A child-centric microbiology education framework

# Blow flies

*Get ready to dive into the intriguing world of blow flies, those fascinating insects that make us go "ewww" and "wow" at the same time! Have you ever noticed those buzzing blow flies that have a knack for finding the most unexpected and, let's admit it, kind of gross sources of food? It's like they have a sixth sense for sniffing out the weirdest and smelliest things around. What on earth drives these extraordinary creatures to seek out such unconventional and icky sources of nourishment? Get ready to be both amazed (and grossed out) as we delve into the fascinating world of blow flies!*


**Aram Mikaelyan**[1], **Tatiana Teixeira Torres**[2], **Kelly Meiklejohn**[3], and **Lauren Weidner**[4]

[1]Department of Entomology and Plant Pathology, North Carolina State University

[2]Department of Genetics and Evolutionary Biology, Institute of Biosciences, University of São Paulo

[3]Department of Population Health and Pathobiology, North Carolina State University

[4]School of Mathematical and Natural Sciences, Arizona State University

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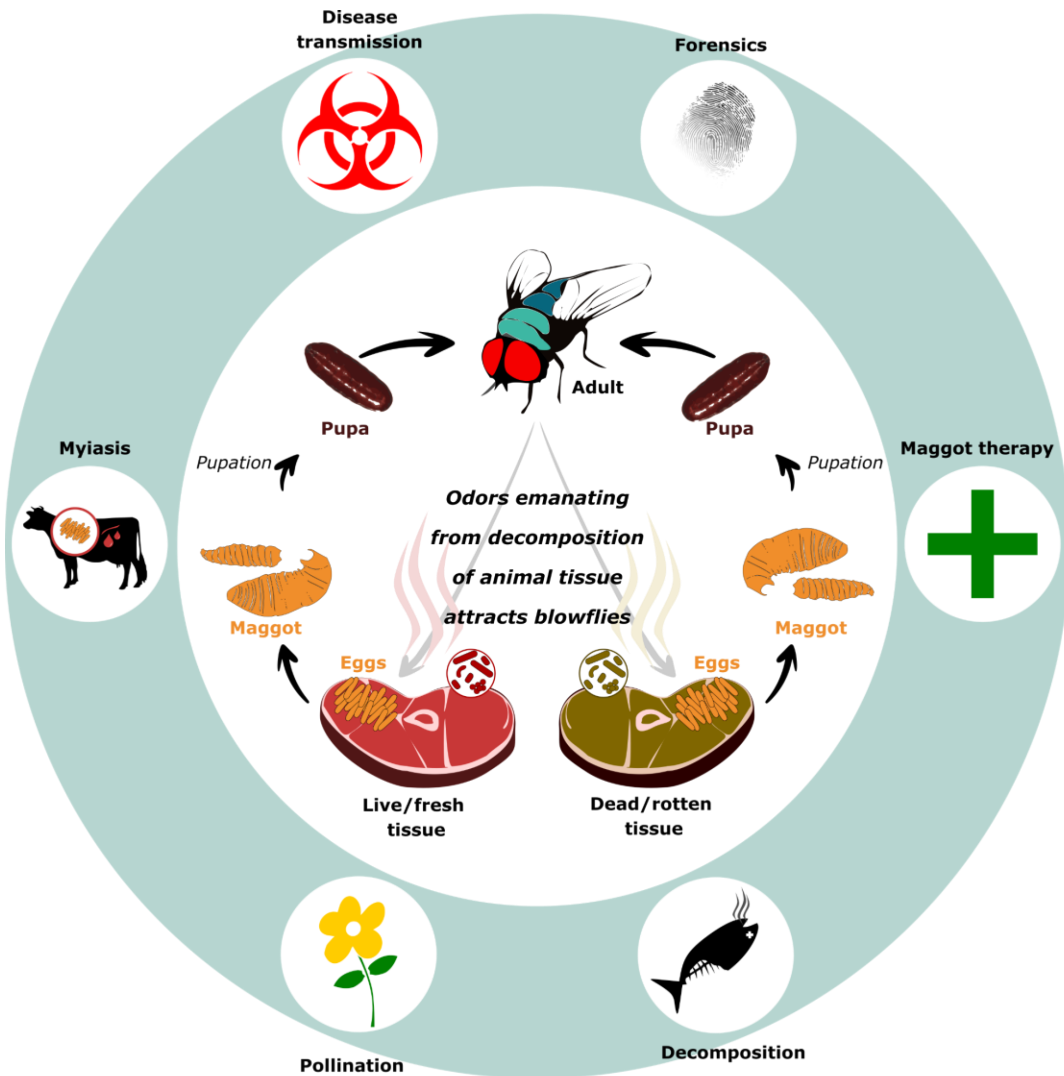
## Storyline

