

Towards a global one health



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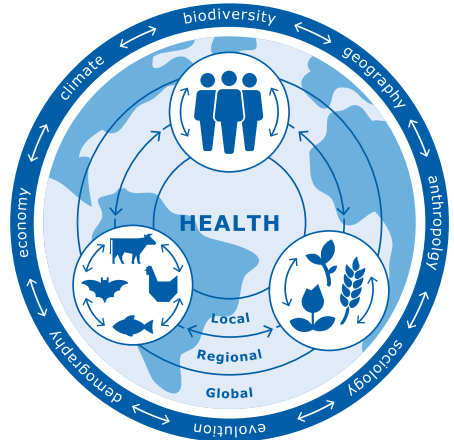
Towards a global one health

The health of people, animals, and their environments are closely connected: think of zoonoses, plant pests, or other vector-borne diseases. Examples in human health are: the recent outbreak of Ebola in West Africa; the global spread of Zika virus; and the alarming invasion of the American fall armyworm in Africa, which threatens food production. Understanding the factors that cause such outbreaks and how they interact is crucial to safeguard the health of people everywhere on the planet. Another important aspect is the significant impact of globalisation on public health, such as malnutrition, urbanisation and climate change. Rapid population growth, inequality in education and income, the rise in CO₂ output and climate change, threaten to destabilise societies and demand measures that mitigate the impact of these developments on health.

Global One Health brings the two scientific approaches together. It is about issues created by this double burden that affect food security, public health, climate change and biodiversity.

Wageningen University & Research has a large number of science groups with expertise in one or several topics related to Global One Health, which contribute to knowledge required to reduce or overcome the effects.

This is being explored in four themes: Health and infectious disease; Health and environment; Health and society; and Health and food. Since many of the topics concerning Global One Health are multidisciplinary, the programme requires collaboration between different research groups within Wageningen University & Research, but also with science groups elsewhere in the Netherlands and abroad. For example, we are one of the participants in the Netherlands Centre for One Health, established in 2016. Wageningen University & Research is, thus, well equipped for its role within the Global One Health community.



- Themes:
- Health & Infectious diseases
 - Health & Environment
 - Health & Society
 - Health & Food
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Reducing the psittacosis burden

About 1,500 cases of human pneumonia are estimated to be psittacosis-related. The causal bird species, however, remain unclear. In cooperation with doctors, researchers, diagnosticians and veterinary public health officials, Wageningen University & Research researchers work on increasing the human diagnostic capacity and identification of additional reservoir bird species. An online platform to share information about human and animal cases has been developed with the aim of reducing the disease burden of psittacosis.





Zoonoses at night

Bats harbour many viruses. A large number of these are potentially zoonotic. Transmission can take place via direct contact or via fomites, contaminated food or hosts, such as cats. Little is known about the potential risks for public health of the bat viruses in the Netherlands. Wageningen University & Research researchers are participating in a study that will indicate the overall virus-diversity in bats in the country; the potential transmission risks to people; and the risk perception, knowledge and practices of professionals and volunteers and the general public towards bats and their pathogens. This will serve as a base for risk surveillance and prevention.





Preparing for emerging pathogens

Pathogens in animals will continue to emerge and re-emerge, throughout the world. A significant part of these agents may jump to humans. To improve preparedness, Wageningen University & Research works on the development and implementation of a tiered approach for rapid detection of new and emerging pathogens in animals. This includes classical, as well as innovative molecular methods to identify and characterise such pathogens. To address questions on risks and control, a structured approach to rapid risk evaluation of potential microbiological hazards has been developed.





Zoonoses in a changing world

Zoonoses appear to crop up randomly. Some factors that influence their emergences have been identified, e.g. a combined human and animal high population density. Wageningen University & Research researchers are identifying the biological and socio-economic drivers and the main impacts of emerging zoonoses on a local and global scale. The study will result in schematic diagrams for several infections. The outcomes can support policy-makers considering preventive measures against the emergence of zoonoses.





The gut microbiome and disease transmissions

The most recent occurrences of veterinary diseases transmitted by midges (*Culicoides* species) in the Netherlands were Bluetongue (2006) and Schmallenberg Disease (2011). Wageningen University & Research researchers are using midges as a model system to investigate the role of the gut microbiome on arboviral transmissions by blood-sucking insects. Micro-organisms in the midge's gut systems play an important role in the modulation of their immune system. Variation in microbiome composition is expected to be based on environmental circumstances and nutrition. The researchers aim to find out if microbiome shifts also influence arboviral transmission frequencies.





