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Published in:
Proceedings of the 34th International Symposium on Halogenated Persistent Organic Pollutants

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Nordentoft, S., Cederberg, T. L., Fischer, C. H., & Bjerrum, L. (2014). Accumulation of dioxins and PCB in house fly larvae (musca domestica) reared in poultry manure and used in feed for organic laying hens. In *Proceedings of the 34th International Symposium on Halogenated Persistent Organic Pollutants*

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ACCUMULATION OF DIOXINS AND PCB IN HOUSE FLY LARVAE (*Musca domestica*) REARED IN POULTRY MANURE AND USED IN FEED FOR ORGANIC LAYING HENS

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A challenging aspect of organic egg and meat production is provision of a balanced nutrient supply. Some essential amino acids are difficult to provide in sufficient quantities in organic feed and undersupply may lead to lower egg production, slower growth and even cannibalism. Due to these problems it is accepted in EU regulations to balance the feed formula by use of synthetic amino acids in the organic production until improved organic sources of amino acids can be provided.

In nature insects and insect larvae are important food sources for poultry and the larva of the common house fly (*Musca domestica*) have been shown to be especially rich in the required essential amino and fatty acids. In Northern Europe the larvae can easily be grown in poultry manure locally on the farm where it may be used as a new organic high value protein and fat source for poultry.

Eggs from free range hens have frequently higher content of the persistent organic environmental contaminants dioxins and PCB than eggs from conventional hens held indoor in cages.[1,2] The elevated levels of dioxins and PCB are most likely due to the hens picking in soils contaminated by industrial activities, burning of waste, chemical spillage etc. As manure from free range hens is expected to have elevated contents of dioxins and PCB, we investigated whether larvae reared in this type of manure accumulate dioxins and PCB, and if feeding organic laying hens with these larvae would increase the levels of dioxins and PCB in the hen eggs.

A feeding experiment was set up on an organic farm where four groups of layers were used with 37 hens in each. Two groups of hens received a supplement of 15 g larvae per hen per day, while two control groups received only compound feed. The duration of the feeding experiment was two month. Samples of fly larvae, poultry manure, compost and compound feed as well as pooled egg samples from each group were analysed for levels of dioxins and PCB. Analytical procedure: after extraction of the sample with a mixture of pentane and acetone (88:12), the extracts were cleaned-up on a multilayer silica column and fractionated by preparative HPLC in dioxins and dioxin-like PCB in one fraction and non-dioxin-like PCB in another. Instrumental measurements were performed by GC-HRMS.

The results show that the house fly larvae had a content of dioxins plus dioxin-like PCB four times higher than the poultry manure (0.37 vs 0.09 pg WHO-TEQ/g dry weight). This indicates the accumulation of the lipophilic substances in the larvae from the rearing medium. However, although the levels of dioxins and PCB in the larvae was four times the levels in the compound feed the added exposure of the hens when feed with 15 g larvae per day constitute only a minor amount compared to the exposure from the compound feed alone. The measured content of dioxins and dioxin-like PCB in the eggs from layers receiving larvae in the feed was not different from the control group (1.9 pg WHO-TEQ/g fat).

Acknowledgements
BioConval is an Organic RDD project. Organic RDD is financed by the Danish Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS (International Centre for Research in Organic Food Systems).

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