Vaccine for methane reduction in ruminants

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Why a methane vaccine?

- Low frequency intervention
- Applicable to NZ's pastoral farming enterprises
- Vaccination is an acceptable farm practice
- No residues in saleable products
- Auditability

From Henderson *et al.* (2015)
Scientific Reports 5: 14567

- Globally applicable to all farmed ruminants (cattle, sheep, deer, goats, etc.)

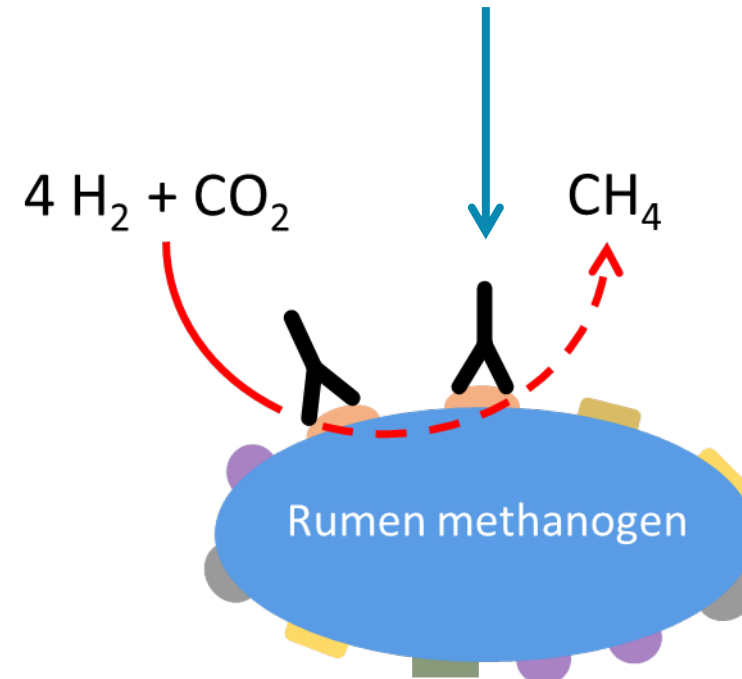- Aiming for 30% methane reduction, but has potential for more
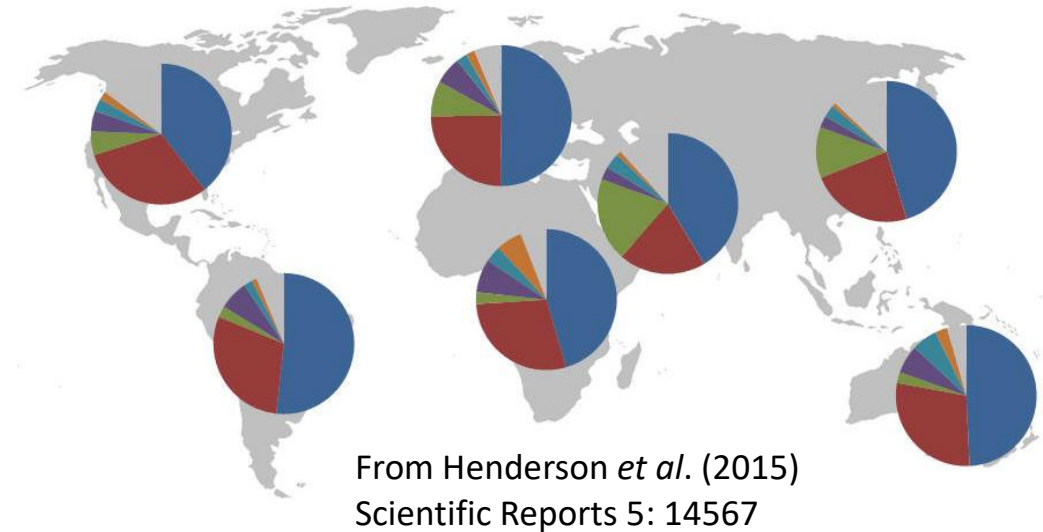
How will it work?