Blow flies, those buzzing, iridescent insects that capture our attention, impact our environment in complex ways. From their role in decomposition of dead animals to their association with disease transmission, blow flies play crucial roles in our ecosystems. Among the various species of blow flies, the misleadingly named primary and secondary “screwworms” stand out as parasites. Primary screwworms target warm-blooded animals (mammals and birds), infesting open wounds and causing severe tissue damage if left untreated. Unlike primary screwworms, secondary screwworms invade existing wounds, impeding healing and causing discomfort to their hosts. While blow flies are known for their association with festering wounds, they can also be used medically for cleansing them. Certain blow fly larvae, when raised under sterile conditions, are used in maggot therapy to selectively devour dead tissue in wounds, which promotes their healing. Additionally, there are several blow flies that can be used in forensic investigations to estimate minimum time since death.

Join us on a captivating journey as we explore the fascinating world of blow flies, including the remarkable adaptations of primary and secondary screwworms. We will delve into their unique life cycles, understand their impacts on animal health and agriculture, and examine the measures taken to control and prevent infestations. By gaining a deeper understanding of these parasitic blow flies, we can appreciate the challenges they pose and work towards sustainable solutions to mitigate their effects. Let's embark on this captivating journey to uncover the secrets of blow flies and their remarkable role in our ecosystem.

## The Microbiology and Societal Context

*The microbiology*: Blow flies inhabit environments bustling with microbes, and their interactions with these tiniest of organisms have far-reaching ecological consequences that affect us in many ways. Exploring the fascinating world of blow flies and the microbes they associate with unlocks valuable insights into how they impact nutrient cycling in our ecosystems and our society. By understanding the microbiology of blow flies, we gain knowledge about how they collaborate with microbes to ensure that the nutrients in dead animals are returned to the environment. We can also learn how best to tackle public health issues, protect the environment, and ensure sustainable agricultural practices. Get ready to delve into the captivating world of blow fly microbiology and discover how it profoundly influences our society.




**Blow flies: The Microbiology**

1. ***Blow flies as decomposers:*** Blow flies are part of the necrobiome, wherein they collaborate with microbes to play a crucial role in the environment as decomposers or saprophages. They aid in the breakdown of organic matter, including carrion, dung, and decaying plant material. By consuming and breaking down these organic resources, blow flies contribute to nutrient cycling and ecosystem health. When an animal dies, blow flies are among the earliest to arrive at the scene. Blow flies, like many other carrion flies, are attracted to the odors emanating from decomposing organic matter, such as carrion, feces, and wound sites. The decomposition process of animal remains involves numerous bacteria and other microorganisms. The metabolic activities of these microbes lead to the production of various volatile organic compounds (VOCs). These VOCs, such as cadaverine, putrescine, and skatole, act as olfactory cues for blow flies, signaling the presence of a suitable site for egg-laying and feeding. They

play a crucial role in the initial breakdown of the carcass by laying their eggs on or near the decaying tissue. The blow fly larvae, also known as maggots, then feed on the decaying flesh, accelerating the decomposition process. By consuming the organic matter, blow flies and their associated microbiomes accelerate the decomposition process, helping to recycle nutrients back into the environment and ensuring the efficient utilization of organic matter. This process is essential for maintaining the balance of nutrients in ecosystems (ecosystem balance) and supporting the growth of plants and other organisms.

