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Global International Scientific Analytical Project



MEMORIAL  
Antonie van  
Leeuwenhoek



## TRADITIONAL AND EXPERIMENTAL METHODS OF STUDYING AND OVERCOMING THE MEDICAL AND BIOLOGICAL PROBLEMS IN ENSURING THE OPTIMAL VITAL FUNCTIONS OF HUMAN BEINGS AND THE WILDLIFE

Peer-reviewed materials digest (collective monograph) published following the results of the CXLII International Research and Practice Conference and I stage of the Championship in Medicine and Pharmaceutics, Biology, Veterinary Medicine and Agricultural sciences (London, April 13 - April 21, 2017)



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Doctor of Medicine, Full Professor

**Place of work:** South Ural State Humanitarian Pedagogical University

**Discoveries and inventions:** 11 certificates of the Russian Federation of computer programs state registration, 6 patents for inventions of new methods of operations and surgical instruments.

**Scope of research interests:** practical and theoretical urology, psychology, organization of health care and public health, the legal aspects of medical practice, intellectual property in medicine, patent law.



### **ALEXANDRATEGZA (KAZAKHSTAN)**

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**Discoveries and inventions:** Copyright certificate «Method of producing dry museum preparations of tubular organs»

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**Discoveries and inventions:** patent pending.

**Scope of research interests:** forest plantations, irrigation forestry.



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**Place of work:** Innovative University of Eurasia, Pavlodar.

**Scope of research interests:** Problems of adaptation of organism when influenced by different etiological factors, problems of developmental physiology.



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**Discoveries and Inventions:** Patent I 2003 0100, Patent I 2012 0091

**Scope of research interests:** entomology, ecological physiology.



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Candidate of Agricultural sciences

**Place of work:** Russian Academy of Sciences - Institute of Forest Science

**Discoveries and inventions:** Patent application submitted in 2013, pending.

**Scope of research interests:** Rational nature management, protective afforestation, restoration of forest plantations.



**LASZLO KORPAS (HUNGARY)**  
East European Cynology Association, PhD



**LIUDMILA KOKOLOVA (RUSSIA)**  
Doctor of Veterinary medicine, Head of the laboratory

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**Discoveries and inventions:** FIIP Patent for invention №2532977, 2014  
Certificate №2014621492, 2014

**Scope of research interests:** Veterinary medicine, helminthology, parasitology, microbiology, biotechnology



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**Scope of research interests:** dentistry, dental diseases, periodontal tissues, oral mucosa, anesthesiology in dentistry, physiotherapy, dentistry, dental filling materials, the organization of health care, drug treatment in dentistry, pharmacotherapy in dentistry, dental ecogenic



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of the National research analytics championship  
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Head of IASHE International Projects Department  
Thomas Morgan

*Morgan*

AGE-SPECIFIC DYNAMICS OF HISTOLOGICAL AND FUNCTIONAL FORMATION OF THE SURFACE EPITHELIUM OF UTERINE HORNS IN HEIFERS

A. Tegza, Dr. of Veterinary medicine, Full Prof.  
Kostanay State University after A. Baitursynov, Kazakhstan

Conference participant,  
National championship in scientific analytics,  
Open European and Asian research analytics championship

The article describes the research of histological formation and functional activity of endometrium in replacement heifers, Holsteinized black-and-white heifers. The study of the surface epithelium of uterine horns in mixed-bred heifers showed that up to the age of 15 months the morphological and cytometric characteristic of epithelial cells undergoes noticeable changes, from 15 to 18 months age these parameters slightly change which implies deceleration of metabolism in tissues. Morphological, histological structure, cytometric parameters and functional activity of the surface epithelium of uterine horns in 15-month heifers are complete and came up to their optimal level, which indicates the readiness of reproductive organ tissues for full-scale implementation of reproductive function.

**Keywords:** surface epithelium, uterine horns, morphological and cytometric characteristic, histological structure

Over extended period of time, the scientists discuss the issue of early transfer of replacement heifers to a reproductive herd. A number of scientists assert that the first insemination of heifers at an early age (12 months) is reasonable, as it allows to early transfer the first-calf heifers to the reproductive herd. Present insemination of heifers at the age of 18 months allows to transfer the first-calf heifers to the reproductive herd at the age of 27 months. Physiological fertility of replacement heifers is very important, which is based upon morphological traits of their reproductive organs. However, we has not found any data on the structure of heifers' reproductive organs during their formation [1, 2, 3, 4, 5, 6, 7, 8].

**The aim of the search.** We performed the research with the purpose to determine the optimal age of heifers for the first insemination, from the perspective of endometrium functional activity formation.

**Material and methods.** The material for the study of cytometric parameters were the organs of the reproductive system of 15 young heifers aged 12, 15, 18 months kept in farms Kostanay region in the same conditions with the same feeding from In order to identify.

To identify morphometric parameters, a fresh material was used to determine the total mass of individual organs (horns uterus with the help of the measuring thread). Weighing was performed on laboratory and torsion scales VT-500 up to 0.001 g. Linear indicators of organ parts were measured with an accuracy of 1.0 mm.

We used the following research methods:

- histological, morphometric, linear study of tissues of the reproductive system of clinically healthy young heifers (10% formol-fixation, paraffin embedding, hematoxylin and eosin stain, cytometry).