Vaccine consists of Antigen(s) + Adjuvant + Vaccination protocol

Animal produces antibodies in saliva against injected antigen(s); carried into the rumen
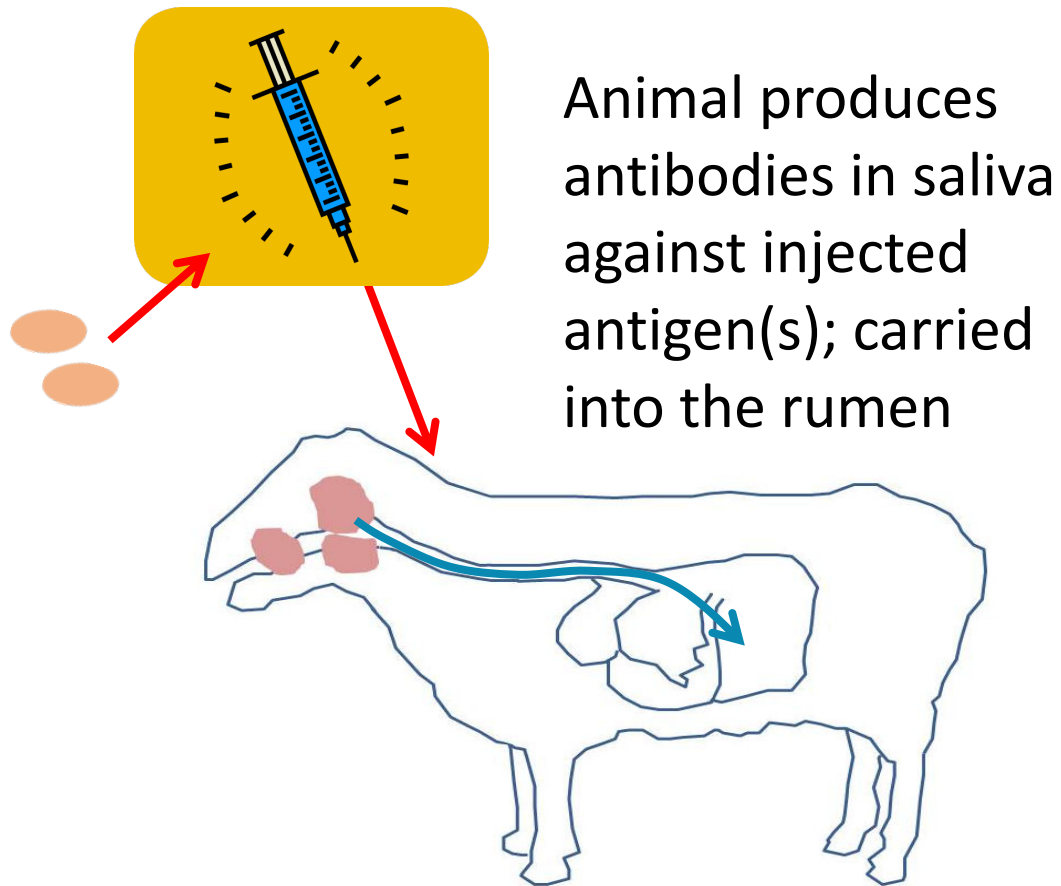
Antibodies bind to corresponding antigens on surface of methanogens