2. ***Blow flies as parasites:*** Some blow flies can also be attracted to wound sites, especially in the presence of necrotic tissue. Here, the microbiome associated with the wound may contribute to the production of similar odorous compounds as in decaying flesh. Wound infections that are left untreated may harbor bacteria that produce strong odors, attracting blow flies and other insects.

3. ***Primary and Secondary Screwworms:*** Primary and secondary screwworms are parasitic blow flies that pose significant threats to both humans and animals. Primary screwworms infest open wounds, cause severe tissue damage, and can cause myiasis, a condition where the maggots feed on living flesh. These infestations can lead to pain, discomfort, and potential complications if left untreated. Secondary screwworms target existing wounds, obstruct wound healing and increase distress to the animals. The presence of these parasitic blow flies requires prompt intervention to prevent the spread of infection and mitigate the negative impacts on the animal's health.

4. ***Unique Life Cycles:*** Blow flies undergo a complex life cycle, with most species going through the following four developmental stages: egg, larva (maggot), pupa, and adult. Some special blow flies under the right conditions are even ovoviviparous, which means they give birth to live maggots instead of laying eggs! The duration of each stage varies depending on environmental conditions, such as temperature and humidity. As with other insects with larval stages, the life cycle of blow flies allows the larva and the adult to exploit diverse habitats and food sources. This ecological flexibility allows blow flies to fulfill their role as decomposers in various ecosystems, contributing to the efficient recycling of organic matter.

5. ***Impacts on Animal Health and Agriculture:*** Blow fly infestations can have detrimental effects on animal health and agriculture. In livestock, blow flies can cause myiasis, resulting in reduced productivity, weight loss, and potential secondary infections. The damage inflicted by blow fly larvae can cause discomfort and distress to animals, impacting animal welfare and leading to economic losses for livestock farmers. Effective management and prevention strategies are

crucial to mitigate the negative impacts of blow fly infestations on animal health and agriculture.

6. ***Control and Prevention:*** Various control measures are employed to manage blow fly populations and minimize their negative impacts. These measures include the use of insecticides to target blow flies, implementing biological control agents that are natural enemies of blow flies, proper waste management practices to remove breeding sites, and maintaining hygiene in animal husbandry to prevent infestations. Integrated pest management approaches that combine multiple control methods are often employed to ensure effective and sustainable control of blow fly populations while minimizing the potential risks to the environment, human health, and non-target organisms.

7. ***Sterile Insect Technique (SIT):*** The Sterile Insect Technique (SIT) is a fascinating method used to control harmful insect populations, and it was first successfully applied to the New World screwworm, which despite its somewhat misleading name, is actually a species of blow fly, scientifically known as *Cochliomyia hominivorax*. This technique involves raising a large number of insects, making them sterile through radiation, and then releasing them into the wild. However, with advancements in gene editing technology, tools like CRISPR are now being explored as a way to create sterile insects, offering a more targeted approach to achieve the same results as radiation. When these sterile males mate with wild females, no offspring are produced, which gradually reduces the insect population. This innovative method has proven to be effective in combating pest insects like *C. hominivorax*, helping protect both livestock and public health. The sterile male technique is a powerful, safe and environmentally friendly tool in pest control that has been successfully applied to various harmful insect pests, minimizing their impact on agriculture, public health, and the environment.

8. ***Microbial pathogens and antimicrobial resistance:*** As blow flies feed on decaying organic matter, including feces and carcasses, they come in contact with various bacterial pathogens. This makes them potential carriers of diseases like diarrheal illnesses and wound infections. One crucial aspect of studying blow flies and their interaction with pathogens is the emergence of antimicrobial resistance. The overuse and misuse of antibiotics have led to the development of drug-resistant bacteria, making infections more challenging to treat. Understanding how blow flies contribute to the spread of pathogens and the potential for antimicrobial resistance is essential for devising effective strategies to prevent and control diseases. The microbiology of blow flies and their interaction with pathogens is an area of ongoing research to better understand the dynamics of disease transmission and develop strategies for disease prevention and control.

