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1 State of the WHO Center Veterinary Public Health

1.1 Terms of Reference

After coordination with the WHO, the terms of reference were structured as follows in 2011. A total of three terms of references are identified:

- (i) "Training and research in collaboration with the WHO in the following aspects of the interrelationship between human and animal health:
 - (a) Health problems associated with animal production practices and their control
 - (b) Zoonoses associated with food hygiene aspects(including infections, veterinary drug residues, chemical residues, contaminants, etc.)

- (ii) Training and research for national, regional and global strategies and methods for surveillance, prevention and control of zoonoses and foodborne infections due to animal products by direct cooperation with WHO Member States.

- (iii) Training and research in the development and application of epidemiological methods in Veterinary Public Health in collaboration with the WHO."

2 Research

The WHO Center VPH conducts research activities in several areas. In 2013, the collaborative research – in other words research with partners from other scientific disciplines – was the main focus. The following short reports summarize all of the projects processed by the institute. Projects which were able to be carried out thanks to additional support from the WHO Center are indicated separately.

2.1 Network projects: Further development of small group housing for laying hens

Scientific institutions and producers of housing systems joined together to form a research network to investigate and further develop the housing system of small group housing for laying hens newly introduced in accordance with the revision of the animal protection regulation from 22 August 2006.

Therefore two new projects were designed, which were supported by the Federal Institute for Agriculture and Food (BLE; FKZ: PGI-06.01-28-1-36.004-07, FKZ: 2807UM009). In another project, new small group housings and aviary systems are compared with each other under practical conditions in agricultural holdings. This is carried out in both projects in terms of animal behavior as well as animal health.

2.1.1 Project 1: Further development of small group housing for laying hens

The project was carried out between 2008 and 2012. Under the controlled conditions of five experimental stations and in small group housings for laying hens, possible influence variables were gradually modified over three laying periods and investigated in terms of their effects on animal behavior and animal health. The use of different functional areas, different arrangements of perches, different sizes of the litter area and modified group sizes of the individual compartments on the behavior characteristics of the hens were taken into account in particular. Within the scope of the survey of animal health, the hens were examined with respect to plumage damage, skin lesions, health of footpad and ectoparasitic infections, and pathological anatomical examinations regarding organ alterations were carried out. Additional examinations were also carried out looking at the immune status of the hens, the stress burden and gene expression, the salmonella load, the environmental inputs and emissions as well as efficiency.

The WHO Center completed the cross-project statistical analyses in the year under review and created a report. In terms of a comparison between the testing stations, further evaluations were carried out using cluster analyses. Detailed analyses were used to compare sections within one system and reasons for possible systematic and consistent differences between the individual sections were sought. Using a meta-analysis, cross-testing station analyses were carried out, although only an incomplete testing plan was able to be realized. Thirteen features of the fields animal health, animal behavior and efficiency were therefore analyzed as target figures. The influence of four variables on these target figures was examined.

Project progress 2013: The project was completed in principle. Publications were prepared during the reporting period and are now in the process of being submitted.

2.1.2 Project 2: Development of manager recommendations on small group housing for laying hens under practical conditions compared to aviary housing

The project was carried out between 2009 and 2012. The new small group housing was also to be investigated under practical conditions. Agricultural holdings with small group housing or aviary housing for laying hens were therefore included in the investigation. These were visited by different project partners at a specific date during a data collection tour. The necessary data entry forms and project databases had already been prepared and evaluated by the WHO Center VPH in close collaboration with the project partners. Cross-project statistical analyses were carried out during the year under review. These were able to be realized for four sections of target figures (animal health, animal behavior, stable climate, efficiency). The evaluation of these questions was carried out using a multiblock redundancy analysis according to Bougeard.

Project progress 2013: The project is completed in principle. A final report was prepared during the reporting period. The WHO Center is currently preparing several publications.

2.2 Network project FBI-Zoo (phase 2): Food borne zoonotic infections of humans: A network of human and veterinary medicine to research food borne infectious diseases

The Federal Ministry of Education and Research is supporting research networks on diseases which can be transmitted between animals and humans (zoonoses). The network "FBI-Zoo" includes more than 40 human and veterinary medicine research facilities from many different research disciplines. A total of 17 projects worked together in this network to conduct research on the four diarrhea pathogens Salmonella, Campylobacter, Yersinia and shiga toxin-producing Escherichia coli for a further three years.

The aim of the WHO Center is to deepen, expand and consolidate the insights gained so far in a second stage of funding (see also <http://www.fbi-zoo.net/>).

2.2.1 Project 1: Ecology of Salmonellae in pig fattening

Within the scope of a follow-up examination, samples from animals (pooled fecal samples) and the animal environment were taken at regular intervals in five selected pig fattening stocks with recognizable dynamics of salmonella transmission. Sampling included the closer and more distant surroundings of the animals (pig herding board, boots, piping, side partitions, animal scales, etc.) and the upstream links of the production chain (piglet production and piglet breeding). Collection of holding data and characteristics provided on a questionnaire were used to identify possible risk factors at the stock level.

Sampling was carried out during two production cycles within the production steps piglet production, breeding and the subsequent fattening. Following the first sampling in the suckling phase, further samples were taken during the breeding and in the fattening phase in regular intervals of approximately four to six weeks. A total of 1,256 samples were collected over the period from January 2012 to December 2012 and were tested for salmonellae cultures in the Branch for Epidemiology (Bakum).

A total of 2,246 salmonella isolates were able to be identified in this study and forwarded to the Robert Koch-Institute in Wernigerode, for further identification of types. Beside determination of serotype, lysotype and the existence of resistances against selected antibiotic agents, molecular methods (PFGE, MLVA and MLST) were used to classify the isolates in clonal lines. On the basis of the results of the type identification, individual holding analyses were carried out focusing in particular on the diversity and dynamics of clones of the Salmonellae detected. An analysis of risk factors for Salmonellae in pig fattening holdings was also carried out based on the data on type and the details about holding management (hygiene regime, etc.) provided by questionnaires.

Project progress 2013: The tests in the laboratory were completed in 2013. Salmonella were classified in clonal lines and variants using a combination of serotyping, MLVA, PFGE and MLST. Of the samples, 22.3% were positive and a primary clonal line was able to be identified in any production system. A publication was also submitted in 2013.

2.2.2 Project 2: Screening study on the transmission of zoonotic pathogens along the food chain

In cooperation with slaughterhouses, fattening pigs from conventional pig fattening holdings with known salmonella problem were selected for a cross-production step sampling within the food chain. Samples of these animals are currently taken and tested for food-relevant pathogen cultures (Salmonella, Campylobacter, Yersinia) within the following production steps: (1) in the holding (pooled fecal samples), (2) several times during the slaughtering process (fecal and various other samples from the carcasses) and (3) following cutting (muscle meat sample).

Visits to fattening holdings and slaughterhouses are timed in such a way as to carry out sampling of an animal or an animal group logistically. Pooled fecal samples from the pigs were taken at a holding level before slaughtering and tested for cultures of all three pathogens (Salmonella, Campylobacter, Yersinia); identified isolates were subjected to further identification of type. During the slaughtering process, various different sample materials of ten animals per stock were selected and tested for cultures of the different pathogens (feces, surfaces of the carcasses for Salmonella, Campylobacter and Yersinia, lymph nodes for Salmonella and tonsils for Yersinia). Following the subsequent cutting, meat samples from the holdings were also tested for cultures of all three pathogens.

