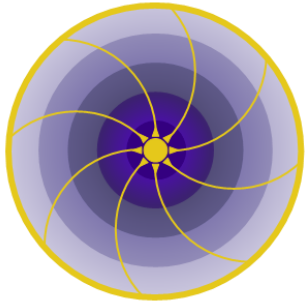




EMERGING
RISK
IDENTIFICATION
SYSTEM

Enhancing Food Safety in New Zealand



New Zealand
**FOOD SAFETY SCIENCE
& RESEARCH CENTRE**



**PHF
Science**

New Zealand Institute
for Public Health and
Forensic Science

Topic updates and recent signals

Nicola King

New Zealand Institute for Public Health and Forensic Science (previously ESR)

<https://www.phfscience.nz/>

Project lead, Emerging Risk Identification System (ERIS), New Zealand Food Safety Science & Research Centre <https://www.nzfssrc.org.nz/resources/eris>

Acknowledgements: **Kate Thomas** (New Zealand Food Safety),
Sam Murray (Cawthron Institute)

Overview

1. Update: Rat hepatitis E virus
2. Update: Rat lungworm
3. New technology: Metal Organic Frameworks
4. Probiotic survey: Label vs. contents
5. Infant formula dispensing machines



Rat HEV

NEW INFORMATION SINCE MAY 2022 STADG-ER

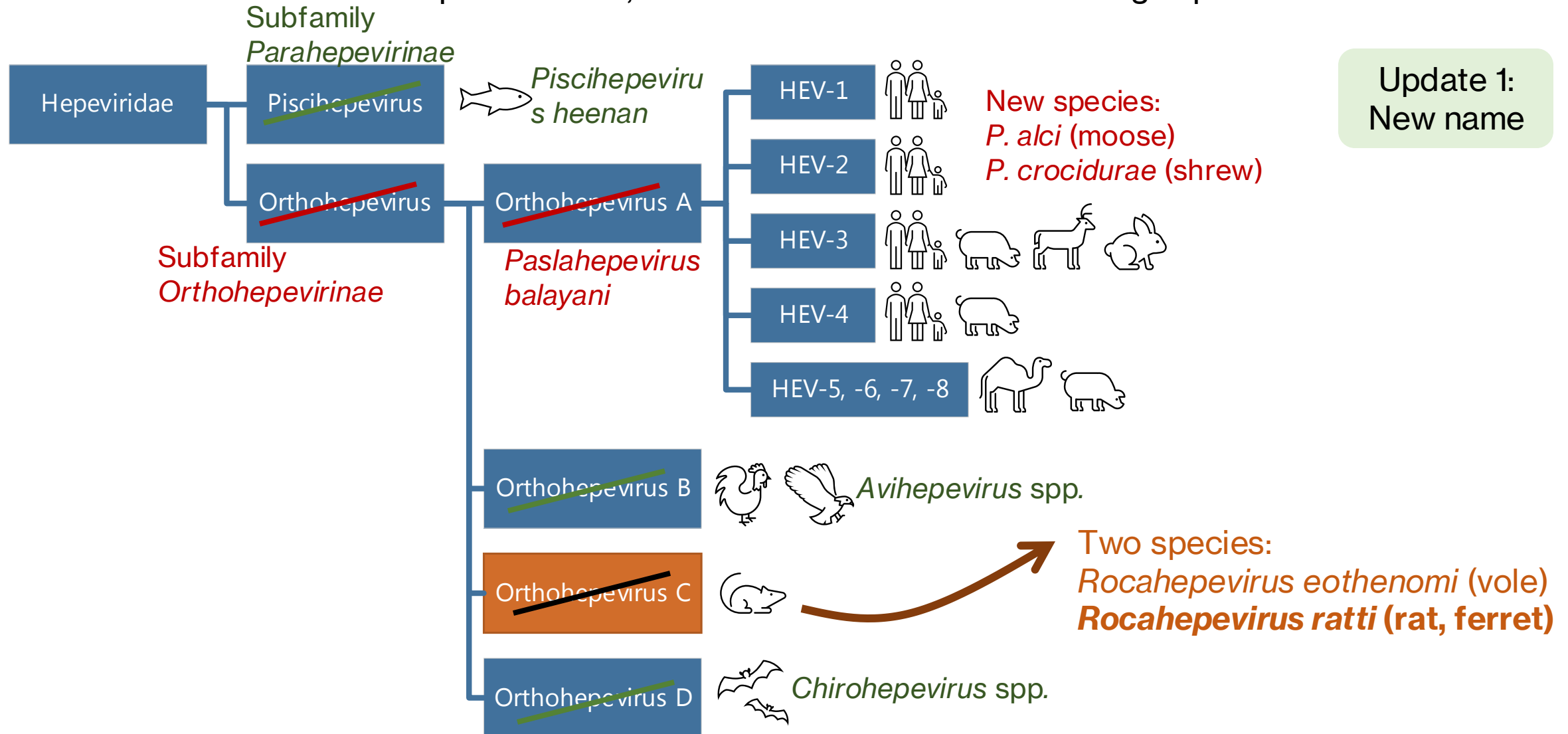


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- 2022 situation: Widespread in rats, few human cases identified through specific studies



Rat HEV

NEW INFORMATION SINCE MAY 2022 STADG-ER



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- 2022 situation: Widespread in rats, few human cases identified through specific studies

Questions, data gaps



Orthohepevirus C

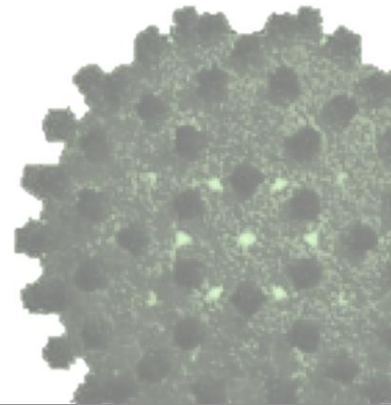
- Can these infect other animal species? (e.g. companion animals, livestock)
- Are there 'hot spots' where strains have adapted to human hosts?

Human health

- How widespread is human infection?

Transmission

- How important is foodborne transmission?



Update 2: Pigs
possibly an
