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Detecting microplastics in feces of pig fed former food products

Peng Lin^{1,2}, S. Mazzoleni¹, A. Luciano¹, M. Tretola², G. Bee², and L. Pinotti¹

¹University of Milan, Department of Veterinary Medicine and Animal Sciences, Via dell'Università 6, 26900 Lodi, Italy, ²Agroscope, Route De La Tioleyre 4, 1725 Posieux, Switzerland;
peng.lin@unimi.it

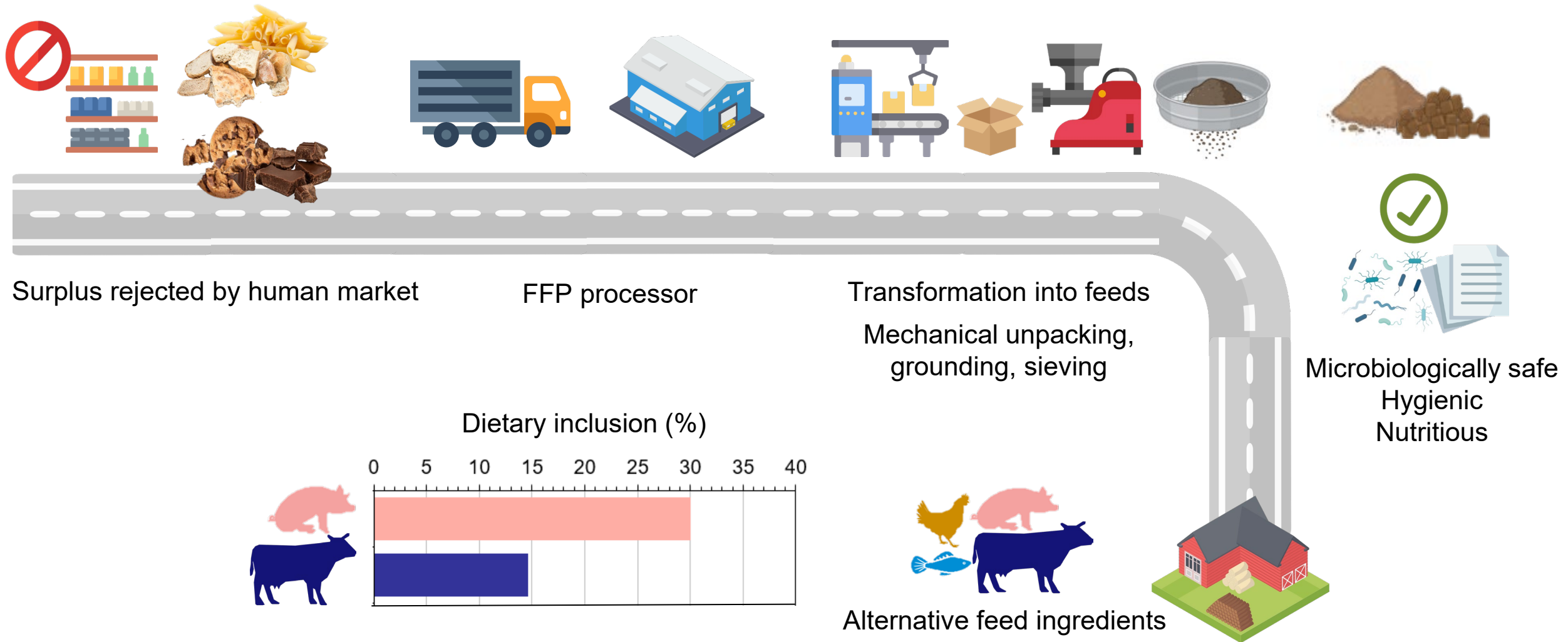
04. Sep 2024, Florence

Session 89

"Free communications in animal nutrition"



Introduction - Former Food Product (FFP) and its use in animal nutrition



Kaltenegger et al. (2020); Mazzoleni et al. (2023); Tretola et al. (2024)

