



## **Fate of polychlorobiphenyls in the insect *Tenebrio molitor*: consequences for further use as food and feed.**

Christelle Planche, Frédéric Mercier, Johanna Rivas, Magaly Angénieux, Hanli Wang, Benjamin Calmont, Sébastien Crépieux, jérémy ratel, Erwan Engel

### **► To cite this version:**

Christelle Planche, Frédéric Mercier, Johanna Rivas, Magaly Angénieux, Hanli Wang, et al.. Fate of polychlorobiphenyls in the insect *Tenebrio molitor*: consequences for further use as food and feed.. 10. International Symposium on Recent Advances in Food Analysis, Sep 2022, Prague, Czech Republic. 81 (OCE2), pp.E71; PII S0029665122000945, 10.1017/S0029665122000945 . hal-03795507

**HAL Id: hal-03795507**

**<https://hal.science/hal-03795507>**

Submitted on 4 Oct 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.





RÉPUBLIQUE  
FRANÇAISE

Liberté  
Égalité  
Fraternité

INRAE



10<sup>th</sup> International Symposium on  
RECENT ADVANCES IN  
FOOD ANALYSIS

September 6–9, 2022 • Prague, Czech Republic



C. Planche<sup>1</sup>, F. Mercier<sup>1</sup>, J. Rivas<sup>1</sup>, M. Angénieux<sup>1</sup>, H. Wang<sup>1</sup>, B. Calmont<sup>2</sup>, S. Crépeux<sup>3</sup>, J. Ratel<sup>1</sup>, E. Engel<sup>1</sup>

<sup>1</sup>MASS group, UR QuaPA, INRAE, F-63122 Saint-Genès-Champanelle, France

<sup>2</sup>SHNAO, Société d'histoire naturelle Alcide-d'Orbigny, F-63170 Aubière, France

