Utrecht University

Veterinary Medicine

# Black Soldier Fly larvae as enrichment for layer chicks

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# A PPILOW pilot

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**PhD Candidate**

***ISAE Benelux meeting, 3 November 2020***

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# What is good enrichment?

# Pilot study → Preparing for main experiment on early-life interventions to improve laying hen welfare

PPILOW

Poultry and PIg Low-input and Organic production systems' Welfare

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# Background

## Feather pecking

- Pecking/pulling feathers of conspecifics
- Abnormal, maladaptive behaviour, impact on welfare
- Multifactorial cause (fearfulness, environment, diet, genetics) (Rodenburg et al. 2013)

*Source: Bas Rodenburg*

## Possible solution

- Early-life enrichment can **reduce** fearfulness and feather pecking (Brantsaeter et al., 2016; Gilani et al., 2013; de Haas et al., 2014)

# Background

- **But what is enrichment?**
  - → Improves biological functioning of captive animals (Newberry, 1995)
  - → Enhances animals' ability to adapt and cope with stressors (Brandsaeter et al., 2016; de Haas et al., 2014)

⚠ Difficult criteria to assess
⚠ Often costly for the owner/farmer
⚠ Ethical considerations

- **In this pilot study:**

Our definition → Enrichment for laying hens should promote foraging behaviour (pecking and scratching)
Preference testing → 'Asking the animal' which enrichment characteristics it prefers to interact with

- **Enrichment of interest:**

Tubes with Black Soldier Fly (BSF) larvae (based on design by Allyson Ipema)

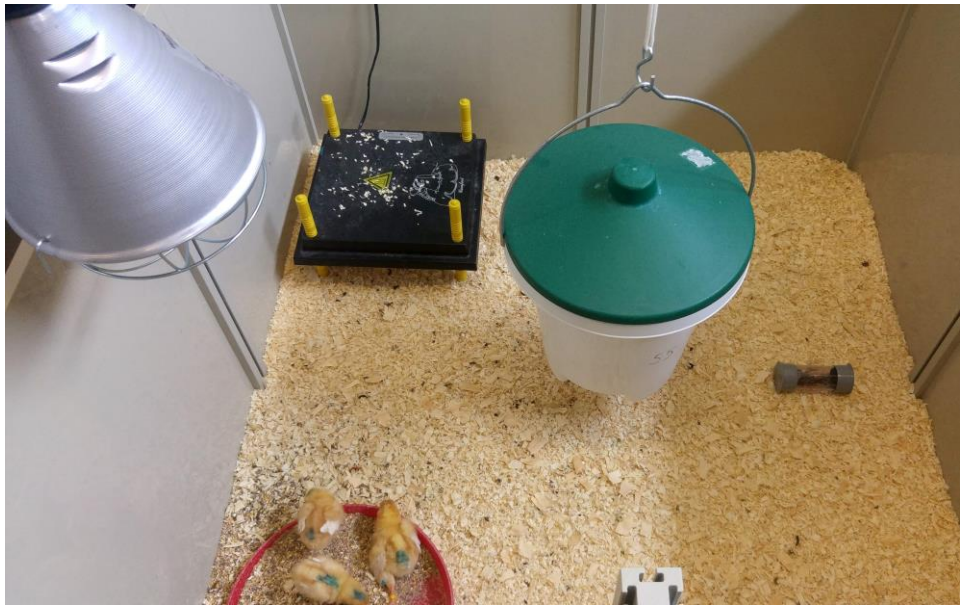
# Pilot study aim: What is the best enrichment for layer chicks?

- **Ethics**: Live vs. dead larvae
- **Costs**: Transparent vs. non-transparent tube

*Kjelt Kruijthoff, veterinary student*

# Methods

**Experiment performed in november-december 2019**



**Animals**

- 28 ISA Brown laying chicks in 4 pens *(7 per pen)*
  Colour-coded with spray paint
- BSF larvae, 10% daily nutritional need

**Preference test**

- Training phase *(4-11 days old)*
- Preference test with 2 conditions *(8 testing days, 14-22 days old)*
  **1. Live vs. dead larvae**
  **2. Transparent vs. non-transparent tube**

**Data collection**

- Score active behaviour towards tubes during 1h after providing tubes, i.e. pecking, scratching, walking, eating
  (video analysis with BORIS)
- Weigh tubes before and after to assess larvae consumption