intermediate host

Rios-Muñoz et al. (2024)

<https://doi.org/10.3201/eid3004.231629>

- ratHEV found in 2/5 pig farms in Spain (11% 387 pigs; c.f. 6% positive for HEV-3)
- RNA in faecal samples – pig infection unconfirmed

Rat HEV

NEW INFORMATION SINCE MAY 2022 STADG-ER

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Questions, data gaps



Orthohepevirus C

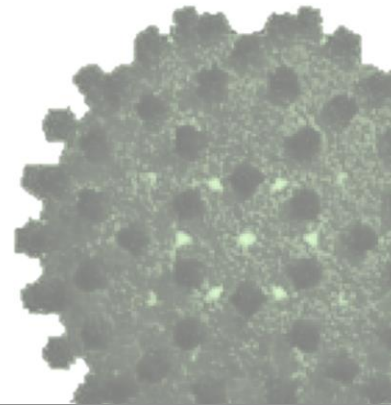
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Update 3: Genomic clustering but all potentially zoonotic

Lo et al. (2026)

<https://doi.org/10.1016/j.jhep.2025.07.004>

- Some geographical clustering but global circulation probable
- “all rHEV strains should be assumed to have zoonotic potential.”

Rat HEV

NEW INFORMATION SINCE MAY 2022 STADG-ER

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Questions, data gaps



Orthohepevirus C

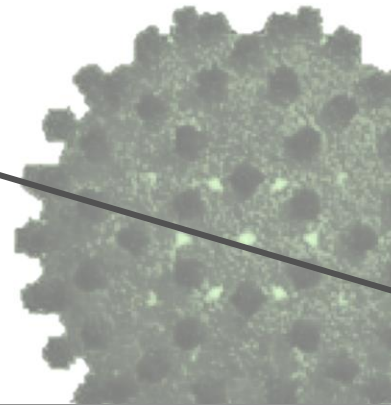
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Transmission

- How important is foodborne transmission?



Rivero-Juarez et al. (2026)

<https://doi.org/10.1038/s41467-026-71382-3>

- A confirmed zoonoses
- 51 confirmed human infections (Europe, Asia, Canada)
- Serology suggests more (methods differ)
- One cause of hepatitis with unidentified aetiology

Update 4: More data (few cases, geographically widespread)

Rat HEV

NEW INFORMATION SINCE MAY 2022 STADG-ER

- 2022 situation: Widespread in rats, few human cases identified through specific studies

Questions, data gaps



Orthohepevirus C

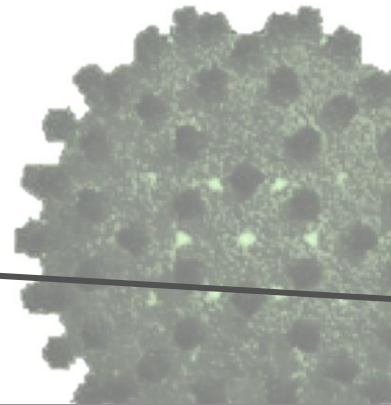
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Human health

- How widespread is human infection?

