SLU

FUTURE
ONE HEALTH

One Health

– One world, One planet

Interdisciplinary research on the health of humans, animals, plants, and ecosystems

A selection of SLU's broad expertise and research within One Health

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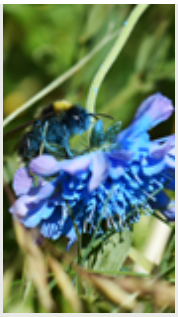

SLU Future One Health is one of SLU's Future Platforms, whose mission is to stimulate interdisciplinary research, education, and collaboration for the good health and welfare of animals and humans in sustainable ecosystems.

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IMAGE MONTAGE: SLU FUTURE ONE HEALTH

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.

Reference: The quadripartite (WHO, FAO, WOAH, UNEP).

ONE HEALTH – ONE WORLD, ONE PLANET

– Interdisciplinary research on the health of humans, animals, plants, and ecosystems

One Health is a concept that provides a holistic view of health and is an important research area where SLU's research and expertise contribute new and important knowledge, both nationally and globally. One Health addresses health-related issues at the interface between animals, humans, and ecosystems and requires an interdisciplinary approach.

Today, we face many crucial health-related issues for humans, animals, and our ecosystems, such as the increased spread of infectious diseases and antibiotic resistance, loss of biodiversity, and climate change. Solving the complex challenges we face requires collaboration between researchers from different disciplines. SLU contributes important knowledge in several subject areas, such as veterinary medicine, agronomy, economics, biology, ecology, water, forestry, and social sciences.

The One Health research at SLU contributes to achieving several of the global goals in Agenda 2030, such as: No Hunger (SDG 2), Good Health and Well-being (SDG 3), Clean Water and Sanitation for All (SDG 6), Sustainable Consumption and Production (SDG 12), Climate Action (SDG 13), Life Below Water (SDG 14), and Life on Land (SDG 15).

This brochure presents a selection of SLU's research and expertise – linked to the One Health concept – and involving all faculties: Landscape Architecture, Horticulture and Crop Production Sciences (LTV), Natural Resources and Agricultural Sciences (NJ), Forest Sciences (S), and Veterinary Medicine and Animal Science (VH).

ILLUSTRATION: SLU FUTURE ONE HEALTH

The umbrella illustrates the broad expertise and interdisciplinary research conducted at SLU, involving all faculties.

PRESERVING BIODIVERSITY

– A wealth of biodiversity promotes our health

Biodiversity is a prerequisite for resilient ecosystems. When there are multiple host species and genetic variations within a population, it becomes more difficult for pathogens to survive and spread to humans, animals, and plants. Rich biodiversity therefore reduces the risk of new pathogens establishing and spreading. Biodiversity is also fundamental to many ecosystem services that humans depend on, including clean air and water, pollination of plants, food supply, outdoor recreation, and protection against natural disasters.

At SLU, extensive research is conducted on biodiversity and ecosystem services in forest and agricultural landscapes. The research also includes pollination of plants and biological control of pests and weeds.

PHOTO: JULIANA DÁNIEL-FERREIRA, SLU

Biodiversity and health are closely linked and are fundamental to many ecosystem services that humans depend on, such as clean air and water, food supply, outdoor recreation, and protection against natural disasters.

PHOTO: JENNY SVENNÄS CHAPMAN, SLU

SLU is the only university in Sweden with a specific societal mission. In addition to education and research, we also conduct ongoing environmental monitoring through twelve environmental monitoring programmes, which provide society with the necessary knowledge and data to achieve Sweden's, as well as the global sustainable development goals (SDGs) adopted by the United Nation. These environmental monitoring programmes monitor our ecosystems and are also important tools for following up on various action programmes.

SLU, as the only university in Sweden, conducts ongoing environmental monitoring through twelve environmental monitoring programmes, providing society with the necessary knowledge and data to achieve Sweden's and the world's environmental and sustainability goals. The map shows all the locations where SLU operates.