Project process 2013: The analysis of the samples was completed in 2013. More than two thirds of the carcasses, 20% of the carcasses surface and 60% of the samples from the caecal content showed one of the tested pathogens at the time of slaughter. A manuscript about further results was prepared.

2.2.3 Project 3: Case-control study on sporadic salmonellosis in humans

Salmonellosis are one of the most common food-borne infections in human. Foods which are not constantly cooled are above all affected by contamination with Salmonellae. Desserts or salad with raw eggs or mayonnaise must be taken into account here in particular. Salmonellae, however, are also occasionally found in foods, the animal origin of which is not so obvious, for example chocolate, tomatoes, salad, sprouts, etc. A possible source of infection can only be determined in 20% of the reported salmonellosis. All other salmonellosis are individual diseases (sporadic cases), the cause of which is unknown.

In order to obtain clues for risk factors of the salmonella infections which have yet to be clarified, the Lower Saxony Health Authority in cooperation with the WHO Center VPH and the Lower Saxony districts and independent towns carried out a case-control study in which persons with sporadic salmonellosis were questioned in writing about their activities and their food consumption within the three days prior to their illness. For each case person, at least one control person of corresponding age and gender was also questioned randomly and in appropriate manner, in order to compare the questionnaire results with the habits of healthy persons.

Project progress 2013: The survey period of the second study phase was completed at the end of November. A total of approx. 3,500 questionnaires were sent out between 20 March 2012 and 20 November 2013. Following a plausibility check and data cleansing, 1,127 fully completed questionnaires (416 cases, 711 controls) are available now. The preliminary data analysis shows a significant correlation between sporadic salmonellosis and the consumption of raw ground pork, the intake of gastric acid inhibitory drugs and the consumption of meat when dining at a restaurant. A subtype-specific analysis identified trips abroad as risk factor for infections with the serovar *S. Enteritidis*, and raw ground pork as risk factor for *S. Typhimurium* infections. The new case-control study thus confirms the results from the first study phase (2008 – 2012). A publication is currently being prepared.

The current study also examines whether factors such as hand and kitchen hygiene affect the risk of infection. It is sometimes difficult to identify differences in the hygiene behavior between case persons and healthy controls, because sick persons tend to socially desirable responsiveness in order to present their hygiene behavior in a more positive light.

By means of specific questions about different hygiene aspects, an attempt is now being made to uncover socially desirable behavior. The analysis with the title "Hygiene Awareness of Salmonellosis Sufferers (Hygienebewusstsein bei Salmonellose-Erkrankten)" is to be processed soon.

2.2.4 Project 4: Characterization of the resistance of salmonella isolates of sporadic salmonella cases in Lower Saxony

The use of antibiotics is understood to be main cause of the effective spreading of resistant bacteria. Since the spread of antimicrobial resistance is very complex and can be affected by many factors, it is, however, difficult to show on population level the association between the use of antibiotics in the host and the antimicrobial resistance of pathogens carried by the host.

The isolates of the case-control study for sporadic salmonellosis (project 3) were tested for sensitivity to 13 different antimicrobial agents in the frame of the laboratory analysis. A multivariate resistance profile and extensive information from the patient questionnaire concerning factors influencing the appearance of salmonellosis is therefore known. This allows the simultaneous evaluation of sensitivity data and epidemiological host factors using multi-factorial, multi-variant models.

Project progress 2013: The data of 383 *Salmonella typhimurium* isolates from the study period 2008-2010 were used to prepare a risk factor analysis on antimicrobial resistance and the results were published (Ruddat et al. 2013).

2.2.5 Project 5: Characterization of zoonotic pathogens from hospitalized patients in German university hospitals

Data from hospital patients diagnosed with one of the four diarrhea pathogens were collected over the entirety of both funding periods of the FBI-Zoo network in the University of Medicine Hannover and the University Hospitals Munich and Münster. Information on symptoms, the current disease status and a preliminary report were recorded using standardized questionnaires. At the same time, a characterization of the isolates is available from the laboratory analyses. Statistic modeling is used to examine whether the severity of symptoms is associated with the pathogen subtype and whether certain factors favor the occurrence of certain pathogen subtypes.

Project progress 2013: A plausibility check and description of data of the first funding period were carried out in the reporting period. Two hundred and fifty-nine data sets are available from this study period. Following completion of field work and data entry in 2014, the data of the entire study period will be analyzed.

2.2.6 Project 6: Comprehensive analyses on the occurrence of Salmonellae in human and animal populations

In the framework of the FBI-Zoo network, different epidemiological studies to investigate the occurrence in different human and animal populations are carried out. Information of all detected isolates is documented in a global database accessible to all network partners, thus enabling a cross-study analysis and comparison of the isolate characteristics between the different populations. The laboratory diagnostic characterization includes the determination of subspecies, serotype and lysotype. Based on this information, pathogen diversity within and between the different study populations can be described and compared using multi-variant statistical methods.

Project progress 2013: Plausibility checks of the database entries and initial statistical analyses were carried out in the reporting period. Complete data sets of 1,056 *Salmonella enterica* isolates from five

different studies are available. A group comparison using a distance-based permutation test shows a significant influence of isolate origin and pathogen characteristics.

2.3 Network project: The significance of *Clostridium botulinum* in the occurrence of chronic diseases in dairy herds

In the past few years, increased occurrences of chronic diseases without clear cause have been observed in cattle holdings. The creeping deterioration of individual animals and whole herds was allegedly associated with the occurrence of the ubiquitous bacteria *Clostridium botulinum* and its neurotoxins. Within the scope of a case-control study, approx. 150 dairy farms were visited up to February 2014. As part of this, beside comprehensive herd examinations (e.g. condition and lameness scoring) and exact individual animal diagnostic, analyses of food and drinking water were carried out.

The objectives are as follows:

1. A case definition for a suspected holding or a suspected animal, respectively, is developed. Thus, considering epidemiological aspects, it should be possible to make a statement with sufficient confidence level as to whether a connection between *C. botulinum* and the occurrence of the disease can be assumed
2. If connections between *C. botulinum* and the occurrence of chronic diseases are found, the relevance of the respective clinical symptoms will be clarified for the assumption "stock affected" or "animal affected", respectively. In addition and in case of the lack of connections to *C.-botulinum* detection, other characteristics collected in the frame of the case definitions and detected symptoms will also be analyzed for their significance in the occurrence of the chronic disease in the stock.
3. For further aetiologic clarification, a molecular biological detection, identification and genotyping of the *C.-botulinum isolate* is carried out.

Further information can be found on the homepage of the study (see: www.rinder-botulismus.de).

Project progress 2013: The WHO Center maintained the project database, set up the data management including plausibility checks and carried out different descriptive analyses during the reporting period. Study hypotheses were furthermore formulated on the basis of which the multi-variant, multi-factorial analysis was prepared. Final analyses will be carried out in spring/summer 2014 as soon as all data are available.

2.4 Improvement of the detection of *Mycobacterium avium sbsp. paratuberculosis* by combination of diagnostic test methods.

A strategy to improve the test quality of the entire control measures against *Mycobacterium avium sbsp. paratuberculosis* using different test methods at the same time should be developed in the project. The objective is to find a (minimal) combination of diagnostic test procedures which are cost-effective and improve the diagnostic reliability.

