

# Science of Veterinary Medicine from 1990 to 2009

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**Abstract.** The article presents analysis of the directions of scientific activities of the academic staff of the Faculty of Veterinary Medicine of LLU, the most significant achievements as well as the most urgent problems being solved today. During the period of time from 1990 to 2009, investigations were not restricted only on the productive animals but also on solving very important food hygiene issues and pet (mainly dogs) health problems. Dynamics of the morphofunctional processes in the digestive system in ruminants since their birth till the transfer to the ruminant status have been investigated. Also studies are carried out on the digestive apparatus in the ostrich and its morphological peculiarities and changes in ontogenesis; strongiliasis of the digestive organs in goats of different age, their effect on the stomach morphofunctional condition, body metabolism as well as on the quality indices of goat's milk and meat. Investigations have been started in novel scientific directions in veterinary medicine in Latvia – in electrocardiophysiology, veterinary anaesthesiology, and dentistry. In co-operation with the Riga Technical University, the scientists of the Faculty are carrying out a new high-quality prosthesis of blood vessels, implants of hernia patches and other types of clinical approbation on experimental animals. Investigation of reproductive problems in domestic animals is continued. Risk factors of endoparasitoses-zoonoses infection in Latvia have been analysed focusing on trichinellosis and toxoplasmosis. Investigations are carried out on a very urgent problem of the epidemiology of food borne infections – contamination possibilities of meat products with the pathogen *Listeria monocytogenes* genus bacteria, *Yersinia* genus bacteria, and mycobacteria.

**Key words:** animals, health, food hygiene.

## Introduction

In Latvia, the focus of research in veterinary medicine has been changed a little after regaining Latvia's independence. Investigations have been carried out not only in productive animals but also in solving urgent health problems in pets, mainly dogs.

In the 1990s, there were several main research trends. Firstly, more profound studies were carried out on dynamics of morphofunctional processes of some organ systems and problems of etiopathogenesis of pathologies in different animal species and age according to the new technological peculiarities of that time.

The second veterinary research direction at the Faculty of Veterinary Medicine (FVM) was to work out and upgrade the general and specific preventive methods of early diagnostics and treatment in the new economic circumstances of the 1990s. Scientists of the FVM worked in the above-mentioned research directions corresponding to the specificity of each department. In addition, most of the leading academic staff–researchers repeatedly had participated in professional extension studies of the relevant institutions in some of western economically developed countries and seriously evaluated scientific research work perspectives of his/her own department.

## Veterinary Medical Problems Investigated from 1990 to 1999

At the Department of Anatomy, liver pathologies of milking cows and their prevention were studied under the guidance of Dr.habil. med.vet. Z. Brūveris. Investigations of the functional morphology suggested that an effective and original preparation may be worked out on the basis of *Richocel* for the treatment of hepatosis of the liver pathology most often occurred in milking cows that did not have an analogue in the world. The scientists of the Department found out that the cellulose, which is a constituent part of *Richocel*, inhibits reduction of holine in the fore-stomachs and facilitates its reaching the intestinal tract so providing its effective absorption. This preparation normalizes metabolism of carbohydrates and fats and decreases the fatty dystrophy of hepatocytes. In 1999, J. Rimeicāns was awarded the Dr.habil. med.vet. scientific degree in veterinary hepatology.

Another scientific theme at the Department of Anatomy was investigation of the effect of different animal keeping technologies on the skeletal development in younger cattle of Latvian brown breed in postnatal ontogenesis. The research results were included in A. Murgurģeviĉs' doctoral dissertation that was defended in 1997. The work showed the influence of the keeping technology on the breed of Latvian brown dairy cow's some metacarpal and metatarsal bone osteometrical indices.

The scientific work of the Department of Physiology in the 1990s was associated with experimental investigations on physiology of digestion. By using a new method of intra-gastric pH-metric measurement in veterinary medicine but widely used in human medicine in that time for the stomach functional diagnostics, under the guidance of Dr.habil.biol. E. Birģele a research was carried out on the functional bases of intra-gastric pH-dynamics in pigs of different age. The pH-dynamics was determined in various stomach glandular zones in a condition when the hydrochloric acid producing fundal glands are in conditionally dormant stage (in the morning in non-fed animals "on an empty" stomach) and after the most physiological gland irritant – feed (E. Birģele, A. Garancs, I. Keidģne, D. Źilvinska). The effect of various feed on the pig stomach cardiac, fundal and pyloric glands secretory function that determines the intra-gastric pH-dynamics in these different glandular zones was studied. The activity of the stomach enzymes, evacuation of the stomach content, as well as the activity of some stages of gastro-duodenal system regulatory mechanism is dependent on the intra-gastric pH-dynamics.

