

## 4. The digestive system

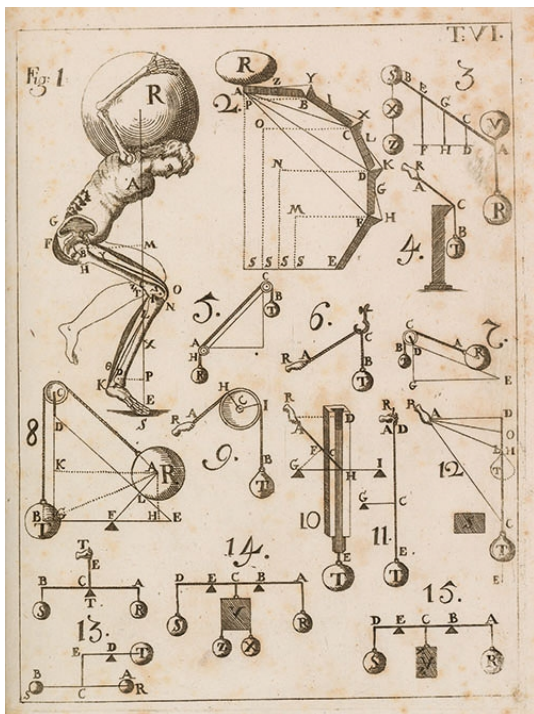
### 4.3 Historical representations of digestion

4.3.2

## In the 17<sup>th</sup> century

### MECHANICAL DIGESTION

The doctrines of Hippocrates and Galen maintained their influence for the next fourteen centuries. It was not until the 17<sup>th</sup> century that digestion was shown to be mechanical.



Credits: Lausanne Cantonal University Library

Borelli founded the theory of mechanical digestion. He carried out unusual experiments on birds. He made them swallow objects and found that they were crushed, deformed and broken. From this, he concluded that they had been compressed and ground by the stomach's internal walls.

So two kinds of mechanical digestion were known in the 17<sup>th</sup> century. This was firstly that teeth grind up food, then the stomach muscles reduce them into pieces which are small enough for them to be taken up by the organism. In fact, Borelli compared jaws to pincers and the stomach to a vice.

### CHEMICAL DIGESTION

At more or less the same time, Réaumur, a scientist, was studying birds of prey.

He put a piece of meat inside an iron pipe and made a buzzard swallow it. When regurgitated by the bird, the pipe was intact, but the meat had been almost entirely dissolved. This proved that digestion happens without grinding and this was the first step to establishing chemical digestion.



## In the 17th century

---

Hippocrates and Galen described a digestive model, which then prevailed for...

- 2 centuries
- 10 centuries
- 14 centuries

---

Who founded the theory of mechanical digestion?

- Réaumur
- Botticelli
- Borelli

---

During his experiments on digestion, Borelli made birds swallow...

- seeds
- food
- objects

---

Borelli's theory also comprises chemical modification.

- False
- True

---

Borelli's experiments allowed him to draw the conclusion that grinding enabled digestion.

- True
- False

---

Which of the following processes is not part of Borelli's theory of mechanical digestion?

- Fermentation
- Grinding by teeth
- Reduction into fragments in the stomach

---

Borelli compared jaws to...

- a nutcracker
- a press
- a pair of pliers

---

Borelli compared the stomach to...

- a press
- a saw
- a blender

---

Réaumur made a buzzard swallow something to prove that digestion takes place without grinding. What was it?

- A tube with meat inside it
- An empty tube
- Just meat

---

Réaumur's experiment proved that the tube remained intact while the meat was...

- still in one piece
- cooked
- broken down

## Answers

---

Hippocrates and Galen described a digestive model, which then prevailed for...

- 2 centuries**  
*Wrong! It was much longer than that.*
- 10 centuries**  
*Wrong! It was a little longer.*
- 14 centuries**  
*Well done! The theory of digestion as a form of cooking food was upheld for a very long time.*

---

Who founded the theory of mechanical digestion?

- Réaumur**  
*Wrong! Réaumur launched the theory of chemical digestion.*
- Botticelli**  
*Wrong! Botticelli was a painter of the Renaissance.*
- Borelli**  
*Well done! Borelli did in fact initiate the theory of the mechanical digestion of food.*

---

During his experiments on digestion, Borelli made birds swallow...

- seeds**  
*Wrong! Nice try, though.*
- food**  
*Wrong! No luck there!*
- objects**  
*Well done! It may seem surprising but, when he noticed that the birds crushed, deformed and broke up the objects, he launched the theory of digestion as a mechanical process.*

---

Borelli's theory also comprises chemical modification.

- False**  
*Well done! Borelli's digestion theory only comprises two stages of mechanical transformation.*
- True**  
*Wrong! This theory came later.*

---

Borelli's experiments allowed him to draw the conclusion that grinding enabled digestion.

- True**  
*Well done! Borelli concluded that, once the objects had passed through the stomach, the particles that remained were usable by the body.*
- False**  
*Wrong! Try again!*

---

Which of the following processes is not part of Borelli's theory of mechanical digestion?

- Fermentation**  
*Well done! Fermentation in the colon was discovered much later.*
- Grinding by teeth**  
*Wrong! Borelli identified this step.*
- Reduction into fragments in the stomach**  
*Wrong! Borelli's experiments with birds highlighted this step.*

---

Borelli compared jaws to...

- a nutcracker**  
*Wrong! Try again!*
- a press**  
*Wrong! That's not the right answer.*
- a pair of pliers**  
*Well done! That's right!*

---

Borelli compared the stomach to...

- a press**  
*Well done! That's right!*
- a saw**  
*Wrong! Try again!*
- a blender**  
*Wrong! That's not quite right.*

---

Réaumur made a buzzard swallow something to prove that digestion takes place without grinding. What was it?

- A tube with meat inside it**  
*Well done! That's right! The tube protected the meat from mechanical actions, so Réaumur concluded that the meat had been digested without having been ground.*
- An empty tube**  
*Wrong! Try again!*
- Just meat**  
*Wrong! You are not far off the correct answer, though.*

---

Réaumur's experiment proved that the tube remained intact while the meat was...

- still in one piece**  
*Wrong! Try again!*
- cooked**  
*Wrong! Try again!*
- broken down**  
*Well done! This is how he illustrated that digestion could take place without grinding.*