The holdings examined are already part of a project for the significance of chronic botulism for chronic diseases in cattle. Ninety-five holdings are included in the investigation. In addition to environmental samples, different samples of individual animals are also taken for each holding. Milk, fecal and serum samples are analyzed therefore. Direct detection methods such as culture and PCR are also used as indirect detection methods for MAP (ELISA). These are used in parallel for different types of samples. In order to find the optimal combination of tests, one method is adapted to multi-variant statistics. In addition, different known risk factors are examined.

This strategy should help to improve the control measures for paratuberculosis in cattle. Future studies will focus on different animal groups, the feasibility of the strategy, the integration of stakeholders and the prevalence of *Mycobacterium avium* sbsp. *Paratuberculosis*.

Project progress 2013: The WHO Center maintained the project database, set up the data management including plausibility checks and carried out different descriptive analyses during the reporting period. Furthermore, first preparatory analyses for a latent class analyses were carried out in order to help estimate the test quality of the diagnostic methods carried out under field conditions in the project. Final analyses will be carried out in spring/summer 2014 as soon as all data are available.

2.5 Network project VetCAB: Representative registration of the use of antibiotics in food-producing animals – Pilot study

As in some European neighboring countries, the use of antibiotics in livestock farming should be continually recorded in Germany, too. Since regulation measures in Germany fundamentally differ from those of other EU states, the monitoring concepts established there cannot be adopted in Germany. It is therefore necessary to take new paths to collect the relevant data in Germany. For this reason, a feasibility study was carried out in 2007 and 2008, the results of which were reported to Federal Institute for Risk Assessment BfR.

On the basis of this, a pilot study for representative collection of the relevant data started in 2010. This project is being carried out in collaboration with the Institute for Pharmacology, Pharmacy and Toxicology of the Veterinary Faculty at the University of Leipzig on behalf of the Federal Institute for Risk Assessment.

The experiences of the previous feasibility study were taken into consideration here and the underlying concept was implemented accordingly. Representative data collection is to be carried out by the targeted selection of agricultural holdings in the appropriate districts. In order to set up the recruitment, talks were held with the veterinary offices and representatives of the veterinary profession and agriculture in selected districts. Together with the groups of people mentioned, farmers and veterinaries were won over to participate in the study.

Project progress 2013: The results were reported to the funding provider, the Federal Institute for Risk Assessment in Berlin, in the first quarter of 2013. The use of pharmaceuticals in 2011 was able to be analyzed in 1,260 holdings (2,700 areas of use) in 89 districts. In 2013, press releases, specialized information and scientific papers were published or are currently under preparation.

2.6 VetCAB-Sentinel: Longitudinal capture of consumption quantities for antibiotics in food-producing animals at selected, representative veterinary practices and holdings (participants-sentinel)

Based on individual internal information, the pilot study for representative capture of consumption of antibiotics in food-producing animals documents for the first time not only the consumption of delivered quantities of antibiotics but this is also directly related to the livestock, so a risk assessment can be carried out. The pilot study defined a status quo for Germany in 2013, allowing the definition of measures to reduce the use of antibiotics.

Project progress 2013: A participant sentinel set up in 2013 will be continued from 2014. Data are continually collected and analyzed according to a standardized pattern in the same holdings of selected districts.

The VetCAB-Sentinel will form the basis for a scientific risk assessment which according to DART contributes substantially to the reduction of antibiotic resistance.

2.7 Survey on the treatment of certain farm animals (turkeys, pigs, beef cattle, beef calves) with veterinary drugs concerning the food chain information – Method development

The objective of the study is to determine at which time in the life of a farm animal up to its slaughtering veterinary drugs are used. All used veterinary drugs with a waiting time greater than zero must be considered in this study. An adaptation of the method developed in project VetCAB should be carried out in this first part of the research project. Considering data protection all the time, type, quantity and treatment time of the mentioned veterinary drugs can be recorded with this method practicably for small and large structured animal stocks (here: turkeys, pigs (breeding and fattening) and beef cattle incl. beef calves). This project is supported by the Federal Institute for Agriculture and Food (BLE) and processed together with the Institute for Food Quality and Safety at the University of Veterinary Medicine Hannover, Foundation.

Project progress 2013: The investigation was set up in the reporting period.

2.8 Feasibility study: Does a networking of the contents of existing data sources in Germany make sense? – Possibility and limits of the network in the context of zoonosis

After increasing specialization in medical science in special fields also caused increasing separation during the last century, it can by now be ascertained that many diseases can only be combated by interdisciplinary research. Recently, more and more claims have been made about the possibility of analyzing information available on zoonotic pathogens together and independently of the sector in which they were collected in order to gain a better understanding of cases of diseases in humans and animals and thus to intervene preventively. In Germany, information on zoonoses is currently collected separately by origin (animal, food, human) and reason for assessment (detection of an outbreak, monitoring, reporting) in different databases. Interfaces between these sources have only rarely been established to date.

The objective of this feasibility study is to document databases of the zoonosis monitoring and to determine whether the contents of the data available are suitable for a merging and whether a joint evaluation can provide answers. The benefit of a joint data evaluation should be checked for different stakeholder groups and limiting factors or an existing demand for additional information should be collected and documented.

Project progress 2013: Inventory and documentation of existent databases was completed during the reporting period. An individual questionnaire was developed for the systematic description of epidemiologically usable databases. Furthermore, an expert workshop was set up to record the requirement for information exchange to improve the detailed zoonosis monitoring.

2.9 Network project RESET: "ESBL and fluoroquinolone resistance in Enterobacteriaceae"

Enterobacteriaceae play an important role in the spread of antimicrobial resistance. Caused by the production of extended spectrum beta-lactamases (ESBL) and (fluoro-)quinolone, resistance to beta-lactam antibiotics presents new resistance characteristics which restrict the therapeutic possibilities of the veterinary and human medicine.

The network RESET consists of nine network partners and 13 associated partners from human and veterinary medicine, basic and applied research and epidemiology. RESET includes different com-

plementary studies on factors linked to the spread of emerging resistance characteristics in *Enterobacteriaceae* from human, animal and environment.

As the coordinator of the network, the WHO Center faces a number of special tasks. The network management has to organize conferences, meetings and conference calls, but also to prepare reports and monitor the budget. In addition, the homepage of the network is maintained by the institute (www.reset-verbund.de).

Project progress 2013: Subsequent funding of the network was successfully applied for covering a period of a further three years (from 1 January 2014).

2.9.1 Project 1: Resistance situation and antibiotics consumption in farm animals – Representative epidemiological studies on *Enterobacteriaceae* in Germany

The research task of the WHO Center within the scope of the RESET network is to link data about the resistance situation in *Enterobacteriaceae* with data on the use of antibiotics in farm animals. Therefore a cross-sectional study was carried out in pigs, cattle and poultry in four districts in Germany. The objective of the cross-structural study was to investigate the spread and possible risk factors for the occurrence of ESBL-producing *E. coli* in farm animals. Within the scope of this study, holdings of pig and poultry fattening and holdings with milk and beef cattle were included in 2011 and 2012.

Sampling was carried out with two spatially separated animal groups of different age. Three pooled fecal samples, one pair of sock swabs and one dust sample were therefore taken per group. These were tested in culture for beta-lactam resistant *E. coli*. The bacteria species were confirmed using MALDI TOF. A standardized questionnaire was used to identify possible risk factors for the occurrence of these bacteria.