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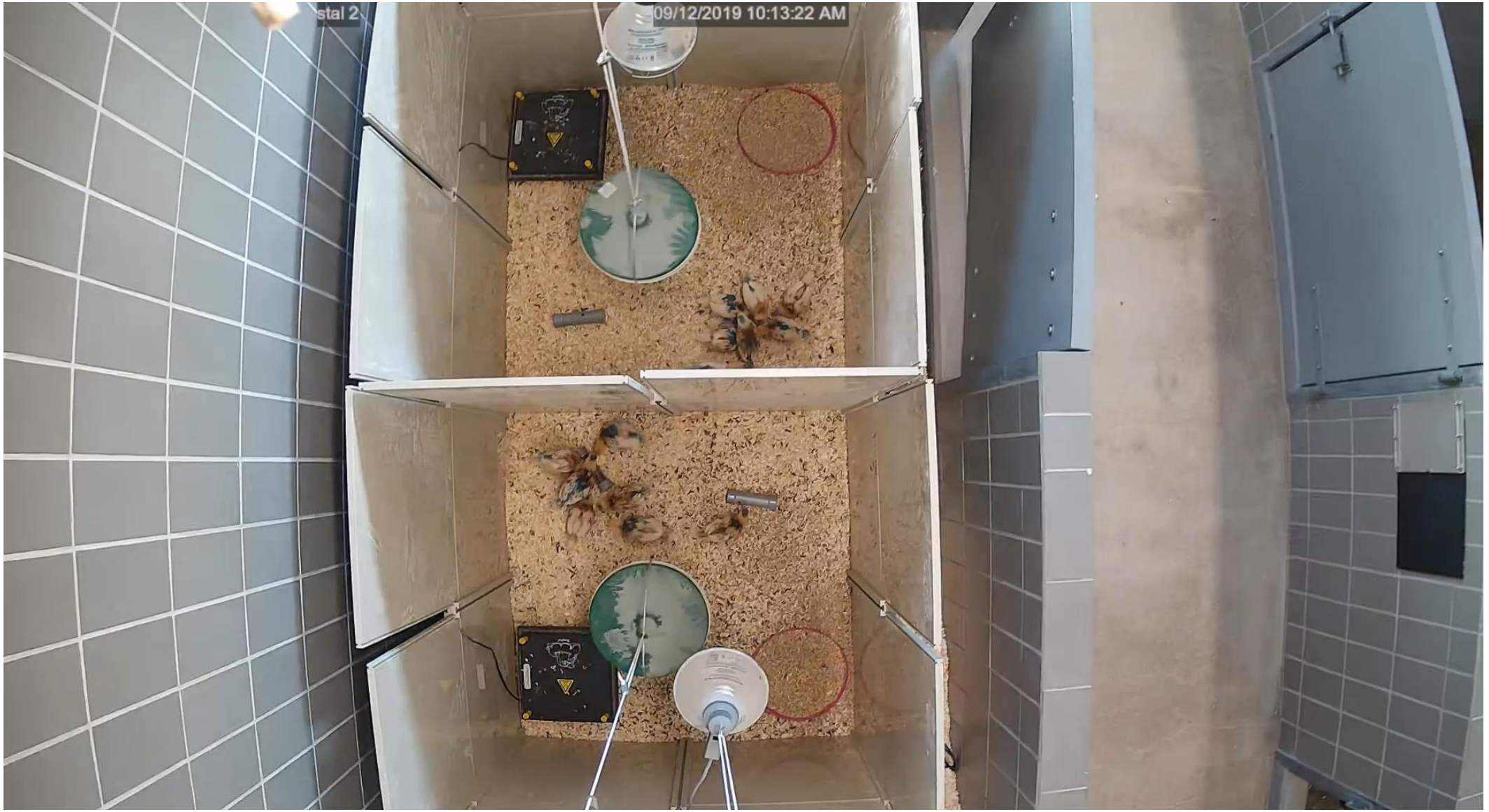
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# Results – Active behaviour towards tube