During this period of time, attention was also paid to cardiopathy in swine, namely the sudden death of swine (O. Parĉinskis). Carrying out the heart morphometry, massometry and voluminometry in swine, significant differences were determined in swine of different age with different types of pathologies in organs and tissues that helped understand the mechanism of setting in death (thanatogenesis) in cases of these pathologies.

Under the guidance of Dr.med.vet. Ņ. Jemeljanovs, investigations on urgent diagnostic, treatment and preventive methods of animal internal non-contagious diseases were continued at the Department of Internal Non-Contagious Diseases (later division) paying a special attention to younger cattle. It is known that diseases of the newborn animals very often are manifested as ailing of the young ones (without clinically expressed typical signs of the disease) thus causing difficulties of making etiological diagnosis of the basic disease. To make the diagnosis more precise, researchers of the Department recommended a new complex follow-up plan of the newly born calves. To treat rationally the widely spread dehydration in young animals they recommended a new way of examination, which was not previously used, to determine the stage and type of dehydration that enabled to choose the most precise therapy of the organism rehydration.

Scientists of the Department of Surgery and Obstetrics were engaged in leading and carrying out very urgent at that time investigations in accordance with their specificity.

Under the guidance of Dr.med.vet. Z. Polģtis and Dr.med.vet. A. Jurģģs, veterinary surgeons worked out new operation methods in cases of bone and joints traumatic injuries in dogs, started to investigate hip dysplasia in some breeds of dogs and the use of some indices of radiomorphometrical parameters in the early diagnostics of hip dysplasia in dogs (O. Kozinda). Scientists also examined a new biologically active preparation developed in Latvia for the wound treatment, studied occurrence of hoof diseases in cows kept in different conditions, and the influence of these diseases on the animal productivity.

In the late 1990s, research was started in a new veterinary branch in Latvia – veterinary dentistry (A. Ilģģģs). The occurrence of dental diseases in dogs, types of diseases and their preventive measures have been also started to investigate.

In the field of obstetrics and gynecology, continuing the started research by Dr.habil.med.vet. professor I. Afanasjevs, under the guidance of his former student Dr.med.vet. V. Antģģne, extended studies on hormonal regulation of animal sexual cycle and reproduction performance are continued. A clinical approbation of new immune-contraceptive preparations is carried out and their toxicity verified. Investigations are started on the udder health evaluation in a cow herd by the somatic cell count and lactose concentration in the bulk milk samples.

Important research was carried out at the Faculty of Veterinary Medicine in the 1990s on upgrading and working out methods of general and specific prevention, early diagnostics and treatment of contagious diseases as well as in the field of veterinary legislation.

In co-operation with the State Veterinary Service, instructions of prevention and control of infectious diseases, criteria and regulatory acts of administration of the new veterinary medicaments were worked out under the guidance of Dr.habil.med.vet. A. Nicmane, Dr.med.vet. E. Liepiņš, Dr.med.vet. R. Trubka.

In Latvia, under the guidance of P. Keidāns, for the first time was found out the coccidiofauna in young animals, epizootology of coccidiosis was investigated and treatment-preventive means were worked out in Latvia. Analyses of the occurrence of swine coccidiosis in regions of Latvia were carried out (A. Krūklīte, D. Keidāne), infection dynamics was investigated in a certain period of time, the most effective treatment preparations of coccidiosis, balantidiosis and helminthoses in cases of miscellaneous infection (trichopol together with panacur or himcocid together with rintal) were experimentally determined.

### Research Activities from 2000 to 2009

Since the year 2000, when the structural changes at the Faculty took place and it was reorganized into three institutes, scientists together with their doctoral students, master students and regular students continued an extended and profound research of the above-mentioned problems as well as turned to the solution of significant issues of food hygiene.

