AGES

RESEARCH, EXPERIMENTAL DEVELOPMENT & KNOWLEDGE TRANSFER ACTIVITIES

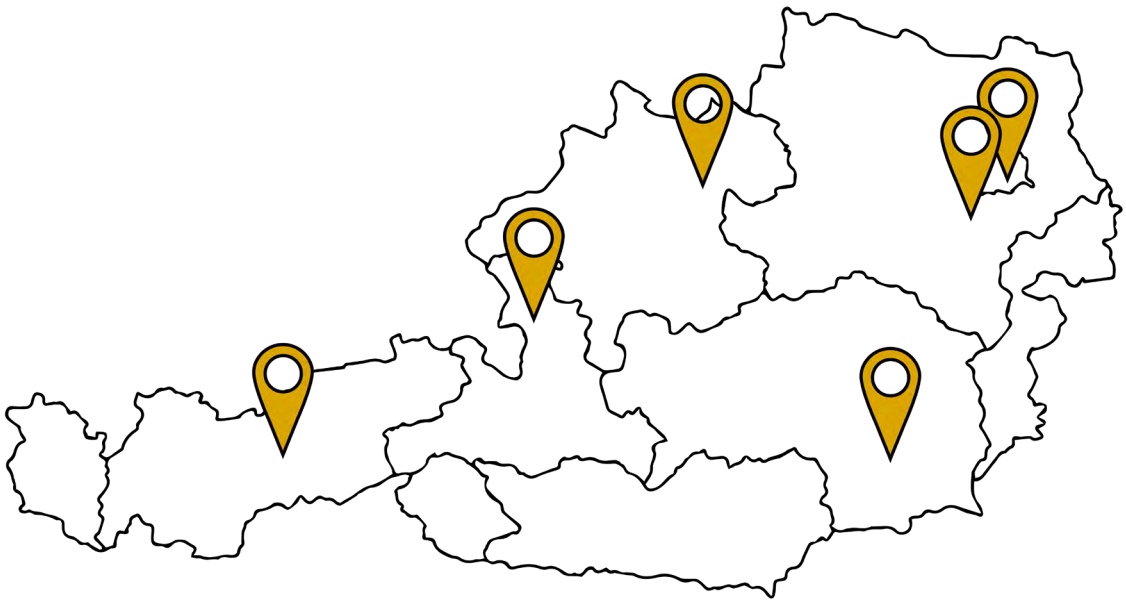
Report 2022

About Us

We are constantly involved in dealing with and containing potential risks to humans, animals and plants and ensuring consumer safety in Austria, whether because of pathogens in humans, animals and plants, counterfeit drugs, resistance to antibiotics, residues in foods, soil and seed examinations or radiation and climate protection. This means we analyse, monitor, evaluate, research, and communicate 365 days a year.

Our Locations

We can be found throughout Austria: our headquarters and three additional locations are in Vienna. We also have sites in Graz, Innsbruck, Linz, Mödling, and Salzburg and operate test stations in Carinthia, Styria, Lower Austria, and Upper Austria.



We inform

consumers and companies

We consult

politicians and authorities

We work

regionally, nationally, and internationally

Our Fields of Activity

AGES is owned by the Republic of Austria. We work on behalf of the Federal Ministry of Social Affairs, Health, Care and Consumer Protection (BMSGPK) and the Federal Ministry of Agriculture, Forestry, Regions, and Water Management (BML). Our six fields of activity cover a wide range of topics relevant to health and the environment:

Food Security

Bee health, plant protection, seed, soil health ...

Food Safety

Mycotoxins, heavy metals, and other contaminants, farm to fork ...

Medical Market Surveillance

Drug licensing, clinical tests, reports of side effects ...

Public Health

Covid-19, influenza, gonococci, tuberculosis, Ebola, cholera, polio ...

Radiation Protection

Radon, drinking water, disposal ...

Animal Health

Animal diseases, zoonoses, parasites ...

The following six fields of activity are supported by our units and our three specialist departments:

Integrative Risk Assessment, Data & Statistics

Risk Communications

Knowledge Transfer & Research

Our Research

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We act professionally and independently using scientific expertise in line with the tasks stated in Art. 8 of the Austrian Health and Food Safety Act. Our official mandate and the extensive task spectrum in our mandate require us to carry out applied research and impart relevant scientific knowledge to the public via our knowledge transfer activities.

Applied Research

AGES employs highly qualified experts and employees, who carry out a vast range of examination and test activities for the Austrian public and represent Austria in national and EU committees, all with the utmost diligence and in line with the legal framework. AGES staff members are represented in more than 1,000 national and international committees.

The research activities of our experts enable us to better assess risks, act appropriately in crisis situations and react promptly to new professional challenges. Moreover, they ensure our value as an independent and objective expert agency in Austria.

We share information selectively with specialists and interact with national and regional authorities/agencies (national, EU, international) at professional levels, also in the form of capacity building projects. Knowledge transfer projects promote the sharing of information and support the EU-wide networking activities of AGES experts beyond our committee work. For example, our consulting activities for authorities and institutions associated with the government at both national and international levels has been expanding in recent times. Young scientists and experts are recruited via projects and given opportunities to develop their careers. Knowledge is shared by our experts with the public via publications and presentations. We are also involved in a wide range of nationwide projects.

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You can find further information on our research activities at our website (www.ages.at) or on the AGES research portal (QR code).