9. ***Forensic Entomology:*** Blow flies are invaluable in forensic investigations due to the various answers they can provide for investigators. They can be used to estimate the minimum postmortem interval (time since death) by studying their development and determining which life stages were associated with human remains and how long it took to reach that stage. Additionally, the species present can be used to detect whether the corpse has been relocated post death. Blow flies can also be used to detect the presence of drugs or toxins in human remains and we can even pull DNA from their gut! The study of blow flies and their life cycle in forensic entomology has helped to enhance the accuracy and reliability of estimating the minimum time of death in various forensic scenarios as well as aid in answering other questions investigators may have.

10. ***Waste Management and Decomposition:*** Blow flies are vital contributors to waste management and decomposition processes. Their ability to break down organic waste, including animal carcasses and decaying matter, accelerates the decomposition process and reduces the environmental impact of organic materials. Blow flies efficiently recycle nutrients and contribute to the overall health and functioning of ecosystems by facilitating the decomposition of organic waste materials.

11. ***Societal Implications:*** The presence of blow flies can have social and economic implications. In addition to their potential role as disease vectors, infestations can cause distress and discomfort to humans and other animals. Blow fly infestations in public spaces, homes, or agricultural settings can impact tourism, food safety, and public health perception. Addressing blow fly infestations and managing their impacts effectively is crucial to maintain a healthy and sustainable environment for human well-being.

12. ***Biodiversity and Conservation:*** Blow flies, despite their notorious reputation, are an integral part of natural environments. It is important to recognize that not all species are harmful pests. Blow flies contribute to biodiversity by supporting diverse ecological interactions and serving as a food source for various organisms. They play an important role in the food web, by themselves serving as a food source for other animals and microbes. While infamous for their roles in decomposition and infestation, many species also have a lesser-known but key role as pollinators of various plants, aiding in the growth of crops that other animals, including humans can feed on. Conserving blow fly populations and maintaining their ecological roles is therefore crucial for preserving biodiversity and ecosystem functioning. By recognizing the importance of blow flies in the ecosystem and implementing conservation measures, we can contribute to the overall balance and health of natural environments.

13. **Maggot Debridement Therapy:** This is a natural healing method, also known as larval therapy, that uses the larvae of certain flies, like blow flies, to help wounds recover. These tiny creatures have a unique diet that consists of dead tissue. When these larvae, or maggots, are placed on a wound, they munch on the dead tissue and bacteria, cleaning the wound area and promoting healing. The maggots also secrete antimicrobial products that have been found to disrupt bacterial biofilms, as well as inhibit fungal and viral pathogens, making this a natural and beneficial treatment for certain types of wounds. Maggot debridement therapy has been used for centuries and has shown great results in treating difficult wounds and infections. Today, it continues to be used as an alternative treatment in some medical centers, especially for wounds that do not respond well to traditional methods.

## Relevance for Sustainable Development Goals and Grand Challenges

***Preserving Health and Well-being:*** The association of blow flies with disease transmission highlights the importance of controlling their populations to mitigate the risk of infections. By implementing effective control and prevention strategies, we can safeguard human and animal health, contributing to the goal of promoting good health and well-being.

***The Path to Zero Hunger:*** The activities of blowflies impact livestock productivity, which has implications for food security. However, while combating blow fly infestations and minimizing their negative effects on agricultural production is important, it is also important to keep in mind their crucial roles as carrion decomposers and pollinators, in any discussion of control strategies.

***Preserving Biodiversity:*** Blow flies play a crucial role in nutrient cycling, decomposition, and maintaining the balance of ecosystems. They are also underappreciated pollinators of several plant species. Conserving blow fly populations and recognizing their ecological significance can contribute to preserving biodiversity, protecting ecosystems, and ensuring sustainable land use.

***Tracking Blow fly-Microbe Interactions:*** The microbiomes of blow flies and their interactions with pathogens provide insights into the microbial world and its response to environmental and economic changes. Studying blow flies can contribute to understanding the complex dynamics of microbial communities, their role in climate change, developing strategies to mitigate the impacts of a changing climate, .