$4 H_2 + CO_2$ CH_4
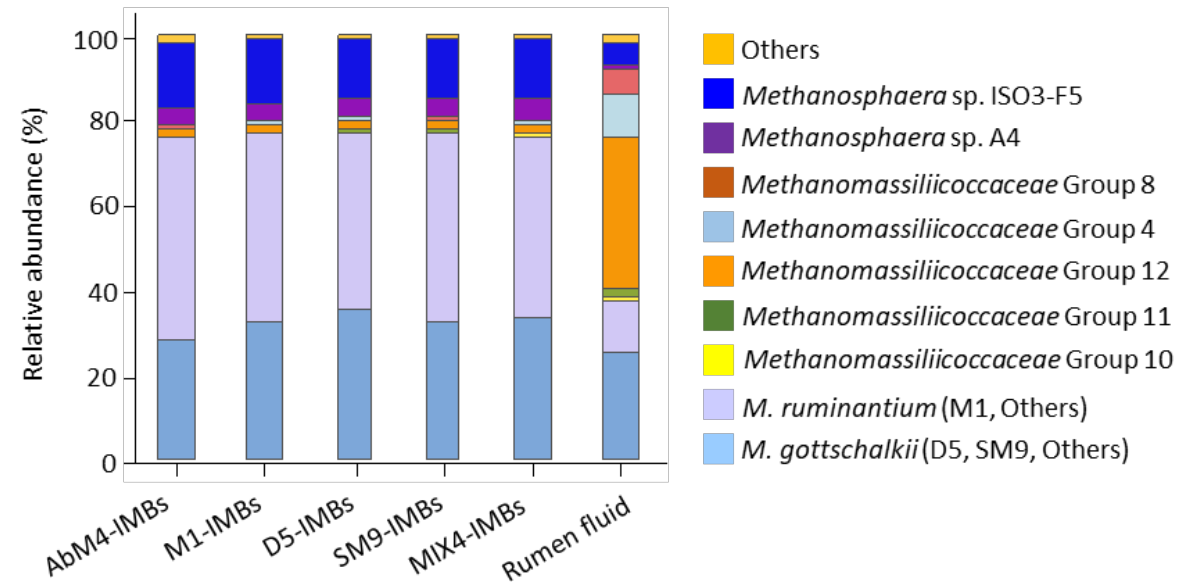
Rumen methanogen

Antibody binding to methanogens in rumen

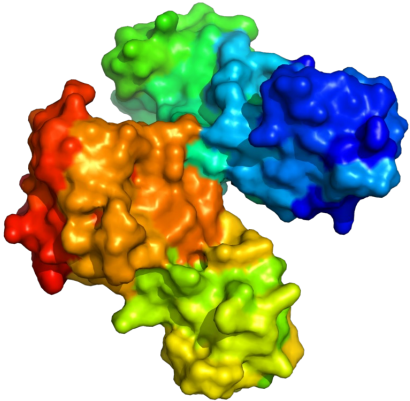Developed methods to measure antibody binding to