Research Cooperation

We carry out research projects together with external partner organisations in all our fields of activity - from food safety and medical market surveillance to animal health, public health, and food security.

Our work in research networks helps us in fields ranging from professional networking, knowledge transfer and the establishment of strategic partnerships for joint project submissions and project execution, to cooperation in crisis situations, among others. Research collaborations exist with universities and other research institutions at both national and international levels.

Our successful scientific work and research projects are based on cooperation agreements and partnerships with, for example, the Federal Ministry of Agriculture, Regions and Tourism, the Federal Ministry of Social Affairs, Health, Care and Consumer Protection, the University of Natural Resources and Life Sciences (BOKU) or the University of Veterinary Medicine Vienna. Additionally, we co-publish the journal: Die Bodenkultur – Journal for Land Management, Food and Environment. We also have cooperation agreements at international levels, such as with the German Federal Institute for Risk Assessment (BfR) and the German Agency for International Cooperation GmbH (GIZ).

Our Core Topics

Internationalisation

Internet trade/fraud

Crisis management

Official Controls Regulation (OCR)

Analytics

Antibiotic resistances

Data management to data reporting

Sustainable food

Risk based approach/ central control planning

Adjustment to climate change

Target group specific communication of AGES topics

Public consulting/Research strategy

Digitalisation

Our Projects

Sustainability-oriented research at AGES strives to contribute to sustainable development and the 17 SDGs (Sustainable Development Goals of the United Nations). It is designed to create understanding, analyse connections, identify problem areas, and create solutions for today's challenges. Furthermore, our research encourages innovation and brings new impulses into society by developing new methods and tools for broader use.

All 193 member states of the United Nations have set themselves 17 goals for sustainable development to improve economic, social, and ecological conditions worldwide. The experts at AGES work actively towards achieving all these goals, bar the first ("no poverty").

Research and science can make vital contributions during the transformation to sustainable development by generating new knowledge and making it useful socially, as well as helping to create and use innovative methods to combine theory and practice and encourage broader participation.

Thus, we would like to present some of our current projects to give you a representative view of our research activities. We contribute to achieving key goals for sustainable development through our projects.

Project: Eco-AlpsWater

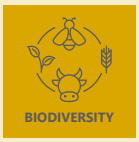
Innovative Ecological Assessment and Water Management Strategy for the Protection of Ecosystem Services in Alpine Lakes and Rivers

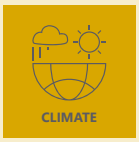
Fresh water makes up only a small percentage of water resources worldwide, yet it is one of the most valuable natural resources on our planet. However, inland waters face serious threats from both human activities and climate change. Many surface waters are polluted and display deterioration in their ecosystem functions. As a result, these waters must be monitored on a regular basis to identify any changes. The **Eco-AlpsWater** project has improved traditional monitoring methods using advanced DNA sequencing techniques.

The main objective of the European **Eco-AlpsWater** project was to enhance the monitoring of ecological conditions in inland waters by using next generation DNA sequencing techniques (metabarcoding). A consortium of 12 partners from the Alpine region developed a new method to analyse DNA found in bacteria, algae and other microorganisms or released by larger water plants and animals, including fish (environmental DNA, eDNA). The distribution of specific organisms can be recorded using this method and is a good indicator of the ecological state of freshwater resources. This technology enables a swift, improved, and cost-effective identification of species, automatic data processing, data storage and information retrieval.

The method developed in the project was tested and refined in 37 lakes and 23 rivers in Austria, France, Germany, Italy, Slovenia, and Switzerland. The new findings have been pooled in a toolbox that has been made available to decision-makers and water management experts.

The **Eco-AlpsWater** has made it possible to understand the ecosystems analysed better and has assisted in reaching targets set in EU bathing water directives. Additionally, monitoring methods for freshwater resources were refined in an effective manner by sharing knowledge and data between the countries involved.





Head of Project at AGES: Dr. Peter Hufnagl
Project coordination: Research and Innovation Centre – Fondazione Edmund Mach Dept Sustainable Agroecosystem and Bioresources (Italy)

Project: ORIGINICS

Microbiome Analysis for the Identification of the Origin of Fish

Demand for fish products has increased in both Austria and Europe in recent years. Consumers value the high quality of Austrian fish products and their regional production. The objective of the "Austrian Aquaculture Strategy – The Austrian Strategy for the Promotion of National Fish Production" is to increase levels of self-sufficiency in fish production, while maintaining the sector's small-enterprise structure with its regional, high-quality products, as well as promote ecologically sustainable and competitive aquaculture. Aquaculture farms in Austria mainly produce trout (flow-through systems) and carp (natural ponds).

The ability to identify the local origin of products plays an important role in consumer purchasing decisions and, thus, contributes to promoting local aquaculture. It is essential to be able to determine the actual origin of fish products analytically to support Austrian production and counteract the misleading use of designations of origin. The **ORIGINICS** project – "Microbiome analysis to identify the origin of fish" was initiated to help develop an analytical tool to verify the origin of Austrian freshwater fish. The project was carried out together with the Federal Agency for Water Management (BAW) and was scheduled to last for three years.

The objective of the **ORIGINICS** project was to examine whether the community of microorganisms (microbiome) in fish can be used to identify their geographical origin. The flow-through systems of five different locations in Lower Austria were selected for the project. Monthly samples were taken from rainbow trout (Oncorhynchus mykiss). The method used to determine the bacteria population was next-generation sequencing (NGS).