Transmission

- How important is foodborne transmission?



Shed in rat faeces

- Direct contact
- Contamination of food via environment or water?
(faeces > food, wastewater > shellfish, irrigation water > crops)
- Intermediary food animals?
(shellfish, pigs?)

Update 5: Plausible
but evidence lacking

Rivero-Juarez et al. (2026) <https://doi.org/10.1038/s41467-026-71382-3>
Figueiredo et al. (2025) <https://doi.org/10.1007/s12560-024-09624-0>
Santos-Silva et al. (2025) <https://doi.org/10.3390/foods14142533>

Rat lungworm

NEW INFORMATION SINCE
NOV 2023 STADG-ER

Angiostrongylus cantonensis

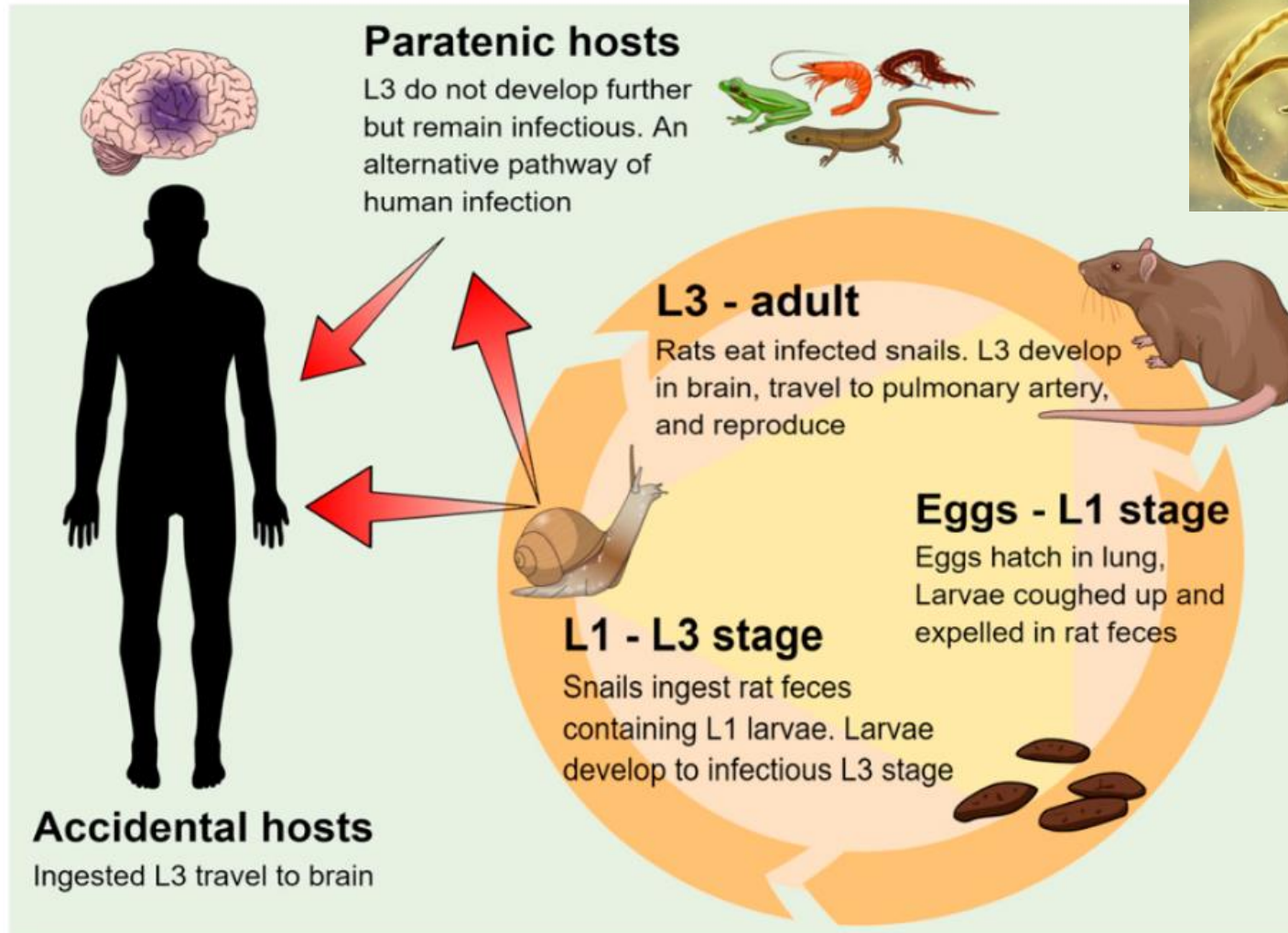


Image: US CDC
<https://www.cdc.gov/parasites/angiostrongylus/index.html> (original credit DPDx)

- L3 stage larva is infectious
- Human disease: Neuroangiostrongyliasis (NAS)

Foodborne exposure:

