



Microsensors in the gut of insects

Axial microprofiles for oxygen, hydrogen, pH and redox potential from intact guts of *Shelfordella lateralis*

The application note is based on the research and article by:

Schauer et al. (2012)

The application note is written by:

Sandfeld et al., Unisense

Introduction

The fine tipped microsensors from Unisense allowed Schauer et al. (2012) to investigate and characterize the physicochemical conditions in the gut of the cockroach *Shelfordella lateralis*.

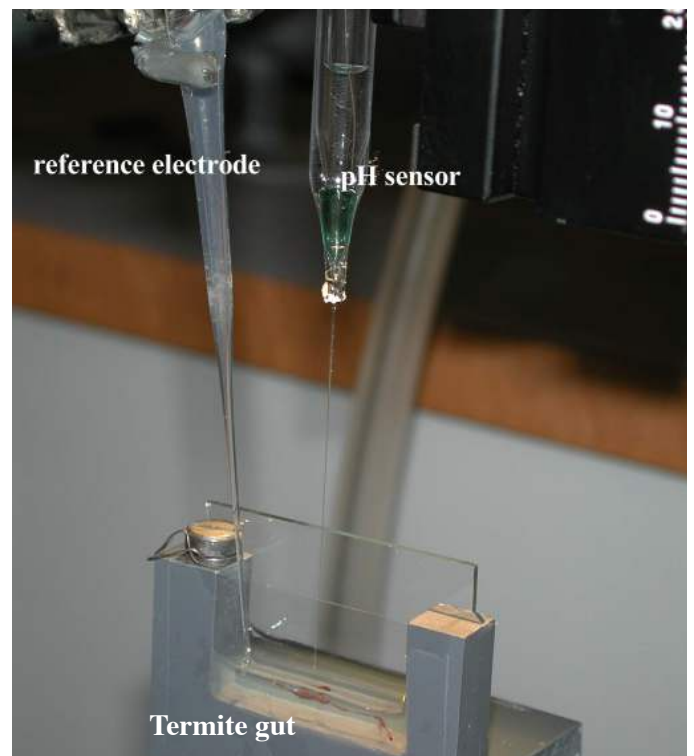
The research team completed axial microprofiles for oxygen, hydrogen, pH and redox potential directly into intact guts of

Shelfordella lateralis. The dissected guts were fixed on a layer of agarose (O₂, Redox and H₂) or embedded in agarose directly after dissection (pH).

The microsensors were mounted on an MM33 and the position of the sensor tip was monitored using a stereo microscope.



MicroProfiling setup with pH electrode and reference electrode



O₂

N₂O

H₂S

NO

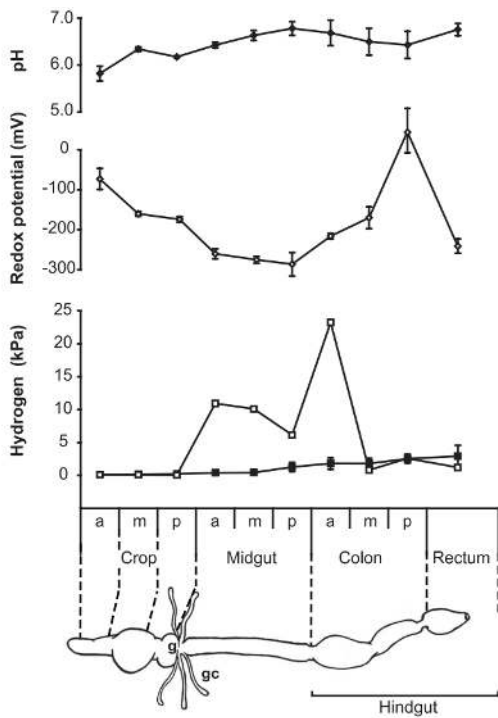
H₂

pH

Redox

Temp

EP



Microsensor profiles of physiochemical conditions in the gut of cockroaches.

Figure kindly provided by Prof. Dr. Andreas Brune. See Schauer et al. 2012 for further information.

Results and conclusion

Based on the microsensor data, Schauer et al (2012) concluded that the gut of *Shelfordella lateralis* had an anoxic and reducing environment at the center of all gut compartments and that pH slightly increased from proximal to distal compartments.

Furthermore, the researchers revealed that in five out of eight individuals, hydrogen was found in low concentrations throughout the gut, whereas in three of the eight individuals hydrogen strongly accumulated in the midgut and hindgut.



Suggested products

- OX-10
- MicroProfiling System
- Single or Multi Channel UniAmp
- SensorTrace Profiling



Related publications

Schauer, Christine et al (2012), The bacterial community in the gut of the cockroach *Shelfordella lateralis* reflects the close evolutionary relatedness of cockroaches and termites, *Applied and Environmental Microbiology*, 2758 - 2767, vol. 78

Köhler, Tim et al (2012), High-resolution analysis of gut environment and bacterial microbiota reveals functional compartmentation of the gut in wood-feeding higher termites (*Nasutitermes* spp.), *Applied and Environmental Microbiology*, 4691 - 4701, vol. 78

Brune, Andreas. et al (1995), The termite gut microflora as an oxygen sink: Microelectrode determination of oxygen and pH gradients in guts of lower and higher termites, *Applied and Environmental Microbiology*, 2681 - 2687, vol. 61

Brune, A. et al (1996), pH profiles of the extremely alkaline hindguts of soil-feeding termites (Isoptera: Termitidae) determined with microelectrodes, *Journal of Insect Physiology*, 1121 - 1127, vol. 42

Hink, L. et al (2023), Microplastic ingestion affects hydrogen production and microbiomes in the gut of the terrestrial isopod *Porcellio scaber*, *Environmental Microbiology*