

Impact Report 2022



CEO's Introduction



I am proud of the efforts of our team who have compiled and analyzed our business activities to prepare this first ESG report. Their work will enable us to start to implement fully, from early stages, ESG best practices and sustainable systems to maximize our positive impacts that drive Proteon forward.

We are at the beginning of our ESG journey. This report is not fully comprehensive. Certain aspects, like materiality assessments, are still works-in-progress for us. Therefore, we have not used the customary ESG standards, focusing instead on the external aspects of our ESG performance as well as those standards that we have been able to achieve. As we grow over the coming years, we will be setting and meeting successive goals to improve our ESG performance and reporting. In the meantime, it is worth emphasizing that Proteon's mission and vision have – from the beginning – been focused on IMPACT. We aim to make agriculture, especially protein production, more sustainable. Our commitment to ESG standards stems from this mission and drives our efforts. It is our vision and ambition to lead the way in increasing sustainability.

Thank you for reading!

Prof. Jarosław Dastyk
Founder and CEO

I founded Proteon Pharmaceuticals 15 years ago, with the aim of helping to develop ways to mitigate the risks posed to animal health by rising antimicrobial resistance.

We at Proteon have developed products using bacteriophages – viruses that control pathogenic bacteria across a number of microbiomes. Over the years, we have progressed from start-up to commercial scale-up. In parallel with our growth as a company, a growing awareness of ESG standards has emerged in Europe and the world. Sustainability has always been at the core of what Proteon does. The concept encompasses our own business goals of reducing the use of antibiotics, reducing waste on farms and improving animal welfare, but clearly also much more. Therefore, we have decided – although there is no requirement to do so yet – to embark on the journey of documenting our ESG Compliance, Standards and Performance.

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Global Challenges

There is a need to ensure that antibiotics remain effective.

Antibiotics are very powerful and useful medications. They are the main tool used to fight infections caused by bacteria in humans and animals. Without effective antimicrobials, the success of modern medicine in treating infections would be greatly reduced, leading to more severe illness and death.

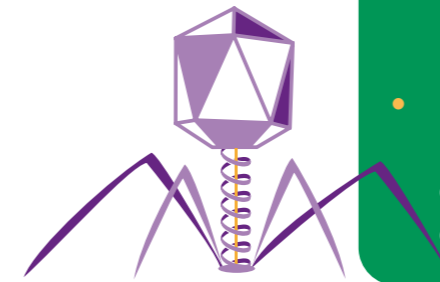
Misuse and overuse of antibiotics have led to the emergence and spread of antimicrobial resistance (AMR), a phenomenon where bacteria become increasingly unresponsive to these medicines over time. Leading authorities, such as the European Medicines Agency and the WHO, warn that the overuse of antibiotics in agriculture is contributing to higher levels of antibiotic resistance in humans. Experts argue that the implementation of more effective antibiotic use policies could reduce the use of antimicrobials in food animals by as much as 80% by the year 2030. However, achieving this goal requires innovation, as current alternative options remain insufficient to sustain food production levels.

- The World Health Organization (WHO) has declared antimicrobial resistance (AMR) to be one of the top 10 global public health threats facing humanity.¹
- According to the US Centers for Disease Control and Prevention (CDC), new challenges to food safety will continue to appear. Important reasons include changes in the environment and the emergence of new resistant bacteria.²
- The first of the five key principles formulated by the UN Food and Agriculture Organization (FAO) to guide the transition to sustainable agriculture calls for improved efficiency in the use of resources.³

There is a need to improve food safety.

Access to safe and nutritious food is a human right and the key to good health. Globalization of the food trade, climate change and the emergence of new and resistant bacteria all impact negatively on food safety levels. Moreover, evidence linking antimicrobial resistance between animals and humans is particularly strong for the most common foodborne pathogens, such as *Campylobacter* spp. and *Salmonella* spp.

The WHO aims to enhance the industrial capacity to prevent, detect and respond to public health threats associated with unsafe food. Successfully addressing this goal will require an approach that goes beyond current biosecurity practices and will take into account the interactions between human health, animal health, and our environment.



- There were nearly 5 million deaths associated with bacterial AMR in 2019, including 1.27 million deaths directly attributable to bacterial AMR. If nothing changes, these numbers will continue to increase year after year.⁴
- Every year, nearly 1 in 10 people around the world fall ill after eating contaminated food and 420,000 die annually, resulting in the loss of 33 million healthy life-years.⁵
- Roughly one-third of all food produced – 1.3 billion metric tons per year – gets lost or wasted globally throughout the supply chain, entailing enormous financial and environmental costs.⁶

There is a need for more sustainable food production.