Jeannette Eggers, Researcher at the Department of Forest Resource Management

My research focuses on how forests can be managed sustainably to provide multiple ecosystem services and biodiversity. In our research, we conduct long-term future analyses of the Swedish forest to understand the consequences of different management options and develop proposals for how to manage the forest for different purposes, such as timber production, biodiversity, recreation, and reindeer husbandry. We use forest decision support systems that can project forest development over time under different management options. One example of such a decision support system is Heureka, which SLU manages and further develops, and which is widely used in forestry in Sweden. An important issue is the role of forests in climate change – where forests are expected to be part of the solution while being affected by a changing climate. Climate change – particularly through increased diversity in tree species composition, age class distribution and management practices – is therefore a key factor in sustainable forestry. A diverse forest provides habitats for more species than a monoculture of the same age. This is particularly important at a time of rapid climate change, which is affecting many species.

(Photo: Mona Bonta Bergman)

PHOTO: JEANNETTE EGGERS, SLU

ENSURING ACCESS TO HEALTHY FOOD

– Promoting the health of humans, animals, plants, and our environment

Food Science is a broad field that encompasses many aspects of the knowledge and research needed to achieve the goals of a sustainable food system. At SLU, we research sustainable development throughout the entire life cycle of food, from primary production to processing, distribution, and consumption. Our researchers study, among other things, the properties of raw materials, crop processing, quality assurance and food safety, as well as microbiology and food technology.

In food production, safe food is an important issue. Here, SLU can contribute a lot of knowledge about how foodborne pathogens spread both via animals and plants. It is of utmost importance to prevent foodborne diseases from a global perspective. Such infections cause great personal suffering and also significant economic losses for both individuals and society. Today's food production is complex, and it is crucial to develop sustainable and climate-smart farming systems where we produce nutritious and healthy food for humans and safe feed for animals. Good animal health is a prerequisite for long-term sustainable animal husbandry. Healthy and well-cared-for animals yield higher returns, reduce the use of medicines such as antibiotics, and reduce greenhouse gas emissions that contribute to climate change. Environmentally friendly alternatives for microbiological control of plant diseases, instead of chemical pesticides, will also be of great importance for sustainable food production in the future.

In food production, safe food is an important issue. Here, SLU can contribute a lot of knowledge about how foodborne pathogens spread both via animals and plants.

More and more people are living in cities, both in Sweden and globally. Urbanisation presents both challenges and opportunities for ensuring access to safe and healthy food.

"Foodborne diseases are important from a global perspective, and to reduce the effects of such diseases, we need to work from a One Health perspective.

PHOTO: AIDA BARGUES

Sofia Boqvist, Professor at the Department of Animal Biosciences

Foodborne diseases are important from a global perspective, and to reduce the impact of such diseases we need to work from a One Health perspective. In my research I study foodborne infections and their impact on people, especially in low-income countries. This is an area that has been underestimated in the past but is now receiving more attention by the World Health Organisation (WHO) and others. Foodborne infections cause personal suffering and significant economic loss to individuals and societies. Another important area is how we prevent the spread and emergence of antibiotic resistance. This is a critical issue for the treatment of bacterial diseases in humans and animals. SLU has extensive expertise and research related to foodborne diseases, making us an important partner in Sweden and globally. (Photo: Anneli Sundin)

REDUCING THE SPREAD OF INFECTIOUS DISEASES BETWEEN ANIMALS AND HUMANS

– Infectious diseases are one of the major health challenges of our time

Infectious diseases are one of the greatest One Health challenges of our time due to their ability to spread rapidly between humans, animals, and the environment. With a warming climate, globalisation with increased travel and trade between countries, and increased urbanisation, the spread of infectious diseases is expected to increase. Some pathogens are zoonoses, diseases that can be transmitted between animals and humans. Outbreaks of infectious diseases cause great suffering for humans and animals and lead to significant economic losses, including reduced production.