A method to identify the bacteria population (microbiome) of fish was developed during the **ORIGINICS** project and a separate database was set up for the storage of sequencing results of the bacteria populations to analyse the data and calculate prediction models (ProbAss – sample analyses and statistics system). In doing so, statistical learning was used in the development of forecasting methods.

In general, the findings demonstrate that the comparison of a specific fish sample with others can be well predicted. The probability of a correct prediction is 90 %. The prediction of the origin of a fish sample based only on water data has been shown to be more difficult using the statistical model selected and resulted in a probability of 70 % in terms of correct predictions.

Head of Project at AGES: Dipl.Ing. Irmengard Strnad
Project coordination: AGES

Project: RADONSURVEY

Evaluation of a Worldwide Radon Protection Survey by the WHO

Radon is a radioactive, colourless, odourless gas and is created in the uranium decay chain. It can be released from the ground into buildings (houses, apartments, workplaces). Radon decay products may get into the air we breathe and can form deposits in the human lung, where they can damage the DNA and cause lung cancer. Radon exposure is one of the most important sources of lung cancer. Exposure to this substance from residential buildings caused about 84,000 lung cancer fatalities worldwide in 2019.

The WHO conducted a survey about radon in its member states in 2019 and 2020 to be able to assess radon contamination more accurately (**RADONSURVEY**). The results showed the progress individual countries have made in the fields of health and radon prevention and allows a glimpse into the work still required to protect people from radon contamination. The last country survey on radon before the current report was carried out in 2006. This more recent report has enabled researchers to track developments since then. We analysed and created visual depictions of the answers submitted by individual countries to summarise the results and assist the WHO.

Almost 60 WHO member states answered the radon questionnaire. Two thirds of them were from Europe, 15 % from the Americas, and the rest from the regions West-Pacific, Eastern Mediterranean and Africa. A total of 45 of the 58 participating nations (75 %) said that they have national radon measures in place. Forty-two countries conduct national radon surveys, with 70 % of these countries in Europe and 17 % in the Americas. There is a national radon map for 33 countries (57 %). More than 90 % of the states surveyed are in Europe, most notably in the European Union (EU). Two thirds of the countries have either obligatory (24) or recommended (15) national regulations or directives for residential buildings. More than 70 % of the countries have introduced a national reference level for apartments (43) or workplaces (42). Radon prevention measures are mandatory in new buildings in one quarter (14) of the countries surveyed (all in Europe). Eighteen nations (31 %) have a national radon risk communications strategy in place, mainly in the European Union, but also in Canada, the USA, Uruguay, and the Republic of Moldova. Several countries in the EU said that a national communications strategy is part of their national radon action plan.

The WHO survey **RADONSURVEY** showed that protection from radon contamination is dealt with at very different levels in the countries surveyed. As a result, the WHO is planning to conduct such a survey on a regular basis to document progress in radon protection.

Head of Project at AGES: Dipl.Ing. Dr. Valeria Gruber and Dipl.Ing. Dr. Wolfgang Ringer MSc
Project coordination: World Health Organization (WHO)

Projects: MARGINS 1 and 2

MARGINS: Monitoring of Antibiotic Resistance Genes in Soil and Sewage

Bacteria can become immune to certain antibiotics naturally or develop resistance as they evolve. The genetic information for antibiotic resistance is stored in the form of antibiotic resistance genes (ARG) in bacterial DNA and can be passed on from one bacterium to another. Our environment holds a never-ending reservoir of naturally occurring antibiotic resistance genes that can be absorbed by bacterial pathogens.

Antibiotic resistance is an increasing risk for public health. The treatment of an infection is often more difficult should resistant bacteria be present. Experts are concerned that up to 10 million deaths per year could be caused directly or indirectly by bacterial resistance by 2050 if no measures to contain such issues are taken. Additionally, sectors such as the food industry, agriculture, human medicine, and public health may face severe economic difficulties due the transfer of various forms of environmental resistance to their products and medicines.

The identification of environmental fields in which there are high prevalences of resistant genes and the development of strategies to fight the spread of antibiotic resistance are imperative at both national and international levels.

The projects **MARGINS-I and -II**, carried out in cooperation with the Institute of Water Quality and Resource Management at the Technical University of Vienna (TU), set out to determine the contamination of soil and sewage with antibiotic resistant genes, as no such data had been available on this subject in Austria up to this point. The project findings will help reduce the risk of antibiotic-resistant gene transmission from environmental sources to bacteria relevant in human and veterinary medicine. Moreover, the results can be used as a basis for future routine ARG monitoring in the ecosystems tested.

The test programmes of both projects were conducted in line with EU requirements outlined in the One Health concept, which is designed to contain the spread of antibiotic resistance and the National Action Plan for Antimicrobial Resistance (NAP-AMR).

Present antimicrobial resistance contamination levels for soil, treated sewage and surface water were characterised in detail and data on the clinical and veterinary relevant ARGs in the ecosystems tested were gathered for the initial Austrian survey.

The results of the soil analysis showed that agricultural soils under strong anthropogenic selection pressure may display a similar pattern of different ARGs compared with non-agricultural areas (e.g. meadows and forests in nature parks). However, the range of different ARGs and their concentration in natural deciduous and coniferous forest soils is usually significantly lower. Fields fertilised with manure are easily recognised in the spectrum of the soils tested and can be characterised by a typical set of manure specific ARGs, increased ARG background concentrations and a typical ARG peak after manure application. Nevertheless, these agricultural soils display a high level of resistance to any foreign ARGs introduced by the manure, as ARG concentration decreases during the growing period, reaching its initial levels before fertilisation. The interesting fact is that antibiotics do not seem to play a role as a selection factor in soil resistance.

