



EXCURSIONS AND OTHER NEWS

Small insights in student's or professor's points of view, field trips, and other stuff we do.

Down the Rabbit Hole: The New BioS-Inspired Podcast

Helen Rothfuß

Listen up everyone! We are excited to share that BioS students Cosima and Leonie, and Prof. Zierau have teamed up to create a podcast! "Down the Rabbit Hole" gets into all things Biology related - starting off with the evolution of sex. New episodes are uploaded regularly and you can find them on the faculty website [1] or on Spotify [2]. And in case you have a burning question you need answered, you can send in your topic suggestion at biologie.podcast@tu-dresden.de.

Stay tuned for updates on their Instagram (@downtherabbithole.bio) and go give them a listen!

EXCURSIONS AND OTHER NEWS

Exploring Food and Feed Safety Policies: Practical at the Ministry

Sebastian Pöttsch

During my six-week internship at the Saxon State Ministry for Social Affairs and Societal Cohesion's (SMS), I gained insights into the responsibilities and functioning of the authority, which, in addition to integration and social affairs, is also responsible for health and consumer protection.

I completed my internship in Department 22, which is responsible for food and feed safety and thereby exercises specialist and supervisory authority over the lower food control authorities of each Saxon district. Every employee of the department has specialized tasks, ranging from monitoring wine to supervising the European-wide rapid alert system for food and feed (iRAFSS). I participated in projects led by these employees, engaging with diverse tasks. For instance, I analysed data from a satisfaction survey conducted by the State Institute for Food and Veterinary Services. I contributed to developing practical solutions to address deficits identified in the survey, resulting in process optimization through close collaboration with departmental leadership.

As my internship progressed, I delved deeper into food safety evaluations, analysing expert opinions from local and federal authorities. This thorough exploration sparked new ideas for tackling non-compliance issues and simplifying control procedures. Exploring toxicology terminology, including terms like TTC (Threshold of Toxicological Concern), MoE (Margin of Exposure), and ADI (Acceptable Daily Intake), piqued my curiosity. These abbreviations are just a few among many others, which are commonly used when talking about food safety and toxicological risk assessment. They are integral to evaluating the potential health effects of chemical substances in food.

In my final weeks, I contributed to formulating focal points for future inspections and participated in developing the department's annual report. Additionally, I wrote the first draft of the preface for the upcoming annual official food and feed monitoring report, enhancing my science communication skills. I also participated in the preparation of a conference, attended by department leaders from all federal states and representatives from relevant federal agencies. The conference aimed to exchange best practices and coordinate efforts in ensuring food and feed safety standards across Germany.

This internship outside the 'university bubble' expanded my horizons and revealed career opportunities for biologists. My work for the ministry not only deepened my understanding of food safety governance but also instilled in me a renewed sense of purpose to contribute to societal well-being.

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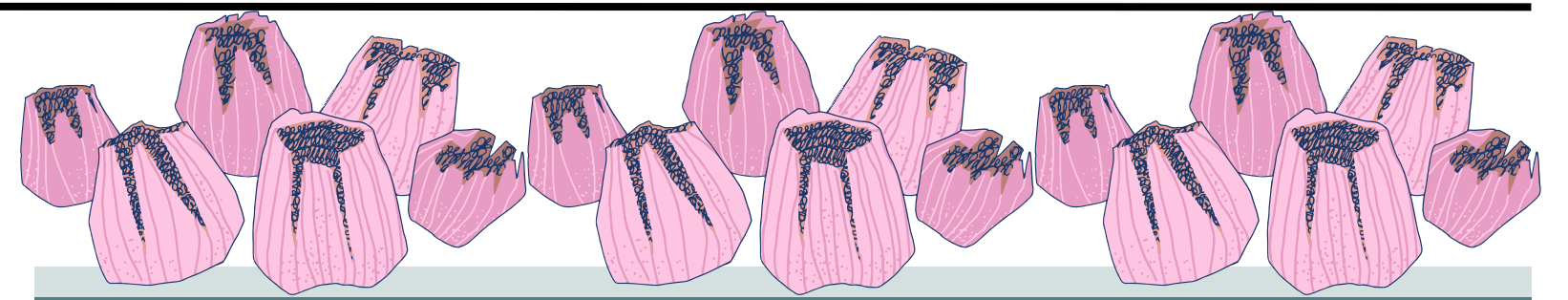
Bakteriopolis

Nele Kheim

Plants can be seen in botanical gardens, and animals in zoos or science museums, but where can we go to explore bacteria or archaea, the other domains of life with almost invisible individuals?