Introduction - FFP and potential packaging remnants

FFP

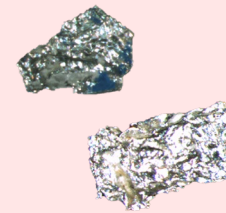


Packaging remnants found in FFP

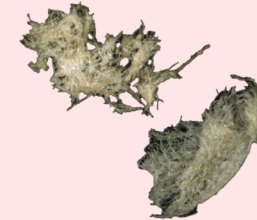


Common packaging materials used in FFP

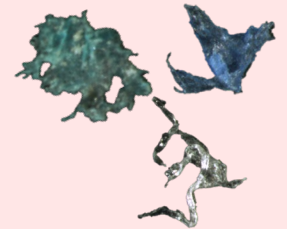
Aluminum



Cellulose



Plastic



Zero packaging remnants



Practicality and feasibility

Mazzoleni et al. (2023)

Introduction - Microplastics

Plastic packaging remnants are present in feed produced from FFP

Microplastics (MP) are known to occur in biological matrices

All synthetic polymer particles < 5 mm
(organic, insoluble and resist degradation)



One Health



Animal health



Food safety



Environment



Objective

Test effectiveness of the selected method for...

- Pig feces digestion
- Material separation by density solution
- MP extraction and detection

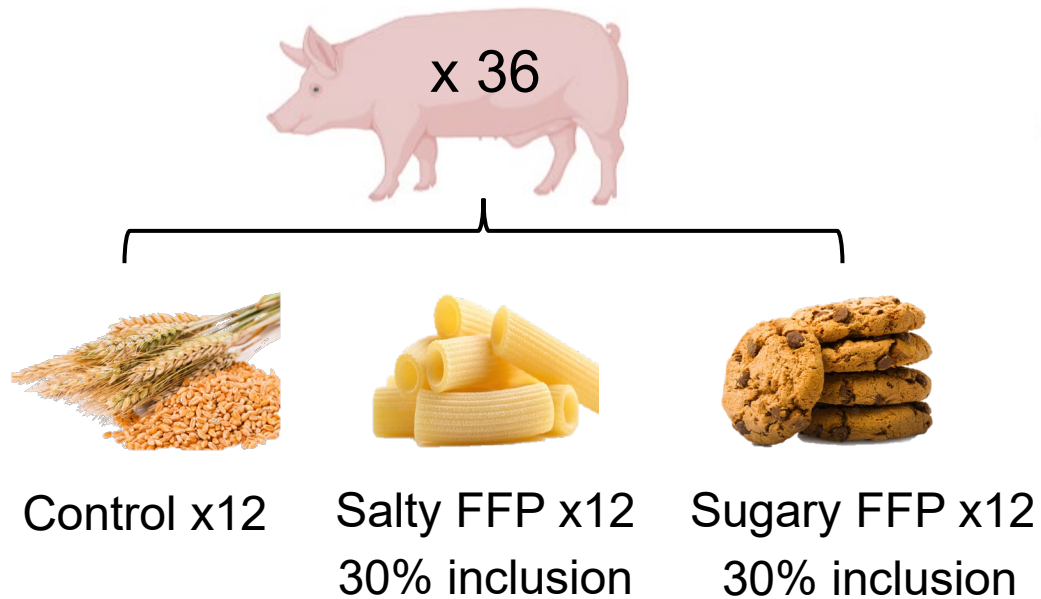
Masiá et al. (2019); Gallitelli et al. (2022); Mazzoleni et al. (2023); Corte Pause et al. (2024)

