein transformation starts with pepsin in the stomach and continues in the duodenum through the action of several enzymes, namely trypsin and chymotrypsin. These enzymes break down **small chains of amino acids** into **small peptides** and **amino acids**.

Lipases are enzymes that transform **lipids** into **fatty acids** and **glycerol**.

Bile emulsifies lipids to help lipases do their job. An **emulsion** is a mixture of two liquids that normally cannot be mixed together, such as oil and water. A third ingredient, called an 'emulsifier', stabilises this mixture. The emulsion allows for the formation and coating of micro-droplets of fat to prevent them from sticking together.



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## THE PANCREAS IN DIGESTIX

The pancreas is an important element of the digestive system and this is also true in DIGESTIX.



Pancreatic juice transforms carbohydrates into glucose and maltose. Just like gastric juice, it also transforms proteins and lipids. So, in DIGESTIX, the pancreas has three specific targets.

## THE LIVER IN DIGESTIX

Bile comes from the liver. It has a yellowish colour and is stored in the gall bladder.

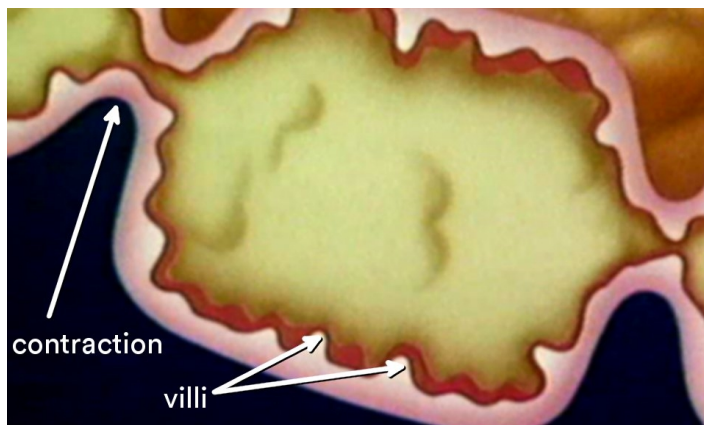


The liver is another digestive piece in DIGESTIX. It has an impact on the transformation of lipids. The game mentions the gall bladder together with the liver, but keep in mind that the gall bladder only stores bile; it does not secrete any enzymes.

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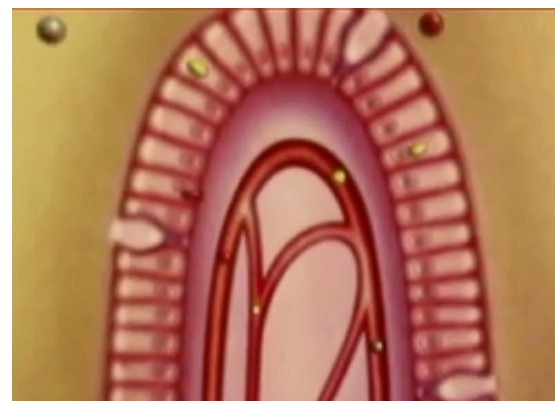
## THE ABSORPTION OF NUTRIENTS

Nutrients travel through the small intestine with the help of peristaltic waves, which are the same type of **contractions** found in the oesophagus and stomach.



Once in the small intestine, nutrients have been sufficiently transformed to allow them to cross the intestinal wall and be absorbed by the body. The small intestine is lined with millions of folds, called **villi**. These folds greatly increase the absorption surface.

Nutrients then move into the blood, which brings them to the body's cells where they will be used.



## The small intestine

---

What is the first section of the small intestine called?

- The duodenum
- The duodanem
- The duodenan

---

What fluid does not go into the duodenum?

- Bile
- Gastric juices
- Pancreatic juice

---

What effect do the enzymes in pancreatic juice have on certain nutrients?

- Simplification
- Swelling
- Disappearance

---

Carbohydrates are not broken down into...

- glucose
- maltose
- fatty acids

---

Lipids are not transformed into...

- fatty acids
- amino acids
- glycerol

---

Bile enables enzymes to transform lipids.

- True
- False

---

What is the emulsification process that helps bile transform lipids?

- Mixing liquids together
- Converting liquids into gases
- Solidifying liquids

---

Peristaltic waves move nutrients into the intestines.

- True
- False

---

Digested nutrients pass through the wall of the small intestine.

- True
- False

---

Where does undigested matter go?

- Into blood vessels
- Into cells
- Into the colon

## Answers

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What is the first section of the small intestine called?

- The duodenum**  
*Well done! That's right!*
- The duodanem**  
*Wrong! That's not the right answer.*
- The duodenan**  
*Wrong! That's not the right answer.*

---

What fluid does not go into the duodenum?

- Bile**  
*Wrong! Bile flows into your duodenum.*
- Gastric juices**  
*Well done! Gastric juices are produced in your stomach.*
- Pancreatic juice**  
*Wrong! Pancreatic juice flows through your duodenum.*

---

What effect do the enzymes in pancreatic juice have on certain nutrients?

- Simplification**  
*Well done! Enzymes help reduce the size of some nutrients.*
- Swelling**  
*Wrong! That's not the right answer.*
- Disappearance**  
*Wrong! Nice try, though.*

---

Carbohydrates are not broken down into...

- glucose**  
*Wrong! Some carbohydrates are broken down into glucose.*
- maltose**  
*Wrong! Some carbohydrates are broken down into maltose.*
- fatty acids**  
*Well done! Lipids are broken down into fatty acids.*

---

Lipids are not transformed into...

- fatty acids**  
*Wrong! Lipids are broken down into fatty acids.*
- amino acids**  
*Well done! Proteins are broken down into amino acids.*
- glycerol**  
*Wrong! Lipids are broken down into glycerol.*

---

Bile enables enzymes to transform lipids.

- True**  
*Well done! That's right.*
- False**  
*Wrong! Try again!*

---

What is the emulsification process that helps bile transform lipids?

- Mixing liquids together**  
*Well done! That's right.*
- Converting liquids into gases**  
*Wrong! Try again!*
- Solidifying liquids**  
*Wrong! That's not the right answer.*

---

Peristaltic waves move nutrients into the intestines.

- True**  
*Wrong! That's not right.*
- False**  
*Well done! Nutrients pass through the walls of your small intestine.*

---

Digested nutrients pass through the wall of the small intestine.

- True**  
*Well done! That's right.*
- False**  
*Wrong! That's not the correct answer.*

---

Where does undigested matter go?

- Into blood vessels**  
*Wrong! Nutrients enter your bloodstream.*
- Into cells**  
*Wrong! That's not right.*
- Into the colon**  
*Well done! Anything that is not digested goes into your colon.*

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## Making an emulsion

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*[11-13 years old and 14-16 years old]*

Definition:

An emulsion is a mixture of two liquids which normally would not mix together (such as oil and water). A third ingredient, called an emulsifier, stabilises the mixture.

Instructions:

- Pour some oil then some water into a container. Note that the two liquids are not miscible (they do not mix together).
- Add an egg yolk and mix all three ingredients together;

We can observe the solution become homogenised.

Why? Because the egg yolk contains an emulsifier called lecithin and this stabilises the emulsion.