At the Preclinical Institute of the FVM, the investigations previously started in the 1990s were continued on physiology of digestion in ruminants in the postnatal ontogenesis (E. Birģele – adviser, Z. Brūveris, A. Ilgaža, D. Keidāne, P. Apetjonoka). Problems associated with digestive upsets in calves are still acute. This fact is approved by wide and many-sided investigations by scientists of many countries in recent years. That is obvious because exactly in the first month of postnatal development in the stomach of a calf very important morphofunctional, microbial and enzymatic changes take place.

Dynamics of physiological processes in the digestive system in ruminants have been investigated from their birth till the transfer to the ruminant status in association with the age of the animal and the feedstuff they are fed. Scientists have investigated the correlation between the morphofunctional parameters of the liver parenchyma, dynamics of the blood biochemical indices, the abomasum morphofunctional condition, as well as the pH changes in saliva and the fore-stomach in newborn calves, in calves during the period of feeding colostrums and milk, and in calves in the transfer period to rough forage.

The regulatory mechanism of hydrochloric acid secretion of the abomasum in calves in postnatal ontogenesis – the influence of histamine H<sub>2</sub> receptors and M-holinoreceptors blockers on the HCl secretion in calves of different age in association with the feed they are fed have been studied. That is important to know because the neuro-humoral secretion regulatory processes of the abomasum determine in many ways a united and coordinated activity of the animal digestive system organs.

Part of the results of the above-mentioned experimental investigations was included into A. Ilgaža's promotion work "Cow's *Bos Taurus* stomach functional adaptation in the early postnatal ontogenesis", which was successfully defended in 2007 (adviser E. Birģele).

Scientists of the Preclinical Institute of the FVM at present are also involved into morphofunctional studies associated with less traditional productive animals in Latvia – ostrich (A. Mugurēvičs, I. Dūrītis), goats (E. Birģele, D. Keidāne, A. Ilgaža), and further investigations are also envisaged into deer.

As to the ostrich, it should be stressed that their breeding in Latvia (and also in other European countries) is associated with the rapidly increasing demand for produce of animal origin with a decreased fat and cholesterol content. It has turned out that in Latvia and other European countries ostrich chickens suffer from high mortality – only about 50% of ostrich chickens reach age of four months. In this connection it is of great importance to investigate the morphological peculiarities of the digestive apparatus in the ostrich, some structural changes in ontogenesis in particular, because there are very few data on this matter. Part of the results of this investigation is included into I. Dūrītis' promotion work (adviser A. Mugurēvičs).

In Latvia, goat breeding is also expanding, therefore investigations are needed to justify production of high-quality and value products of these animals. Nematodes infection in the digestive tract of goats is one of the most important causes of weight loss and decreased productivity in animals. Investigations of recent years show evidence

that in Latvia many parasitoses are spread in goats (P. Keidāns, D. Keidāne, A. Krūklīte), the most actual problem of which is strongilatoses of the digestive organs. What is the influence of this infection on the morphofunctional condition of the goat stomach in different postnatal periods of onthogenesis, how it reflects on the blood biochemical indices, and how it influences the quality indices of goat's milk and meat – these are the issues scientists of the Preclinical Institute have been involved to solve (E. Birģele, D. Keidāne, A. Ilgaža).

D. Keidāne has completed writing her doctoral thesis about the functional condition of the goat's stomach in relation to the animal nutrition and parasitocenoses of the digestive tract.

It is generally known that in the gastro-intestinal tract in humans and animals, helicobacteria may occur many of which are pathogenic and may cause different pathologies of the stomach, intestines and liver (stomach ulcer, gastroenteritis, etc.). A question arose – is it possible in goats with a digestive tract strongilate infection in the abomasum to have at the same time helicobacteria? (It is considered that basically the source of these bacteria is contaminated food or faeces consumed orally.) And how it is with *Helicobacter pylori* in the dog's digestive tract? In order to have professional extension courses in veterinary pathology as well as to acquire the newest diagnostic methods of *Helicobacter spp.*, Mg.med.vet. D. Bērziņa went to the Faculty of Veterinary Medicine of the South Korea Chonbuk National University (2005). At present intensive studies are carried out on *Helicobacter spp.* presence in the mucous membrane of dog's stomach – in the zones of cardiac, fundal and pyloric glands. This research is included into D. Bērziņa's doctoral thesis (adviser E. Birģele).