At SLU, extensive research is conducted on how infectious diseases spread and how they affect animals and humans. We also have a long tradition of monitoring wildlife populations and their infections, which creates good conditions for increasing our knowledge of the effects of climate and landscape changes on the spread of zoonoses. There is also much research on preventive work to reduce the risk of spreading infectious diseases in animal populations. This research thus contributes to strengthened food security, especially in parts of the world where high-quality protein is scarce.

Jonas Johansson Wensman, Senior lecturer at the Department of Animal Biosciences

There is a lot of research going on at SLU that is linked to the biology and epidemiology of infectious diseases, both diseases that spread between animals and humans (zoonoses) and other infectious diseases with serious consequences for animal health, food production, and the economy. The role of wildlife in spreading infection is also emphasised. I study how viral diseases are spread and diagnosed, how they can be prevented, and how viral infections affect infected animals. My research aims to improve animal health, which is necessary for sustainable food production, both in Sweden and in low-income countries. The research is interdisciplinary because the challenges are often complex. For example, in low-income countries such as Tanzania and Zambia, I have collaborated with social scientists to study how smallholder farmers and livestock traders perceive, act, and are affected by infectious diseases in sheep and goats. In an ongoing project in Zambia, we are also addressing the impact of climate on the spread of disease, as goats can provide a more secure source of income for resource-constrained farmers. However, it is important that goats are not affected by various infections. (Photo: Eva-Stina Lindell, SLU)

Rickard Ignell, Professor at the Department of Plant Protection Biology

My research focuses on developing more effective ways to reduce the spread of malaria in countries where the disease is endemic. The measures currently used to control malaria in several countries in sub-Saharan Africa are beginning to lose their effectiveness. This is mainly due to the increasing resistance of malaria mosquitoes to conventional control methods. Finding solutions requires a multidisciplinary analysis of the factors that drive the spread of the disease. In my research group we study both genetic and behavioral factors that drive resistance. We also develop new methods and technologies that do not rely on conventional insecticides. By combining biological and technical expertise, we have a good chance of finding effective solutions. A key factor in making progress is working with colleagues from different disciplines to solve the complex problems of vector-borne diseases – using a One Health approach. (Photo: Jenny Svennås Gillner, SLU)

PHOTO: NECHAEV KON BY CANVA

Many research projects at SLU aim to combat malaria. Two examples are developing new methods and techniques that do not rely on conventional insecticides, and using mosquitoes' gut bacteria to produce substances that kill malaria parasites in the gut.

REDUCE THE DEVELOPMENT OF ANTIMICROBIAL RESISTANCE

– What would a future without effective antibiotics look like?

Ineffective medicines against infectious diseases are one of our major future threats. Antimicrobial resistance (AMR) is a threat to both animal and human health as bacterial infections become increasingly difficult to treat. Bacteria have globally become increasingly resistant to antibiotics, which is a major problem as resistant bacteria can spread in many different ways, including directly between humans and animals or indirectly via food and the environment. The strong connection between humans, animals, and the environment means that AMR can only be solved with a One Health perspective.

SLU's research plays an important role in developing sustainable systems for good animal health and profitable production with restrictive use of antimicrobial drugs. Furthermore, research is ongoing to develop vaccines to prevent and control various infectious diseases in animals. Like bacteria, parasites have also developed resistance to drugs, which is a growing problem for global animal health. Research is also being conducted at SLU to understand how resistance arises and to find functional and effective genetic markers that can be used diagnostically to track resistant parasites.

The health status of Swedish pigs is better than in many other countries and is proof that our *Swedish model – healthy animals do not need antibiotics* – has been successful. The strong connection between humans, animals, and the environment means that antibiotic resistance can only be solved with a One Health perspective. SLU can contribute to the development of sustainable animal husbandry systems of the future.

"Securing water supply now and for future generations is one of our greatest societal challenges, and to succeed in this, we need a holistic approach that integrates knowledge in environmental research, veterinary medicine, and infection biology.