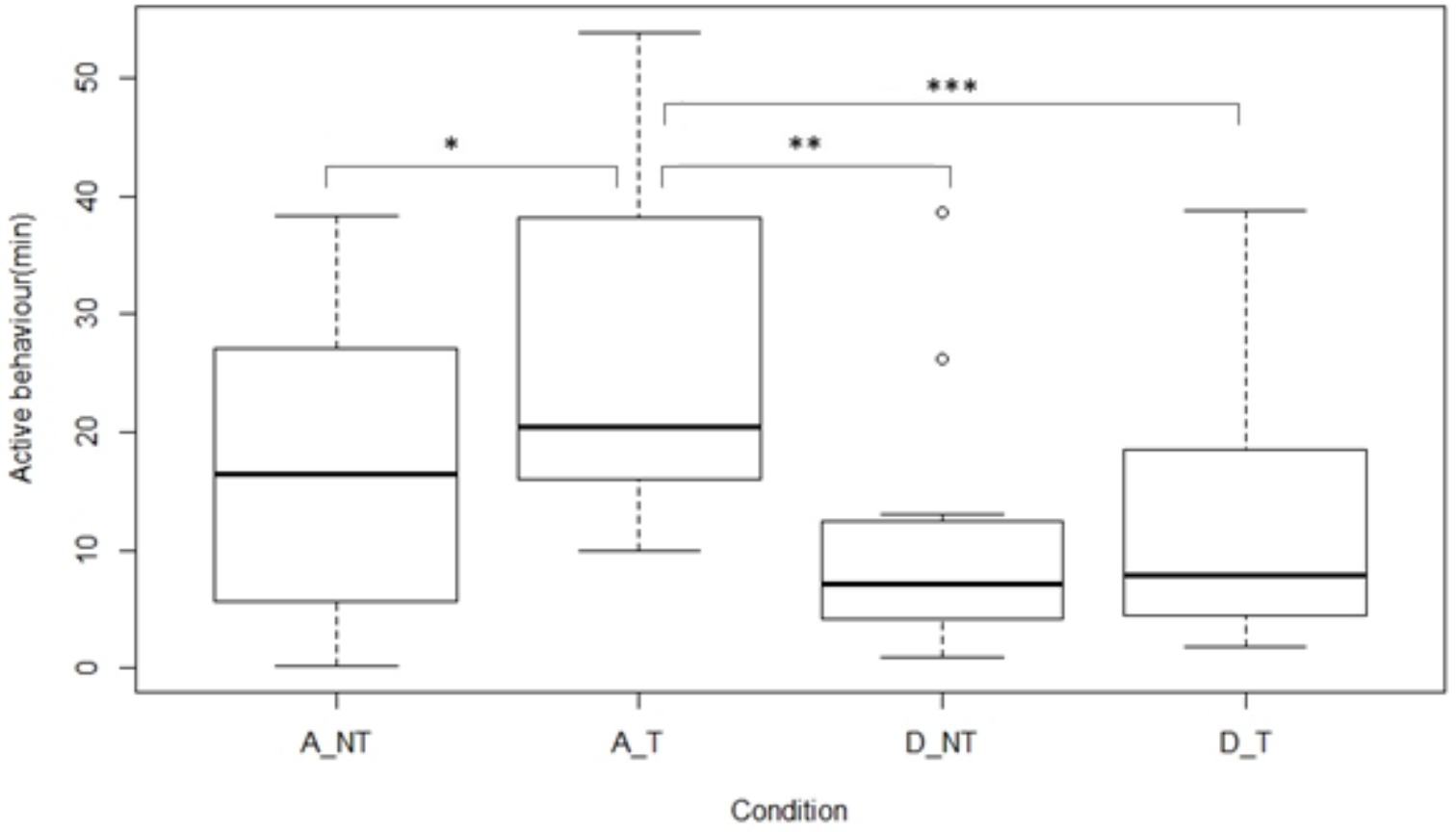
- 2 chicks per pen observed for 1 hour for 4 days (due to time constraints)
- Most active behaviour towards Alive_Transparent tube (Wilcoxon signed rank test)

P-values Wilcoxon signed rank test

| | A_T | A_NT | D_NT | D_T |
|---|---|---|---|---|
| A_T | . | 0.067* | 0.000** | 0.001*** |
| A_NT | | . | 0.112 | 0.323 |
| D_NT | | | . | 0.696 |
| D_T | | | | . |

| | |
|---|---|
| A | Alive |
| D | Dead |
| T | Transparent |
| N-T | Non-transparent |

**Total active behaviour towards tube**



# Results – Larvae consumption

- All 8 testing days combined
- Alive larvae were consumed significantly more compared to dead (Wilcoxon signed rank test)

P-values Wilcoxon signed rank test

| | A_T | A_NT | D_NT | D_T |
|---|---|---|---|---|
| A_T | . | 0.755 | 0.011**** | 0.001*** |
| A_NT | | . | 0.016** | 0.001* |
| D_NT | | | . | 0.696 |
| D_T | | | | . |