Project progress 2013: The analysis of pooled fecal samples, sock swabs and dust samples from 124 agricultural holdings was completed in 2013. Beta-lactam resistant *E. coli* could be detected in more than 80% of the holdings with broilers, pigs and cattle. The risk factor analysis showed factors from the fields operational and hygiene management and stable building. In 2013 two papers were prepared and submitted for publication.

2.9.2 Project 2: Database

The central database of the network (<http://datenbank.reset-verbund.de>) should document all significant information on the obtained samples and isolates.

Project progress 2013: The essential functions of the database were completed and actively used by the project partners during the reporting period. The quantity of samples and isolates recorded is shown on the home page. Data from 9,816 samples and 2,660 isolates of a total of nine project partners was entered or read in automatically via an internal interface into the database until March 2014.

Very extensive details with the individual project partners about the data structure of entry and processing masks for samples/isolates and the subsequent implementation/programming with the required tests was completed since the last reporting period. Furthermore, output and processing possibilities were implemented and expanded, the message transfer chain of the samples/isolates was displayed and internal interfaces for automated data import from excel data and data export in CSV data (for further data analysis and evaluation using data models for risk assessment) were programmed.

As the project progresses, additional data from project partners should be entered or read in, the output options should be supplemented for search and filter functions and the export interface should be adapted to existing requirements.

2.10 Zoonosis research in the subtropical rainforest of Guatemala

Interaction between the human and animal population is a possible hazard for the outspread of zoonotic agents. This is especially true for the strong interrelationship between wildlife and rural populations in semi-development countries like Guatemala. In the proposed communities for the study, villagers use and collect material from wildlife, cultivate maize and other crops for domestic consumption and raise pigs and poultry as sources of animal protein. Hunting is common, and subsistence hunting pressure is biased towards larger vertebrate species, and individuals are generally harvested without regard to sex or age-class. Therefore, there is an interface between wildlife and domestic animals as well as humans, which may increase the zoonotic burden and cause human diseases.

The focus of the research is therefore to determine the prevalence of potential zoonotic agents (i.e. Rickettsias, Leishmaniasis, Leptospirosis, Brucellosis, Tuberculosis, and Vesicular Stomatitis) as well as the existence and prevalence of suidae pathogens (CSF, Mycoplasma, and Actinobacillus), and blood parasites in peccaries (*Tayassu pecari* and *Pecari tajacu*), and domestic pigs (*Sus scrofa*) in the community forestry concessions of Carmelita and Uaxactún. Thus, samples which are taken from domestic pigs and from peccaries which are hunted by the residents will be analyzed for the above mentioned pathogens. Analyses will focus on prevalence and coexistence of pathogens in these taxa, as well as on epidemiological baseline information of the interrelationship of the villagers with the wildlife by means of a questionnaire survey in the communities.

With both information, the pathogen burden on the human population in the community forestry will be estimated and basis for possible future actions are given.

This project was possible only due to the additional funding as WHO Center VPH.

Project progress 2013: During the reporting period the preparation of the project was completed and the field work in the Guatemala started. Based on this experience it is expected that the project will last until mid 2015.

2.11 Preparation of the study protocol (focus on zoonoses) for the national cohort study

Two feasibility studies were carried out by the WHO Center within the scope of the preparation of the main phase for the national cohort. The feasibility of sampling on dogs and cats by their owners was investigated in 2011.

Furthermore, a feasibility study on the mobile recruitment of participants in the context of pretest 2 was performed in order to set up the national cohort. The recruitment of the test persons within the scope of the national cohort is carried out in 18 study centers, which preferably include test persons from urban centers. Since it generally makes sense to complement the cohort also with rural population, smaller towns and rural regions were specifically opened up in this feasibility study by the use of a mobile examination unit.

The objective of the study was the technical and logistical testing of this approach, the determination of the acceptance in rural residential populations and the estimation of the effort for this type of recruiting, in order to establish a basis to decide, whether establishing of such a type of recruiting makes also sense in the main phase of the national cohort.

The field phase took place from October to December 2012 in Stade and Vechte, Lower Saxony in collaboration with the center for collection Bremen (BIPS) and in Ladbergen, North Rhine-Westphalia in collaboration with the center for collection Münster (WWU). In this way the essential study elements of the basic survey set for the second phase of the pretest were performed.

Project progress 2013: The results of the feasibility study for sampling of dogs and cats by their owners were published. In order to establish the animal sampling in the main phase of the national cohort, a joint project application was prepared in collaboration with the Helmholtz Center for Infec-

tion Research. Appropriate reports were prepared on the results of the feasibility study for mobile recruiting.

The feasibility study for the mobile recruitment of the population in smaller towns and in the rural area was successfully completed with the examination of 116 test persons. There were no incidents during the examinations and taking the blood sample which called the kind of recruiting into question. The response was 20.2% in Stade, 16.9% in Vechta and 22% in Ladbergen (total: 19%). Compared to the in-patient results, the examination results were, essentially, in an average range.

In summary, the response to and implementation of the examinations were very satisfactory. The collaboration with the local health authorities proved to be the optimal solution in terms of the premises and also for the acceptance of the study among the population.

2.12 Case description of patients in German veterinary practices

The Royal College of Veterinary Surgeons Knowledge (RCVS Knowledge) wants to establish better the concept of the evidence-based medicine (EbM) in the veterinary medicine. Information on species and number of animals presented in the practice, the diagnoses made and the used therapies is the base of the EbVM. However, there is currently hardly any national comparison information available.

The RCVS Knowledge therefore created a new project to collect appropriate data. In Germany, the WHO Center VPH is taking on the task of collecting data on the following aspects in 2014:

- Which do owners bring their animals to a vet?
- Which are the organ systems affected and the main symptoms?
- Which diagnoses are made using which methods?
- Which further treatments are carried out?

This project was only able to be implemented because the WHO Center VPH was granted additional support in the form of federal funds.

2.13 Collaborative research in rural and commercial farming in Chile

Since 2012, projects in close collaboration with the University of Chile, Santiago, the Agricultural and Fisheries Services, Chile in the area of animal health and food production have been under preparation. The recent main focus is on scientific consulting in the epidemiology of census data and the preparation of monitoring studies on the antibiotic use in veterinary service of livestock.

Chile is composed of a large variety of aboriginal ethnic groups that have lived in its territory for thousands of years. Although initially only the groups in the north domesticated animals (Llamas & Guanacos), nowadays all of them practice animal husbandry at some level. In 2007 a full scale agricultural census took place in Chile, generating valuable information regarding both key elements: ethnic group of the owners and number of animals of each species simultaneously. Additional other information of agricultural interest was also integrated into the census data. This study therefore focuses on this association and describes the relationship of different Chilean ethnic groups and their animals especially with their non-aboriginal counterparts for the first time.

This project was possible only due to the additional funding as WHO-Center VPH.

Project progress 2013: The analyses of the census data were finalized in a multi-step stratified approach using administrative regions as well as geographical measures (altitude, agricultural zone etc) as classes to adjust for possible confounding and to study interactions in the different livestock systems. These results are of great interest to develop a new series of studies exploring the animal husbandry traditions of Chilean aboriginal ethnic groups, and by doing so, helping the government to

develop their agricultural policies according to each specific group. These studies were addressed by our partners from Chile.

In addition results of the VetCAB-project on the use of antibiotics (see 2.5) and the RESET-study on the resistance in livestock in Germany (see 2.9.1) were used to transfer the study protocol of the situation in Chile.