Sewage analysis showed that all the ARGs tested were present in the samples taken. The reduction of ARG concentration between the inflow and outflow of the treatment plants tested was between 1.3 and 4.3 LOG levels (value showing the efficiency of disinfection), which was further decreased using additional treatment methods. The concentration of some ARGs in surface waters was up to 105 times lower than in the treated water exiting plants. This helped identify ecosystems with a high risk of spreading clinically relevant ARGs - supporting Austrian risk management. Regular ARG monitoring at sewage treatment plants, in surface water and in selected sentinel soils is necessary to minimise potential hazards for humans. Additionally, strategies to minimise the spread of the relevant ARGs were developed.

Head of Project at AGES: Dr. Markus Wögerbauer
Project coordination: AGES

AGES Research Infrastructure

3.500 m² High greenhouse area	**1.074** Accredited methods	More than **80** Reference labs and Reference centres
9 Field testing stations	**3** High security labs	**2** Research greenhouses

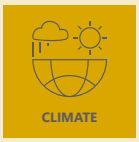
Project: i-SoMPe

Innovative Soil Management Practices across Europe

Innovative soil management practices (SMP) should improve the performance of eco-systems to minimise soil hazards and safeguard agriculture during periods of climate change. However, there is no comprehensive overview of management practices in Europe. The **i-SoMPE** project (Innovative Soil Management Practices across Europe) should assist in collecting data on innovative agricultural practices using a survey concept. This should help improve agricultural production and biogeochemical cycles.

The data collected was analysed taking technical and ecological restrictions and socio-economic barriers into account. Context specific, thematical charts were created to give political decision-makers efficient, innovative SMPs to use as sustainable, climate-intelligent tools.

An inventory of 100 SMPs was developed based on the data of 25 partners in 24 European countries, which describes environmental boundaries regarding cultivation systems, land use, locations, and soils. The project also investigated the potential impact of these SMPs and their potential suitability for overcoming key soil issues.

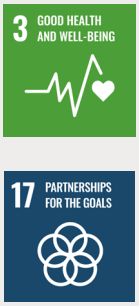


Regional statistics on environment variables were used to develop a framework to help estimate whether a practice can be applied in a specific environmental zone, and the scale of application, should be deemed appropriate. Furthermore, the data compiled made it possible to calculate SMP-specific variables that could restrict the application of a method as necessary.

Furthermore, the data analysis rated the soil management practices according to their practical application and detailing the most important barriers and opportunities regarding their use. Interactive online maps, descriptions, data, and graphics are accessible to the public.

Head of Project at AGES: Dr. Taru Sandén and Dipl.Ing. Dr. Heide Spiegel
Project coordination: Institute for Agricultural and Fisheries Research (ILVO, Belgium)

Project: HBM4EU

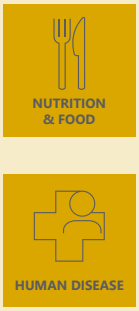


The European Human Biomonitoring Initiative

People are exposed to a complex mixture of chemicals in their daily lives, which they ingest via the environment, consumer goods, foods, drinking water and at their workplace. Unfortunately, uniform, comparable data on the pollution load experienced by the population is sparse. In particular, risk groups such as children and pregnant women, as well as workers in specific industrial sectors, would benefit from the better, more uniform measurements of contaminants.

HBM4EU is a European research project by 30 countries, the European Environment Agency, and the European Commission. The objective is to set up a Europe-wide human biomonitoring system. This should improve the measurement of environmental chemicals and their metabolic products in blood and urine. Additionally, the project investigates current issues on chemical risk assessment.

HBM4EU draws on the scientific expertise of the individual countries, while simultaneously building capacities, to establish a human biomonitoring platform at EU levels. In addition, the project is an interface between science and politics. The project findings have been passed on to political decision-makers to enable them to take targeted, effective political action to reduce exposure to contaminants.



The project also developed new methods and models to better assess the ingestion and effects of specific substances. Moreover, chemical mixtures people are exposed to on a daily basis were also identified and examined. The results of the Europe-wide tests are available on the **HBM4EU** Website. AGES carried out risk assessment for the food-related ingestion of organophosphate flame retardants, the data from which was compared with HBM data to evaluate how much food-related ingestion contributes to contamination in humans. The project was published scientifically.

Head of Project at AGES: Dipl.Ing. Johann Steinwider and Dipl.Ing. Elke Rauscher-Gabernig MScTox
Project coordination: Environment Agency Austria (Umweltbundesamt GmbH, UBA)

Project: FED-AMR

OHEJP TP: The role of free extracellular DNA in dissemination of antimicrobial resistance over ecosystem boundaries along the food/feed chain

Antimicrobial resistance (AMR) is the ability of bacteria, viruses, parasites, and fungi to develop mechanisms to defend themselves against the effects of active substances with antibiotic properties. Antimicrobial resistance is bacterial resistance to antibiotics. This resistance may lead to antibiotics becoming ineffective. This means that antibiotic resistance is an acute threat to global health. Therefore, coordinated countermeasures are essential, both nationally and internationally.