| | |
|---|---|
| A | Alive |
| D | Dead |
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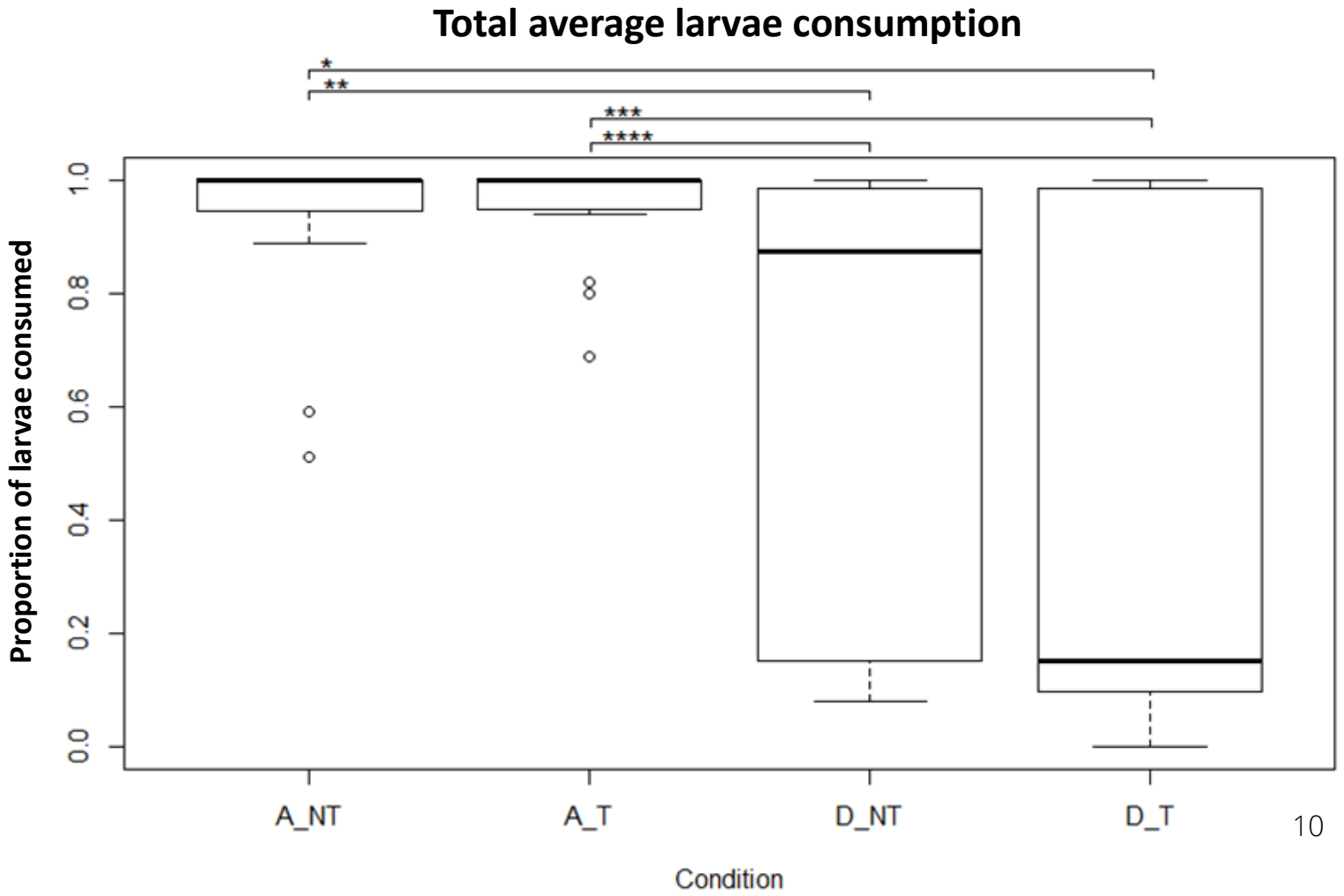


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# Discussion

- Transparent tubes promoted more active behaviour than non-transparent tubes
- Alive larvae were more attractive to birds than dead larvae (visual cue important: Jones et al., 1998)
- Dead better for larvae welfare than alive? (Larouche et al., 2019)
- Larvae consumption: alive larvae crawled out. But might contribute to more relevant (non-object related) enrichment. No larvae were found in pen.
- When larvae were alive, there was no significant difference in larvae consumption between trans and non-trans tubes → Learning effect

# Conclusion

Providing alive larvae in a transparent tube promoted foraging behaviour the most, and is therefore considered the best enrichment.

Therefore, we used this as enrichment in the main experiment we performed from January until June this year (data and hopefully papers will follow!)