By the year 2050, the world's population will increase to 10 billion people, resulting in even greater demand for food than today. Moreover, meeting the challenge of future food production needs will have to be faced in tandem with key sustainability challenges, such as the need to reduce greenhouse gas emissions, protect biodiversity, avoid land degradation, and increase rational water management.

Improving resource-use efficiency is the number-one priority on the list of five key principles formulated by the FAO to guide the transition to sustainable agriculture. For instance, many farmers in low- and middle-income countries still face high morbidity, high mortality rates, and low productivity in livestock farming, leading to wasted resources. In high-income countries, by contrast, food gets wasted on a massive scale as millions of tons of food a year never make it to the plate. Some of this waste occurs because of food recalls and pathogen contamination, both of which pose a threat to human health.

Bacteriophages: A New Alternative

In nature, bacteria have their own enemies: specific viruses that can infect them in the same way as other viruses infect people.

These bacteria-killers, called bacteriophages, or phages for short, are an important part of all ecosystems and microbiomes, and occur in great numbers and variety. When harnessed for industrial use, phages have a very precise mode of action, targeting only very specific bacteria without causing side effects. They are safe to use on an industrial scale, leave no chemical residue, and do not cause anti-microbial resistance.

Although phages have been known for over a century, their complexity made them difficult to use industrially and the discovery of antibiotics pushed them into the background. Today, with new technological advances, it has become possible to fully develop the potential of phages. The timing is right to use phages to help solve the challenges faced by rising antibiotic resistance, as well as to help improve sustainable agriculture.

About Proteon

Since 2008, Proteon Pharmaceuticals has been working to become a leader in developing and applying phages on an industrial scale. Our advanced technological platform brings together substantial developments in genomics, bioinformatics, AI and molecular biology to deliver world-class products supporting animal and human health and addressing the threat of rising antimicrobial resistance. Our products support food safety as well as increasing efficiency and quality in sustainable protein production.

Mission and Vision

Our products modulate the microbiome to improve animal and human health.

We help remove antibiotics from the food chain, increase environmental sustainability, improve economic efficiency and enhance animal welfare in protein production.