***Understanding how Blow flies Sense the World:*** Blow flies possess unique sensory abilities and behaviors of blow flies that enable them to find food sources and suitable habitats. Valuable insights into the mechanisms of insect behavior and sensory processing can be gained using blow flies as model systems. By extension, studying blow flies can also contribute to advancing our understanding of neural systems and inspire new approaches in the field of neurobiology.

***Understanding Trophic Specialization:*** Different species of blow flies have adapted to different environments and evolved to exploit diverse food sources. This diversity includes trophic specialists that are parasites, feeding on fresh animal tissue (e.g. wounds) as well as saprophages that feed on rotting animal tissue (e.g. carrion). Some called "facultative parasites" have the capacity to feed on both. Although it is known that microbes play an important role in blow fly ecology, whether they influenced their trophic specialization remains to be seen. By studying what each species of blow flies feeds on, we can gain insights into how parasitism may have evolved not just in blow flies, but across insects and other animals as well.

***Managing the Nitrogen Cycle:*** Blow flies play a central role in nutrient cycling, particularly nitrogen (the Nitrogen cycle), which highlights their significance in the context of the recycling of nitrogen from animal carcasses. This contributes to developing sustainable practices for managing nitrogen resources and reducing environmental impacts.

***Innovating Pest Control Strategies:*** The development of novel methods to manage blow fly populations can serve as a guide for controlling other pest species. One such approach is the Sterile Insect Technique (SIT), a potent strategy in pest management that has seen successful implementation across a variety of insect pests globally. This technique is not only safe but also environmentally conscious, aiding in the regulation of harmful insect populations. Consequently, it mitigates their detrimental effects on agriculture, public health, and the environment, showcasing the potential of innovative pest control strategies.

## Potential Implications for Decisions

The study and understanding of blow flies and their ecological roles have important implications for various decision-making processes. Here are some potential implications to consider:

1. ***Agricultural Practices:*** Recognizing the impact of blow flies on livestock, farmers and agricultural policymakers can implement measures to prevent and manage blow fly infestations. This may include adopting integrated pest management strategies, promoting proper waste management practices, and using SIT, targeted insecticides or biological control agents to mitigate the economic losses caused by blow flies.
2. ***Public Health Measures:*** The potential role of blow flies as vectors of diseases underscores the need for public health interventions. Health authorities can educate communities about the risks associated with blow flies and implement awareness campaigns to promote personal hygiene, wound care, and effective waste management practices to reduce the chances of disease transmission.
3. ***Conservation Efforts:*** Understanding the ecological significance of blow flies can inform conservation initiatives. By acknowledging the contribution of blow flies to biodiversity and ecosystem functioning, especially their underappreciated role as pollinators, we can advocate for the protection of the habitats supporting blow fly diversity. By recognizing blow flies as important contributors to biodiversity and, conservationists can advocate for the protection of blow fly habitats, promote sustainable land use practices, and include blow flies in biodiversity monitoring programs.
4. ***Waste Management Strategies:*** Blow flies are valuable contributors to waste management and decomposition processes. Decision-makers responsible for waste management can consider the role of blow flies in accelerating organic waste decomposition and explore ways to optimize their beneficial effects. This may involve implementing composting programs, utilizing blow fly larvae in waste treatment facilities, or designing waste management systems that facilitate blow fly-assisted decomposition.
5. ***Sustainable Agriculture and Livestock Production:*** The impacts of blow fly infestations on animal health and productivity highlight the need for sustainable livestock production practices. Balancing these negative impacts with their positive contributions as carrion decomposers and pollinators necessitates a more nuanced and comprehensive understanding of their ecology. Implementing targeted pest management, ensuring proper hygiene in animal husbandry, and exploring alternative methods for blow fly control can promote sustainable agricultural approaches and animal welfare, while minimizing the use of chemicals..
6. ***Research and Innovation:*** The study of blow flies presents opportunities for further research and innovation. Decision-makers in academia, research institutions, and funding agencies can prioritize research on blow flies' biology, behavior, and interactions with the environment. This can lead to the development of novel control methods, improved understanding of disease transmission

dynamics, and innovative applications of blow flies in waste management, agriculture, and other sectors.