2.14 Research and development for the use of epidemiological methodology

Various different methods for the modeling and analysis of veterinary epidemiological data are examined. The data are obtained from internal study data or from counseling cases of the institute and include general modeling and specific applications of contingency table analyses, logistic regression cluster analyses, multiblock redundancy analyses and processing of modern diagnostic data structures of the "Next Generation Sequencing".

These projects were only able to be implemented because the WHO Center VPH was granted additional support in the form of federal funds.

Project progress 2013: In 2013 familiarization with the methodic and software for multiblock redundancy analyses and initial evaluation of project data were carried out. The multiblock redundancy analysis is methodically elaborated, there is, however, no study on quality and control of type 1 error depending on, among other things, the case number or the association of the cause variables among themselves. Methodical questions and suggestions for the examination of the quality of type 1 errors were planned together with the project partners from France.

Within the scope of two case studies, a systematic comparison of selected software for gene sequences were carried out with regard to the availability of different algorithms and the examination on the influence of the different parameter settings of the algorithms. The case studies were implemented on the basis of data on the PRRS virus (porcine reproductive und respiratory syndrome virus). This virus causes health problems in pigs which result in very considerably economic losses in holdings. The basis for the development of vaccines or a possible trace-back of virus strains is the selection of appropriate software to compare sequencing data and an explorative analysis of existing sequencing data.

Following determination of the appropriate software, sequences of the PRRS viruses were compared by multiple alignments. Furthermore, phylogenetic trees were created to analyze relationships between the sequences.

2.15 Sustainable availability and transferability of learned competences in the veterinary education - Interdisciplinary integration of epidemiological and biometrical methods

Biometry and epidemiology as an independent specialist discipline within the veterinary medicine always a cross-sectional character, since the methods made available here can be used in all areas of veterinary activities. The curriculum of the University of Veterinary Medicine Hannover Foundation and of other educational institutions for veterinary medicine therefore includes, in addition to the fundamental content, repetition of partly identical biometrical and epidemiological methods, but always in the context of the respective specialist discipline. This may be due to the fact that knowledge already acquired is not sustainably available to the students or that, as a result of the usual learning of biometrical and epidemiological methods by special field-dependent application examples, the transferability to other special fields is made difficult and repetition is therefore necessary. This can also be a consequence of insufficient cooperation or exchange between the specialist disciplines. This, however, is not a problem specific to veterinary medicine teaching. Lecturers on other courses of studies such as human medicine, biology, agriculture, forestry or environmental science face comparable conditions.

The research question to be addressed is therefore: Which biometrical and epidemiological contents must be unanimously considered relevant by all specialist disciplines and reflects a bundling and didactic reprocessing of this central knowledge in the basic course for veterinary medicine biometry and epidemiology possible in order that a fundamental acquisition of competencies which allows the transfer of what has been learnt to other specialist disciplines becomes possible for the students?

Project progress 2013: The evaluation of a German-Austria-Switzerland wide didactic survey showed which biometrical and epidemiological skills and knowledge veterinary medicine students should gain from the point of view of the veterinary lecturers. The results of this survey together with the course evaluation at the end of semester 2013 and the in-depth interviews carried out with both the students and the lecturers enabled the creation of a detailed topic catalogue which should subsequently be used as guideline for the contents of the course "Basics of Biometry and Epidemiology in Veterinary Medicine".

Based on this topic catalogue, operationalized learning objectives were first defined for each topic followed by the revision of the lecture contents according to the desired learning objectives. An appropriate paper referring to the survey and the conclusions of the survey was prepared and submitted for publication.

An identical course basis has already been able to be built in cooperation with the FU Berlin. This includes learning objectives, course contents, presentation slides, a task pool for each topic and an examination question base. A catalogue of basic didactic principles to be pursued in the future was also agreed.

3 Training

The WHO Center VPH holds training events and scientific colloquia or supports these activities. In 2013, the following events were carried out or prepared.

3.1 Seminar on Veterinary Public Health: "Risk-oriented monitoring and advising - methodical and content strategies"

In this year's seminar on Veterinary Public Health held on 8 February 2013 at the University of Veterinary Medicine Hannover Foundation, strategies and methods for an overall, risk-oriented monitoring were presented. Applications of this concept in food chain, animal protection, production of feed and other fields were also discussed. In addition to practicing veterinaries and scientists, state and federal office employees and representatives of the industry were among the 175 participants.

After the welcome by the president of the University of Veterinary Medicine, Dr. Gerhard Greif, Professor Dr. Günter Klein, Head of the Institute for Food Quality and Safety, gave an introduction to the topic of the event.

Prof. Dr. Marcus Doherr from the VPH Institute at the University of Bern gave an overview of the different kinds of sampling including stratified samples and their use in risk-based monitoring of animal epidemics. He emphasized the connection between monitoring and surveillance systems (MOSS) and risk analysis (this provides the basis for the selection of subpopulations in sample surveys). As an example, he mentioned the risk-based monitoring of BHV1 in Switzerland, for which a cost-reduction of approximately 40% compared to the traditional sampling was able to be achieved. However, he pointed out that new analyses for sampling must be carried out in regular intervals and after outbreaks.

Prof. Dr. Truls Nesbakken from the Norwegian School of Veterinary Science in Oslo presented an example for risk-based meat inspection in Norway. He talked about the results of an EFSA working group who had grappled with the request of the European Commission on the risks for the public health in the course of visual meat inspection. In this, the pathogens *Salmonella*, *Yersinia enterocolitica*, *Toxoplasma* and *Trichinella* were classified as particularly relevant for the human health. As the most important measure, Nesbakken pointed out the implementation and maintenance of biosafety at all levels, not only in the stable (in and out shower) but also in the slaughterhouse (disinfection of the equipment between the animals, closure of the intestine with plastic bags etc.).

Prof. Dr. Diana Meemken, Institute for Food Quality and Safety, Hannover/Bakum, then reported on the German approaches to risk-oriented ante-mortem and meat inspection. Examples were the concepts of Vion, Westfleisch, Manten and Bösel-Goldschmaus, some of which are already in use. All concepts have in common the auditing of the holdings by QA (or possibly IKB, Certus), the declaration on free-range husbandry and the acquisition of information on the food chain. Differences in the concepts concern the collection of data on the use of antibiotics or the serologic examination for certain pathogens. Dr. Meemken pointed out that improved information on the food chain enables the differentiation of the risk between stocks and slaughterhouses and that monitoring systems in meat inspection are still used too infrequently as instrument to improve animal health and animal well-being in the supplying animal populations.

These latter points were also addressed by Dr. Thomas Richter from the University of Economics and Environment, Nürtingen, whose research fields are animal husbandry and farm animal ethology. As an example of risk-oriented monitoring of animal protection, he cited the interpretation of organ findings in meat inspection. Organ findings can therefore point to deficiencies in the keeping which cause avoidable pain, suffering or damage. Monitoring and assessment of the holdings should be carried out according to a traffic light model. He demanded a type examination for mass-produced husbandry systems for animals and a specialist certificate for animal owner which must be regularly updated.

Prof. Dr. Hans Schenkel of the State Institute of Agricultural Chemistry at the University of Hohenheim reported on the contributions of the feed tests for risk assessment. He explained that a revision of

the sampling instructions was urgently needed and that the focus should not only be on the analytical processes but on the general view. He felt that an assignment of the feed companies to a risk mode was important. This is important, since feed is frequently traded across borders and often consist of mixtures from different regions.