- Snails, slugs (deliberate, inadvertent)
- Paratenic hosts (prawns, crabs, frogs, toads, lizards)
- Outbreaks: Salad, vegetable juice

Rat lungworm

NEW INFORMATION SINCE NOV 2023 STADG-ER

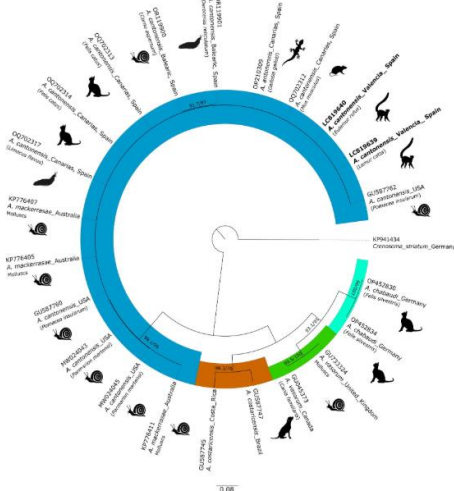
- 2023 European situation: Detected in mainland Spain (Valencia)
Galán-Puchades et al. (2023) <https://doi.org/10.3390/pathogens12040567>

Update 1: Non-human primate deaths in Valencia

Garijo-Toledo 2025

<https://doi.org/10.1016/j.ijpara.2025.04.002>

- Cause of death for three lemurs in Valencia zoo

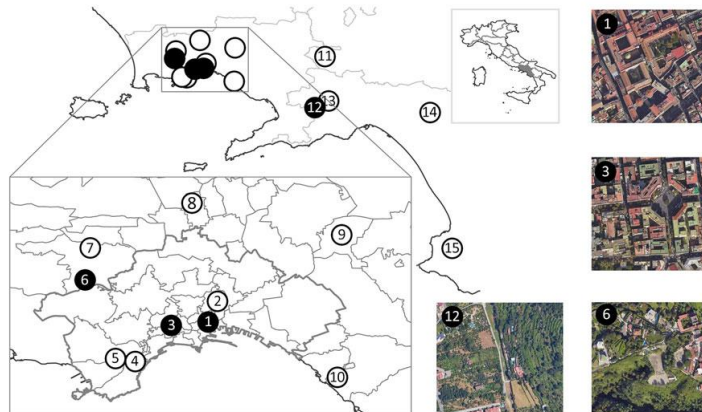


Update 2: Detected in the Campania region of Italy

Pandian et al. (2025)

<https://doi.org/10.3201/eid3109.250648>

- Found in rats and snails
- Found in urban and rural locations

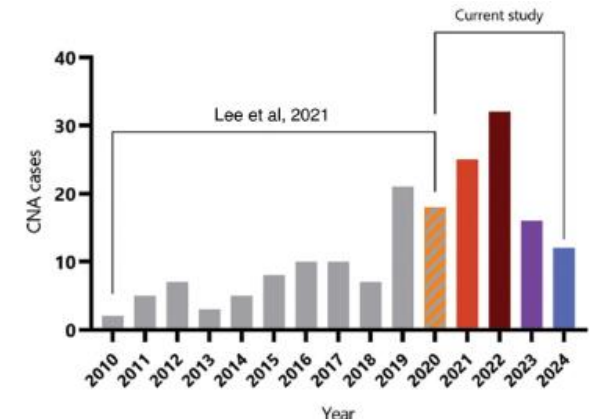


Update 3: Increasing cases in dogs (Australia)

Rivory et al. (2025)