7. ***Policy Development:*** The knowledge gained from studying blow flies can inform the development of policies and regulations. Policymakers can integrate scientific findings on blow flies' ecological roles, impacts, and potential risks into policy frameworks related to public health, agriculture, waste management, and biodiversity conservation. This can help ensure that policies are evidence-based, promote sustainable practices, and address the complex ecological and societal implications associated with blow flies.

## Pupil Participation

1. ***Class Discussion of the ecological and economic impact of blow flies*** In this classroom discussion, students will explore the role of blow flies in ecosystem health and engage in critical thinking about their ecological significance. The discussion will revolve around the following questions and prompts:

   a. The Role of Blow flies: What is the ecological role of blow flies as decomposers? How do they contribute to nutrient cycling and the breakdown of organic matter in the environment?
   b. Disease Transmission: Discuss the potential impacts of blow flies as vectors of human and veterinary diseases. How do their feeding habits on decaying organic matter expose them to pathogens? What kinds of diseases can be transmitted by blow flies, and what are the implications for public health?
   c. Economic Implications: Explore the economic consequences of blow fly infestations in agriculture and livestock farming. How do blow flies affect crop yield, livestock productivity, and overall economic sustainability? Discuss the challenges faced by farmers in managing blow fly populations.
   d. Control and Prevention Strategies: Brainstorm and evaluate different control and prevention strategies for managing blow fly populations. Consider the use of SIT, pesticides, biological control agents (pathogens and parasitoids of blowflies), waste management practices, and hygiene measures. Discuss the advantages, disadvantages, and potential environmental impacts of these approaches.
   e. Ethical Considerations: Engage students in a discussion about the ethical implications and potential ecological consequences of managing blow flies. Should we prioritize the

conservation of some blow fly populations despite the challenges they pose? How can we strike a balance between protecting public health and preserving ecological interactions?

***2. Pupil Stakeholder Awareness***

a. Question: How can the presence of blow flies in our surroundings affect public health, hygiene, and community well-being?
   Prompt for Discussion: Explore the implications of blow fly infestations in different environments, such as urban areas, livestock farms, and agricultural settings. Discuss the potential risks associated with blow flies as disease vectors and the importance of targeted control strategies. Consider the impact of blow fly infestations on public perception, tourism, and overall community hygiene. Brainstorm preventive measures and strategies that individuals and communities can adopt to minimize the negative consequences of blow fly infestations and promote a healthier living environment.
b. Question: How can we promote sustainable pest control practices to manage pest populations of blowflies while minimizing harm to beneficial populations?
   Prompt for Discussion: Explore the various methods and approaches to controlling blow fly populations, taking into consideration the principles of sustainability. Discuss the advantages and disadvantages of different pest control techniques, such as the use of insecticides, biological control agents, Sterile Insect Technique (SIT), and integrated pest management strategies. Consider the potential environmental impacts of each method and the long-term sustainability of their application. Brainstorm innovative and eco-friendly approaches that can effectively manage blow fly populations while minimizing harm to beneficial insects, wildlife, and the overall ecosystem. Discuss the importance of education and awareness in promoting sustainable pest control practices and their role in maintaining a balanced and healthy environment.

***3. Exercises***

a. Exercise 1: Environmental Impact Analysis
   Instructions: Divide the students into small groups and assign each group a specific scenario related to blow flies. The scenarios can include situations such as blow fly infestations in agricultural settings, blow fly-mediated disease transmission, or blow fly impact on waste management. Instruct the groups to discuss and analyze the potential environmental impacts of the given scenario. They should consider the ecological

consequences, biodiversity effects, and sustainability implications. Each group should present their findings to the class, highlighting the significance of understanding blow fly-related environmental impacts and proposing potential solutions for mitigating the negative effects.