<sup>3</sup>Invers, F-63720 Saint-Ignat, France

## Fate of polychlorobiphenyls in the insect *Tenebrio molitor*: consequences for further use as food and feed

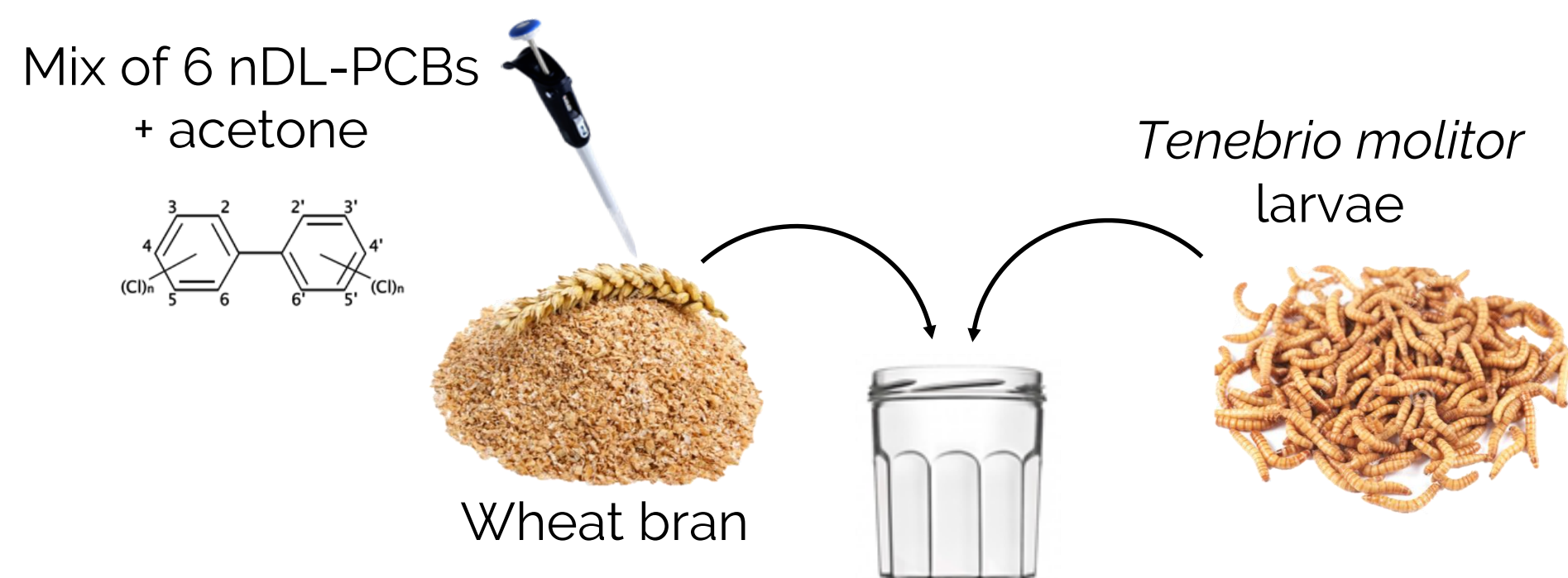


## Background

There is a growing demand for animal protein while the resources used for animal feeding are limited or may raise environmental issues. Thus, there is a need to find alternative and sustainable protein sources. Edible insects may be an interesting solution with a good nutritional value [1]. Learning from the BSE prion crisis, it is essential to ensure the safety of insect products and the chemical contamination is a crucial issue [2]. Among priority contaminants, persistent organic pollutants (POPs) such as polychlorobiphenyls (PCBs), dioxins (PCDD/Fs) or polycyclic aromatic hydrocarbon (PAHs) are of serious concern in food supply [3]. In this context, this study explored the ability of yellow mealworm (*Tenebrio molitor*), the most widely bred and traded insect species in Europe, to bioaccumulate PCBs from their feeding substrate.