methanogens in rumen contents (manuscript in preparation)
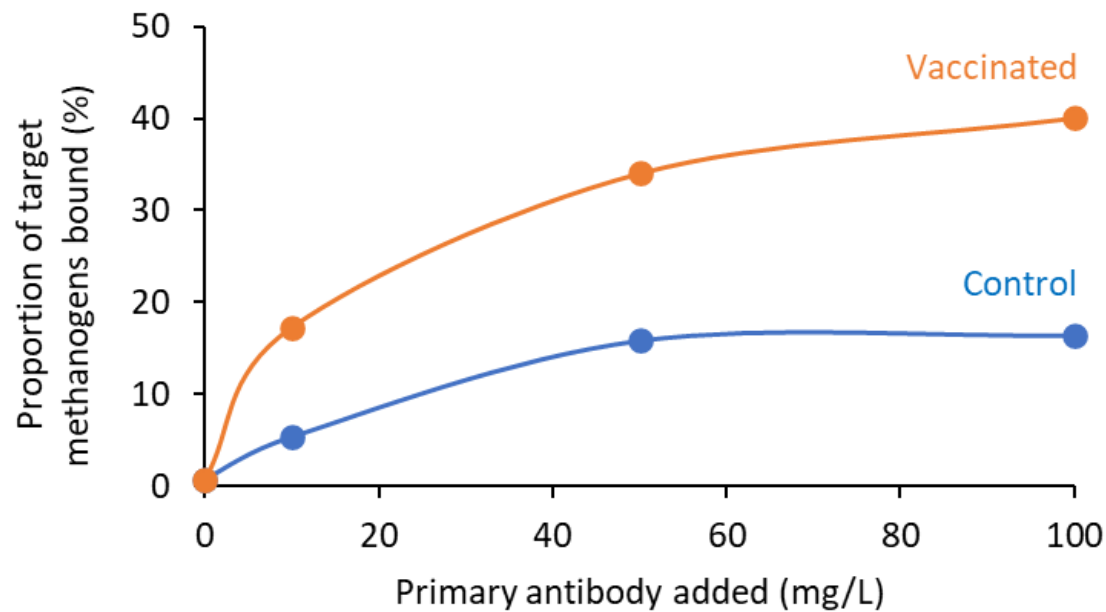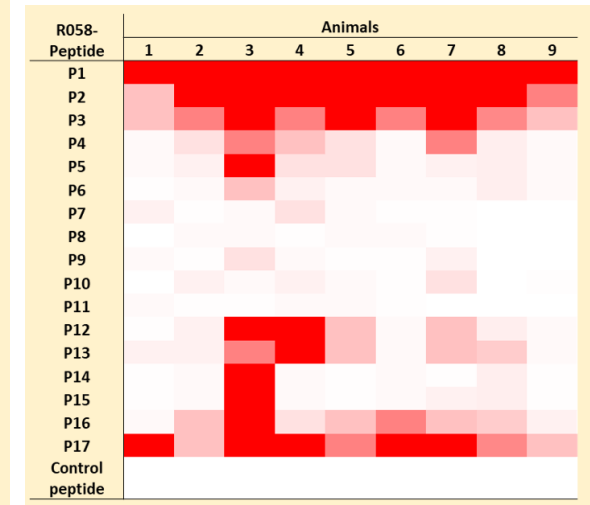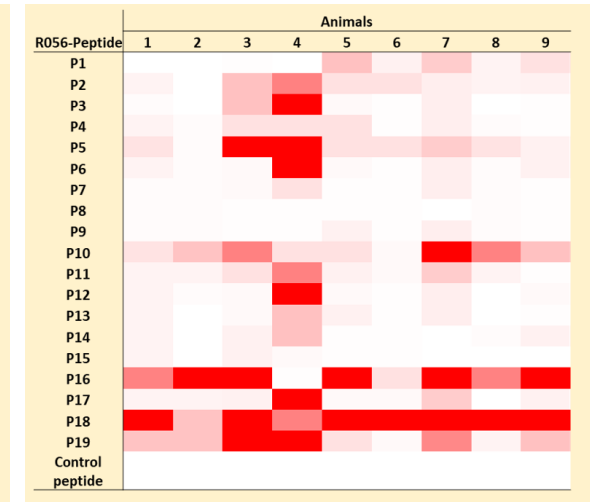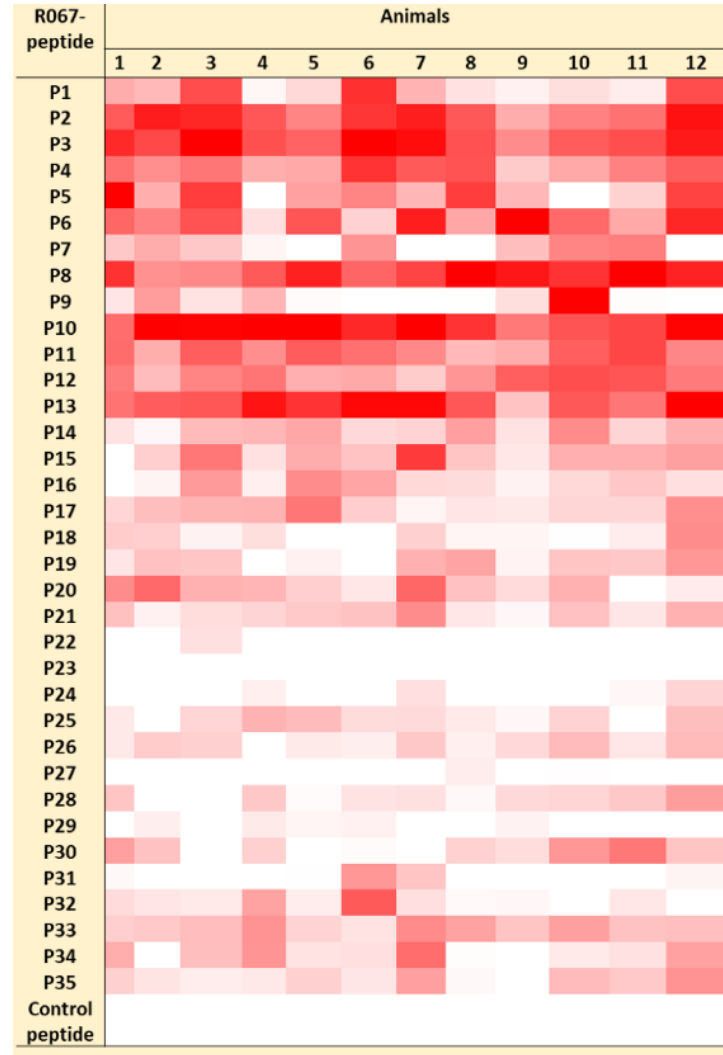