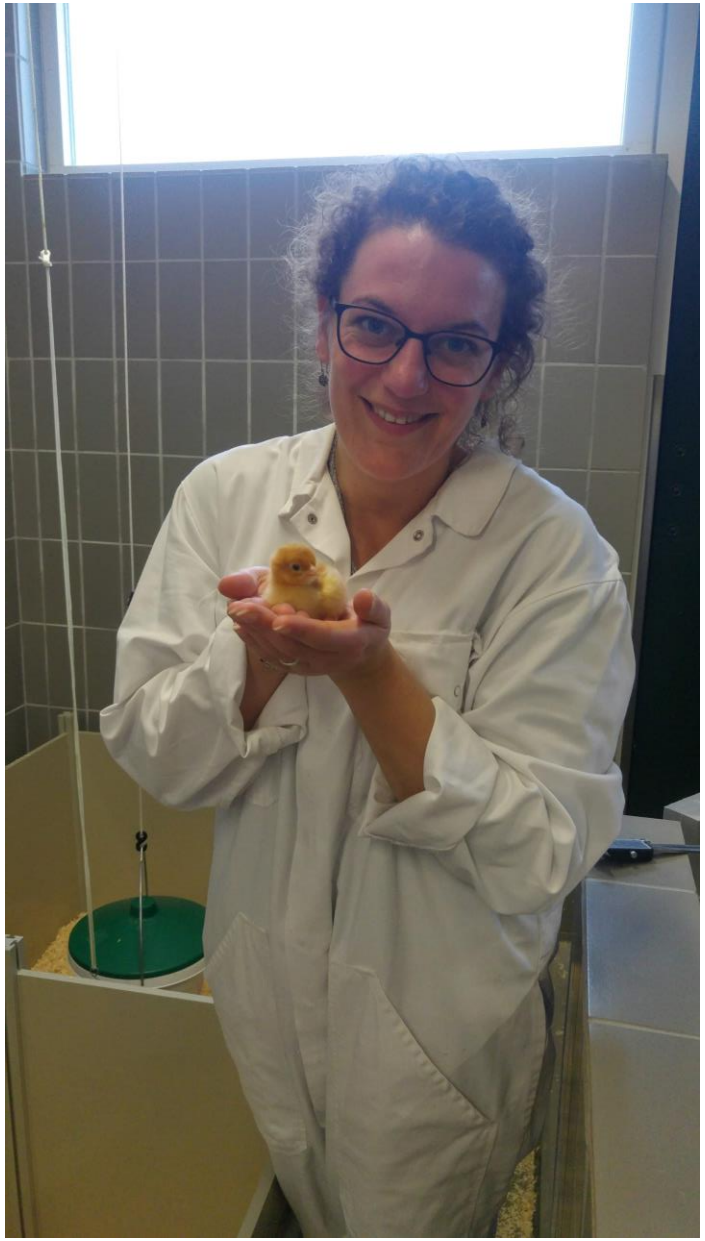
# Final note from a rookie PhD

- Pilot in every sense of the word:
  - First own experiment (OMG, the paperwork!)
  - First student to supervise
  - First time in facility and getting to know the caretakers
  - First time responsible for research animal's well-being

- Allowed trial and error before 'the real work' started

**This pilot was, in every aspect, indispensable for my development as a researcher. If you have the opportunity to do a pilot, do it!**

# Questions?



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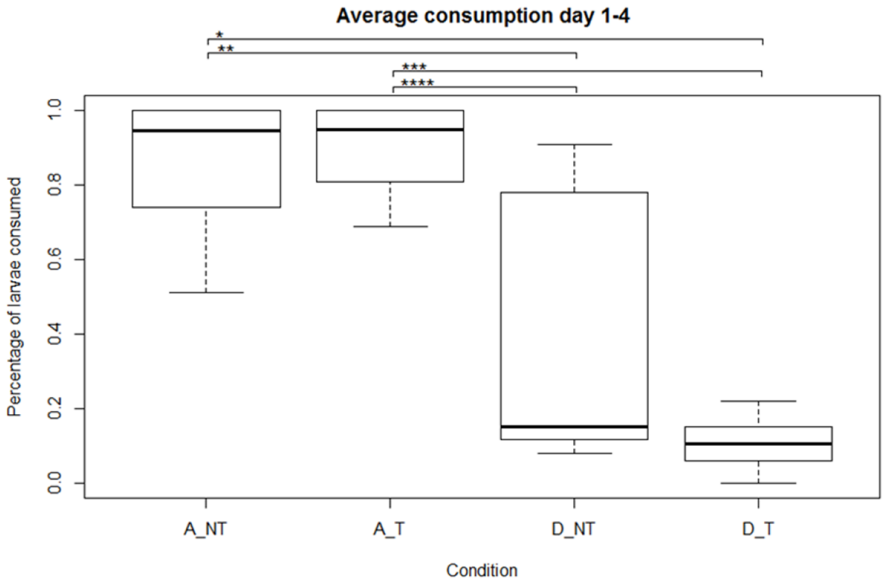
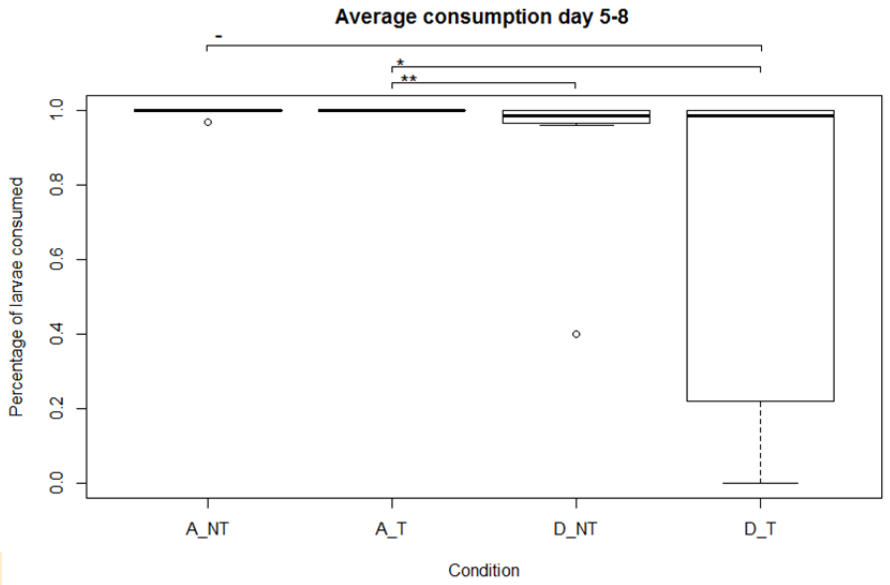
# **Additional results -** Larvae consumption