<https://doi.org/10.1093/infdis/jiaf173>

- Sentinel species for human NAS
- Canine NAS increasing



MOFs INTRODUCTION TO AN EMERGING TECHNOLOGY

Metal Organic Frameworks

- Nanoscale, porous crystal structures made from metal ions and organic ligands (binders)



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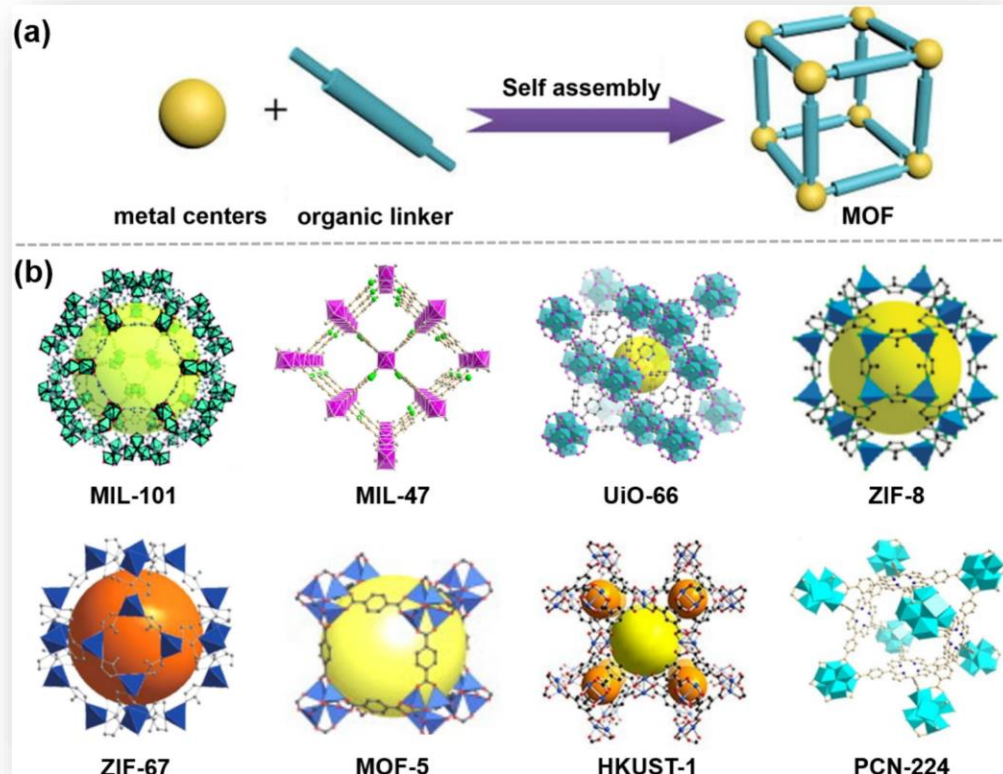


Image: Liu et al. 2025

<https://doi.org/10.1016/j.foodchem.2025.145860>

Smart packaging

Application of MOFs toward food safety

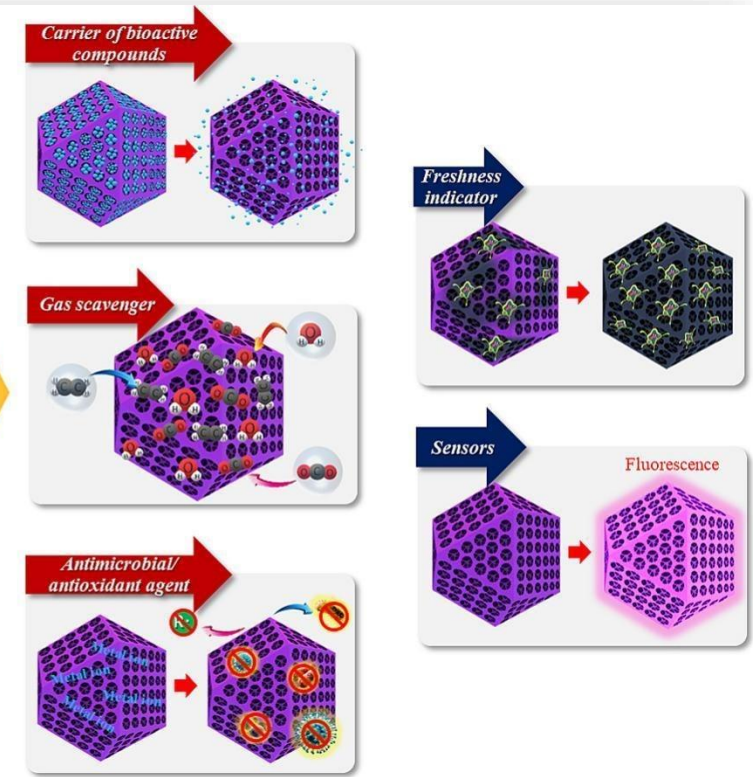
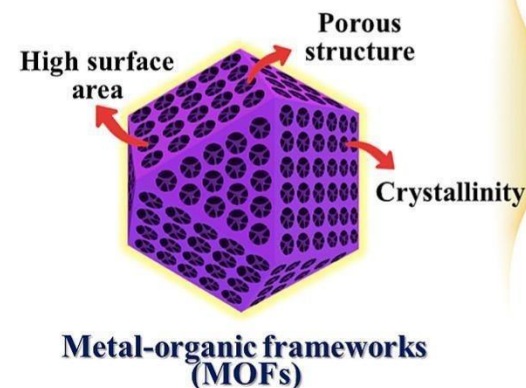