Dr. Josef Schulte-Wülwer, Head of the Pig Health Service of the Chamber of Agriculture in Lower Saxony, Meppen, then presented the experience of five years of health monitoring by means of piglet screening. One of the main objectives of the screening program is to detect new infections and to prevent the spread of pathogens. The upstream and downstream stages such as supplier of gilts and sperm for example should also be included in the veterinary stock care. Continuity of care and communication with the farmers are particularly important in order to guarantee an unbiased sampling. A web-based database is currently under construction in which laboratory results are entered and in which slaughterhouse findings could also be recorded in the future. As a conclusion, Dr. Schulte-Wülwer emphasized that laboratory diagnostics can always only be an auxiliary means for assessment in connection with clinical findings and that the implementation of screening results is important in integrated veterinary stock care (ITB).

Dr. Albert Groeneveld, Head of the Department for Animals and Food in the district of Borcken, presented a system of risk-oriented classification of pig stocks for the animal disease fund. This is the EU-funded project Safeguard which brings together data from the QA audits and the official results of the district of Borcken. He also presented approaches with regard to biosafety (BSI) on the one side the QA-BSI index and on the other hand the bonus-malus BSI classification of the animal disease fund. The conclusion was that both approaches create comparable conditions to carry out a risk-oriented classification of animal populations in terms of biosafety.

In the last session, PD Dr. Lüppo Ellerbroek from the Federal Institute for Risk Assessment (BfR), Berlin, provided an outlook as how the meat investigation should develop in the future. He explained that there should be a uniform federal regulation for risk-based meat investigation and that a transparent collection of data along the entire food chain should be carried out. In case of information about the animals delivered, it would also be useful to consider not only the salmonella status but also the risks identified by the EFSA such as *Yersinia* and *Toxoplasma*. In this way, the burden on the official veterinary could be alleviated, and in return the official auxiliary strengthened. Furthermore, the nature and intensity of the official control could be limited in coordination with international trading partners. He also referred to the symposium of the BfR for further development of meat investigation which took place on 7 February.

Perspectives of risk-oriented monitoring and advice were debated in the final discussion. The important points were the issues of how the consumer demand for a zero risk of the transmission of zoonoses, which cannot be achieved by any form of monitoring, could be met. Furthermore, some of the participants saw difficulties in implementation, since smaller holdings could possibly not fulfill the requirements. Overall, the participants agreed that the current methods are not bad but, due to new knowledge, are no longer adequate. This therefore means that the old traditions should not be stuck to but rather risk-oriented investigation should be used. German legislation must be updated accordingly, since this still complicates the flexible EU law too much by amendments.

This event was only able to be implemented because the WHO Center VPH was granted additional support in the form of federal funds.

3.2 Course Program Epidemiology – Biometry 2013

The courses were held in February and March 2013 by the Association for Applied Epidemiology and Ecology in collaboration with the WHO Center VPH. The courses are intended for anyone who deals with the planning, analysis and evaluation of empirical studies within the scope of their work.

Four courses are offered consisting of three days training each. "Descriptive Epidemiological Methods", "Analytical Epidemiological Methods", "Basic Risk Analysis", and "Planning and Evaluation of Monitoring and Surveillance Programs".

The courses "Descriptive" and "Analytical Epidemiology" impart the methodical knowledge necessary for epidemiological studies and explain them by examples. The concepts for construction and collection of epidemiological measured values, the most important collection methods, evaluation and correction of error sources and basic evaluation methods were described.

In the course "Basic Risk Analysis", the terminology of risk analysis (standards according to OIE, Codex Alimentarius) and of risk modeling (deterministic, stochastic models, simulation) was explained. Additional topics were modeling tools and qualitative risk assessment on the application model animal protection, these were theoretically imparted and on the basis of example applications (modeling, data availability, validation).

Since good knowledge of epidemiological and statistical aspects of planning and implementation of monitoring programs are increasingly expected, a course on the topic "Planning and Evaluation of Monitoring and Surveillance Programs" was also offered in 2013. The course deals with the essential epidemiological components in planning and evaluation of health monitoring studies based on random samples and imparts the following questions:

- Which fundamental objectives does a monitoring program pursue?
- What kinds of random sampling planning are available?
- What are the possibilities in terms of optimizing a monitoring program when only limited resources are available?
- Which concepts of risk-oriented planning and evaluation are available?

The course includes the handling of basic methodical procedures.

3.3 Baltic-Scandinavian-German Cooperation in Courses in Veterinary Public Health

Since 2013, the WHO Center VPH has been supporting efforts to improve the development of the subject Veterinary Public Health by targeted further training for advanced students. A program in the Baltic States was among other things developed in order to do this. The following courses were carried out as two weeks intensive course at the Faculty of Veterinary Medicine, Latvian University of Agriculture, Jelgava, Latvia assisted by various different colleagues.

Day	Program of lectures and other activities
1	Arrival
2	6 Working hours Welcome from organizers. Veterinary public health – needs for interdisciplinary approach between public health, veterinary medicine and other scientific areas. Basic information on biology and pathogenicity of emerging and reemerging zoonotic diseases of veterinary and public health relevance.
3	6 Working hours Basics of epidemiology. How to assess disease status. Risk assessment. Diagnostic tools.
4	6 Working hours Current epidemiological situation regarding zoonotic diseases in the Baltic - Nordic region. Working groups: zoonoses in the EU member states (participating in IP).
5	6 Working hours The most important food-borne zoonoses in the EU (Salmonella, Campylobacter, E. coli, Yersinia, Listeria). The problem of antimicrobial resistance.

- 6 6 Working hours
Protozoal diseases (Toxoplasma, Cryptosporidium) Samples and principles of laboratory diagnostics (animal, food, human and environmental samples) – BIOR?
- 7 Day off – day for cultural activities. Excursion/ trip to Rundale palace, Bauska castle.
- 8 6 Working hours
Outbreak analysis. Interdisciplinary approach on foodborne and non-foodborne zoonoses. Basic principles of risk analysis. Working groups: case handling.
- 9 6 Working hours
Vector borne diseases – West Nile virus, Bluetongue, TBE. Influence of climate change on emerging diseases. Working group: case handling.
- 10 6 Working hours
Systemic bacterial diseases (Brucella, Listeria, Q fever). (Field trip to brucellosis outbreak site?)
- 11 6 Working hours.
Flu – avian, swine, other animal species. Policies in Latvia and European countries.
- 12 6 Working hours
Parasitic diseases – Echinococcus multilocularis, Dirofilaria repens. Monitoring and surveillance systems on zoonoses in the EU. Closing session of the course.
- 13 Departure.

This project was only able to be implemented because the WHO Center VPH was granted additional support in the form of federal funds.

3.4 DACH Epidemiology Meeting 2013 "Veterinary medical epidemiology in clinic and stock medicine"

The meeting of the German Veterinary Medical Society – specialist group Epidemiology and Documentation of the Epidemiology and Animal Health Forum and of the Austrian Society for Veterinaries - Epidemiology section (DACH) took place in Hannover from 4 to 6 September 2013 and was organized by the WHO Center VPH and supported by many scientific contributions.

The field of epidemiology has become increasingly important in veterinary medicine in recent years. The image of the tasks of epidemiology has sharpened in both the scientific and the public perception, above all in the attitude towards risk assessment and animal disease control. Further significant fields of activity were not yet been publicly allocated sufficient epidemiological expertise. This also includes the field "clinical epidemiology". What starts in the consideration of one individual case can finally result in clinical studies using retrospective, systematic analyses. Epidemiology is an important partner in all levels from observation to intervention. The objective of the meeting was to bring the focus onto this field of activity and thus to present the tasks of epidemiology in the context of clinic and stock medicine more clearly.

