

## The germaphobia problem: the growing pathological aversion to microbes



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**Storyline**

Germaphobia is the pathological aversion to microbes and “dirt”. This modern-day fear may be reducing our exposure to microscopic life-forms by changing our behaviours, for example, mass sterilisation of surfaces, and avoiding natural environments. In turn, this could be contributing to an explosion in immune disorders. Humans need to be exposed to a diverse range of microbes from a young age in order to ‘educate’ the immune system. The rise of germaphobia has likely been influenced by decades of advertising campaigns creating negative perceptions of microbes, and falsely prompting mass (non-targeted) sterilization of surfaces to achieve “safe” human environments. However, far less than 0.1% of the microbes on the planet are human pathogens, and many are essential to our health and survival.

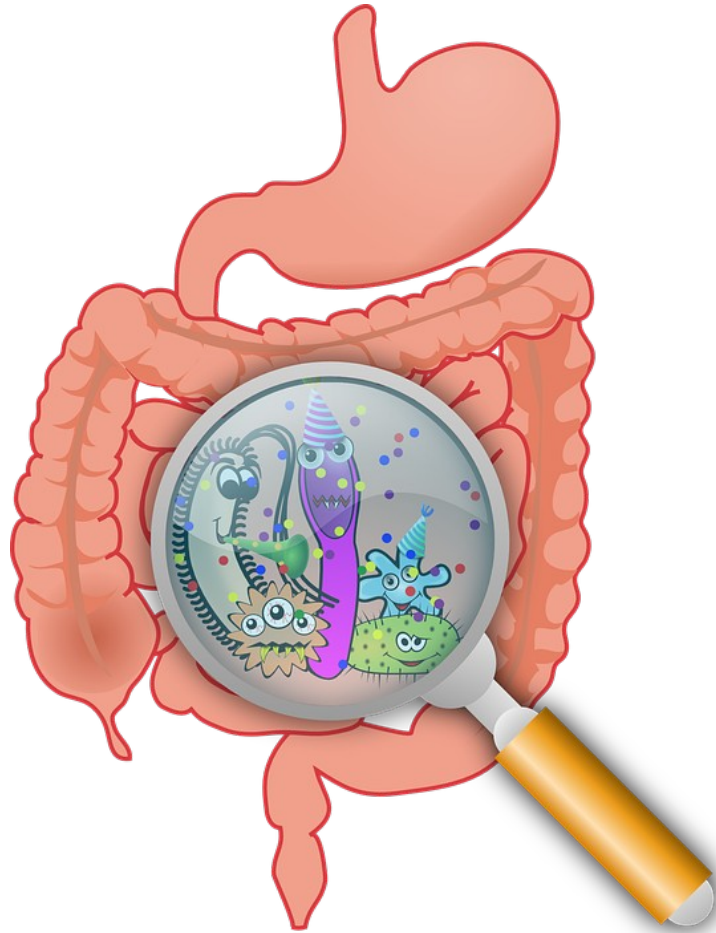
**The germaphobia problem: the growing pathological aversion to microbes**

**1. So what is Germaphobia?** Germaphobia is the pathological aversion to microbes and “dirt”. It is also known as mysophobia. Symptoms of germaphobia include avoiding certain “dirty” environments (e.g., soil) due to fear of microbial exposure, excessively washing hands, over-use of sanitizers and antibiotics.

**2. Why is Germaphobia an issue?** Germaphobia may have contributed to a major increase in human immune-related disorders (such as diabetes, allergies such as asthma, and inflammatory bowel disease). It is now recognized that exposure to environmental microbiomes—the diverse network of microbes in a given environment—plays an important role in human health. Indeed, from a young age, exposure to a diverse range of environmental microbes is considered to be essential for the establishment of the human microbiome and the training and regulation of our immune system.

Colonization of a stable and functional human microbiome begins following birth. Firstly, by transfer to the baby of microbes from the mother’s vagina, skin and in breast milk, and later supplemented from visitors, pets, biodiverse environments, and a “normal dirty” (not overly cleaned) home environment. Whilst recognizing that targeted hygiene is essential, germaphobia and the associated overly-clean disposition could conceivably inhibit all of these activities (e.g., avoiding playing in soil or staying away from animals), and if the human microbiome establishment process is derailed, the negative health consequences such as improper immune function, could be a long-term issue. In addition to helping to prevent disease, microbes are essential to human health by contributing to digestion, providing vitamins and other chemicals that are useful to the human body (see fig. below).

**3. How else do microbes benefit humans?** Microbes play essential roles in carbon and nutrient cycling, climate regulation, animal and plant health, and global food security. They can be viewed as the foundations of our ecosystems. Consequently, ongoing threats to communities of microbes likely poses an important threat to global biodiversity and to human societies across the planet.



Humans are protected by two layers of biodiversity. The microbes from the environment, and the microbes in our guts, skin and airways. The latter inhabit our bodies, which are colonised from microbes in the environment (from plants, soil, the air, and other animals).

**4. *What might happen if germaphobia continues?*** If the growing fear of and lack of appreciation for microbes continues to increase, then humans could face increasingly severe immune diseases and our ecosystems may also suffer. Because avoiding natural ‘dirty’ environments is a symptom of germaphobia, it may also reduce our connectedness to nature. Nature connectedness is a person’s cognitive, experiential and emotional connection with the natural world. It is strongly linked to pro-ecological behaviours as well as mental and physical wellbeing. Therefore, avoiding natural environments may be detrimental to both our physical and mental health, and may inhibit environmental stewardship.

