



Rapid research inquiry

Teacher resource

Exploring the human microbiome and Gut Bugs

What is rapid research inquiry?

- a rapid research inquiry (RRI) is a structured scoping activity to give an overview of information available based on an inquiry topic
- has a tight timeframe which is enforced
- intended to encourage scanning of information
- intended to encourage curation of information from trusted sources but not in-depth exploration at this stage
- includes a report-back of some form
- aim is to generate key words and search terms within the topic and identify further questions/areas for development

About this resource

This resource includes information and topic cards as starters for student inquiries. The questions are designed to facilitate further research, learning and discussion.

The purposes of conducting an RRI will vary depending on overall learning objectives.

By conducting an RRI teachers might be seeking to:

- support students to discover or develop specific (preliminary) understandings
- develop a resource or background information base with and for students
- explore a context with students/map a broad contextual landscape
- support students to be curious within a context
- help students refine questions

Different learners will require different levels of scaffolding and support. For example, consider using [RATA \(Read-aloud-think-aloud\)](#) techniques to model scanning and assessment of information. Consider curating (for example on [Scoop.it!](#)) or providing a list of trusted sources.

Instructions for rapid research inquiry

Choose one broad question or topic for your RRI.

Give students a 10-minute (or decide what is appropriate) time limit to:

- define key words and search topics
- conduct a search and decide on 3-5 websites which provide useful, accessible information about the topic
- come up with a broad answer to the question in 100-200 words
- identify three more questions or areas for inquiry within this topic
- present findings, for example, contribute one slide to a collaborative Google slide presentation



Enhancing gut health

1. Use the terms [biodiversity](#) and [ecosystem](#) to explain why a healthy gut requires a rich diversity of microbes.
2. Research and discuss steps that you and your friends can take towards enhancing your gut health.
3. Investigate and explain how microbial action (for example acid-producing bacteria) plays a part in making or preserving food and drink. Here are some suggestions: kombucha, Kānga kōpiro, ginger beer, yoghurt, kefir, sauerkraut, Rēwena paraoa, sourdough bread, vinegar, miso...
4. The word probiotic comes from Greek and means "for life". Explain the difference between prebiotics, probiotics and symbiotics. Discuss their effect on the human gut microbiome and human health. How do they achieve, restore, or maintain a favourable balance of microbes in the gut microbiome?
5. Would you consider the capsules containing faecal material in the Gut Bugs GMT process to be a probiotic? Why/why not?
6. It is becoming increasingly evident that rise in NCDs in Western countries could be due in part to the loss of beneficial bacteria and microbial diversity. Explore traditional diets e.g. the [Indian thali](#) or the diet of the [Hadza people](#). Discuss ways that these diets differ to Western diets. Explain how the types of foods in these diets might support a gut ecosystem that allows diverse, beneficial bacteria to flourish.
7. Scientists are only recently beginning to understand the many ways that microbes impact human health. Research and discuss how microbes might work to influence our digestion and metabolism processes, i.e. how we are able to extract nutrition and energy from our food.
8. Investigate and explain the differences between coprophagy and rumination in the digestion and extraction of nutrients from food.



The human microbiome

1. Microbiome research is a new and fast-developing area of biology. Discuss possible reasons for why this type of research has not been conducted before.

Listen to this [RNZ podcast](#) of Jeff Leach from the Human Food Project to help you.

2. Use the terms symbiosis, commensalism, mutualism and parasitism to explain, giving examples, the many types of interactions between humans and microbes.

3. Explain why microorganisms colonise our gut (colon or large intestine) but not our stomach or small intestine.

4. Hygiene means keeping clean in order to stay healthy – for example washing hands before eating. Discuss the role of anti-microbial cleaning fluids and cleaning strategies in hygiene practices. Link this to the germ theory of disease. Does hygiene mean complete sterilization? Is the Hygiene Hypothesis still relevant? Read about the different, and changing scientific perspectives surrounding this theory.

5. Discuss these statements, which were made in a [Cosmos article](#) about the human microbiome:

- a) Our bowels are outside our bodies
- b) More than 99% of our DNA isn't ours

Use this [TED talk by Rob Knight](#) to help you think about and respond to the statements.

6. Research and discuss the topic of infant microbiome development.

7. Read about the [Liggins Institute ECOBABe study](#). What hypotheses are being tested? Discuss the processes and ethics involved in this controlled clinical trial.

8. Research and explain how antibiotic resistance occurs and the implications for human health.

9. Research and discuss the impact of antibiotic use on the gut microbiome.



Gut Microbiome Transfer

1. The Gut Bugs pilot showed that recipients' gut microbiome shifted to resemble that of the donor. What might be next steps for this research - what other question(s) could the team ask? What might be their hypotheses? Could you think of an experimental design to test that hypothesis?
2. Research and discuss the use of GMT in treating *Clostridium difficile* infection.
3. Discuss the types of screening that GMT donors undergo and explain reasons for each screening procedure.
4. The Gut Bugs trial is led by Professor Wayne Cutfield (a Paediatrician) and Associate Professor Justin O'Sullivan (a Microbiologist). They are supported by a large team. Make a list of the different types of expertise required to conduct the Gut Bugs trial and explain each role. Think about who would be required to find and communicate with participants, design the experimental methods, market the trial, do the lab work, coordinate the trial, screen participants, analyse results.
5. Discuss the processes involved in a double-blinded, placebo-controlled, clinical trial and explain how this delivers valid results. Use the terms bias and random in your answer.
6. Discuss ethical implications of the Gut Bugs trial. Consider both donors and recipients.
7. Explain the role of DNA sequencing in identifying microbes in the Gut Bugs trial.
8. What does current scientific research tell us about the relationship between diet and diversity of the gut microbiome? Should the recipients of the GMT treatment have been required to alter their diet? Discuss reasons for and against using the concept of scientific control.



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Rapid research inquiry sample answer

Question or topic for inquiry

Research and discuss steps that you and your friends can take towards enhancing your gut health.

Key words and search topics: enhancing gut health, good bacteria, probiotics, prebiotics, gut microbiome, fermented foods, legumes, beans, fibre

Starter websites:

<https://www.medicalnewstoday.com/articles/325293.php>

<https://www.healthline.com/nutrition/improve-gut-bacteria#section1>

<https://www.sciencefocus.com/the-human-body/how-to-boost-your-microbiome/>

<https://time.com/5556071/gut-health-diet/>

Brief, broad answer to question

Encourage diversity of good bacteria – diversity = healthy gut. Eat a wider variety of plants. Eat fermented foods to encourage the good bacteria, eat fibre, don't be hygiene-obsessed.

Further questions or areas for investigation:

- What are prebiotics/probiotics/ what recipes might I use?
- How many plants do I eat in a day?
- How many plant-based foods *could* I eat in a day?
- What is gut health and what are signs of gut health?
- Why is gut health important?