Scientists from practice and basic research, decision-makers from ministries, federal institutes and professional associations and official veterinaries and veterinaries supervising in the animal health service came together to exchange current research results and experiences and to develop new ideas, concepts and collaborations. The main focuses of the specialist conference were:

- Epidemiology in the clinic from individual animal to clinical study
- Epidemiology in animal protection: recording and evaluation of animal welfare
- Epidemiology in zoonosis research from animal to human
- Current methods of statistics and documentation

Guests from a wide range of countries participated in this event. Henrik Stryhn, Canada and Mo Salman, USA were also able to be recruited as well-known guest speakers.

4 Webpage Veterinary Public Health

The WHO Center VPH considers it to be its task to coordinate public relations to the topic veterinary public health. The internet is ideally suited for this as information and contact forum. The website

www.veterinary-public-health.de

is a newly designed webpage with new layout and updated contents which has been active since spring 2014. This extensive offer of information contains the following topics:

1. Home page
 - 1.1 What is VPH?
 - 1.2 VPH in context
2. Tasks and areas of activity
 - 2.1 Zoonoses and animal diseases
 - 2.2 Food production and food safety
 - 2.3 Feed production and feed safety
 - 2.4 Use of antibiotics and antibiotic resistance
 - 2.5 Environmental hygiene
 - 2.6 Animal welfare and animal protection
3. WHO Collaborating Center
4. Organization VPH in Germany/EU/worldwide
5. Further training/ advanced training possibilities
6. Imprint
7. Contact

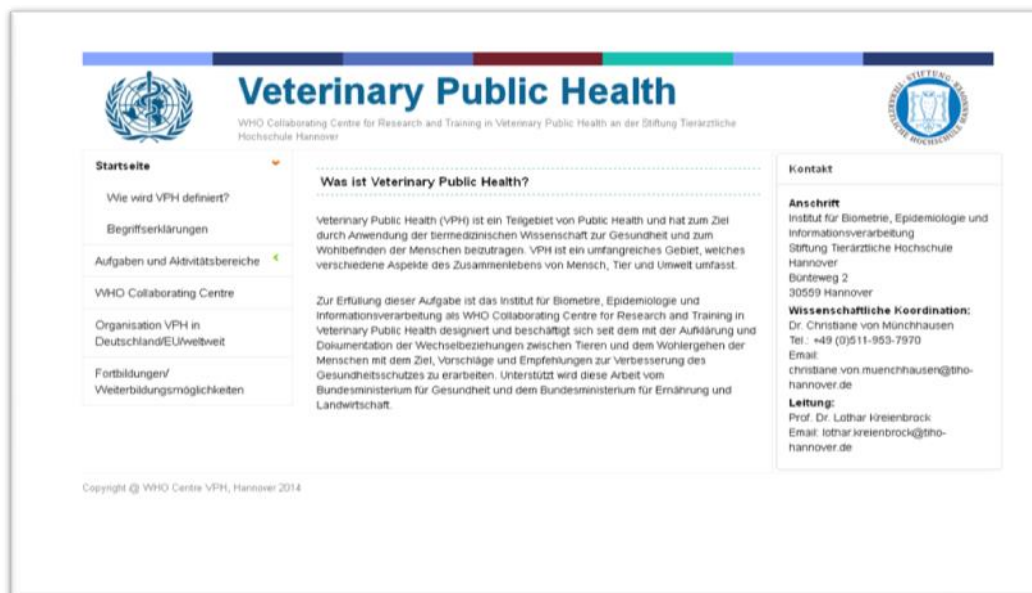


Fig. 1: Home "www.veterinary-public-health.de"

The screenshot displays the website for Veterinary Public Health (VPH). At the top, there are logos for the WHO Collaborating Centre and the German Veterinary Association (VetMärkte). The main title is 'Veterinary Public Health' with the subtitle 'WHO Collaborating Centre for Research and Training in Veterinary Public Health an der Stiftung Tierärztliche Hochschule Hannover'.

The page is divided into several sections:

- Startseite:** A navigation menu with links to 'Wie wird VPH definiert?', 'Begriffserklärungen', 'Aufgaben und Aktivitätsbereiche', 'WHO Collaborating Centre', 'Organisation VPH in Deutschland/EU/weltweit', and 'Fortbildungen/ Weiterbildungsmöglichkeiten'.
- Wie wird VPH definiert?:** The main content area, which includes:
 - A definition: *Die FAO, WHO und OIE definieren Veterinary Public Health als "Die Summe aller Beiträge zum leiblichen, geistigen und sozialen Wohl der Menschen durch das Verständnis und die Anwendung der tiermedizinischen Wissenschaft"*
 - A paragraph explaining the relationship between human health, animal husbandry, and animal health, mentioning zoonoses and food safety.
 - A list of areas where VPH plays a role, such as diagnosis, surveillance, control, prevention, and eradication of zoonoses; food safety; management of health aspects in research facilities and diagnostic laboratories; biomedical research; education and consultation in the health sector; production and control of biological products and medical devices; management of domestic and wild animal populations; protection of drinking water and the environment; and management of public health.
 - A diagram showing a human figure with the word 'Mensch' written below it.
- Kontakt:** Contact information for the Institute for Biometry, Epidemiology and Information Processing at the University of Veterinary Medicine Hannover, including the name of the scientific coordinator, Dr. Christiane von Münchhausen, and the head of the department, Prof. Dr. Lothar Kreienbrock.

Fig. 2: Presentation of the first sub-item "How is VPH defined"

This information service was only able to be offered because the WHO Center VPH was granted additional support in the form of federal funds.

Project progress 2013: An extensive reworking and update to the previous contents of the information service was carried out in the reporting period and should be completed in 2014.

5 Future Activities

5.1 Continuation of Current and Establishing of New Research Projects

The WHO Center VPH intends to continue, deepen or establish the following research activities from 2014:

- Significance of *Clostridium botulinum* in the occurrence of chronic diseases in dairy cattle stocks
- Representative registration of consumption quantities of antibiotics in food-producing animals – Sentinel study
- Interdisciplinary research network "RESET"
 - Cross-sectional study in agricultural holdings, environment and food
 - Comprehensive analyses
 - Fundamental linkage of sequence-based data on resistance characteristics of isolates with the epidemiological characteristics of the hosts
- Research in connection with the national cohort
 - Establishment of mobile recruiting centers
 - Creation of examinations on resistance and zoonosis research
- Research on merging and for secondary data analysis of public and private data with current research data
 - In the field of animal diseases
 - In the field of economically relevant stock diseases
 - In the field of zoonoses
- Research in cooperation with the Republic of South Africa:
 - Study on the occurrence of tick populations
 - Development of training units of laboratory monitoring
 - Establishing of an epidemiological summer school program
- Zoonosis research in the tropical rain forest of Guatemala
- Collaborative Research in Rural and Commercial farming of Chile
 - In-depth analysis of the census data on the connection of agricultural regions and animal health
 - Creation of a cross section on surveillance of resistances
- Collaborative Research with the Royal Veterinary College
 - In connection with the establishing of methods used in evidence-based veterinary medicine
 - In connection with the establishing of Animal Health Economics methods
- Research and development on the use of epidemiological methodology
 - In-depth analysis of resistance patterns with epidemiological information
 - In-depth analysis of next generation sequencing data with epidemiological information

5.2 Events in Preparation

The following further training courses are already in preparation or intended (see above):

5.2.1 Seminar on Veterinary Public Health

In 2014, the seminar on Veterinary Public Health deals with the topic "ESBL: a new danger or a current name for old problems? – The task of veterinary medicine in avoidance and reduction of resistance".