By the Numbers



3
Commercial products



143
Employees



5
New products in the pipeline



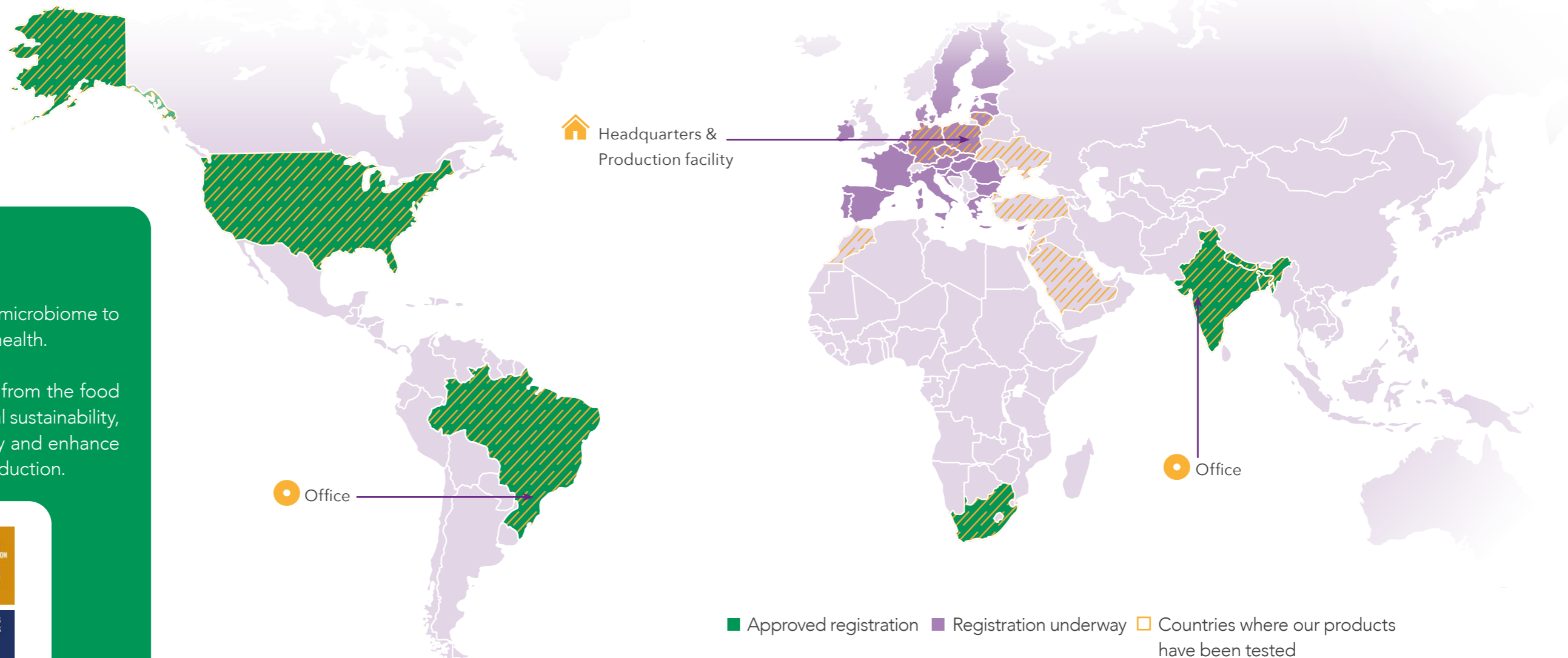
15
Patents



€8.2m
EU grants received



1
Production facility



Product portfolio

Our current product portfolio includes three bacteriophage cocktails supporting disease prevention in poultry and aquaculture.



BAFASAL®

A bacteriophage-based feed additive for poultry that increases food safety and enhances performance. Effective against *Salmonella* Enteritidis and *Salmonella* Typhimurium.

BAFACOL®

A bacteriophage-based feed additive cocktail for poultry. Effective against Avian Pathogenic *E. coli*, preventing colibacillosis.



BAFADOR®

A bacteriophage-based feed additive cocktail for aquaculture. Effective against *Aeromonas* spp. and *Pseudomonas* spp. bacteria.



We are working to further expand our product portfolio and have 5 additional products for the poultry, swine, aquaculture, and dairy industries in our pipeline.