Stefan Bertilsson, Professor at the Department of Water and Environment

I study the spread of waterborne infections: what environmental factors, biological interactions, and processes control this? How should societal water supplies be planned to reduce vulnerability? Securing water supplies now and for future generations is one of our greatest societal challenges, and to succeed, we need a holistic approach that integrates knowledge from environmental science, veterinary medicine and infection biology. My research explores the role of microorganisms in nature, particularly their ability to transform and redistribute key elements such as carbon, nitrogen and mercury. We also study predation, symbiosis and other interactions between microorganisms and their evolution in the laboratory, lakes, and oceans. SLU's research profile and sectoral responsibilities give us a key role in water research. This gives us good opportunities to lead work to secure society's future water supply. This, combined with strong sector-based veterinary and animal science and close collaboration with leading research environments in infection biology, allows us to make a difference. (Photo: Jenny Svennås Gillner, SLU)

PHOTO: JENNY SVENNÅS GILLNER, SLU

AN ENVIRONMENT FREE FROM POLLUTION

– Chemicals affect the health of humans, animals, plants, and the environment

Synthetic chemicals have been produced in large quantities by humans over the past century and are used in, for example, building materials, food, textiles, and electronics. These chemicals provide various properties and functions that are necessary, desirable, or facilitate our everyday lives. When products containing chemicals are produced and used, they leak into the environment we share with both animals and plants. Some chemicals can persist in the environment for a long time. Therefore, humans, animals, and nature are exposed to a variety of substances, often in low doses over a long period. For most of these substances, knowledge of their health effects is very limited or completely lacking. It is therefore of great importance to investigate how humans, animals, and plants are affected by environmental pollutants and which substances can be linked to negative health effects.

At SLU, One Health research related to environmental pollutants is conducted across the entire spectrum; from investigating where and which environmental pollutants are found, to how humans and animals are affected by these substances. SLU has research that examines the effects of environmental pollutants on wild animals, where both terrestrial animals and fish and molluscs serve as important indicators of effects on the entire ecosystem. SLU also conducts research on domestic animals, which provides

PHOTO: YLVA GUSTAFSSON, SLU

Ida in the laboratory where she works with egg cells and early embryos from cattle. Here, she studies how environmental chemicals affect embryo development.

Ida Hallberg, Researcher at the Department of Clinical Sciences

My research focuses on how environmental pollution can affect development and fertility in domestic animals and humans, using a laboratory model and studying populations of domestic animals. We are developing a laboratory model to study how environmental pollution can affect early embryo development without using laboratory animals. We mainly use cows and pigs as model animals, but embryos at an early stage are very similar between animal species. Therefore, the results we obtain can be used to understand how environmental pollution can affect development in other mammals, including humans. To make the most of the experiments I perform, we collaborate both within SLU between departments and faculties and also represent SLU in other national and international projects.

(Photo: Johan Hallberg)

valuable knowledge for both the domestic animals themselves and humans. Researchers also look at the link between environmental pollutants and health effects in humans.

SUSTAINABLE WATER AND LAND MANAGEMENT IS KEY TO HEALTHY DEVELOPMENT

– Clean water and healthy soils are essential for all life on earth

Water is closely linked to health, and access to fresh water and sanitation for all is crucial to achieving the global sustainability goals. Water is essential for all life on earth and plays a central role in human and animal health, plant and animal production, and food and nutrition security. Challenges such as water pollution, poor water management, water scarcity, and water-related disasters (such as floods, landslides, droughts, and waterborne disease outbreaks) pose major threats to health. Land degradation exacerbates the effects of forest-related disasters, while climate change increases their frequency and severity.

At SLU, many researchers and experts work on water-related issues, from source to sea. Our knowledge contributes to achieving the global sustainability goals by focusing on water quality, life in water, and human use of water resources. Research on integrated water resource management and land restoration is crucial for improving water and food security, soil and land health, and reducing the risk of water-related disasters. Additionally, the research contributes to climate change adaptation, which in turn helps us address health challenges related to these changes.