Material and Methods

Animal and diets

Growing-finishing pigs

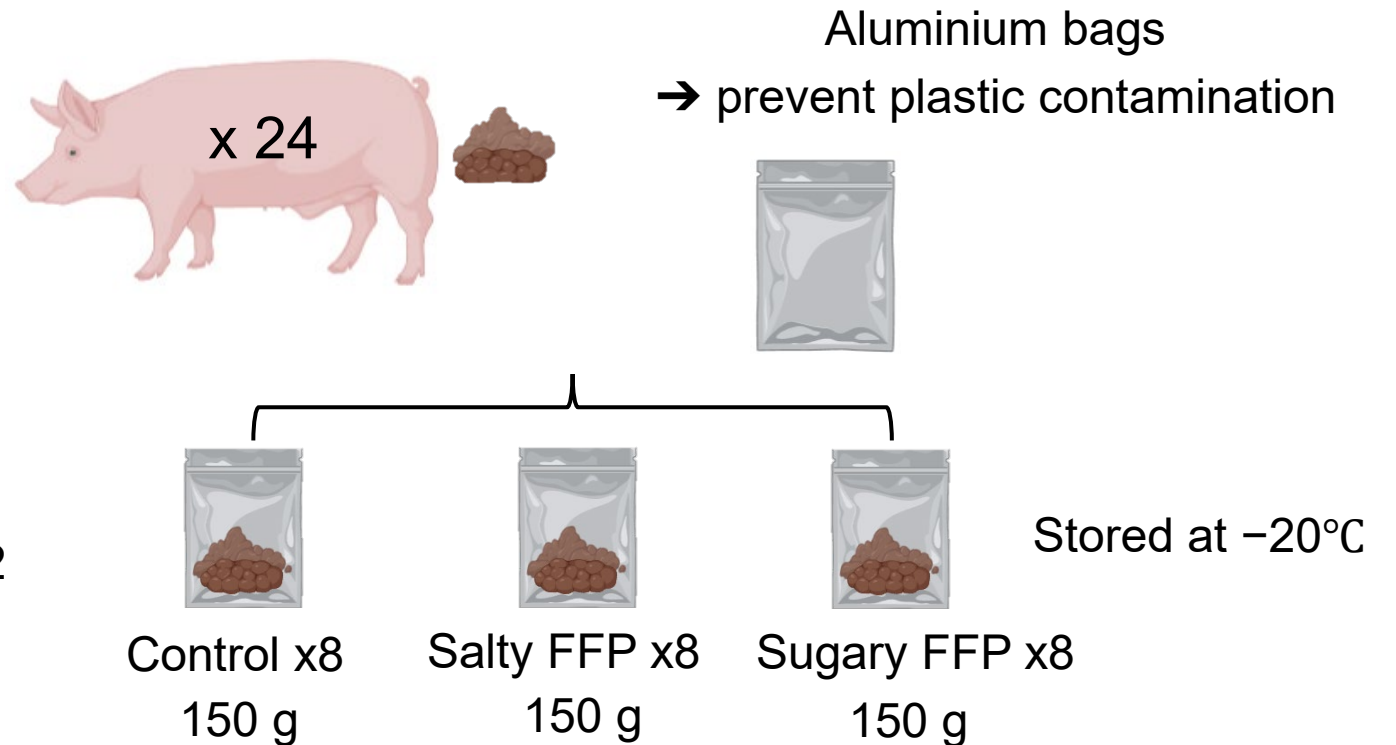
(22.4 ± 1.70 kg until 100 kg)



Feces sample acquisition

In the middle of growing (≥40 kg) and finishing period (≥80 kg)

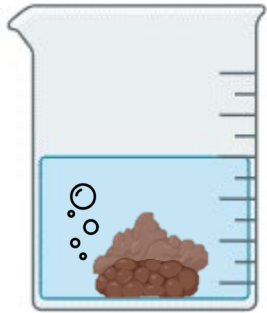
Collecting from 4 consecutive days



Mazzoleni et al. (2023)

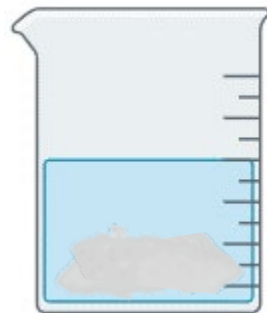
Material and Methods

Digestion



- 3 g feces (3 technical replicates)
- 25 mL 30% H_2O_2
- At room temperature for a week

Density separation



- 100 mL saturated NaCl solution (density = 1.19 g/cm^3)
- Overnight at room temperature

Masiá et al. (2019); Gallitelli et al. (2022)

Material and Methods

Reference microplastics

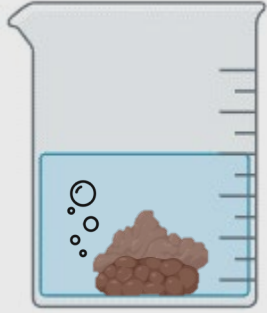
Polymer	Density (g/cm ³)
PE	0.862
PP	1.083
PET	1.216
PVC	1.369
PLA	1.300
PBS	1.234
MB	1.241

The most abundant polymers found in FFP

Mazzoleni et al. (2023)