## Methods

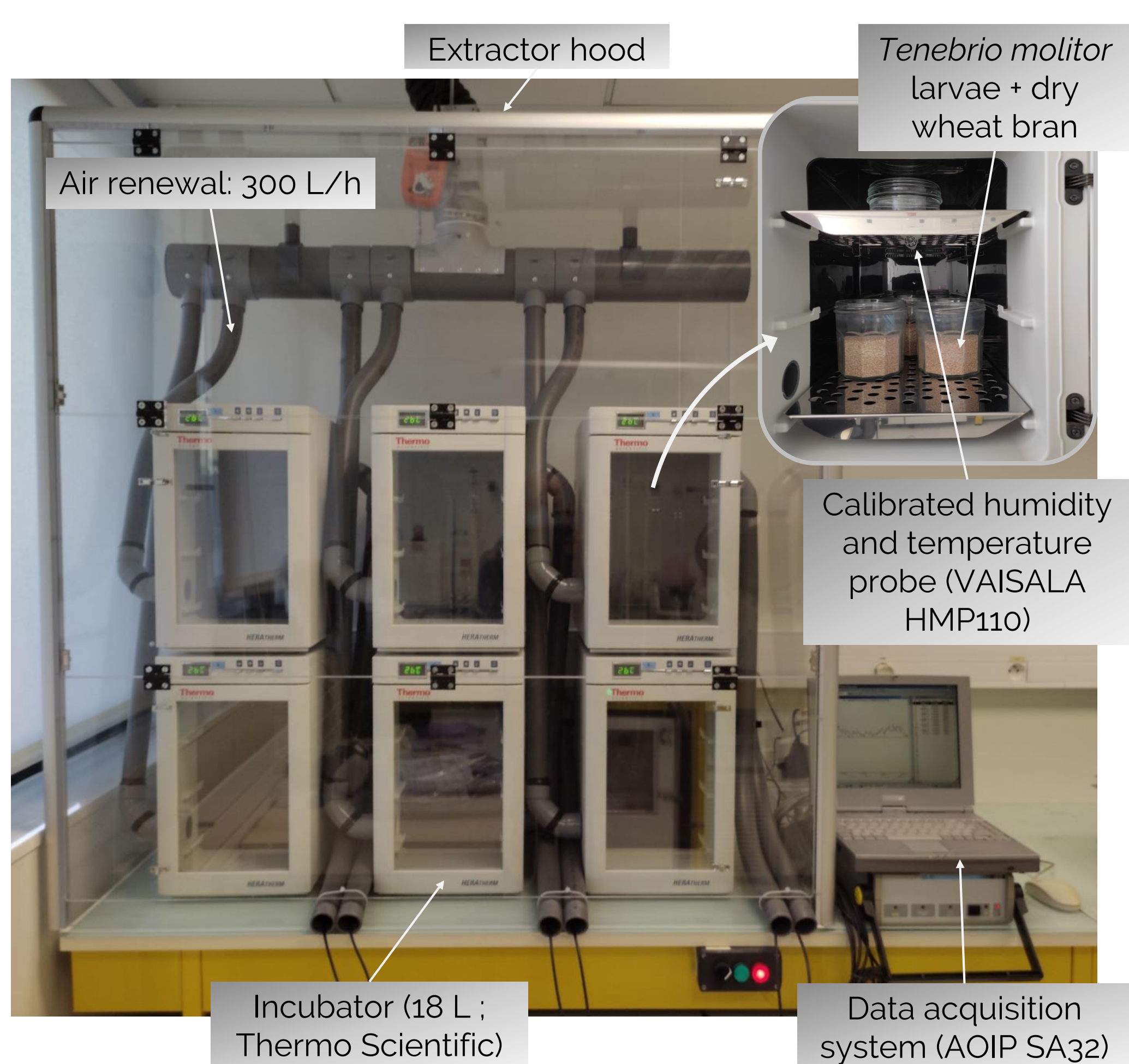
### Spiking



Three levels of nDL-PCBs in wheat bran

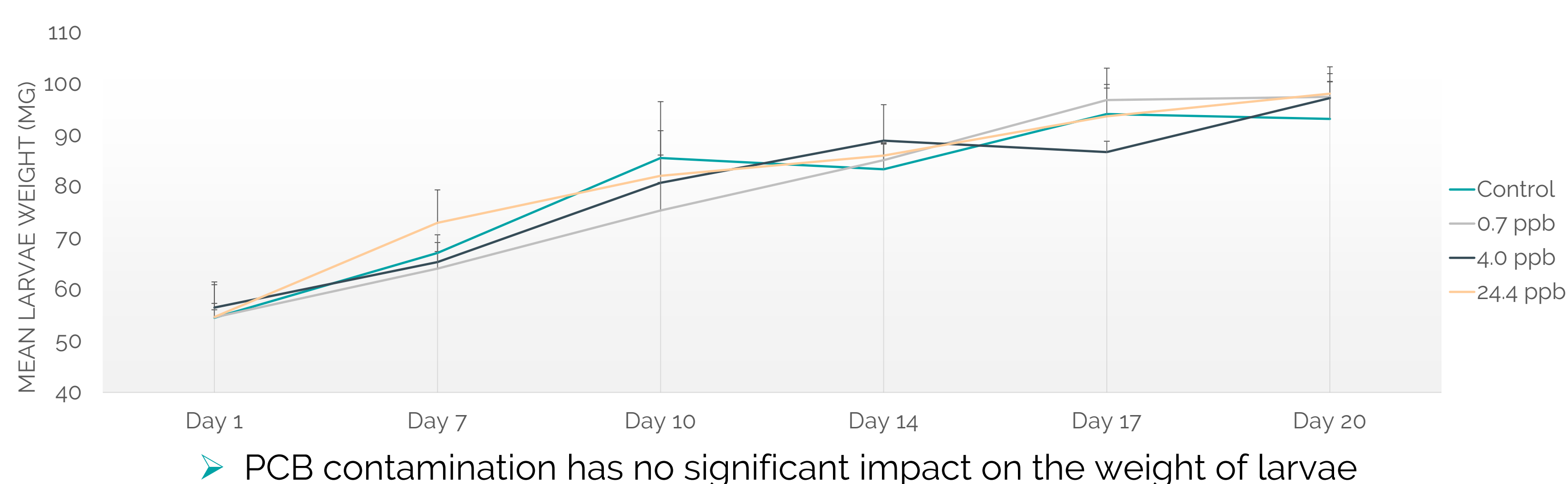
0.7 ppb / congener	0.4 × maximum level
4.0 ppb / congener	2.4 × maximum level
24.4 ppb / congener	14.6 × maximum level