Unpublished data

Refining antibody response

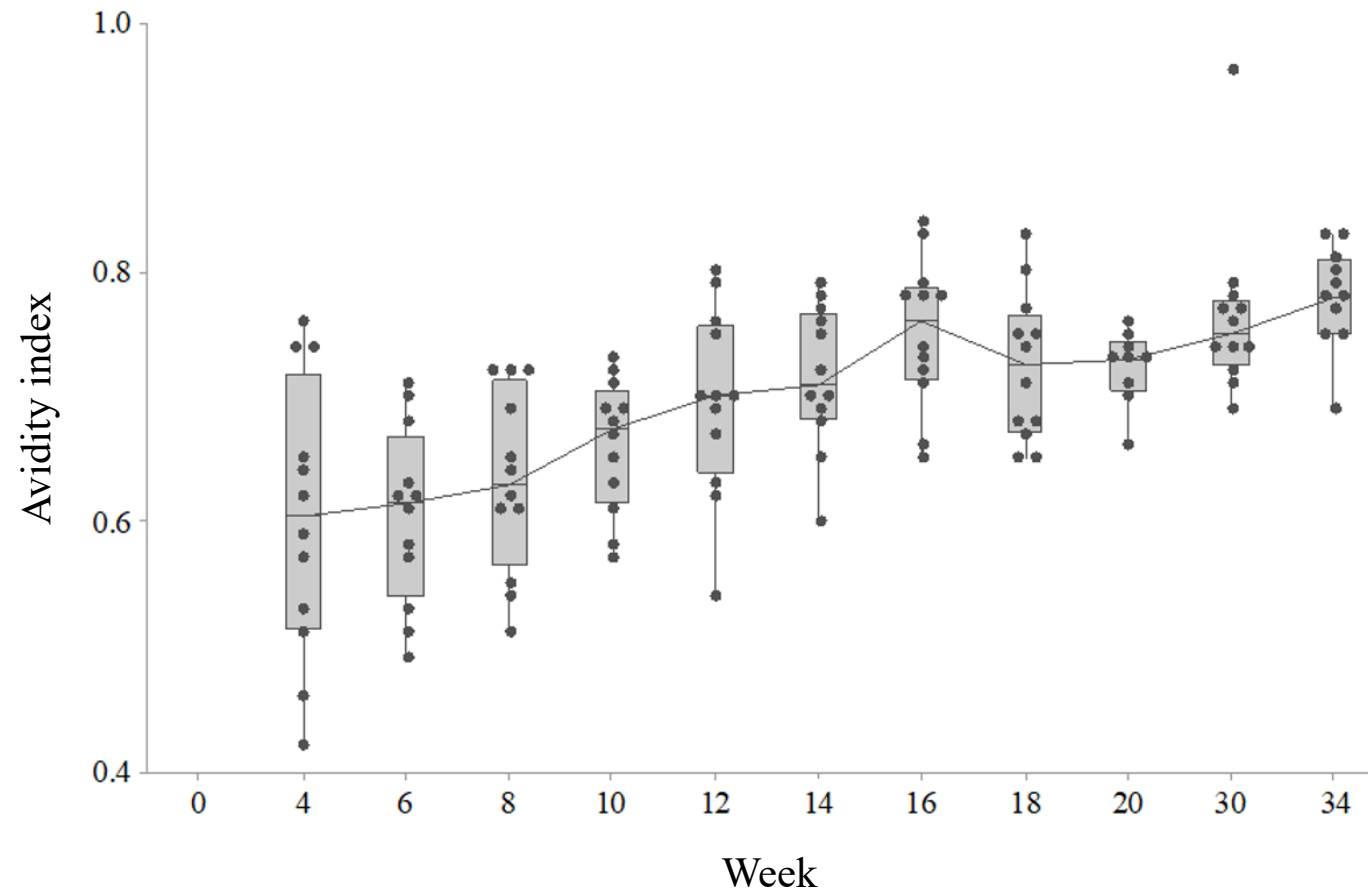The original uploader was Anmoll at German Wikipedia. -
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https://commons.wikimedia.org/w/index.php?curid=8991790

Unpublished data

Increasing avidity & reducing animal-to-animal variation

Developed method to quantify the avidity of antibody binding (manuscript in preparation)

Other activities to develop an effective vaccine

- Identification of effective antigens

- Production of antigens to better mimic the native structure

- Vaccination strategy and timing

- Adjuvants for stronger immune responses

- Directing response to saliva

- Stack gains in these for greater methane impacts

Who is doing this research?