2022 Product Impact



1.52 metric tons

Estimated reduction in antibiotic use in poultry



0.29 metric tons

Estimated reduction in antibiotic use in aquaculture



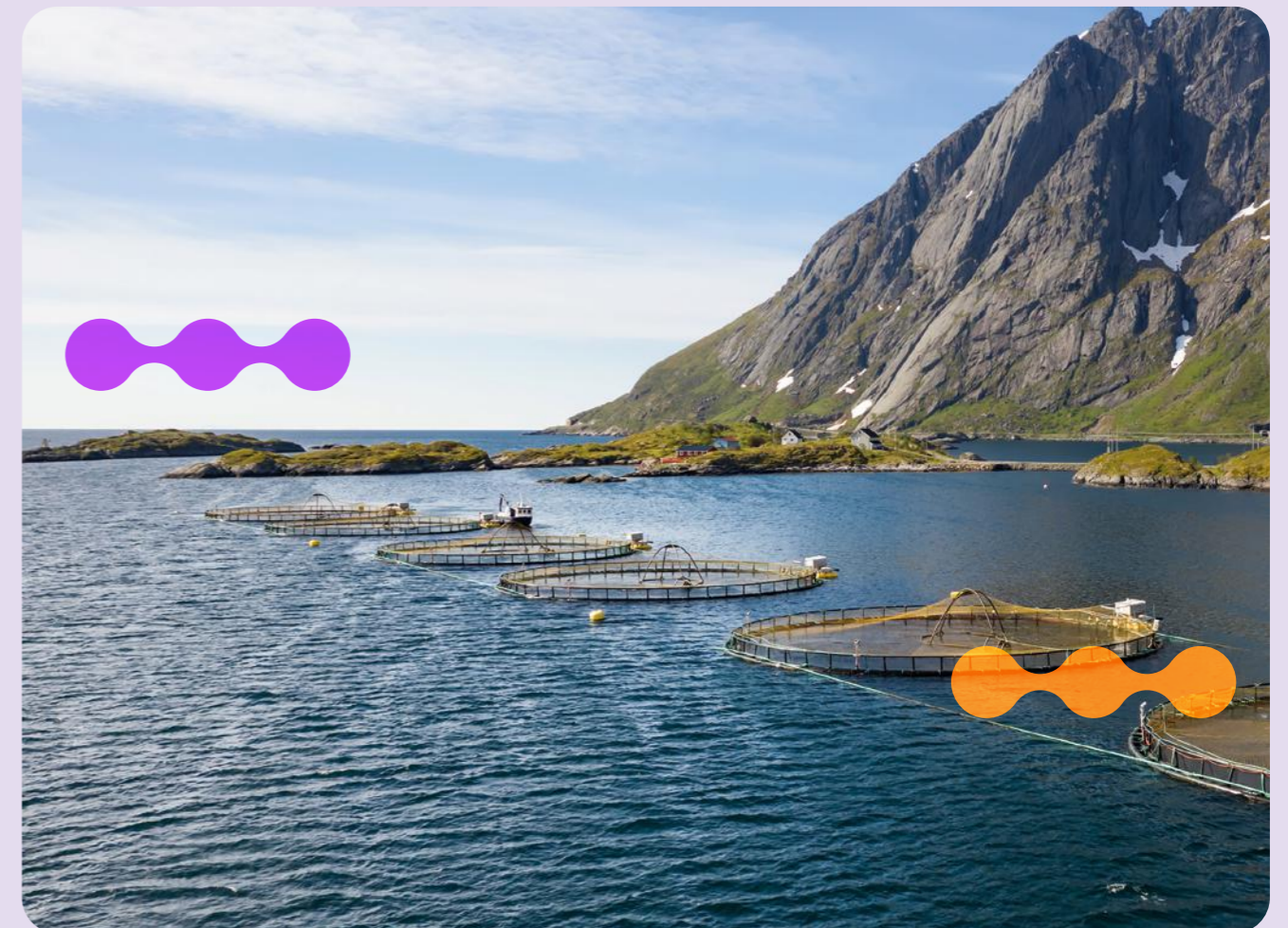
156k metric tons

Food produced using bacteriophages as a part of sustainable pathogen-control practices



5.5k metric tons

Reduction of feed use due to improved efficiency



Our Impact

Our products reduce the need for unnecessary antibiotic use, helping fight the dangerous rise of antimicrobial resistance.



Social Impact:

By reducing the unnecessary use of antibiotics in the food chain, Proteon products help limit the emergence of antibiotic-resistant bacteria and maintain the effectiveness of antibiotic therapy in humans.

Environmental Impact:

Our feed additives work preventatively, reducing the risk of bacterial infection in farm animals. They leave no harmful residues.

We support farmers in eliminating on-farm animal health challenges.



Social Impact:

We educate farmers on the best use of our products to ensure effective disease prevention. Our phage cocktails enable poultry and aquaculture producers to reduce their reliance on antibiotics and chemicals while also helping them to achieve productivity improvements.

Environmental Impact:

By preventing disease, we contribute to improving the health, comfort, and safety of farm animals. A healthy animal with a balanced microbiome enables greater productivity and a more sustainable use of resources, reducing pressure on the environment.

Our products improve human health through increased food safety.



Social Impact:

Our feed additives help improve biosecurity on poultry and egg farms, helping assure the supply of safe products to the market. By reducing the risk of pathogen contamination in poultry and eggs, we reduce the risk of bacterial disease being transmitted to humans via food and the human cost of foodborne illnesses.



We help to reduce food waste and ensure food security.



Social Impact:

Our products help improve the efficiency of protein production, resulting in both increased production and less waste. Our products also enable farmers to thrive economically and support communities, especially in the developing world, to meet protein consumption needs.

Environmental Impact:

Our products support more efficient production by reducing the negative impact of disease, resulting in the use of fewer resources. This, in turn, enables livestock farming and aquaculture with a smaller environmental footprint that is more environmentally sustainable and efficient.

We support more sustainable aquaculture.



Social Impact:

By providing a solution for disease prevention, we help aquaculture farmers to improve survival rates, generate more profit, and boost the sustainability of their business.

Environmental Impact:

Our products help reduce contamination of antimicrobial residues in water sources and reduce disruption of the aquatic microbiome. By bettering the welfare of farmed animals, we reduce the risk of disease transmission to wild fish.

We help reduce greenhouse gas emissions associated with livestock farming and aquaculture.



Social Impact:

Our products improve productivity and environmental sustainability through waste reduction.

Environmental Impact:

Our feed additives improve productivity, so farmers are able to achieve the same outcomes using less feed and water. This leads to the use of fewer natural resources and a reduction in greenhouse gas emissions.

Our Dedicated Team

Behind Proteon's success, there are motivated and passionate people.