### *Tenebrio molitor* rearing (20 days)



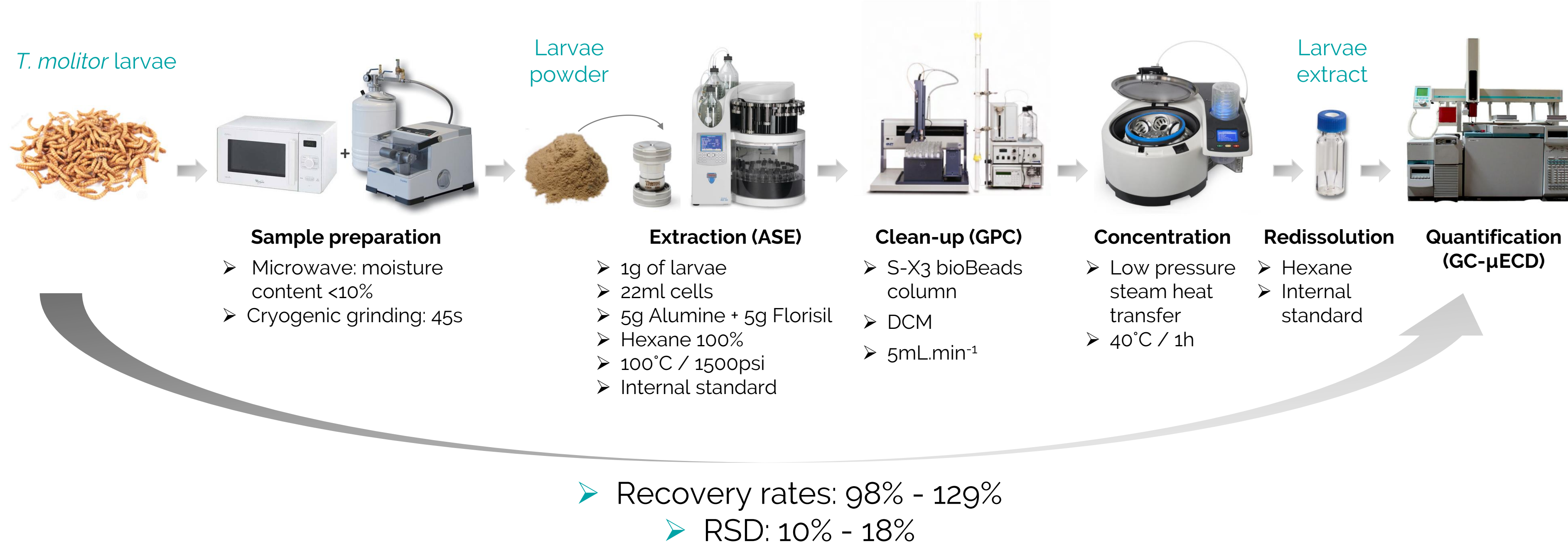
## Results

### Impact of PCB contamination on larval growth



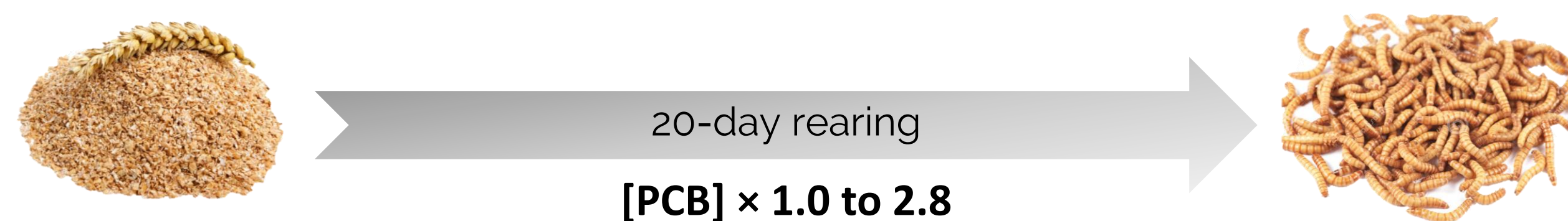
➤ PCB contamination has no significant impact on the weight of larvae

### Analytical method set up



### Bioaccumulation factors

Bioaccumulation factor (BAF) = PCB concentration in larvae / PCB concentration in wheat bran



- No significant difference between spiking levels for low-molecular weight PCB congeners
- BAF increases with the contamination level for high-molecular weight PCB congeners

## Conclusions



- No significant impact of PCBs on larval growth
- Bioaccumulation factors of up to almost 3
- Importance of monitoring the quality of the substrates used for farming insects as food and feed



Centre  
Clermont-Auvergne-Rhône-Alpes

UR370 QuaPA  
Route de Theix  
63122 Saint-Genès-Champanelle  
Tél. : + 33 (0)4 73 62 45 14  
christelle.planche@inrae.fr  
www6.clermont.inrae.fr/quapa

## References

- [1] van Huis, A. (2021). Prospects of insects as food and feed. *Organic Agriculture*, 11(2), 301-308.
- [2] Meyer, A. M., Meijer, N., et al. (2021). Chemical food safety hazards of insects reared for food and feed. *Journal of Insects as Food and Feed*, 7(5), 823-831.
- [3] Guo, W., Pan, B., et al. (2019). Persistent organic pollutants in food: contamination sources, health effects and detection methods. *International Journal of Environmental Research and Public Health*, 16(22), 4361.