b. Exercise 2: Exploring Alternative Solutions

Instructions: Engage students in a brainstorming session to explore alternative methods for controlling blow fly populations, focusing on sustainable and eco-friendly approaches. Provide them with information on different strategies, such as biological control, cultural control, or natural repellents. Divide the students into pairs or small groups and assign each group to come up with a creative solution for blow fly management that minimizes environmental harm. Instruct them to prepare a short presentation or poster showcasing their proposed method, highlighting its advantages, potential effectiveness, and its compatibility with sustainable practices. Encourage discussions and debates among the groups, fostering critical thinking and innovation in finding sustainable solutions to blow fly-related challenges.

c. Exercise 3: Role-Playing Scenario - Maggot Debridement Therapy

Instructions: This exercise is designed to help students understand the practical applications and potential challenges of using maggot debridement therapy in a medical setting. Divide the class into small groups and assign each group a role: patient, doctor, nurse, family member, and hospital administrator.

Scenario: A patient has a non-healing wound that has not responded to traditional treatments. The doctor is considering the use of maggot debridement therapy and needs to discuss this with the patient and their family. The nurse will be responsible for administering the treatment and providing care. The hospital administrator is concerned about the cost, potential risks, and public perception of the therapy.

Each group should discuss the scenario from their assigned perspective, considering the benefits, challenges, ethical implications, and other factors relevant to their role. After the discussion, each group should present a summary of their discussion, including their decision on whether to proceed with the therapy and their reasoning. This exercise is designed to encourage critical thinking, empathy, communication skills, and a deeper understanding of the practical implications of using maggot debridement therapy.

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


1. Barton, Philip S., Saul A. Cunningham, David B. Lindenmayer, and Adrian D. Manning. "The role of carrion in maintaining biodiversity and ecological processes in terrestrial ecosystems." Oecologia 171 (2013): 761-772. https://doi.org/10.1007/s00442-012-2460-3
2. Tomberlin, J. K., Crippen, T. L., Tarone, A. M., Chaudhury, M. F., Singh, B., Cammack, J. A., & Meisel, R. P. (2017). A review of bacterial interactions with blow flies (Diptera: Calliphoridae) of medical, veterinary, and forensic importance. Annals of the Entomological Society of America, 110(1), 19-36. https://doi.org/10.1093/aesa/saw086
3. Classroom Body Farm Setup: How I Set Up a Classroom Body Farm - A detailed guide on setting up a classroom body farm to study decomposition and the role of blowflies. https://thetrendyscienceteacher.com/2023/04/16/how-i-set-up-a-classroom-body-farm/
4. Limsopatham, K., Khamnoi, P., Sukontason, K. L., Boonyawan, D., Chaiwong, T., & Sukontason, K. (2017). Sterilization of blow fly eggs, *Chrysomya megacephala* and *Lucilia cuprina*,(Diptera: Calliphoridae) for maggot debridement therapy application. Parasitology research, 116, 1581-1589. https://doi.org/10.1007/s00436-017-5435-9
5. Video on Microbiology of Blowflies: American Society for Microbiology - Blowflies and Microbes - A YouTube video by the American Society for Microbiology that explores the relationship between blowflies and microbes. https://www.youtube.com/watch?v=2K_m8Ad4HOw&ab_channel=AmericanSocietyforMicrobiology
6. Cook, D. F., Voss, S. C., Finch, J. T., Rader, R. C., Cook, J. M., & Spurr, C. J. (2020). The role of flies as pollinators of horticultural crops: An Australian case study with worldwide relevance. Insects, 11(6), 341. https://doi.org/10.3390/insects11060341


**Glossary**

**Antimicrobial resistance:** The ability of microorganisms to survive and multiply in the presence of antimicrobial substances, such as antibiotics.

**Animal welfare:** The well-being and humane treatment of animals, ensuring their physical and psychological needs are met.

**Biodiversity:** The variety of different species of plants, animals, and microorganisms in an ecosystem.

**Carrion:** The decaying flesh of dead animals.

**Climate change:** Long-term shifts in temperature, precipitation patterns, and other climatic variables, primarily attributed to human activities.

**Composting:** The process of decomposing organic materials, such as food scraps and yard waste, to produce nutrient-rich compost for soil enrichment.