There are a large number of natural antimicrobial resistant genes in the environment, especially in soil, water and sediments. This environmental resistome is a permanent threat to human and animal health. Knowing the type, number, and dynamics of these resistance forms in ecosystems helps limit the introduction of new types of resistance from natural sources into relevant human and veterinary health fields. This can help reduce health and economic difficulties along the food chain and is the main reason behind data collection for this project.

The **FED-AMR** project from the One Health European Joint Programme (OHEJP) investigates the significance of free extracellular (ex)DNA as a source of AMRs in agricultural soils and along the food/feed chain. Several countries tested microbial communities, clinically relevant bacteria, contaminants, and antimicrobial resistant genes (ARG) across ecosystem boundaries as part of this project in different European countries. The findings of **FED-AMR** project can contribute to improvements in methods, monitoring, and strategy development, as well as to swifter reactions and more targeted actions in relation to AMR threats.

A total of 511 samples were taken from various ecological compartments (pig manure, fertilisers, soil, crops, feeds, surface waters, sewage, wild animals, people) in so-called open-air laboratories (OALs) and other agricultural areas and from wild animals over a one-year cultivation period. The samples were tested for their microbial diversity, the presence of clinically relevant, resistant bacteria and the presence of contaminants that could cause AMRs - i.e. antibiotics, pesticides, and heavy metals.

Preliminary results showed a high level of bacterial diversity and high levels of ARG variability between different countries, different compartments, different fields, etc. The lowest number of ARGs was found in river water and crop plants, the highest number in faeces from wild animals, sewage sludge and animal feed.

The final analysis provided new, detailed information on the role of exDNA as an AMR source, and antimicrobial, microbial and ARG diversity, as well as the interactions and factors that affect the distribution of AMRs and resistant microorganisms in an agricultural environment. The results were analysed to identify critical checkpoints for interventions and for the curbing of AMR distribution.

Head of Project of AGES: Mag. Dr. Werner Ruppitsch and Dr. Adriana Cabal Rosel
Project coordination: AGES

AGES Staff Members 2022

1.680 Staff members in total	**922** Academic staff members	**338** Staff members with doctorate
218 Senior Experts	**60 %** Women	**13** Staff members with a teaching post or professorship

Project: VAC2VAC

Vaccine lot to Vaccine lot comparison by consistency testing

The quality and safety of vaccines is ensured through the use of numerous tests during the manufacturing process and on the end product. Currently, a large number of laboratories are needed to comply with quality control requirements for the manufacturing of vaccines. This raises not only ethical questions but can also be very expensive, while the significance of the findings is limited in many cases.

The objective of the **VAC2VAC** project was to develop methods and concepts to demonstrate reliability in manufacturing vaccine lots and encourage alternative testing methods. Consistent manufacturing processes not only ensure consistent effectiveness but help minimise animal trials by using in-vitro systems (consistency approach). **VAC2VAC** was a research project financed by the IMI2 (Innovative Medicines Initiative 2) focusing on the development and validation of alternative, animal-friendly test methods for human and veterinary vaccines. The project was conducted by scientists from the human and veterinary vaccine sectors, as well as experts from research institutions, universities, and regulatory authorities.

Physical-chemical, immunochemical methods and cell-based tests for the routine quality, safety and efficacy checks of vaccines were investigated, optimised, and evaluated. The project was designed to develop tests and approaches that promote the acceptance of the consistency approach for established vaccines at regulatory authorities. This should help reduce the use of animals for batch tests in conventional vaccine production considerably in the future.

AGES took a leading role in this project to replace animal tests carried out as part of official lot approvals for FSME vaccines. The Medicines Control Laboratory is the only official laboratory to authorise batches of FSME vaccines EU-wide. AGES's Medicines Control Laboratory has not carried out animal tests on these products since January 2023, but has been using equivalent, alternative tests. As a result, the animal testing facility at the laboratory was closed. Additionally, progress was made in the evaluation of the quantity and quality of antigens that are the main component of many vaccines and which trigger immune reactions.

Immunological methods, such as the Enzyme-linked Immunosorbent Assay (ELISA), were used to determine the quality consistency of vaccines between the individual lots and more animal tests could be replaced. The development of ELISAs for FSME viruses, rabies viruses, *Clostidium chauvoei* (blackleg disease pathogen), diphtheria, tetanus and pertussis vaccines was promoted as part of this project.

Head of Project at AGES: Dr. Dieter Pullirsch
Project coordination: European Vaccine Initiative (EVI)

Project: EU4H11

EU4H11 Joint Action on quality of medicines and implementation of the pharmaceutical legislation/strategy

The Joint Action EU4Health-11 (**EU4H11**), which is part of the EU4Health programme that is financed by the European Commission, aims at strengthening the performance of and cooperation between EEA (European Economic Area) Medicines Inspectorates, as well as strengthening mutual trust in the inspection systems. The project is coordinated by AGES on a Europe-wide level.

Good manufacturing practice (GMP) describes the directives for quality assurance in medicine production with the objective of manufacturing safe, qualitatively perfect pharmaceuticals. The JAP (Joint Audit Programme) is an audit programme that evaluates GMP inspectorates, thus ensuring uniform GMP standards and a harmonised procedure for these inspection bodies in Europe. The JAP was established following a decision by the Heads of the EEA Medicines Agency and is conducted by the Compliance Group of the EMA GMDP IWG (Good Manufacturing and Distribution Practice Inspectors' Working Group of the European Medicines Agency), assisted by the EMA Inspections Office.