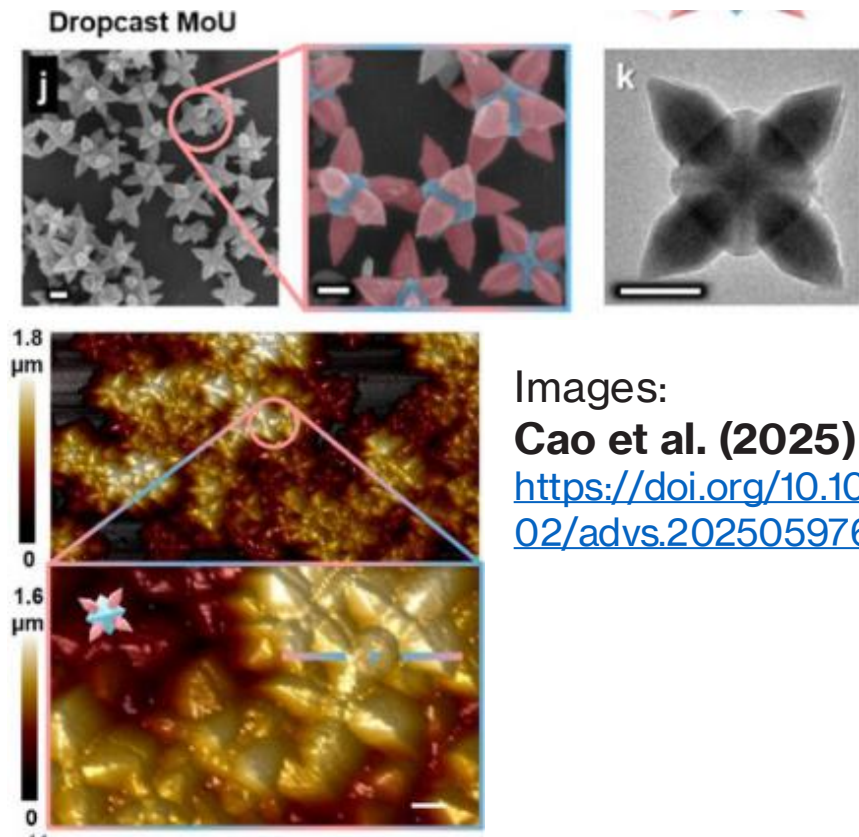
Image: Hong et al. 2025

<https://doi.org/10.1016/j.microc.2025.112816>

MOFs INTRODUCTION TO AN EMERGING TECHNOLOGY

Metal Organic Frameworks

Bactericidal surfaces



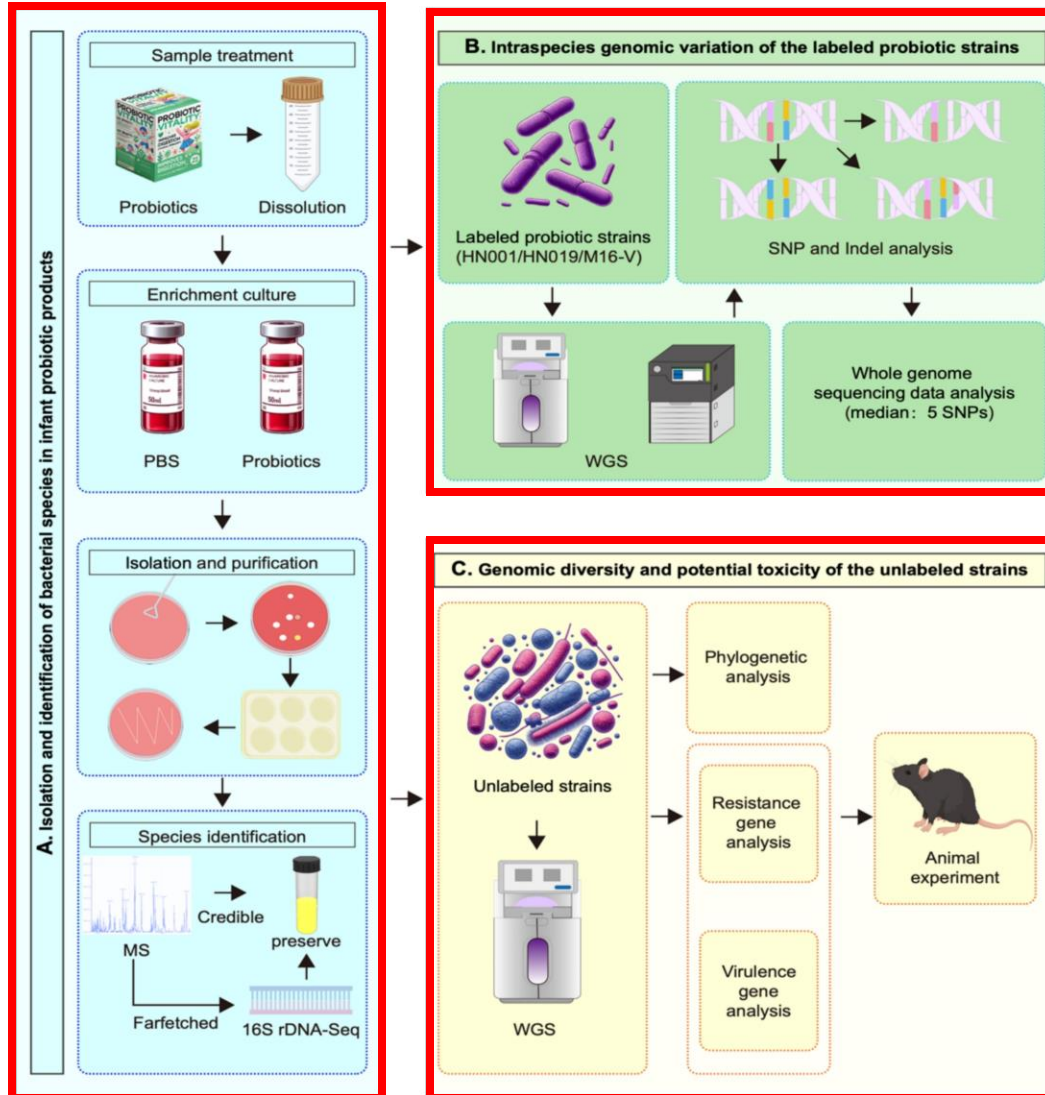
Food safety considerations

- Transfer to food from packaging/surfaces?
Need migration studies
- ADME in people?
Need toxicokinetic studies
- Health effects? (acute, chronic)
Need toxicity studies

Need standardised human health risk assessment frameworks for MOFs in food contact materials

Probiotics AN INTERESTING STUDY

Wang et al. (2026) <https://doi.org/10.1016/j.ijfoodmicro.2025.111500>



- 23 probiotic products for infants or toddlers via e-commerce (17 China, rest Sth Korea, UK, Australia, NZ)
- 2022, repeat 2023
- 7398 colonies isolated -> 26 species identified
 - Product labels: 11 species listed
 - Labelled strains absent from some products
 - Labelled strain counts non-compliant in some products
 - Unlabelled strains commonly found, incl. some not approved and some known causes of human illness.
- Labelled strains genetically diverse, some gene loss (impact on functionality?)
- Some unlabelled strains genetically similar (shared origin?)
- Virulence and antibiotic genes detected in some isolates

Infant formula dispensing machines



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Food safety risks?