Safe application of manure

Animal manure has widespread use as natural fertiliser to increase food production. However, manure application bears potential risks for human and animal health, and effects on the ecosystem. Wageningen University & Research assesses the 'One Health' risks of contaminants, such as pathogenic bacteria and viruses, resistant bacteria and residues of veterinary medicines. The research focuses on relevant reservoirs of contaminants, transmission routes, and related processes. This knowledge can contribute to the development of intervention strategies to assure safe food production.





Tackling endotoxin emissions

Human health can be affected by endotoxins, dead bacteria particles that can trigger the immune system. These endotoxins are present in farm animal faeces, excreta and manure. Wageningen University & Research scientists study the effects of endotoxins on animal health and the options to reduce endotoxin production, concentration and emission in animal production systems. They consider the interactions of the microbiome and feed that influence manure and excreta quality, and technical designs to reduce airborne endotoxins. Promising interventions are evaluated on socio-economic feasibility and consumer acceptance.





Platform for food systems research

Climate change, population growth and increasing life expectancy put increasing pressure on our food system. An integral solution is hampered by scientific fragmentation. Wageningen University & Research has developed a transdisciplinary data platform to facilitate synergy between research on food production, nutrition and health. The platform provides access to reliable data, indicators, standards and algorithms. Case studies evaluate healthy and sustainable innovations in the food system and our diet. This will foster the development of a large-scale European infrastructure for integrated food, nutrition and health research.





Fighting an avian influenza outbreak

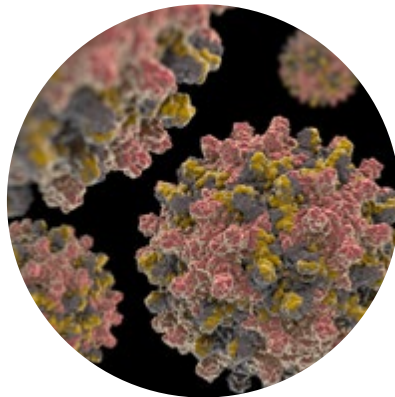
In November 2016, many dead water birds were found in the Netherlands. Wageningen University & Research Bioveterinary Research proved that a great deal had died of an H5N8 avian influenza virus infection. The contagious virus also occurred at multiple poultry farms. The infected poultry were culled to prevent virus spreading. Determination of the genetic code of the viruses showed this avian influenza had been introduced by the autumn migration of wild birds from Russia. Inter-farm transmission could be ruled out for most affected farms, as the viruses were not genetically related. This is vital information for effectively fighting the disease.