The JAP not only helps strengthen mutual trust inside the EEA, but also trust between EEA medicines authorities and those of non-EU partner countries that have signed agreements for mutual recognition (MRA) with the EU, such as Canada and the USA. The JAP is harmonised in the EEA largely through the international Joint Reassessment Programme of the PIC/S (International Pharmaceutical Inspection Co-operation Scheme).

The Joint Action **EU4H11** optimises training and qualification processes for both JAP auditors and GMP inspectors in close cooperation with the PIC/S Inspectorates' Academy (PIA). Additionally, there is a plan for the evaluation of potential for improvement within existing JAP processes. The collaboration between GDP Inspectorates in the EEA is to be intensified and a proposal developed for evaluating Medicines Inspectorates in the GDP.

The Joint action should encourage the active participation of auditors in the JAP by co-financing their additional workload, in order to carry out the programme successfully. Additional training courses and harmonised training and qualification processes should guarantee a sustainable number of qualified auditors and GMP inspectors in the EEA. First steps to harmonise and evaluate the inspection systems at European levels are being made in the GDP sector. The Joint Action provides an opportunity to advance these subsectors in medicines inspection sector significantly.

Head of Project at AGES: Mag. Andreas Kraßnigg and Ing. Ingrid Zlabinger BSc
Project coordination: AGES

Project: HERA NGS

HERA enhancing Whole Genome Sequencing (WGS)

The European Health Emergency Response Authority (HERA) was established as a directorate-general in September 2021 in the wake of the COVID-19 pandemic. Its tasks include the creation of capacities for the timely and effective fight against infectious diseases and preparation for future pandemics.

One of the measures in the HERA precautionary plan was the provision of financial support to enable EU/EEA member states to improve national laboratory methods to detect pathogens with the help of genetic material, Whole Genome Sequencing (WGS) and reverse transcription polymerase chain reaction (RT-PCR) methods in the health sector. This promoted the development of advanced laboratory methods for disease monitoring and preparations for dealing with cross-border disease outbreaks.

The comprehensive, coordinated investment in WGS and RT-PCR infrastructure for public health laboratories has made a significant contribution to early recognition and the increased monitoring of new and previously known SARS-CoV-2 variants. The objective was to create a sustainable infrastructure that can be used together with strategies on national and EU levels. The genome-based routine monitoring of outbreaks of infectious diseases at regional, national and EU levels was, thus, extended, and optimised.

Head of Project at AGES: Dr. med. univ. Bernhard Benka MSc and Dr. Adriana Cabal Rosel
Project coordination: AGES

Research Projects 2022

972 Project partners

122 ongoing R&D Projects

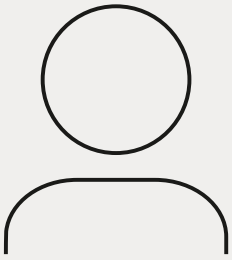
42 scientifically completed and finished R&D Projects

6.4 % Research quota

16.59 Mio. € for R&D and knowledge transfer activities

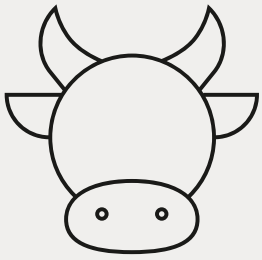
4.77 Mio. € Third-party revenues for R&D and knowledge transfer activities

Human



12 finished projects

Animal

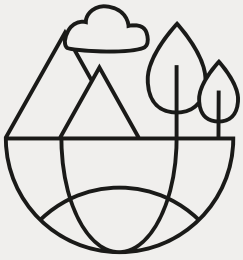


3 finished projects

Plant

9 finished projects

Environment



7 finished projects

Project: Animal Species

Development and Validation of DNA metabarcoding methods for species identification in food using Next Generation Sequencing (NGS)

Food producers are not only obligated to guarantee the safety of their products, but also their authenticity. The correct labelling of food products is very important for people with allergies, intolerances, and specific diets. A correct label also assists traceability and, thus, global challenges, such as the reduction of illegal fishing and protection of endangered species. Products are often adulterated for business reasons by using cheaper ingredients, reducing meat content, or using wrong labels. Thus, testing methods for inspection laboratories are needed that protect consumers from fraud. Mislabelling is more frequently found in higher priced goods (e.g. game, seafood) and this is why method development is being focused on the creation of suitable identification and differentiation methods for products.

The combination of two DNA analysis processes taken from PCR and sequencing analysis has shown some promise. Following an intensive literary research, the most suitable DNA sections were used for the development of new methods or previously proven systems and adapted to the metabarcoding conditions required. DNA Metabarcoding Assays use DNA sections that are characteristic for various species (barcodes) and are different in their nucleotide sequences. First, the relevant DNA sections are reproduced via PCRs and then the nucleotide sequence is determined (sequencing). The resulting DNA sequences are then allocated to the entries of a species database for taxonomic identification. At the same time, a sample and sequence database were established, comprising various species and species-specific DNA sequences.