General PIF safety advice:

- Wash hands
- Sterilise bottles, caps
- Use boiled water (temperature advice varies, e.g., cooled or $>70^{\circ}\text{C}$)
- Make when needed, discard unused
- Keep PIF containers closed

Purpose: Prevent microbial contamination and growth

UK survey: 56% of 489 carers using PIF used a machine

Brown et al. (2020)

https://static1.squarespace.com/static/59f75004f09ca48694070f3b/t/5f93548ed1d6ae350aa8050c/1603490967170/Marketing_of_infant_milk_in_the_UK-what_do_parents_see_and_believe_finala.pdf

Dispense warmed water



Dispense ready-to-drink formula



Infant formula dispensing machines



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Food safety risks?

Dispense warmed water

Machine adds water to bottle with powder

- Water tank ('drinking water', boiled water, distilled water? Water changes?)
- May have water filter (performance? how often changed?)
- May have "hot shot" (small volume of water heated by machine to $>70^{\circ}\text{C}$)
- Final fill (heated or unheated water to make up the final required volume, at selected temperature)
- Cleaning (water flush or dismantling?)

Core principles remain:

- Wash hands
- Sterilise bottles, caps
- Use safe water
- Make when needed, discard unused

Dispense ready-to-drink formula

Machine mixes powder and water

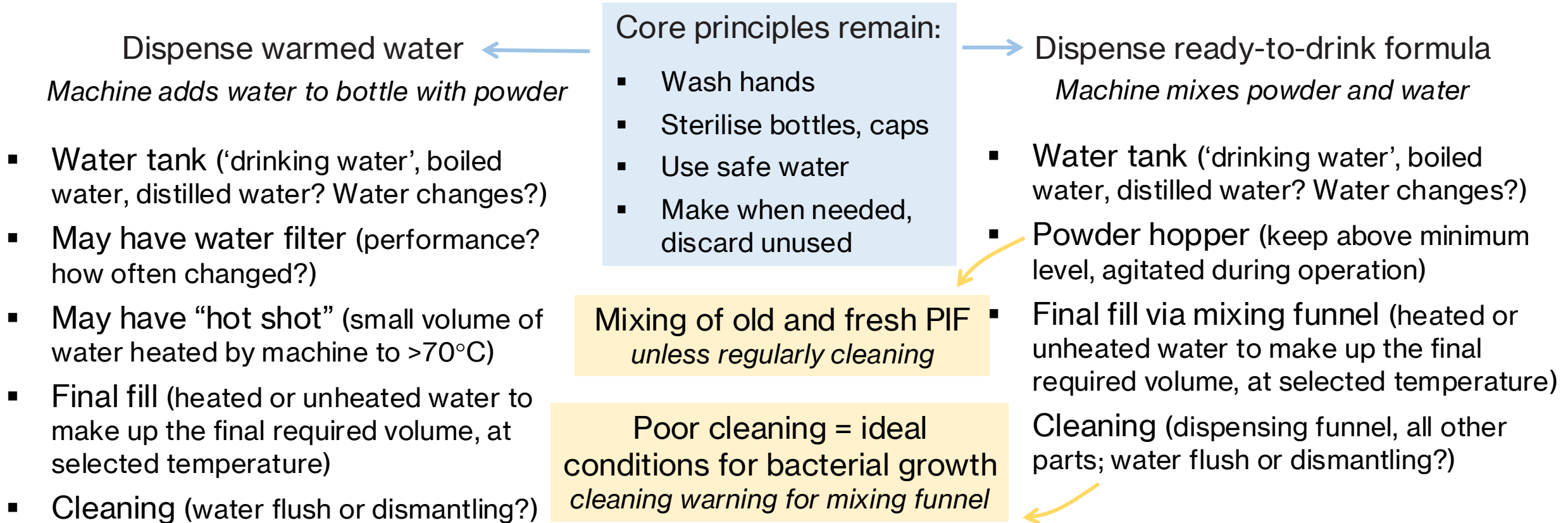
During household use:
Mean 66.8°C
(range $50.1\text{--}99.5^{\circ}\text{C}$)
falls quickly below 70°C

Grant et al. (2023)

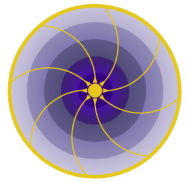
<https://doi.org/10.1111/mcn.13567>

Infant formula dispensing machines

Food safety risks?



Hygiene and maintenance by users are key to ensuring the prepared formula remains safe for infants.



Questions?



Update: Rat hepatitis E virus



Update: Rat lungworm



New technology: Metal Organic Frameworks



Probiotic survey: Label vs. contents



Infant formula dispensing machines