Jennie Barron, Professor at the Department of Land and Environment

My research focuses on agricultural water management for climate-resilient food production. Preparing our croplands for the challenges of dry and wet weather is a major issue for both climate adaptation in agriculture and food security. More specifically, I study soil physics in interaction with agroclimatic factors, hydrology, and technical solutions such as irrigation, storage, and drainage for water management from the field to landscape levels, both in Sweden and globally. Good water management is crucial for developing safe, nature-based solutions and technical infrastructure for humans and animals, especially in the face of increasing variability in precipitation and water availability due to climate change. SLU's broad expertise in agricultural science, animal science and nutrition make us well-positioned to drive development and change in global water management issues.
(Photo: SLU)

Preparing our agricultural land to meet challenges with both too wet and too dry weather involves both climate adaptation of agriculture and food preparedness.

PHOTO: ISTOCK

COMPARATIVE MEDICINE BENEFITS BOTH ANIMAL AND HUMAN HEALTH

– Treating or preventing lifestyle diseases with the help of veterinary medicine

Comparative medicine and translational research involve using clinically identified problems, such as diabetes, as the basis for pre-clinical research and development in human and veterinary medicine, with the goal of better understanding, treating, or preventing diseases in both humans and animals.

At SLU, researchers use spontaneously occurring diseases in animals as models for similar diseases in humans to gain a better understanding of cardiovascular diseases, obesity, osteoarthritis, diabetes, and cancer. Pets such as dogs and cats are good models because they live in and are exposed to the same environment (including pollutants and lifestyle) as their owners. The knowledge we can gain in the clinic when our dogs and cats seek care for various diseases can also improve human health. The interaction between microbiota and gut health is also of interest for translational medicine. The aim is to identify beneficial microbes and microbially encoded functions in the gut that can improve gut health in animals and humans.

PHOTO: MIA [illegible]

A veterinarian at SLU University Animal Hospital (UDS) examines a dog's blood pressure. SLU conducts research on animal health for the sake of the animals and to discover common diseases that humans share with animals.

Henrik Rönnberg, Professor at the Department of Animal Biosciences

In my research, I study spontaneously occurring cancers in pets to learn more about the development, prevention, diagnosis and new forms of treatment of cancer in pets and humans. Cancer is a widespread disease and probably the disease with the highest mortality rate in both pets and humans. Unfortunately, as the average life expectancy of humans increases, so does the incidence of cancer. The disease and various forms of treatment have a huge impact on quality of life and function. It would, therefore, be extremely beneficial if the clinical knowledge we gain from cancer treatment in dogs and cats could also improve the lives of humans. SLU has a key position as the only university in Sweden with both veterinary education and advanced clinical research capabilities. The unique concentration of interdisciplinary expertise in clinical practice, molecular biology, protein chemistry and animal welfare makes us an excellent partner for collaboration with both human research universities and the medical industry. (Photo: Sofia Stenqvist)

ANIMAL CONTACT CAN CONTRIBUTE TO INCREASED WELL-BEING

– Animal-assisted services can help people: it is important that it is done with a focus on good animal welfare

The interaction between humans and animals has a positive impact on both human and animal well-being. Research shows that contact with both pets and farm animals can improve human health and reduce healthcare costs. These animals play an important role both in preventive health care and in animal-assisted interventions for illness and disability.

Social service dogs can help people with various challenges in life to feel better, but it is also important to consider the welfare of the dogs.

At SLU, research is conducted in the field of anthrozoology, which focuses on the interaction between humans and animals. One example is the area of animal-assisted services, where our research shows how specially trained dog teams can promote well-being among the elderly in elderly care. We also investigate whether trained school dog teams can reduce school absenteeism, improve learning outcomes, and increase psychological well-being among school students. Our researchers also study how the relationship between humans and their pets (e.g., cats, dogs, and horses) affects the well-being of both humans and animals.

SLU has also contributed to the development of international guidelines to promote animal welfare and increase human safety during interactions between humans and animals. Another research field within anthrozoology is the study of the handling of farm animals, where we investigate how attitudes affect the handling of pigs during loading and transport, as well as how the handling of dairy cows and calves affects their reactions during various interactions with farmers.