The innovation in the development of metabarcoding processes was that these methods can be used for processed/mixed products and can be combined freely, thus making it possible to identify several species in one analytic step (multi-parallel amplicon sequencing). As a result, species that are categorised as seafood in the Austrian Food Code, could be analysed in one single test - i.e. shellfish and molluscs (e.g. squid, mussels, and snails) during a FFoQSI project. Additionally, a metabarcoding method developed and validated at AGES for the identification of mammals and poultry was published in the official collection of test methods in line with Art. 64 of the German Food and Feed Act (LFGB; L 00.00-184 NGS Barcoding Säugetiere/Geflügel). The methods provide laboratories with an attractive alternative when it comes to checking the authenticity of food products and have made a significant contribution to more transparency and greater safety in this sector, which used to be difficult to control.

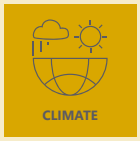
Head of Project at AGES: Dipl.Ing. Verena Peterseil
Project coordination: AGES

Project: LORN

Leptospirosis in Cattle in Lower Austria (LORN)

Leptospirosis is a bacterial zoonosis occurring worldwide. Zoonoses are infectious diseases that can be transferred from animals to humans. Leptospirosis occurs at increased levels in the warm, humid regions of our planet, as well as in Austria. This disease may become a more severe problem in Austria because of climate change. Almost all mammals, even pets and farm animals, can be affected by leptospirosis. The bacteria are transmitted by pests (rats and mice). These rodents release the Leptospira into the environment via their urine where they can get into the bodies of other animals or humans via open wounds and mucous membranes. Vets, farmers, and butchers may have a higher infection risk than other humans, based on their work with animals, but also travellers from South America and Southeast Asia face a risk of this disease. Symptoms in humans and animals range from slight to severe. The infection can cause fever and kidney and liver damage in humans.

Leptospirosis may cause miscarriages in cattle, affect their fertility and their milk production. Together with the University of Veterinary Medicine, Vienna, we set out to find out more about this disease in cattle in project **LORN**. Outbreaks and test results in humans and animals in Lower Austria indicate that Leptospirosis is becoming an increasing problem for public health. Data on the dissemination of Leptospira in Lower Austria hardly exist, though. The aim of the project is to detect Leptospira in cattle and improve diagnostics.



The procedure is as follows: should there be an increasing number of miscarriages on a cattle farm in Lower Austria, urine samples taken from the animals are tested. Additionally, the kidneys of cattle from Lower Austrian farms with an increased risk of Leptospirosis infection are tested at local slaughterhouses. A mobile laboratory has been set up as the bacteria often die during urine transportation. This lab goes directly to the farm affected and carries out the first stages of the urine sample test on site.

The **LORN** project will have a considerable, positive impact on human health thanks to the infection risk evaluation of high-risk professions. Furthermore, it will contribute to improvements in animal health and animal protection, which help ensure food security and reduce the negative economic effects of Leptospirosis in the region.

Head of Project at AGES: Dr. med. vet. Romana Steinparzer and Priv.-Doz. Dr. Georg Duscher
Project coordination: University of Veterinary Medicine, Vienna

Project: VETcapacity

EU's support to capacity building and gradual Union acquis alignment in the veterinary sector of Bosnia and Herzegovina

The agricultural and food producing sectors are important industries in Bosnia and Herzegovina. In an attempt to facilitate the potential EU membership of Bosnia and Herzegovina, the Twinning project "EU's support to capacity building and gradual Unionacquis alignment in the veterinary sector of Bosnia and Herzegovina" (BA 18 IPA AG 02 19)" was tendered to assist the local veterinary authorities. (Twinnings are partnership projects between EU members and EU candidates financed by the EU.) AGES, VET International France (the agency of the French Ministry of Agriculture) and the Veterinary and Food Safety Department of the Croation Ministry of Agriculture jointly won the bid to carry out the four-year project in 2020.

The project's tasks and objectives are to adapt the laws and regulations in the veterinary sector in Bosnia and Herzegovina to EU standards. Three core tasks were defined to achieve this:

Animal health: this focuses on the traceability of animal transportations and the monitoring of and fight against animal diseases. Biosafety also plays an important role in this task.

Animal welfare: regulations for pets and farm animals are adapted to EU standards and the new welfare animal law (AHL – Animal Health Law) was part of this task.

Animal waste and by-products: this task aims at transforming EU requirements and procedures in standard processes for Bosnia and Herzegovina and assist with their establishment.

These steps should not only facilitate cross-border commerce, but also improve the reporting of diseases and, subsequently, outbreak management. Austria will derive large benefits from better animal disease control in Bosnia and Herzegovina, as such diseases have consistently been demonstrated to spread across borders very quickly (BSE, African swine fever, bird flu etc.).

Head of Project at AGES: Univ.Prof. Dr. Friedrich Schmoll
Project coordination: AGES

Project: MOBILISE

A novel and green mobile One Health laboratory for (re-)emerging infectious disease outbreaks

Certain pathogens are finding better conditions due to climate change and global warming. This is particularly the case with viruses (arboviruses) transmitted by arthropods (e.g. mosquitoes or ticks), as they are finding increasingly better conditions that help them spread further across Europe. This includes the pathogens of Crimean-Congo haemorrhagic fever, West Nile fiver, Rift Valley fever and Dengue fever, among others. This poses a risk to public health and requires special monitoring, which is done using the so-called One Health approach. Samples from humans, animals and the environment are analysed from the areas of the vectors' habitats.

However, an analysis of existing mobile lab capacities revealed several shortcomings. A total of 66 % of the 193 laboratories surveyed are designated to civilian use, and 88 % can only be used for human diagnostics. Only 11 % of the labs have an accredited quality management system and only 3 % feature a laboratory at biosafety level BSL4.