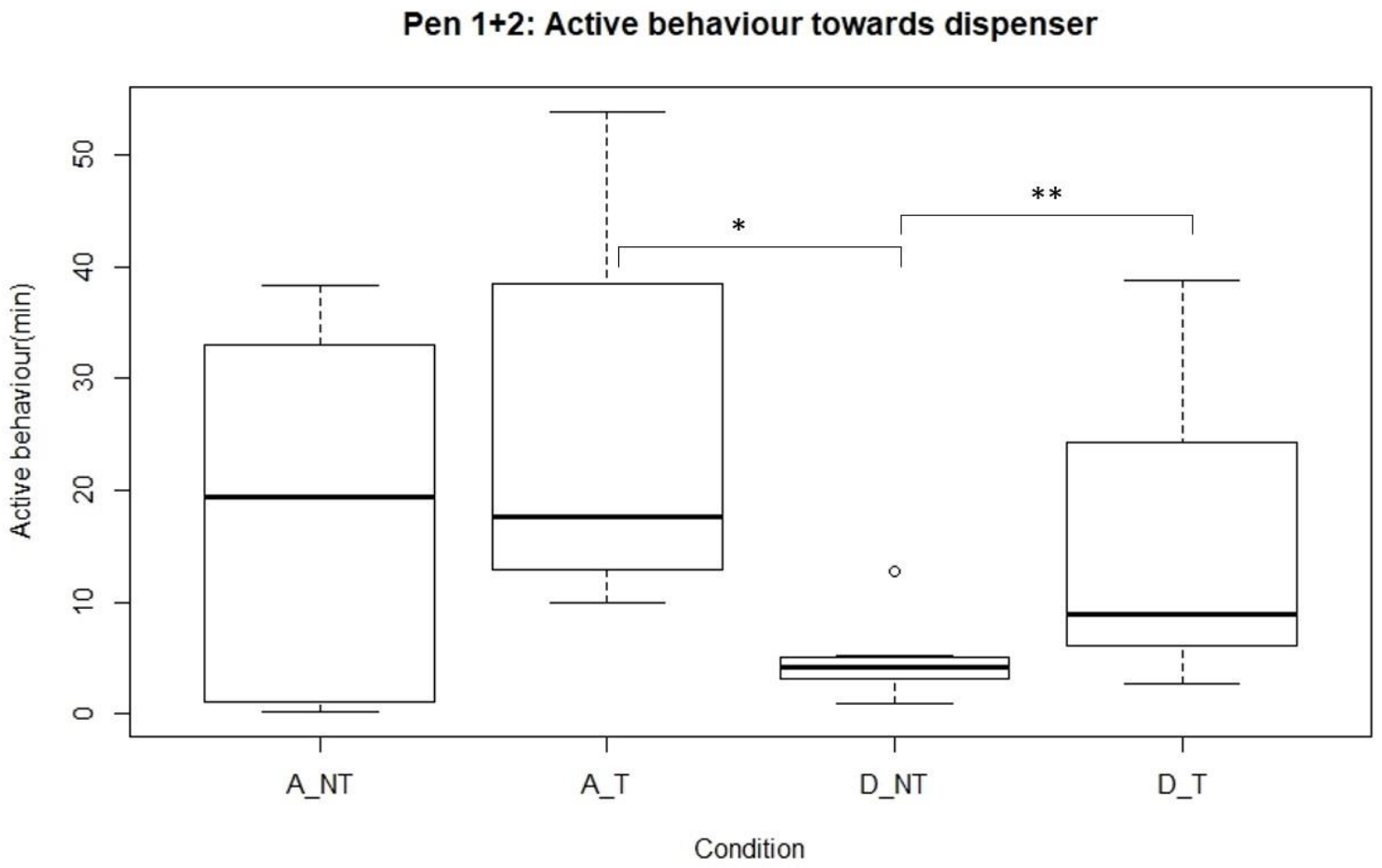
- Days 1-4 of testing
- Significant differences between alive and dead




- Days 5-8 of testing
- Difference between A_NT and D_NT disappeared → learning effect?




| | |
|---|---|
| A | Alive |
| D | Dead |
| T | Transparent |
| N-T | Non-transparent |