Anna Bergh, Researcher at the Department of Clinical Sciences

Reduced physical activity and increased sedentary behaviour are major global problems contributing to lifestyle diseases such as obesity and diabetes. According to the World Health Organisation's guidelines, almost half of Swedish adults are sedentary, and more than half of both dogs and humans are classified as overweight. It is therefore important to increase knowledge about the factors that motivate people to be physically active in the long term – as this also affects the dog. Our research group is studying, among other things, new ways of assessing body condition and muscle mass, as well as risk factors for type II diabetes linked to sedentary behaviour and physical activity. We also work with experts on environmental planning to increase outdoor physical activity in humans and animals. More knowledge is needed on how the dog can be a motivator for human physical activity; such as companionship, safety during outdoor physical activity, and care for the dog's health and well-being - both for the sake of the human and the dog. (Photo: Carin Wrange)

PHOTO: LISA CHRÖISTY, SLU

NATURE AND WELL-BEING

– How can nature promote our health?

Humans are a part of nature and have been so for millennia. We therefore have a biological need for contact with nature in our daily lives. Unfortunately, this contact is decreasing every day. More and more people are moving to cities, and today more than half of the world's population lives in urban areas. Research shows that we need nature in all its forms to feel well. Contact with nature and animals promotes both our physical and mental health by providing opportunities for physical exercise, relaxation, and stress reduction.

At SLU, research is conducted on the interaction between different natural environments and human health. Our researchers investigate how people can benefit from simply being in nature, without any demands for activity, to aid recovery and improve well-being. This is studied in relation to conditions such as burnout, depression, and traumatic experiences. We also study how nature and gardens can be used as a basis for rehabilitation or work training, and how spending time in nature can contribute to returning to work. The function and form of the urban outdoor environment, and its significance for health, quality of life, and well-being, are studied from various perspectives. Among other things, we study urban forests and green infrastructure in urban environments and their effect on people's opportunities for daily exercise and mindful relaxation.

PHOTO: MARTEN SVENSSON

Nature-based interventions is a term used in this field of research that focuses on outdoor environments, meaning that nature is the main factor in the intervention and can include different types of natural environments such as forests, farm settings, gardens, mountains, coastal and beach environments.

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A large part of what we call outdoor recreation takes place in Swedish cities and their urban environments. This means that the majority of our outdoor recreation occurs on a very small part of the country’s area. Therefore, it is important that there are high-quality areas in all cities to promote biodiversity and health.

Marcus Hedblom, Professor at the Department of Urban and Rural Development

My research examines how we can plan, design and manage urban green spaces so that people, animals and plants thrive. I am particularly interested in how to conserve biodiversity in urban environments and how biodiversity affects human health. My research shows that greenery has a positive impact on human well-being. It is therefore worrying that green spaces in our cities are declining due to urbanisation. Cities also host a significant amount of biodiversity as the landscape around cities becomes increasingly rationalised and production-oriented. Often, urban planning focuses on the amount of green space rather than its quality. In my research, I study how humans are affected by qualitative aspects of nature, such as different types of green spaces, the sound of birdsong and smell from nature. The aim is to try to find synergies between the management of greenery so that biodiversity – and – human health are rewarded. One example is children’s playgrounds, which, if properly designed, can both host species – and encourage play, known as playotopes.

(Photo: Jenny Svennås Gillner, SLU)

PHOTO: MARTEN SVENSSON

SLU Future One Health

– A strategic initiative to meet tomorrow's complex challenges

SLU Future One Health is a strategic platform for stimulating interdisciplinary research, education, and collaboration for the good health and welfare of animals and humans in sustainable ecosystems.

We are a meeting place for the One Health research conducted at SLU. Our primary target group consists of SLU researchers, but we also collaborate with decision-makers, other authorities and universities, and research institutes. Our mission is part of SLU's and Sweden's work towards achieving the UN's global goals for sustainable development.

THE GLOBAL GOALS

Curious about more One Health research at SLU?

Most welcome to contact us if you want to know more about our work.

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FOTO: MARTEN SVENSSON

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