Bakteriopolis, a colorful traveling exhibition in an old container was created by the Institute of Microbiology at TU Dresden to offer just that. This exhibit allows visitors of all ages to observe bacterial colonies in various shapes and forms and try out modern lab equipment. Attendees can also learn about the technological potential and innovations involving bacteria, and even try some kefir—a bubbly drink produced by bacterial fermentation.

After being stationed in front of Alte Mensa for three weeks, the exhibition will move to Dresden city center from 12th to 26th August. Bakteriopolis invites everyone to have a look into the fascinating world of bacteria, which is usually hidden from us.



ANIMALS AND MONEY

This part of BioS Reports unravels interesting relation between animals and the economy

Clingy Crustaceans: Shipping Industry Loses Billions to Barnacles

Min Mao, Sophie Merz, Helen Rothfuß

Maritime transportation is a cornerstone of global trade. Roughly 1200 billion tons of goods were transported by sea in 2022 [1]. This is equivalent to about 80% of the world's trade volume. However, ocean shipping faces several challenges, one of which is the threat of barnacles.

Many will recognize barnacles as small bumps with hard shells covering rocks by the sea, reefs, turtle shells, or whale skin [2]. Barnacles are crustaceans. As larvae they attach themselves to hard surfaces under water, where they then metamorphose into the barnacles as we know them with a hard shell covering their soft body [3]. They fuse themselves to surfaces by depositing and curing a multi-protein natural adhesive [4]. This special protein-based waterproof bioglue is usually called barnacles' glue. When and where barnacles settle depends on various environmental cues that indicate suitable living conditions [3]. They will stay at this selected spot for the rest of their lives [5].

Barnacles not only attach to natural surfaces, they can also be found glued to the hulls of ships where they become a rather costly situation for the shipping industry. Barnacles sitting on the outside of a ship increase the ship's surface roughness. This increases the frictional resistance of the ship in water, which leads to higher fuel consumption, decreased speed, longer voyages, and finally together leading to more fuel requirement. In the U.S. alone, the shipping industry may spend more than 30 billion US\$ a year to overcome drag caused by marine creatures [6].

British Navy ships in temperate waters were estimated to experience a 35-50% increase in fuel consumption after six months of operating [7]. Assuming a 50% increase in fuel consumption, we can estimate the cost barnacles have for the worldwide trade of goods. A container ship at normal speed (20-25 knots or 37-46 km/hr) with a ship size of 8000 TEU consumes 225 tons of fuel per day [8]. The cost of a ton of fuel is around 700 US\$ [9], costing the company 158.000 US\$ a day. In this case, barnacles create an extra cost of around 79.000 US\$ due to the additional drag. Now we assume that the entire amount of goods transported by sea in 2022 (1200 billion tons) was transported by such container ships. One 8000 TEU container ship can be estimated to carry a volume of about 87.000 tons [10]. In 2022 the trade volume per day would have been around 3,3 billion tons. To carry this daily volume, around 38.000 container ships would be necessary. Every day each container ship likely experiences an additional cost of 79.000 US\$ due to barnacles, which was calculated above. For the year of 2022, barnacles would have created an additional fuel cost due to drag of roughly 1000 billion US\$ for the entire trade volume moved by sea.

Besides the additional expenses on fuel because of barnacles, removing them from ships is another costly matter. Hulls can either be coated early on to prevent barnacles from attaching or cleaned from barnacles. The cost of cleaning up so-called biofouling, including algae, barnacles and other shellfish, was estimated for ships of the U.S. Navy. The total cost for hull coatings, cleaning, and antifouling of a specific model of U.S. ships, which makes up 30% of US Navy fleet ships, is estimated at \$56 million per year. Considering the entire U.S. Navy fleet, the approximate cost of hull fouling is between \$180 and 260 million per year [11].

Cleaning costs can vary considerably depending on the size of ship, cleaning method and severity of biofouling. Scraping clean one square foot of hull surface can roughly cost 4,50 US\$ [12], which would equal about 49,5 US\$ per square meter. For the earlier example of an 8000 TEU containership, which likely has an underwater surface area of 16.644 square meters [13], this would create costs of about 824.000 US\$ per ship if the entire area needed cleaning. It is safe to assume that cleaning all shipping vessels from biofouling creates an additional cost for the industry in the range of multiple millions of US\$.

Although barnacles might look innocent, these little creatures cost the shipping industry multiple billions of dollars to prevent, get rid of, or otherwise deal with. Despite the economic consequences we face because of the barnacle's life cycle, we can also learn from them. The barnacle's glue has been an area of research in bionics because of its strong adhesive properties underwater [14]. This substance that is a pain to shipping can be used as a tissue glue to quickly seal up wounds and help them heal [15]. What can we learn from this? There are always two sides to a coin.