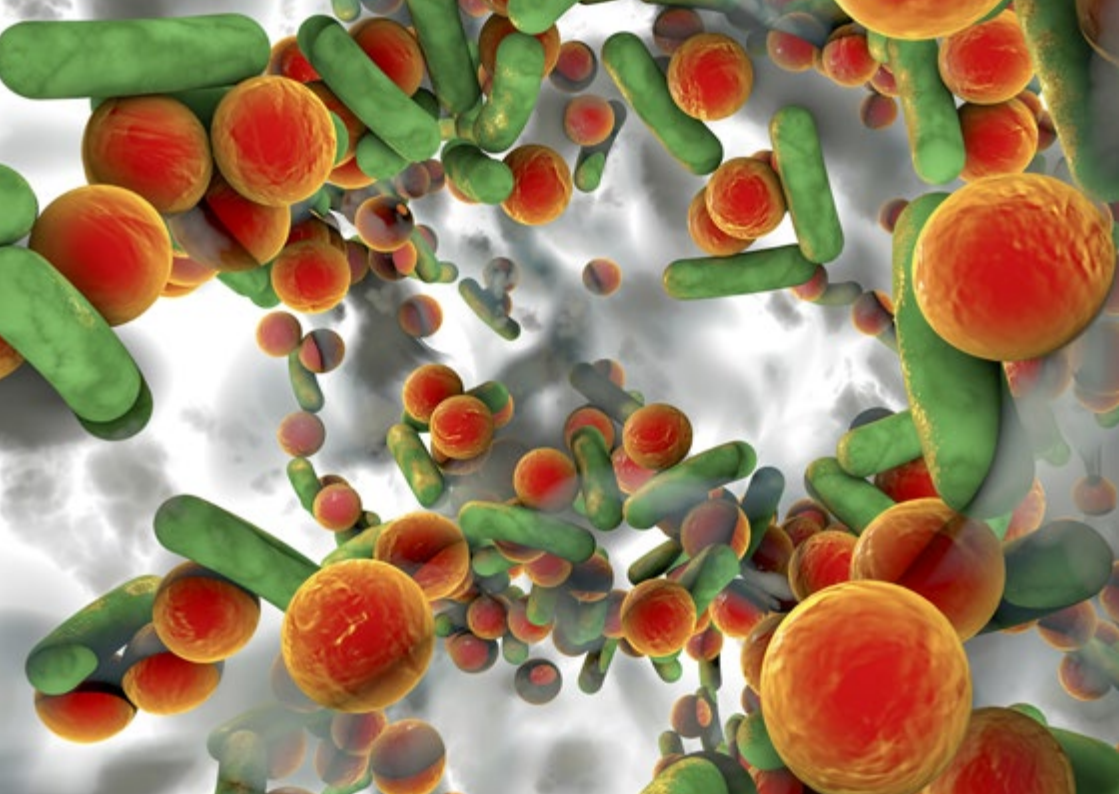




Monitoring the Hepatitis E risk from swine

Pigs can carry Hepatitis E viruses (HEV) without showing clinical signs of the disease. Humans can catch Hepatitis E after contact with infected pigs or contaminated pork products. Infections can have serious health implications, such as liver failure and even death. Identification and characterisation of the viruses in pigs is needed to determine if there is an increasing risk for humans. Wageningen University & Research is characterising and comparing the HEVs circulating in pigs in different European countries, including the Netherlands, to assess the actual risk of zoonotic HEV infections from swine.





Managing the risks of drug resistant bacteria

Infections with antibiotic-resistant bacteria are hard to treat. With European partners, Wageningen University & Research studies the complex epidemiology and ecology of antimicrobial resistance in animals, the food chain and the environment, by using newly developed molecular and bio-informatics technologies. The focus lies on predicting and limiting the future evolution and exposure of humans to the antimicrobial resistance from animal origin. The results will support the decision-making process on risk management along the food chain.





Outrunning zoonotic viruses

Zoonotic viruses can infect both animals and humans. Viruses tend to spread rapidly in previously unaffected populations, with severe socio-economic consequences. Vaccination and antiviral therapies cannot optimally control this spread, as the development and subsequent registration of new products takes years. Wageningen University & Research collaborates with European universities and the pharmaceutical industry on a swift response to new infectious disease threats, by stimulating innovations in product development and the regulatory arena.





Clean air near livestock farms

Bacteria that live within livestock have endotoxins in their cell walls. These toxins travel out into the open on dust emitted by the livestock farm with the out-flowing ventilation air. If they reach human lungs, endotoxins can cause inflammation. Wageningen University & Research and several scientific partners are developing computer models that can calculate endotoxin concentrations in the air in the vicinity of livestock farms. They also examine if the concentrations are related to any health problems amongst residents. The study helps policy-makers to develop emission reduction policies, if necessary.





Can Dutch mosquitoes spread Zika?

The Zika virus is transmitted by mosquitoes to infect humans. Since 2015, Central – and South America and the Caribbean have suffered from a Zika epidemic of unprecedented scale. A Zika infection generally causes a mild disease, but unborn children can develop severe brain damage when their mothers get infected. Wageningen University & Research virologists and entomologists are studying the capacity of Dutch mosquito species to transmit the Zika virus. The results are important to determine the risk of Zika outbreaks in the Netherlands.





From apes to humans

Zika, Chikungunya and Dengue are all examples of diseases that originate from non-human primates and are infectious to humans through a mosquito bite. Wageningen University & Research is determining the role of mosquitoes as bridge vectors of pathogens between apes and humans. Primate body odours are collected in zoos and sanctuaries, and tested for their attractiveness to mosquitoes. Bridge vectors will be identified in Congo and Cameroon in Central Africa. The study aims to help prevent the cross-species exchange of infectious diseases.