Elżbieta Fornal, PhD
Formulation Department

I joined the company just as I had graduated from the technical university, and I even received an offer to do my PhD degree with Proteon. My PhD project was a great success, ending in the development of patent-protected microencapsulation technology for bacteriophages. From the very beginning, the company has kept me motivated to broaden my horizons in the fields of engineering, new technologies and microbiology. I am proud of each phage product format invented by the Formulation Department that I manage. Proteon has enabled me to grow on many levels, but my co-workers and the culture we create together are what makes our company unique.



Justyna Kowalska
Product Management

My adventure with Proteon began with a summer internship in 2012, followed by a master's thesis written in a collaborative arrangement between Proteon and my university. After graduating, I joined the R&D Team, where over the years I have gained experience working on various projects that have required cooperation with many teams across the company. In 2019, I became the head of one of the R&D teams, then two years later I moved over to Product Development, where I manage our poultry product portfolio. I'm pleased to have the opportunity to work in an international team, lead exciting projects, and participate in interesting conferences. It's really important to me that I can contribute to developing a healthy food system and reducing unfavourable practices in animal production.



Dr. Varun Namdeo
Techno - Commercial

As Techno-Commercial Manager at Proteon, I have the opportunity to combine my veterinary knowledge with commercial skills, to work with various departments within the company and to support our industry partners. I help solve technical problems related to veterinary care, perform diagnostics and assist farmers in improving the performance of their flocks. I'm also involved in the sales process, bringing in new clients and building strong relationships with current ones. Overall, it's a great learning opportunity and experience. I strongly believe in taking an innovative approach and the importance of preventative action. In my work I have always supported solutions designed in line with the "One Health" concept – unifying concern for animal health, human health and the environment.

Risks and Mitigation Strategies

Proteon's business goals directly and positively impact the environment. However, our production processes and business impacts may create environmental costs and risks. Proteon has initiated a risk and mitigation process to reduce our environmental footprint and proactively mitigate ESG risk. We are just starting this program and intend to report on it in the coming years. The key potential risks we are evaluating include those presented below.

Water Pollution

Water sources could potentially become contaminated by bacteria and other biological waste from our production wastewater if internal production protocols are not strictly followed.

What do we do to manage the risk?

We treat all wastewater before discharge and have implemented strict protocols requiring waste-collection companies to be certified for storing and processing wastewater.

Greenhouse Gas Emissions

Our company's carbon footprint could potentially increase, due to ongoing expansion to markets on various continents, as well as the need to deliver products from a manufacturer located in Poland.

What do we do to manage the risk?

We are working to optimize our supply chain and logistics, so as to shorten product delivery routes and the share of air transport used in the process.



Waste Production

Production of plastic containers and their subsequent disposal both entail greenhouse gas emissions, which contribute to climate change. Moreover, improper disposal of plastic packaging can pollute the environment.

What do we do to manage the risk?

The Proteon R&D Team is working on product management processes that will allow for more efficient storage, weight reduction, and potentially plastic-free packaging.

Biodiversity Threat

Antimicrobial products could potentially disturb the natural microbiota of production animals, thus reducing their immunity and increasing the risk of other infections. Harmful residues that remain after product use could contaminate the environment.

What do we do to manage the risk?

Bacteriophages are inherently selective and target only a specific type of bacteria. Therefore, they do not endanger bacteria that are beneficial to animals or negatively interact with the environment. Even wide-scale and long-term use of our products will not create a biodiversity threat.

Education and Knowledge Development

Cooperation with Universities

We view university partnerships as an accelerator for innovation and an effective tool for knowledge exchange. The scientists in our R&D division collaborate actively with universities from across Europe. So far, we have been engaged in projects in partnership with seven universities throughout Poland as well as institutions in the United Kingdom and the Netherlands.

Education and Knowledge Development



Proteon works closely with the career offices of universities in Poland and abroad, enabling students of biological sciences to discover and develop their passion by working together with our R&D team on real-world projects and programs.

In 2022, we launched an internal doctoral support program, which enables PhD candidates to work on a project in our labs.

References

- 1 World Health Organization - Antimicrobial Resistance Factsheet
- 2 Centers for Disease Control and Prevention – Challenges in Food Safety
- 3,6 UN Food and Agriculture Organization – 2030 Agenda for Sustainable Development – Sustainable Agriculture
- 4 The Lancet - Global Burden of Bacterial Antimicrobial Resistance in 2019: A Systematic Analysis
- 5 World Health Organization – Food safety – Key facts

