Key Stage 5 Worksheet

Podcast: Will Maggots Save the Human Race? With Biomedical Scientist Yamni Nigam

From the series: Exploring Global Problems, by Swansea University

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What is it about?

In this podcast, Biomedical Scientist Professor Yamni Nigam discusses her research into wounds and antimicrobial resistance. Yamni talks about using maggots to combat the antimicrobial crisis and heal infected wounds while working to overcome the "yuck factor" associated with these creepy crawly medical powerhouses.

Listen to the podcast:
swansea.ac.uk/research/podcasts/yamni-nigam/

Open the file in your web browser to click on the links.

Why is antimicrobial resistance a problem?

The easiest and most effective way to treat bacterial infections is with antibiotics. There are many kinds, but all of them work by killing bacteria or preventing their growth and spread. Unfortunately, the ease of access and effectiveness of antibiotics has led to their overuse for treating minor infections and in intensive farming. As a result, antibiotic-resistant bacteria, such as MRSA, have started to evolve – making the infections they cause much harder to treat. The World Health Organisation (WHO) has classified this microbial resistance as a "widespread serious threat", making the discovery and implementation of antibiotic-alternatives of upmost importance. The pharmaceutical industry, in general, has shown a reluctance to invest in researching new antibiotics, as it is more profitable to develop drugs for long term conditions. Fortunately, due to research by biomedical scientists- such as Professor Yamni Nigam, alternatives are starting to be put forward.

Why use maggots?

Professor Nigam's research is primarily on the use of maggots (fly larvae) as an alternative to antibiotics in the treatment of infected wounds **(maggot therapy).** The process involves placing maggots, either loose or in a permeable bag (like a teabag), onto a wound and placing a dressing on top (so the maggots cannot escape or be seen). Medicinal maggots perform 3 helpful jobs:

1. Get rid of dead tissue – maggots eat necrotic (dead) tissue. The maggots can safely work their way into any nooks and crannies more effectively than could be done with surgery. There is also no chance of them removing any healthy tissue as they can't eat it.
2. Disinfect the wound – maggots release an antimicrobial fluid to kill bacteria on the tissue they are eating. They react to infection, producing more fluid when there the infection is greater.
3. Stimulate healing – maggots help to kickstart our own healing process once the infection is gone.

Maggots are like nature's janitors!

Maggot Myth-Busting

Even though the science behind maggot therapy is sound, lots of people turn down the option. Research shows that this is because people have a negative association with maggots. Professor Nigam is working to change people's negative perceptions by informing them of how helpful they can be and by myth-busting preconceived notions. Check out some common ones below!

"Maggots are dirty and would introduce dangerous bacteria!" – Only clinical-grade maggots are used, which are from specially reared greenbottle flies. The eggs are treated to ensure they are sterile.

"Maggots are medieval. Medicine has progressed past such primitive procedures." – The benefits of using maggots are well-researched and have shown positive results in many cases where antibiotics have not. The treatment has undergone extensive testing using modern scientific methods to confirm effectiveness. They are available on NHS prescription.

Maggot Myth-Busting Continued...

"They would eat me alive!" – Maggots cannot digest living tissue and leave it alone.

"They would turn into flies on me." – Maggot therapy is only in place for a relatively short time. They would be removed long before the maggots became flies.

"I'm scared it would hurt" – The maggots grow from about 1 mm – 1 cm during the treatment so it is possible you would feel some wriggling. Like all medical treatments, our bodies can react in different ways with some finding it painful and others not feeling anything at all.

"Couldn't we do the same with a pill?" – Work is being done to turn the maggots' ability to disinfect wounds into a pill. Maggots can react to infection severity, however, making them more effective than a potential pill. Maggots also get rid of dead tissue and stimulate healing and these helpful effects would be lost.

Questions

Interactive: Click on box to start typing

By what methods do antibiotics work?

Antibiotics work by killing bacteria or preventing their growth.

Why are alternatives to antibiotics being researched?

Overuse of antibiotics has led to the evolution of antibiotic-resistant bacteria. This will eventually make antibiotics obsolete, making it is important that we find alternatives so that:

1. We can keep antibiotics effective for as long as possible
2. We have solutions for when we can't use antibiotics anymore

Considering their role in the natural world, why are maggots being considered as a viable alternative to antibiotics in certain circumstances?

Maggots are detritivores that eat decaying animal matter. Because they can only survive of dead tissue they are a safe and effective way of removing necrotic tissue from a patient. They are also very useful for cleaning infected wounds because they produce an antimicrobial fluid to kill bacteria on the tissue they are eating, reacting to the severity of the infection with more or less fluid.

What do you think is the greatest barrier to people using maggot therapy? How would you combat it?

The greatest barrier is probably people's perceptions of maggots. By educating people on how effective maggots can be and giving them a positive 'image' doctors will be more likely to offer the treatment and patients would be more likely to choose it. The best way to do this is to teach young children about the benefits before they develop a 'yuck' response and to feature maggots and maggot therapy in a positive light on tv, film, radio, podcasts, magazines and anywhere that gets lots of people watching/listening/reading.

Exercise

Create a leaflet that could be used to promote the use of maggot therapy to potential patients and inform them of the effects and benefits. You should include facts and figures and should try to address common concerns and misconceptions. You should also include some pictures, but make sure they are appropriate – anything too gory might be off-putting to a potential patient!

Find out more about it

- Visit **loveamaggot** for more on medicinal maggots!
- Read this NHS information sheet to find out more about the benefits and risks of maggot therapy.
- **Watch this (Content Warning!)** - maggots/dead animals/infected wounds) National Geographic video if you would like to see medicinal maggots in action.
- Check out this Khan Academy guide to learn more about antibiotic resistance.
- Watch this TED Talk about the history of antibiotics and the problems being caused by their overuse.
- Read this factsheet from the World Health Organisation (WHO) about antibiotic resistance.

For teachers and home schoolers

Links to Science in the National curriculum for Wales (KS5)

A-Level Biology

LIVING ORGANISMS, INCLUDING PLANTS, ANIMALS AND MICROORGANISMS, INTERACT WITH EACH OTHER AND WITH THE NON-LIVING WORLD.

BIODIVERSITY

- The variety of life, both past and present, is extensive, but the biochemical basis of life is similar for all living things.

ECOSYSTEMS

- Biomass transfers through ecosystems and the efficiency of transfer through different trophic levels can be measured.
- Ecosystems are dynamic systems, usually moving from colonisation to climax communities in a process known as succession.

Swansea University Science for Schools Scheme

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