More species, fewer diseases?

Infectious diseases threaten human health and food production. The richness of wild animal species in an area is an important determinant of disease risks, because host species vary in their competences for pathogen transmission. A decline in biodiversity may either increase or decrease disease risks. It is, thus, important to know where and when changes in disease risks may/could be expected. Wageningen University & Research studies how disease risks respond to global biodiversity changes and generates predictions on disease prevalence in animal populations that vary in species composition.





Infections of and by ticks

Ticks can transmit pathogens, including the bacteria that cause Lyme disease, when they bite humans. But how do ticks become infected? Mice and other small rodents can function both as hosts for ticks and as reservoirs for zoonotic pathogens.

Wageningen University & Research researchers study the immunology, physiology, and ecology of these rodents, which involves trapping rodents in forests, examining them for ectoparasites, and collecting blood and tissue samples. This leads to better understanding of disease dynamics in wild animals and the threats posed to humans.





Health effects of dietary fibres

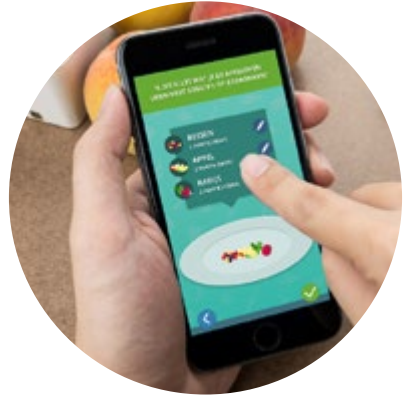
Dietary fibres are important for healthy digestion and contribute to a feeling of satiety. Eating fiber appears to be associated with lowered risks of heart diseases, several types of cancer and diabetes mellitus. Wageningen University & Research, together with other knowledge institutes and companies, work on deeper knowledge of the role of carbohydrates in health and the interplay with the human intestinal microbiota. The consortium aims to develop a toolbox to substantiate health claims regarding dietary fiber.





Personalised nutrition and health

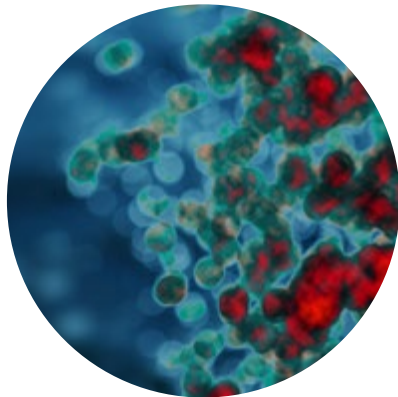
People differ not only genetically, physically and mentally, but also in terms of their preferences and the social environment, in which they live. As each individual is different, food advice must reflect this. Wageningen University & Research develops the technology and knowledge to realise this personalised food advice. With this information, each and every individual can be informed and enabled to make conscious choices and adopt an eating pattern attuned to his or her needs.





Food to support immune therapy

Did you know that certain food components are important to keep the immune system strong? In fact, certain food compounds might even support the immune system in fighting cancer. Beta-glucans and fungal immunomodulatory proteins are such food components. They can be found in, for instance, yeast, mushrooms and oats. Wageningen University & Research is investigating how these components can support the immune system. In addition, they will test if immune support can lead to improved anti-melanoma activity, especially in combination with anti-tumour immune therapy. In this way, special nutrition could improve anti-cancer immune therapy.





GLUTEN FREE

Less allergic reactions to foods

An increasing number of people experience allergic reactions to foods. In Western societies, 5-7% of children have food allergies, and 2-3% of adults. Food allergies have a strong impact on quality of life and can sometimes be life-threatening. Wageningen University & Research participates in a European project that aims to create tools to manage allergy-related problems. Wageningen University & Research develops diagnostic and analytical methods to measure if food components still can provoke allergic reactions after processing or formulation. With these methods, safer foods for people with allergies and more patient-friendly diagnostic methods can be developed.





Muscle power for the elderly

Muscle mass and muscle strength progressively decline with increasing age. This has negative consequences for daily functioning of older adults. Clinical studies show that sufficient protein intake combined with resistance exercise can maintain or improve muscle health and function in older adults. Wageningen University & Research have designed an innovative and evidence-based lifestyle programme for vulnerable older people. Successful daily implementation of the programme will contribute to independency and better quality of life of the elderly.