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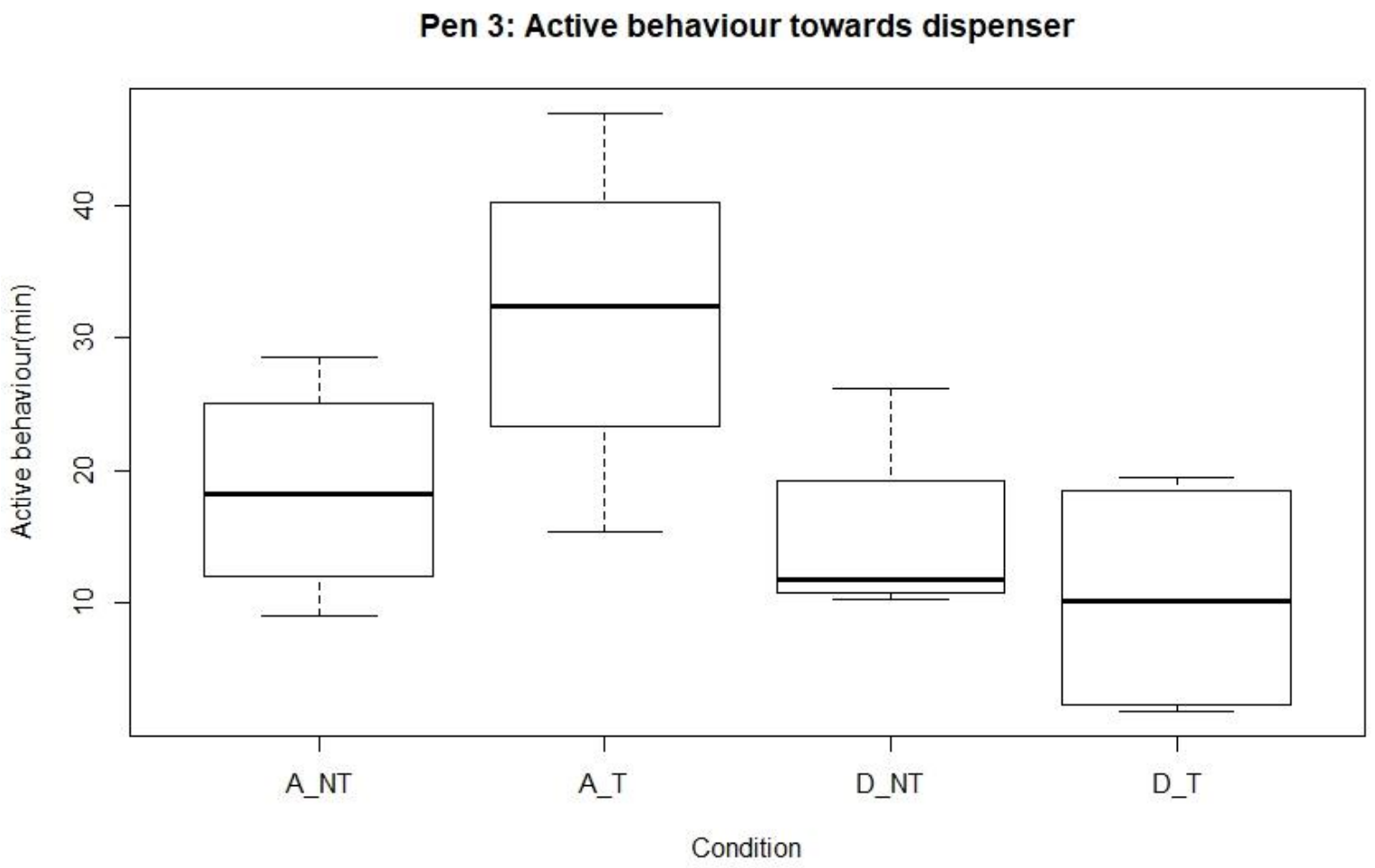
| A | Alive |
| D | Dead |
| T | Transparent |
| N-T | Non-transparent |

# Results

## Observations

## Pen 1+2

- 2 chicks from pen 1 and 2 chicks from pen 2 observed for 1 hour for 4 days
- 2 significant differences