Important investigations have been carried out at the Preclinical Institute on electrocardiophysiology in dogs. This is a new direction of veterinary medicine in Latvia (G. Avdoško, D. Upeniece, E. Birģele). Regularities of electrocardiophysiological parameters as well as their differences in Cocker Spaniel, Rottweiler and German Shepherd dogs in connection with the age and breed peculiarities of animals were investigated. Novel data were obtained allowing assessing a cardiac functional state of healthy dogs in a complex manner as well as to reason about electrocardiogram (ECG) parameters and their differences in dogs. For the first time separate ECG parameters were analyzed in connection with the age of an animal and peculiarities of a certain breed of dogs. For the first time the application of 10 ECG leads for dogs and the use of this method in veterinary medicine had been assessed.

Further on it was important to find out the effect of currently widely used anaesthesia substances on the functional parameters of the hearts of dogs. With this work investigations had started in veterinary anaesthesiology both experimentally *in vitro* on an isolated heart of a frog to find out the effect of premedication and anaesthesia agents on the heart rate rhythm and the contraction power of the heart muscle and in dogs *in vivo* (G. Avdoško). *In vivo* studies of dogs and *in vitro* studies of frogs demonstrated that premedication agent atropine sulphate together with acepromazine maleate has a negative chronotropic effect, whereas general anaesthesia agents ketamine hydrochloride and diazepam act in opposite manner – increase the heart rate, which gives a positive chronotropic effect.

Research in veterinary anaesthesiology is continued on the above-mentioned premedication and general anaesthesia (narcosis) agents effect on the eye functional parameters in dogs (L. Kovaļčuka).

The issue of the effect of the widely used premedication agents and anaesthetics on the different organism functions, in fact, is at the very beginning stage of its investigation.

At the Clinical Institute of the FVM, in the period from 2000 to 2009, several actual trends of scientific research have been started. Co-operation with the Riga Technical University has appeared to be very perspective – together with professor Dr.habil.sc.ing. V. Kanceviča in solving different orthopedic and blood vessel problems in human medicine as well as in veterinary medicine of small animal clinics.

Under the guidance of Dr.med.vet. A. Auzāns, a preclinical approbation of blood vessel prostheses and hernia patches made of composite materials is carried out on experimental animals (A. Ozols, K. Drevinska, O. Kozinda).

Nowadays, one of the main problems in medicine is the high morbidity and human mortality from the heart-circulatory system pathologies. Human doctors have proved that the injured part of the artery may be partly substituted with a synthetic prosthesis. However, it should meet many requirements, the main of which are longevity, elasticity,

non-toxicity, etc. Therefore, approbation of new high-quality prosthesis of blood vessels on experimental animals was and is absolutely necessary and very urgent.

The same refers to the experimental investigations at the Clinical Institute concerning the composite materials worked out at the Riga Technical Institute for implants of the hernia patches (in rabbits) and weaved prostheses in case of cranial cruciate ligament rupture in dogs (K. Drevinska, A. Auzāns, O. Kozinda).

At the Clinical Institute, prof. Dr.med.vet., Dr.habil.agr. A. Jemeljanovs<sup>1</sup> and Dr.med.vet. V. Antāne together with their doctoral students and regular students continue investigations on the reproduction problems in productive and non-productive animals.

During 2002-2004, Dr.med.vet. V. Antāne was a project coordinator in Latvia and took an active part in the international project "Farm animal reproduction – reducing infectious disease and conserving local genetic resources". Faculties of Veterinary Medicine of the Universities of Agriculture of all three Baltic States and Biological Centre of the Swedish University of Agricultural Sciences in Uppsala were involved in this project. Further on also the Belarus Academy of Agriculture and the Agrarian Business Institute in St. Petersburg joined the next project "Animal farming in transition – the role of animal reproduction" (2005-2008).