Resistant microbes in the care sector

Dutch healthcare has strict procedures to prevent antimicrobial resistance. Such policies can disadvantage people who have resistant microbes on their body. For example, nurses are not allowed to work, patients are refused surgery or other treatment, and children are excluded from day-care facilities. Philosophers of Wageningen University & Research together with public health specialists are developing an ethical framework for the prevention of antimicrobial resistance in health care. The framework helps professionals overcome practical dilemmas, enabling successful infection control and respectful treatment of individual patients.





Zoonoses and social responsibility

One Health suggests that protecting animal and environmental health also contributes to human health and vice versa. It also suggests that humans and animals are all worthy of protection. However, what does this imply for common measures to control zoonotic diseases, such as the culling of livestock? Wageningen University & Research philosophers explore ethical arguments for decision-making in dilemmas, in which animal welfare, personal health and public health are at odds. The goal is to strengthen the One Health approach and to contribute to quality of life of humans and animals.





Push and pull for malaria mosquitoes

Worldwide, malaria causes nearly half a million deaths a year. The disease is transmitted by mosquitoes. Wageningen University & Research is testing different combinations of mosquito repellents and attractants under semi-field conditions in Kenya and Tanzania in Africa. They aim to develop an optimised 'push-pull' system, pushing the outdoor and evening biting mosquitoes away from houses and pulling them into traps, thus, removing them from the environment. By reducing contact between humans and malaria mosquitoes, malaria transmission will be reduced and health improved.





Strengthening food and nutrition security

Strengthening food and nutrition security in Europe requires a turnaround towards sustainable consumption and production. Wageningen University & Research is part of a consortium of industry and science that will identify how food production and nutritional health can be aligned. This is a shared responsibility between farmers, companies, consumers and government at national and EU levels: to ensure that food produced and consumed 'scores better' in terms of health and the environment. The researchers develop suitable metrics, models and foresights on future food and nutrition security. The outcomes will help to underpin more integrated EU policies in this field.

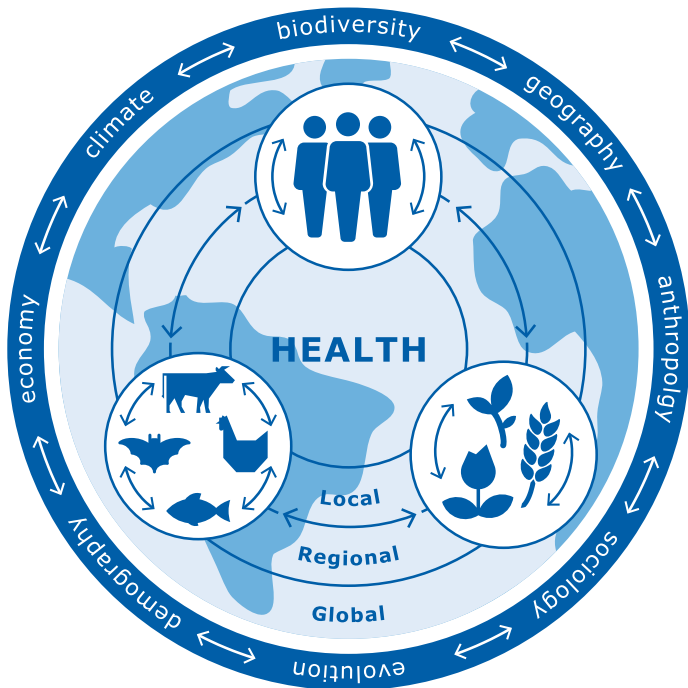




Cost-effective Rabies control

Rabies is endemic in many countries and causes 60,000 deaths globally per year. The disease can be controlled by vaccination of dogs, in some cases, combined with culling of roaming dogs. Yet, in many places, regulated control is failing. Together with Indonesian counterparts, Wageningen University & Research researchers showed that control of rabies by mass dog vaccination can be cost-effective in reducing human rabies cases. Vaccination campaigns should be adjusted to the dog owners, for example, by planning vaccinations, when owners and dogs generally are at home. Effective and efficient control programmes of zoonoses are situation-specific.





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Communication Services, Wageningen University & Research


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To explore
the potential
of nature to
improve the
quality of **life**