**Conservation measures:** Actions taken to protect and manage natural resources, ecosystems, and biodiversity.

**Decomposers:** Organisms that break down organic matter into simpler substances, facilitating nutrient recycling in ecosystems.

**Disease transmission dynamics:** The mechanisms and factors that influence the spread and transmission of diseases within populations and communities.

**Dung:** Animal excrement or feces.

**Ecosystem balance:** The equilibrium between different components and processes within an ecosystem, ensuring its proper functioning and health.

**Ecosystem functioning:** The processes and interactions within an ecosystem that determine its overall stability, productivity, and resilience.

**Ecosystem health:** The overall condition and functioning of an ecosystem, including the balance of ecological interactions and the ability to sustain life.

**Evidence-based:** Informed by scientific research and empirical evidence, ensuring that decisions and actions are supported by reliable data.

**Facultative:** The ability of organisms to adapt to different conditions. It often refers to something that is optional rather than strictly necessary. A facultative parasite is an organism that can live either as a parasite (e.g. relying on a live animal or tissue) or independently (e.g. on rotten meat).

**Forensic entomology:** The application of insect biology and ecology to legal investigations, particularly estimating the minimum time since death based on insect activity on human remains.

**Infestation:** The presence and rapid increase of pests or harmful organisms in a specific area.

**Innovation:** The development and application of new ideas, technologies, and approaches to address challenges and improve processes or outcomes.

Integrated pest management: An approach to controlling pests that combines various strategies, such as biological control and cultural practices, to minimize the use of chemical insecticides.

**Microbial communities:** Populations of microorganisms living together and interacting within a specific environment.

**Microbiomes:** Collections of microorganisms that inhabit specific environments or organisms, such as the gut microbiome.

**Maggots:** The larval stage of flies, including blow flies.

**Myiasis:** A condition where maggots infest living tissue, typically resulting from the eggs of flies being deposited in open wounds.

**Necrobiome:** The community of microorganisms associated with decaying organic matter, including carcasses.

**Nitrogen cycle:** The cycling of nitrogen through the atmosphere, soil, water, and living organisms, involving various biological and chemical processes.

**Non-target organisms:** Organisms that are not intended to be affected by a particular intervention or control measure.

**Pathogens:** Microorganisms, such as bacteria or viruses, that can cause diseases.

**Policy frameworks:** A set of guiding principles, objectives, and guidelines that shape policy development and decision-making processes.

**Postmortem interval:** The time that has elapsed since death, typically in forensic investigations.

**Public health:** The branch of healthcare focused on promoting and protecting the health of communities and populations.

**Regulation:** Rules or guidelines set by authorities to control or govern specific activities or practices.

**Saprophage:** An organism that feeds on dead or decaying organic matter, and in doing so, helps return the nutrients back into the ecosystem. Saprophages include certain types of fungi, bacteria, but also certain insects like blow flies.

**Sterile Insect Technique (SIT):** The Sterile Insect Technique (SIT) is a fascinating method used to control harmful insect populations, and it was first successfully applied to the New World screwworm, which despite its somewhat misleading name, is actually a species of blowfly, scientifically known as *Cochliomyia hominivorax*.

**Sustainable land use:** Practices that ensure the long-term viability and productivity of land while minimizing negative environmental impacts.

**Sustainable practices:** Actions and approaches that promote long-term environmental, social, and economic well-being without depleting or damaging resources.

**Targeted insecticides:** Pesticides designed to selectively control specific insect pests while minimizing harm to non-target organisms.

**Trophic Specialization:** If an organism feeds on only one or a few types of food, they are said to be trophically (relating to food) specialized or trophic “specialists”. Others, called "generalists," have a more varied diet. This specialization helps to shape the relationships between different organisms in an ecosystem and can influence how they adapt and survive in their environment.

**Volatile Organic Compounds (VOCs):** Volatile Organic Compounds, or VOCs, are a group of chemicals that easily turn into vapor or gas at room temperature. The smells associated with a fresh slice of lemon or pinewood are the result of VOCs.

**Waste treatment facilities:** Facilities designed to process and manage various types of waste, such as sewage treatment plants or composting facilities.

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