Under the guidance of Dr.med.vet. V. Antāne, mainly problems dealing with the udder health of cows were studied – changes in indices of the udder health and immunoglobulins in milk and blood of cows transferring to the pasture period (I. Kociņa, Ļ. Jemeljanovs). It was important to find out if some indices of the udder humoral immunity and the cell immunity of the udder in cows were changing during this period, which would show evidence of the udder health status in general. The authors studied the immunoglobulin (IgG, IgM, and IgA) concentration in milk and blood of cows when the keeping and feeding conditions were changed, as well as assessed the correlation between Ig concentration in milk, blood and somatic cell count in milk. According to these criteria, some medical preparations for treatment of subclinical mastitis were also assessed (V. Antāne, I. Lūsis, Ļ. Jemeljanovs, M. Mangale). The studies have proved that changes in somatic cell count, lactose concentration and immunological parameters in milk allow assessing objectively the udder health condition in the cow.

At the Clinical Institute, investigations are also continued on the problems of metabolism in milking cows mainly in perinatal period, when energy deficit often occurs (L. Liepa); also investigations on small animal dentistry are being continued. One of the most widely spread pathologies in the mouth cavity in dogs is periodontitis in different stages of development. Connection of this pathology with the bacteria spectrum in the mouth cavity and in the duodenum is also studied (A. Ilgažs). Part of the results of this investigation is included into A. Ilgažs' doctoral thesis that is being written now.

O. Kozinda has completed and submitted his doctoral thesis about the hip dysplasia in dogs and its early diagnostics using x-ray morphometrical parameters.

Investigations at the Institute of Food and Environmental Hygiene in 2000-2009 in general were and are carried out into two closely related blocks: risk analysis of endoparasitoses-zoonoses infection in Latvia (P. Keidāns, A. Krūklīte, D. Keidāne, E. Eihvalde), and epidemiology and control of the productive animals and foodborne infections (E. Liepiņš, R. Trubka, A. Valdovska and others).

As to endoparasitoses-zoonoses, investigations were focused on trichinellosis and toxoplasmosis. *Trichinella* species spread in the game animals and domestic pigs in Latvia are investigated, the risk factors are shown and epidemiological situation of trichinellosis in recent years in Latvia is also found out. The main object of studies was foxes, which in 28% of cases were trichinella infected in all regions of Latvia. Identification of the trichinella larvae took place at the Danish Experimental Parasitology Centre in Copenhagen. The authors have proved that in Latvia there are three trichinella species distributed – *T. spiralis*, *T. nativa*, and *T. britovi*, and all of them are dangerous to humans. A conclusion has been drawn that more effective diagnostic method of trichinellosis is a tissue digestion in artificial gastric juice.

As regards toxoplasmosis, scientists have shown that it is a widespread parasitosis in domestic animals in Latvia. Toxoplasmosis infection was diagnosed by latex agglutination reaction in 30.4% of pigs, 44% of cats, 46.6% of dogs, 45.0% of sheep, and 40.0% of goats. The most important risk factors of infection are the environmental contamination

<sup>1</sup> Professor A. Jemeljanovs' and his headed scientific institution "Sīgra" scientific activities are described in this edition separately.

with oocysts of toxoplasma passed by cats and their ability to survive for a year or more; insufficiently cooked meat, milk and other products of infected animals; an increasing number of rodents and stray cats; ignoring measures of precaution in contact with animals (P. Keidāns, A. Krūklīte). For more complete risk analysis, more extensive epidemiological investigations are needed.

In recent years, studies in food hygiene have become more intensive at the Institute of Food and Environmental Hygiene of the FVM. Analysis of human health risk factors caused by using cow milk and dairy products has been carried out (E. Liepiņš). Researchers have shown that an acute problem still is contaminated milk and dairy products with enterotoxins produced by *Staphylococcus aureus* (R. Joffe). Investigations show evidence that in Latvia on average 77% of the isolated *S. aureus* strains causing cow mastitis are able to produce enterotoxins, most often enterotoxine A serotype. Investigations in this field are of great importance because a very significant part of the risk of enterotoxemia is developed by subclinical mastitis affected cows, also those the milk of which does not reach the market.

Investigations on epidemiology of food borne infections are also carried out in another direction, namely, possibilities of meat products to become contaminated with *Listeria monocytogenes* genus bacteria (A. Bērziņš), *Yersinia* genus bacteria (M. Terentjeva, A. Bērziņš, E. Liepiņš), as well as mycobacteria (A. Zirņītis, E. Liepiņš, G. Cicers). An important role of transmitting these bacteria from one environment to another belongs to the raw material of the certain product of animal origin and its processing stage.