The **MOBILISE** project was designed to close this diagnostic gap by developing innovative, quality assured One Health lab solutions. The mobile lab focusses on the molecular diagnostics, serology, and microbiology of samples of different origins (human, animal, environment). Furthermore, the project also created a platform for genome sequencing to identify pathogens and epidemiological analyses and for rapid tests for specific BSL3/4 pathogens.

New software based on artificial intelligence should help coordinate the use of the **MOBILISE** lab across Europe. This software is designed to recognise outbreaks in real time and report them to the relevant authorities.

The mobile lab has been tested by national authorities and first responders in Austria, Greece, Romania, and in Africa for a technology readiness level of up to 7 (TRL-7). An additional focus of **MOBILISE** is its compliance with the European Green Deal: the lab equipment should be operated using solar and wind energy.

Head of Project of AGES: Priv.-Doz. Dr. Georg Duscher and MMag. Dr. Karin Rainer
Project coordination: Bernhard Nocht Institute for Tropical Medicine (Germany)

Knowledge Transfer and Exchange

AGES Academy

We organise lectures, congresses, conferences, and training courses to share new and proven knowledge about current and future hazards and risks and to debate within our capacity as a certified training institution. We teach topics along the food chain, public health and food security in our training courses, as well as courses on further development for authorities and companies.

The **AGES Academy** is responsible for planning and carrying out AGES (training) events aimed at the public. This includes:

1.) Events on behalf of federal agencies and stakeholder ministries.

2.) In-house formats such as events and further training formats in the non-profit sector (in line with legal provisions) and information and further training formats for business partners (private sector offers in the business sector) developed by the **AGES Academy** together with the experts from individual departments.

3.) Guided tours and delegations: AGES offers selected stakeholders (universities, colleges, delegations from international health and food agencies etc.) the opportunity to become familiar with the AGES facilities and our research methods as part of guided tours.

4.) Knowledge transfer projects: the **AGES Academy** manages and develops the European training programme EU-FORA on behalf of the EFSA. The programme aims to extend the pool of experts for food risk assessment in Europe. Additionally, the **AGES Academy** is the national contact point for applications for the Europe-wide, cross-spectrum training initiative Better Training for Safer Food (BTSF), and for people based in Austria participating in it.

You can find out more about our events in our event calendar on our website (QR code). Explore our diverse lecture and training offering. We look forward to your participation!

The **AGES Academy** always strives to professionalise and innovate training and further training formats for authorities, government officials and businesses along the food chain on topics such as public health and food security (also in cooperation with colleges/universities, decentralised or online).

Additionally, the **AGES Academy** supports its expert fields in expanding their stakes in capacity-building projects (BTSF, Twinning, SRSS, EU-FORA and others) and in public consulting projects for EU agencies (CHAFEA, EFSA, ECDC, EPPO and IOBC, Health and Food Audits and Analysis (HFAA), EU Parliament etc.), as well as at international and supranational levels.

FFG Internships, Wiener Ferienspiel, Wiener Töchtertag & Co.

FFG internships (FEMtech and FFG talents) give students and school pupils the opportunity to have an internship in companies such as AGES and extramural research institutions in every field of the natural and technical science, with a special focus on climate, the environment, and species diversity. The objective is to share practice-related knowledge through active participation in research projects and guide participants towards applied research, assisted by qualified mentoring at the company involved (https://www.ffg.at/femtech-praktika).

We also offer younger children the opportunity to get to know new things at AGES as part of the **Wiener Ferienspiel**, in addition to our internship programme. Children can learn about types of flour and how to make bread from them. Furthermore, soil samples, insects and wild herbs are gathered during a walk through the AGES grounds and examined afterwards. Girls are offered a glimpse of how food is examined, information on plant pests and an overview of the many different professions for women at AGES, as part of the **Wiener Töchtertag** (Vienna Girls' Day).

AGES Events and Internships 2022

8,800 Participants	**134** AGES Academy Events	**164** Full-time months FEMtech Interns (female students)	**28** Full-time months FFG talents (school pupils)

Lectures and Publications 2022

612 lectures and events

106 scientific publications

98 popular-science publications

113 other publications
(poster, articles in conference transcripts etc.)

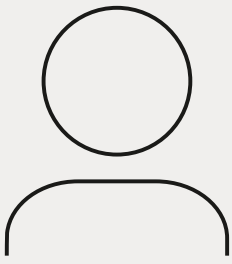
Most frequent goals for sustainable development 2022

73 | 66 | 52 | 39 | 32 | 22

Most frequent research topics 2022

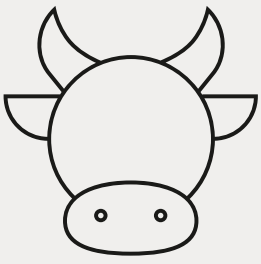
251 | 231 | 211 | 162 | 91 | 65

Human



523 Lectures and publications

Animal

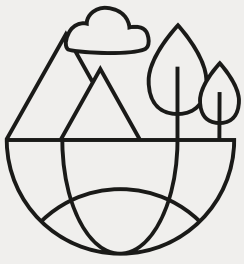


172 Lectures and publications

Plant

309 Lectures and publications

Environment



137 Lectures and publications

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You can find out more about our research activities on our website and on our AGES Research Portal (QR code).

AGES

HEALTH FOR
HUMANS, ANIMALS
AND PLANTS

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