

Thème 1 – La Terre dans l'Univers, la vie, l'évolution du vivant
1-A – diversification des génomes et diversification des êtres vivants

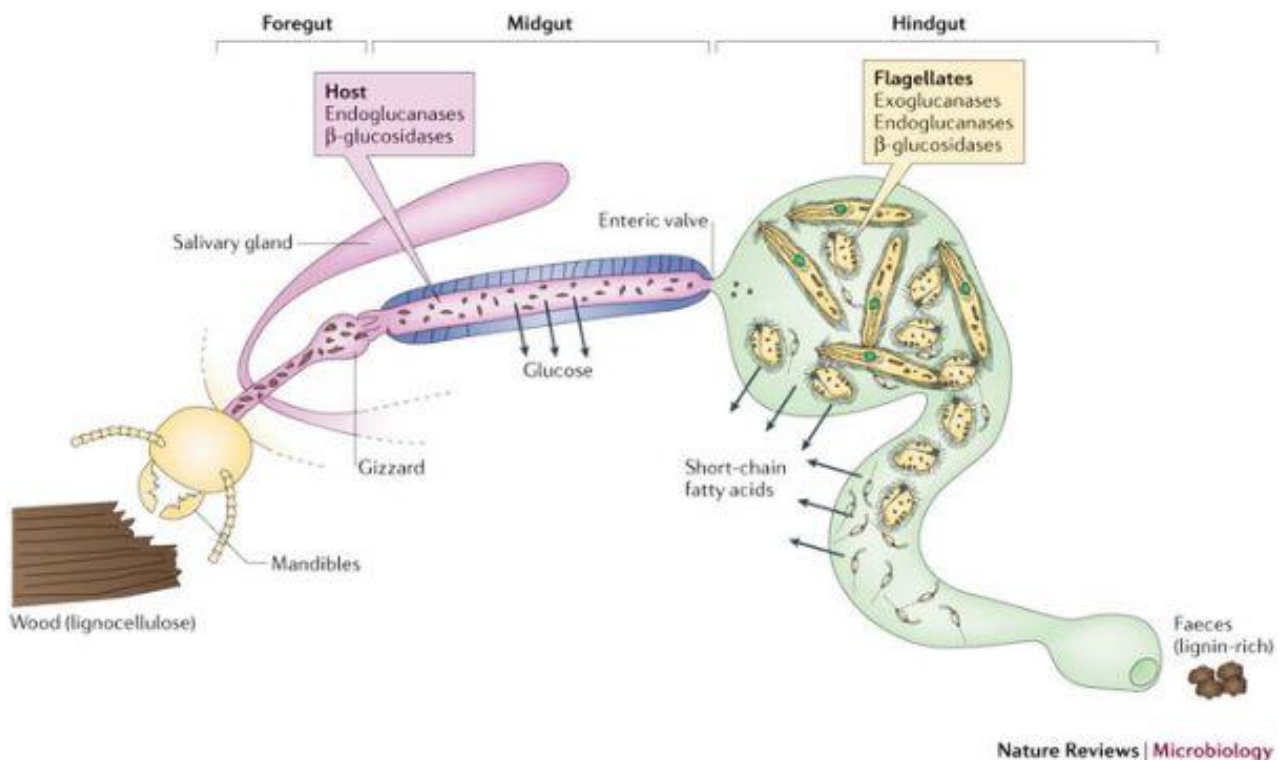
Insects and microorganisms symbiosis: the endosymbionts

Adapted from Irene Lobato Vila - Nature Reviews Microbiology - 05/01/2018

[All you need is Biology - WordPress.com](http://www.allyouneedisbiology.com)

Question – Using the text and document 1, explain the benefits of symbiosis using this example of gut¹ microbes.

Document 1 - Worker termite gut; the green part corresponds to the hindgut² without oxygen.



Brune, A. (2014). Symbiotic digestion of lignocellulose in termite guts. Nature Reviews Microbiology, 12(3), 168-180.

Gut microbes

5 **The gut microbiota** of the insects is composed both of **prokaryotes** (unicellular, without nucleus, like bacteria and archaea) and **eukaryotes** (unicellular or pluricellular, with nucleus, like protozoans) that live outside the gut cells. They usually **inhabit the hind part of the insect's gut (hindgut*)**, either moving freely in its lumen or remaining attached to its walls. In some phytophagous insects, like termites and cockroaches, the hindgut is a **chamber without oxygen (anaerobic)** where the **fermentation of cellulose and other complex sugars takes place**.

10 In **termites**, this anaerobic chamber contains **optional anaerobic prokaryotes** (they can develop either with or without oxygen) and **compulsory anaerobic prokaryotes** (they can only develop without oxygen), such as spirochetes and methanogens, which aid in digestion. In addition, in **some worker termites**, this chamber also contains **protozoans** that play a major role in the **digestion of wood cellulose** (Have you ever seen a piece of furniture pierced by termites?).

15 Unlike other endosymbionts, **gut microbes are horizontally transmitted between insects**; that is, insects don't inherit gut microbes from their parents, but **they can acquire them throughout their lives**. In termites, the acquisition of gut microbes takes place through a process called **trophallaxis**: the workers, which are the only ones able to feed by themselves, digest the food and transmit the resulting product mixed with gut microorganisms to the rest
20 of the colony members through their mouthparts.

Moreover, **microorganisms are removed during molting processes**, so termites (and other insects performing trophallaxis) **can acquire them again through trophallaxis**.

1. **Gut**: intestin

2. **Hindgut**: intestin postérieur