At present the focus is on the investigation of *L. monocytogenes* in cold smoked meat products. The factors connected with *L. monocytogenes* contamination of cold smoked meat products during the production process in some enterprises in Latvia are studied. In co-operation with the Faculty of Veterinary Medicine of the Helsinki University, a molecular typing of the isolated and identified *L. monocytogenes* by pulsed-field gel electrophoresis (PFGE) is carried out. Results of the investigation are included into Mg.med.vet. A. Bērziņš' doctoral thesis that will be soon completed.

Occurrence of the pathogenic *Yersinia* genus bacteria was tested in swine by-products, carcasses and tonsils (M. Terentjeva, A. Bērziņš, E. Liepiņš). It appeared that 54 of tonsils were tested positive for *Yersinia spp.*, where *Y. enterocolitica* 4/0:3 and *Y. pseudotuberculosis* accounted for 50% and 5%, respectively. Both *Yersinia* species were recovered from by-products (48%), while *Y. enterocolitica* (23%) – only from carcasses. The prevalence of *Yersinia* on by-products was significantly higher in tongues and liver than in other parts of the pluck set.

High prevalence of *Yersinia* on by-products and carcasses may present concerns for public health. The results of this study indicate that possibilities of *Yersinia* contamination of by-products and carcasses may occur during pig slaughtering from *Yersinia* positive tonsils. It is very important to continue these investigations in the same way as investigations on the possibilities to contaminate pork with mycobacteria from the mesenteric lymph nodes affected by caseous necrosis, and not only from them. In co-operation with the Centre of Biomedical Investigations of the Latvia University it was stated that in a slaughterhouse of one particular meat processing enterprise where pigs were slaughtered from different regions of Latvia, in 35.8% of pigs caseous necrosis processes were found in mesenteric lymph nodes, in 70.6% of them mycobacteria were isolated. Carrying out genotyping, it turned out that all of them belong to *Mycobacterium avium* species, although with different phenotypic features.

It should be stressed that investigations in this field are deepened and extended because they are connected with the provision of consumers with healthy and safe foodstuffs of animal origin. Furthermore, this research is included also in the FVM doctoral students M. Terentjeva's and A. Zirņītis' promotion work.

## Conclusion

Research carried out at the Faculty of Veterinary Medicine of LLU in different veterinary sub-branches during the period from 1990 to 2009 was focused mainly on three objectives:

- 1) renewal of the scientific and academic personnel (to increase the number of doctoral students; to stimulate the motivation for successful doctoral studies);
- 2) science development in universities;
- 3) development of applied research and increase of its proportion.



We consider that these objectives are more or less successfully completed, although the science of veterinary medicine in Latvia is not included in the priority science group to apply for the EU financing. Thanks to the co-operation with the Ministry of Agriculture, Veterinary and Food Department, Food and Veterinary Service, and with its National Diagnostic Centre many issues have been solved in co-ordination and co-operation.

The nearest objective of our scientists at the Faculty of Veterinary Medicine of the LLU is to extend the international scientific co-operation as well as to continue the mutual co-operation with related scientific institutions of Latvia. In that way we will be able to supplement some sub-branches of veterinary medicine with high-level specialized scientific investigations both in terms of their leading and completion.

Also, in the future the urgent problems investigated at the Faculty of Veterinary Medicine may be conditionally grouped into four blocks. The grouping is conditioned because in one research direction of today's veterinary science investigations of several relevant sub-branches are included:

- 1) elaboration of research system for obtaining a high-quality, safe and healthy produce of animal origin;
- 2) etiopathogenetic problems of most common non-infectious animal diseases and prevention of disorders caused by them;
- 3) epidemiology of most dangerous animal contagious diseases in Latvia, development and implementation of modern diagnostic, treatment and preventive methods;
- 4) investigations of the body functional processes of small animals (pets), studies of pathogenetic disorder mechanisms of different body functions and prevention of these disorders.

In all these directions of investigations the science of veterinary medicine welcomes young talented doctoral students!

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