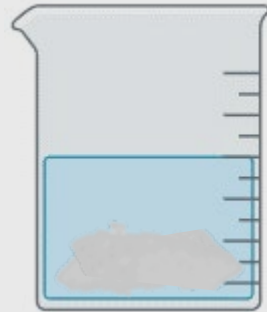
Material and Methods

Digestion



- 3 g feces (3 technical replicates)
- 25 mL 30% H_2O_2
- At room temperature for a week

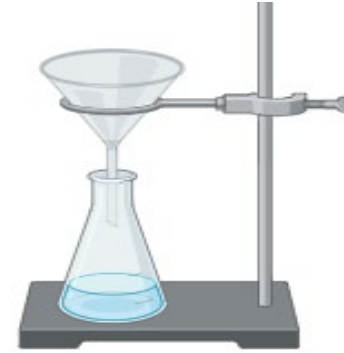
Density separation



- 100 mL saturated NaCl solution (density = 1.19 g/cm^3)
- Overnight at room temperature

Masiá et al. (2019); Gallitelli et al. (2022)

Filtration



Sieving

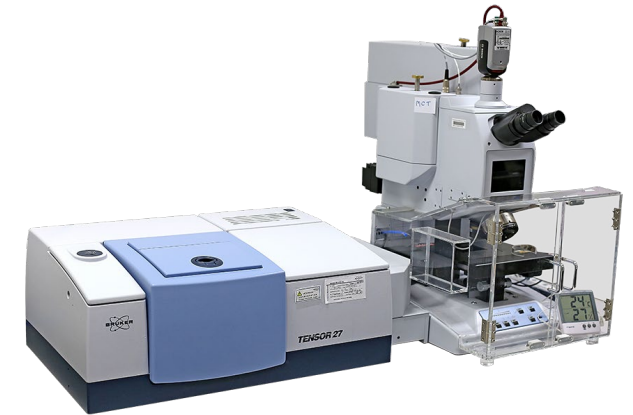


- Pore size 5 mm

Identification



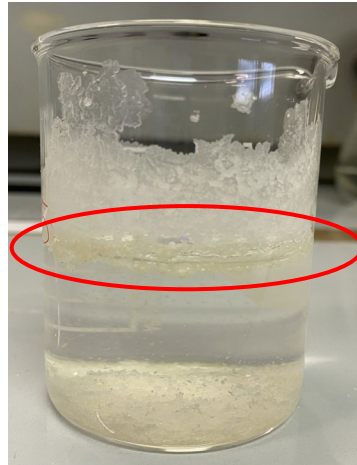
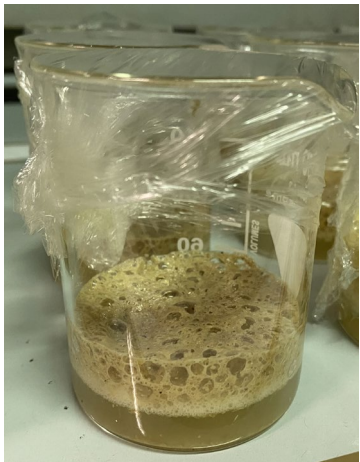
Stereoscope



Fourier transform infrared spectroscopy

Material and Methods

Feces digestion



Cellulose
Fiber
(from raw feed)

One week later
After density separation

After filtration



Results and Discussion

We were not able to detect MP in the collected feces

Particles found were mainly **cellulose, undigested fibers**, and a few aluminium remnants

Low plastic-contamination level in FFP and the experimental farm

30% dietary inclusion of FFP

Non-even distribution of MP in feces

Fecal samples being spotted

Dilution effect

Feed intake of pigs

Possible MP retention in the intestine

Amounts of MP excreted < ingested

Need further studies to varify

Wu et al. (2021); Mazzoleni et al. (2023); Corte Pause et al. (2024)

Conclusion

More research is needed to clearly understand the fate of MP in FFP

- MP remained in animal's intestine
- MP excreted via feces, urine, or other biological matrices
- Proportion of retention and excretion

Currently, there are several methods for MP extraction in animal feces, other methods can be tested to see their effectiveness and to develop optimized protocol



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Thank you !

Peng Lin



peng.lin@unimi.it



Peng Lin

PhD student at Università degli Studi di
Milano, Nutritional Sciences