- AgResearch (Hopkirk Research Institute, Grasslands Research Centre)
- Victoria University of Wellington (Mattie Timmer, Bridget Stocker)
- Moredun Research Institute (Tom McNeilly)
- University of Technology Sydney (Iain Duggin)
- Flowjoanna (Joanna Roberts)
- Advised by the Methane Vaccine Think Tank

- Funded by
  - The Pastoral Greenhouse Gas Research Consortium (PGgRc; NZ's pastoral farmers and their organisations, and MBIE)
  - Beef+Lamb NZ, DairyNZ, Deer Industry NZ, Fonterra, AgResearch
  - The New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC; funded by MPI and MBIE)
  - The New Zealand Government as part of its support for the Global Research Alliance on Agricultural Greenhouse Gases (GRA, GPLER)
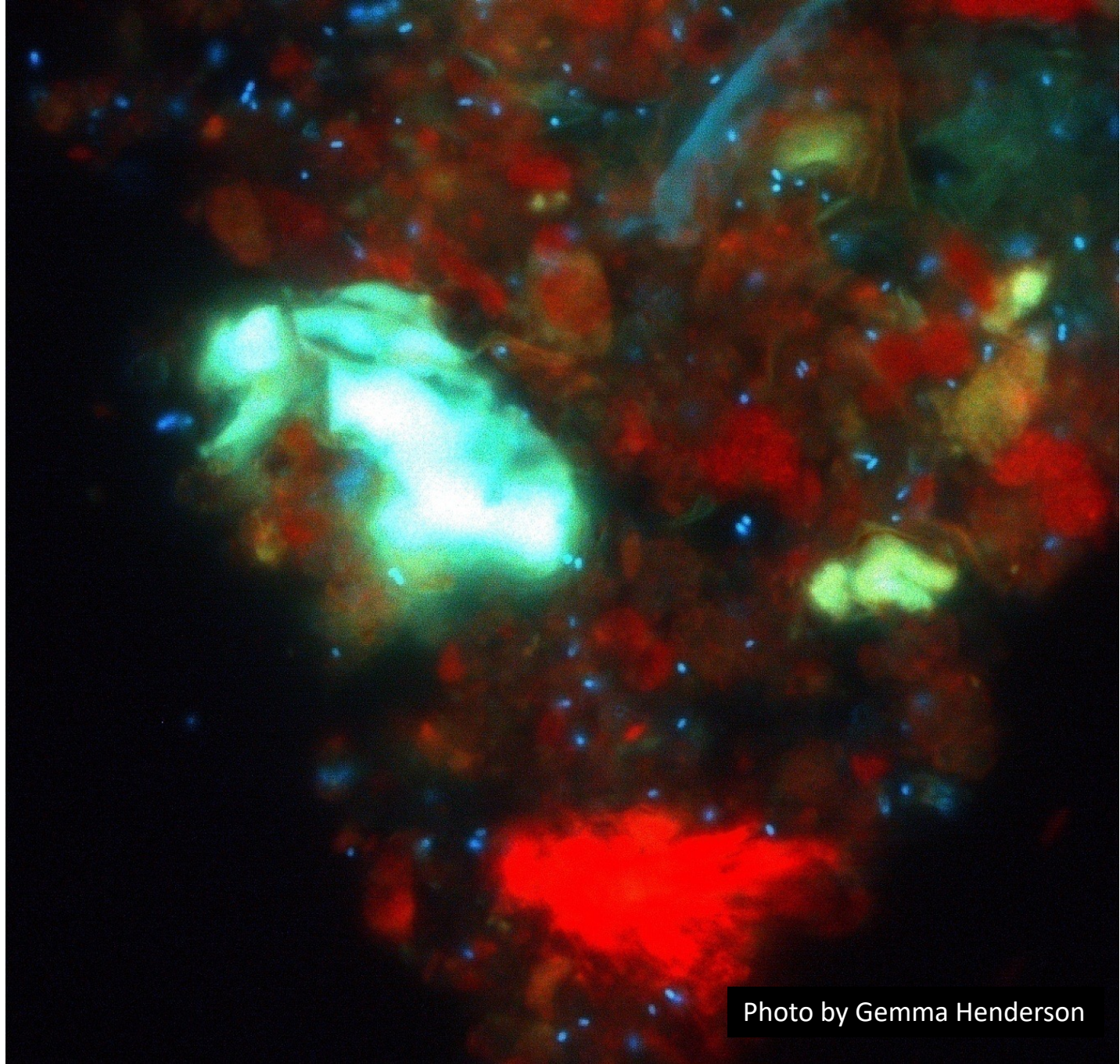
Photo by Gemma Henderson