Antibiotic-resistant pathogens have become a core problem in veterinary and human medicine in recent years. Beta-lactam resistant enterobacteria known as ESBL-producing bacteria spread particularly rapidly and extensively. These intestinal bacteria can cause infections or transfer their resistance genes to other potentially pathogenic bacteria. For this reason, these pathogens are of key interest. The following topics should be discussed:

- What is ESBL? – Terms and definitions
- How is resistance spread? (animal populations and environment)
- What are the measures to reduce resistances?
- How is the risk to assess?

Leading experts will present current data and information to the participants. The main focus of this will be on what kind of methodical and content strategies can be used to reduce the occurrence of resistances from the veterinarian point of view.

5.2.2 Course program Epidemiology – Biometry

The established course program which is intended to convey both fundamental knowledge and application-oriented procedures based on examples from practice of science, veterinary medicine and veterinary management will continue in 2014.

5.2.3 International courses and collaborations in the field of veterinary public health

In addition, the course offer should be extended in joint cooperation with the WHO. This includes among other things:

- Participation in the establishment of additional teaching capacity in the province of Oostkap, South Africa
- Development of courses on veterinary public health in collaboration with the Department of International Relations, coordinator of external relations, Latvia University of Agriculture

5.2.4 Further events

The DACH Epidemiology meeting of the specialist group Epidemiology and Documentation will be held in Zurich, Switzerland from 3 to 5 September 2014 and is organized by the Department for Epidemiology of the Vetsuisse University. The title of the event is "Animal Health and Economy". From the veterinaries' point of view, animal health economy is a specialist field which has been developed comparatively little in the German-speaking world in the past. A substantiated economic analysis is often missed as basis for the decisions on the therapy of diseases of the individual animal and on prevention and combat of diseases in a population up to national animal health programs. Given the lim-

ited resources and the multitude of possible pathogens and prevention measures, there is an urgent need to show and transparently present the costs and benefits of the different options. This year's meeting aims to bring together specialists from the fields of epidemiology, population medicine, state veterinary service, agricultural science, laboratory diagnostics and animal health economy and encourage an interdisciplinary discussion.

The meeting should provide an overview of the current status of methods and applications of the animal health economy. Thereby, the application of economic methods should be strengthened in epidemiological practice and research.

The WHO Center VPH will participate in the academic organization of the program and share its experience from the event organization of the previous year.

6 Collaborations

Within the scope of its research and trainings activities, the WHO Center VPH works with the following institutions:

6.1 International cooperation partners

- Veterinary Epidemiology Unit, Department of Agriculture, Belfast, Northern Ireland
- Veterinary Public Health-Institute, Bern, Switzerland
- Federal Food Safety and Veterinary Office, Bern, Switzerland
- Department of Biomathematics and Informatics, University of Veterinary Science, Budapest, Hungary
- Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, Canada
- Royal Veterinary College, London
- RCVS Knowledge, London
- Department of Veterinary Tropical Diseases, University of Pretoria, Onderstepoort, South Africa
- WHO Collaborating Center for Drug Statistics Methodology, Oslo, Norway
- Department of Epidemiology, French Agency for Food, Environmental and Occupational Health & Safety (ANSES), Ploufragan, France
- Faculty of Veterinary Medicine of the University of Chile, Santiago de Chile, Chile
- European Center for Disease Prevention and Control, Solna, Sweden
- State Veterinary Services, Department of Agriculture, Stutterheim, Eastern Cape Province, South Africa
- Veterinary Faculty, Universidad Austral de Chile, Valdivia, Chile
- Austrian Agency for Health and Food Safety Vienna, Austria
- University of Veterinary Medicine Vienna, Austria
- Vetsuisse Faculty of the University of Zurich, Switzerland

6.2 National cooperation partners

- Department of Veterinary Medicine at the Free University of Berlin
- Charité, Berlin
- Federal Institute for Risk Assessment, Berlin
- Federal Office of Consumer Protection and Food Safety, Berlin
- Robert Koch Institute, Berlin and Wernigerode
- Carl Friedrich Gauß Faculty at the Technical University Carolo-Wilhelmina of Braunschweig
- Helmholtz Research Center for Infection Medicine, Braunschweig

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- Johann Heinrich von Thünen Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries, Braunschweig
 - Leibniz Institute of Prevention Research and Epidemiology - BIPS GmbH, Bremen
 - Friedrich Loeffler Institute, Celle, Jena, Mariensee, Riems Island and Wusterhausen
 - Max Rubner Institute, Detmold
 - Bavarian State Office for Health and Food Safety, Erlangen
 - Bavarian State Institute for Agriculture, Freising
 - Veterinary and Medical Faculty of the Justus Liebig University Gießen
 - Hannover Medical School
 - Lower Saxony State Office for Health (NLGA)
 - Lower Saxony State Office for Rural area, Food, Agriculture and Consumer Protection, Hannover (NML)
 - Ministry of Energy, Agriculture, the Environment and Rural Areas, Schleswig-Holstein (MELUR), Kiel
 - Veterinary Administration of the District Kleve
 - Veterinary Faculty of the University of Leipzig
 - Veterinary and Medical Faculty, Institute for Statistics of the Ludwig Maximilians University Munich
 - Helmholtz Research Center for Environment and Health, Munich
 - Medical Faculty of the Westphalian Wilhelms University of Münster
 - Lower Saxony State Office for Consumer Protection and Food Safety, Oldenburg (LAVES)
 - Veterinary Administration of the District of Osnabrück
 - Faculty of Natural Sciences, University of Paderborn
 - Schleswig-Holstein Chamber of Agriculture, Rendsburg
 - Health Authorities of the District of Stade
 - Faculty of Agricultural Sciences at the University of Hohenheim, Stuttgart
 - Health Authorities of the District of Vechta
 - Institute for Structural Research and Planning in Agricultural Intensive Production Regions (ISPA), University of Vechta

7 Publications

The following publications were published by the WHO Center during the 2013 reporting period:

7.1 Scientific publications in journals

- Abd El-Wahab A, Visscher CF, Beineke A, Beyerbach M, Kamphues J. Effects of high electrolyte contents in the diet and using floor heating on development and severity of foot pad dermatitis in young turkeys. *J Anim Physiol Anim Nutr (Berl)*. 2013 Feb;97(1):39-47. doi: 10.1111/j.1439-0396.2011.01240.x. Epub 2011 Oct 13.
- Abd El-Wahab A, Visscher CF, Wolken S, Reperant LM, Beineke A, Beyerbach M, Kamphues J. Outcome of an artificial coccidial infection in poults under the influence of floor heating. *Poult Sci*. 2013 Mar;92(3):629-37. doi: 10.3382/ps.2012-02614.
- von Altrock A, Hamedy A, Merle R, Waldmann KH. *Campylobacter* spp. - prevalence on pig livers and antimicrobial susceptibility. *Prev Vet Med*. 2013 Apr 1;109(1-2):152-7. doi: 10.1016/j.prevetmed.2012.09.010. Epub 2012 Oct 3.
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