**5. *What can we do to address germaphobia?*** Perhaps the most important thing we can do to address germaphobia is to learn to appreciate the invisible biodiversity that surrounds us – the diverse communities of microbes. As mentioned, they provide many benefits to humans, plants and animals across the planet and deserve a renewed appreciation.

It is important to emphasise here that targeted hygiene (e.g. cleaning toilets, washing body parts, preparing food safely) is essential to our health and for preventing diseases. However, mass sterilisation of natural microorganisms is not needed to sustain good levels of hygiene. Therefore, the other thing we can do to address germaphobia is to think about our

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hygiene in a more balanced and reasoned way. This includes reminding ourselves that keeping every object and surface squeaky clean is not needed.

Another thing we can do to address germaphobia is to spend more time engaging with the natural world. This means regularly visiting the green and blue spaces around us – the woodlands, parks, lakes – and enhance our nature connectedness. A recent study has shown that this may improve our attitudes towards microbes, which is a precursor to reducing germaphobia-related behaviours.



Spending time in natural environments is essential to our health and wellbeing and could reduce germaphobia.

### Relevance for Sustainable Development Goals and Grand Challenges

- **Goal 3. Good health and wellbeing.** Germaphobia could be detrimental to health and wellbeing by reducing our exposure to immune system-promoting microbes from the environment. Avoiding certain environments as a result of germaphobia could also reduce the myriad of other health benefits that spending time in nature provides.
- **Goal 11. Sustainable cities and communities.** To achieve sustainable communities we need to protect natural environments. If we avoid natural environments due to germaphobia and our environmental stewardship is reduced, and this could have important implications for sustainability.
- **Goals 13 Climate action and 15 Life on land.** As above, we need to promote a deeper appreciation for nature in order to address the climate and biodiversity crises. Germaphobia could inhibit this appreciation.

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### Potential Implications for Decisions

#### 1. *Individual*

- a. Should I constantly sterilise all household surfaces? Or can I just employ a 'targeted' approach (cleaning body, toilet, sinks, preparing food safely)?
- b. Should I avoid spending time in nature due to it being 'dirty'? Or can I spend more time exploring different natural environments, and more regularly?
- c. Should I learn about the different roles microbes play in making sure the human body is healthy?
- d. Should I learn about the different roles microbes play in sustaining functional ecosystems, and all other life on Earth?

#### 2. *Community policies*

- a. Local education and campaigns about the importance of microbes, their roles in human health and ecosystem functionality.
- b. Campaigns aimed at increasing people's time spent engaging with nature, and exposure to diverse microbial communities.
- c. Campaigns aimed at educating about the importance of diverse diets (for pre and probiotic benefits).

#### 3. *National policies*

- a. National education and campaigns about the importance of microbes, their roles in human health and ecosystem functionality.
- b. Declaring microbial literacy and access to safe biodiverse environments a national priority
- c. Taxes and other incentives/disincentives to eat a more diverse, plant-based diet

### Pupil Participation

1. *Class discussion of the issues associated with germaphobia*, and the importance of targeted hygiene and spending time in nature
  - Approximately how much time do you spend in natural environments (such as parks, woodlands, lakes etc.)?
  - The next time you visit a natural environment, note down three ways in which you think microbes contribute to the environment, and bring these to the next session.
  - The next time you visit a natural environment, note down three good things you see in nature and bring these to the next session.
2. *Pupil reflection on microbes and their engagement with natural environments*
  - What is your opinion about microbes?
  - Do you think some microbes are beneficial to humans and if so, in what ways?
  - Do you think some microbes are beneficial to ecosystems and other animals/plants, and if so, in what ways?

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### The Evidence Base, Further Reading and Teaching Aids

#### *Useful resources/groups*

- The Healthy Urban Microbiome Initiative (HUMI): <https://www.humicity.org/about>
- Microbes and Social Equity Working Group: <https://sueishaqlab.org/microbes-and-social-equity-working-group/>
- Professor Graham Rook and the Old Friends Hypothesis: <http://www.grahamrook.net/>
- Conversation Article: 'Why spending more time in nature could reduce germaphobia' <https://theconversation.com/why-spending-more-time-in-nature-could-reduce-germaphobia-163741>
- The Schoolrun.com Microorganisms: <https://www.theschoolrun.com/homework-help/micro-organisms>

#### *Videos*

- Prof. John Cryan TEDMED: Food for thought: how gut microbes change your mind: <https://www.youtube.com/watch?v=vKxomLM7SVc>
- Dr Tim Spector: What role does our microbiome play in a healthy diet? <https://www.youtube.com/watch?v=-LUuqxQSaFQ>
- FEMS Microbiology Ecology Webinar on Ecology of Soil Microorganisms: <https://www.youtube.com/watch?v=nvRiEPi3SC0>

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### Glossary

**Biodiversity:** the variety of plant and animal life in the world or in a particular habitat

**Germaphobia:** pathological aversion to microbes and dirt

**Ecosystem:** a biological community of interacting organisms and their physical environment.

**Microbe:** a microscopic organism, which could be bacteria, algae, archaea, fungi, protozoa

**Microbiome:** the collection of microorganisms in a given environment and their theatre of activity

**Nature connectedness:** a person's emotional, cognitive and experiential connection with the natural world

**Pathogen:** any disease-causing organism, for example certain viruses, bacteria, protozoa, fungi, algae, worms, etc.