P192

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Presenting author
Steen Nordentoft

Composting poultry manure by fly larvae (*Musca domestica*) eliminates *Campylobacter jejuni* from the manure

Steen Nordentoft and Birthe Hald

DTU National Food Institute, Technical University of Denmark,
Mørkhøj Bygade 19, DK-2860 Søborg, Denmark. Snni@food.dtu.dk

Introduction

The common house fly, *Musca domestica* (*Md*) is an important carrier of zoonotic agents, and *Campylobacter jejuni* is one that may be transmitted between animals and humans by flies. Colonized animals shed the bacteria in feces where larval stages of *Md* flies develops.

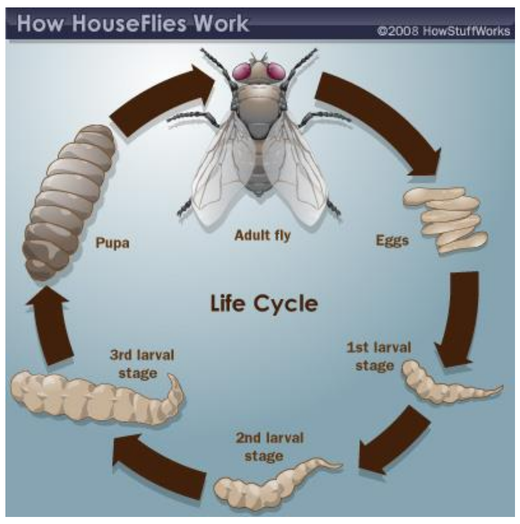
Aim of the present study

To monitor fly larvae composting of poultry manure artificially contaminated with *C. jejuni,* and to investigate a possible transmission route of *C. jejuni* from the manure through the fly larvae to the adult fly.

Background

The house fly, *Musca domestica* (*Md*) is ubiquitous around the world, where it nourishes and reproduces on degrading organic material. Eggs are typically deposited on fresh manure where they hatch, and the larvae undergoes 3 instar stages inside the manure. Following a pupal state, where it undergoes metamorphosis, the adult fly emerge and may begin a new life cycle. During the stay in the manure, the larvae initiate a fast aerobic composting process, where the manure is degraded. However, among many other bacteria, manure may contain *C. jejuni*, and we wanted to investigate if these could be transmitted from the larva to the adult fly.

The lifecycle of *Musca domestica*



Third instar larvae ready for entering the pupal stage

Methods

- Poultry manure were seeded with *C. jejuni* (10^{+8}/g), and 3 day-old *Md* larvae were added, and incubated at 25°C for 7 days.
- Daily samples from manure and larvae were tested by CFU for *C. jejuni* and total viable count (TVC).
- Enrichment culture were used when the CFU came below one log / g.
- Emerging pupae were collected and tested for *C. jejuni* and TVC count.
- Remaining pupae were incubated, and the adult flies were tested for *C. jejuni* by enrichment culture.

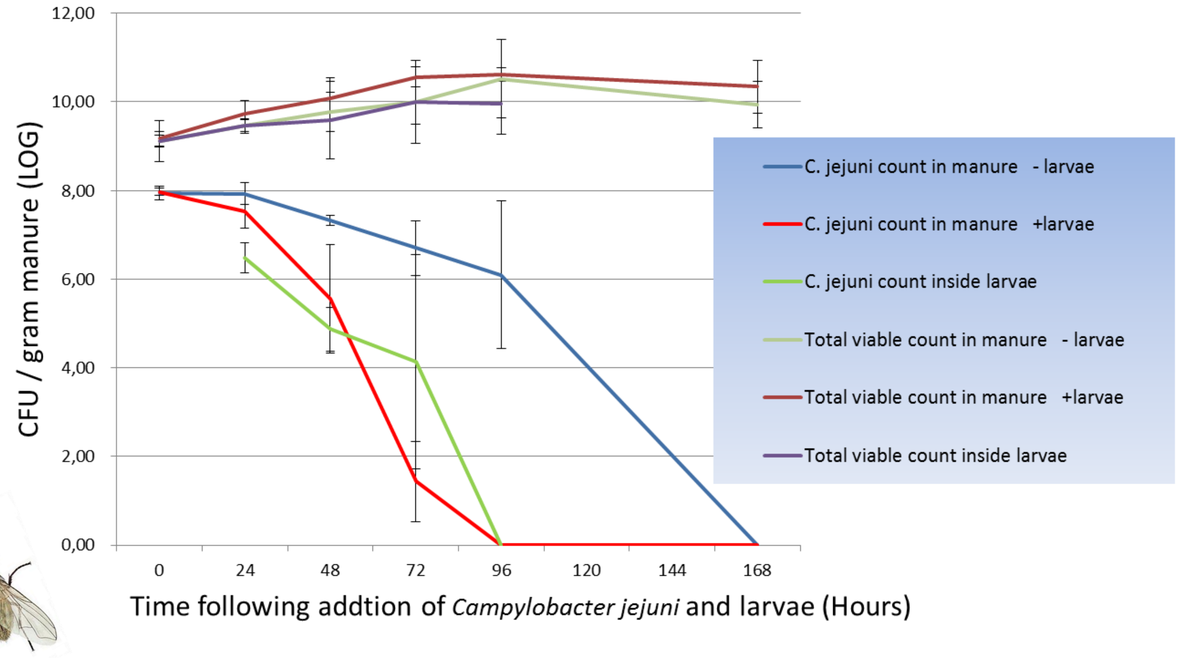
Conclusions

The addition of fly larvae both accelerated the degradation of manure and *C. jejuni*. Pupae or newly hatched flies were not carriers of *C. jejuni* although larvae were grown in contaminated manure.

Impact

When composting poultry manure with *Md* fly larvae, it is possible both to reduce the amount of waste and to sanitize it from *C. jejuni*, thereby reducing the risk of contaminating the environment.

Fig 1. The microbial development in poultry manure contaning *Campylobacter jejuni* (replicates n=6)



Results

The CFU number of *C. jejuni* inside the larvae reflected the number in the manure. Four days following the addition of larvae could *C. jejuni* not be cultured from manure or the interior of larvae.

Control samples, without larvae, *C. jejuni* maintained high culturability for more that 4 days at 25°C.

Pupae and adult flies were all negative for *C. jejuni* by enrichment culture

Discussion

Our data suggest that the larval stages of *Md* actively eliminate *C. jejuni* inside the larvae and in the manure. The transmission cycle of *Md* is therefore interrupted, as adult flies are not carriers of *C. jejuni* when they emerge from the pupae. However, adult flies may encounter *C. jejuni* from contact with fresh manure afterwards. Although *C. jejuni* was eliminated from manure and the interior of the larvae, both media maintained a high level of other culturable bacteria (Fig 1).