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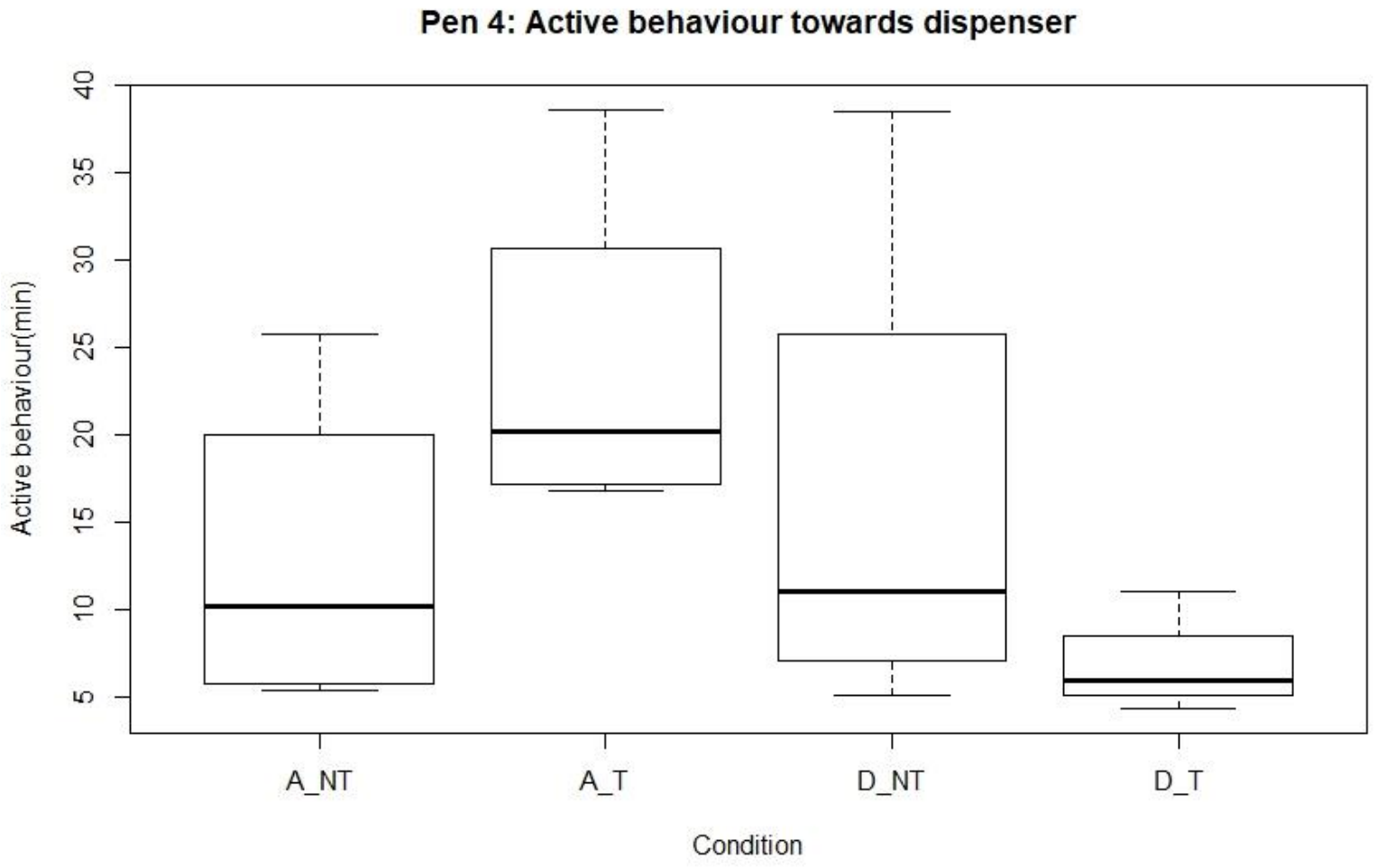
|---|---|
| A | Alive |
| D | Dead |
| T | Transparent |
| N-T | Non-transparent |

# Results

## Observations

## Pen 3

- 2 chicks from pen 3 observed for 1 hour for 4 days
- No significant difference



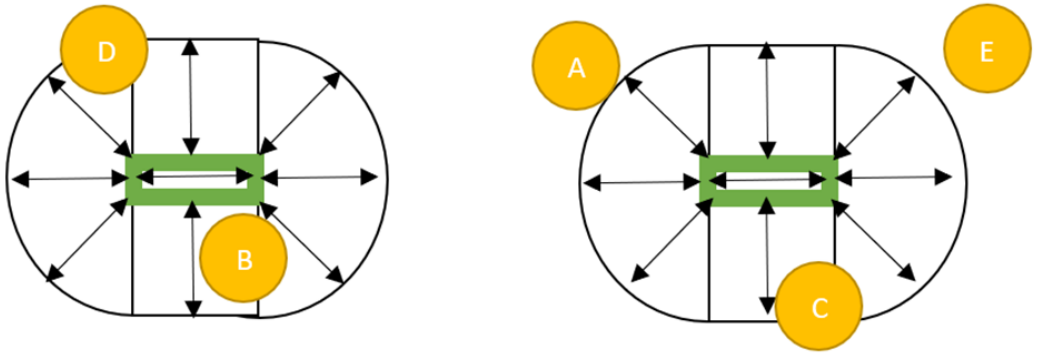

| | |
|---|---|
| A | Alive |
| D | Dead |
| T | Transparent |
| N-T | Non-transparent |

# Results

## Observations

## Pen 4

- 2 chicks from pen 4 observed for 1 hour for 4 days
- No significant difference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