- work with equipment for preparation, embedding, staining of histological sections (Thermo scientific tissue processor, tissue embedding system TES 99 Medite medizintechnik, semi-automatic rotary microtome Accu-cut SRM, slide stainer Tissue-Tek DRS). For identifying the functional activity of epithelial cells, the area of the surface and glandular epithelium and their nuclei, nuclear-cytoplasmic ratio of epithelial cells by an imaging analysis computer program were determined.

Digital material was processed statistically using the Excel 2010 computer program. Figures and diagrams were compiled based on the results of research

Surface epithelium of uterine horns in **12-month age** heifers is presented by multirowed ciliated epithelium with numerous mitoses. Apical surface of epithelial cells has eosinophilic edging. Ciliated, non-ciliated and goblet cells are clearly visible in the epithelial layer.

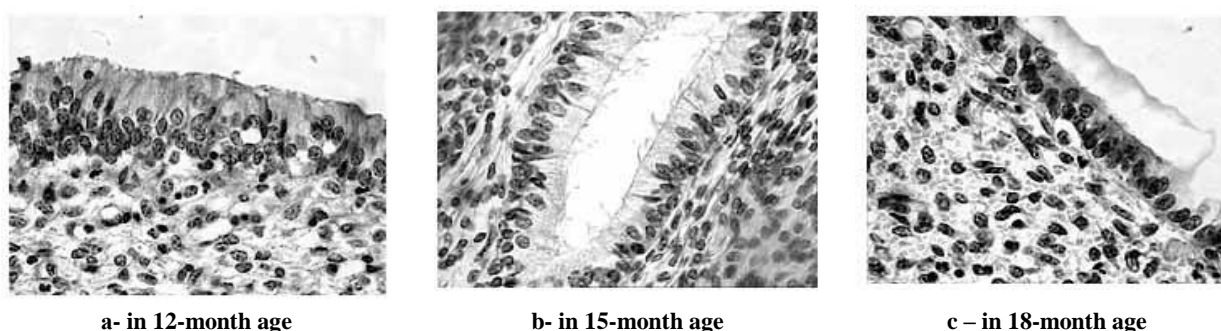


Fig. 1. Mucous membrane of the uterine horn. Surface epithelium of uterine horns in heifers is presented (hematoxylin and eosin X1000)

In prismatic non-ciliated epithelial cells, euchrome cores which usually have single nucleus are located in the center. Cytoplasm is cleared, transparent. Cores of ciliated prismatic epithelial cells with 1-3 nuclei are shifted to a basal pole and have more solid cytoplasm.

Goblet epithelial cells are large, with a large centrally oriented core. They are filled with light clear cytoplasm, so in tissue specimens they appear spherical- or oval-shaped. Connective tissue of mucous membrane is loose, with a few myocytes (figure 1-a).

**At the age of 15 months**, epithelial lining of mucous membrane in uterine horns is covered with one-layer ciliated epithelium which becomes more definite, as compared to the above-mentioned structure. Ciliated prismatic columnar-shaped epithelial cells with cleared cytoplasm contain oval-shaped neutrophilic centrally-oriented cores with hyperchromic nuclei. On the apical pole of such epithelial cells, the cilia are located which form a clearly distinctive edging. The edging has even, sharply defined borders with few long projections of plasmolemma (figure 1 b).

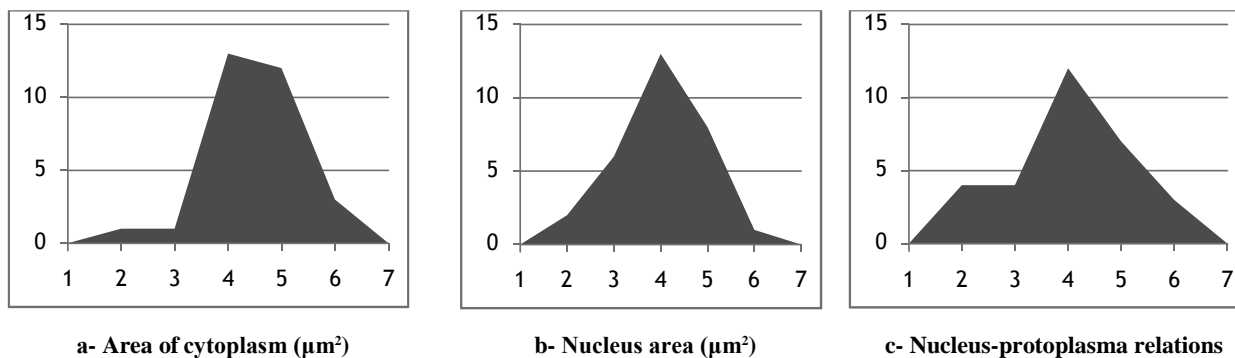
Non-ciliated prismatic cells are smaller than ciliated cells, they contain the cleared, more intensely coloured cytoplasm, centrally oriented rounded core with 2-4 nuclei. Goblet cells are the largest in the surface epithelium. They contain a large volume of clear cytoplasm. Empty ovoid cells with rounded large euchrome cores. The cores contain 1-3 hyperchromic nuclei. Goblet cells filled with secretion take on the spherical-like form. Cores in the filled goblet cells shift to the basal pole.

Muscular tunic of uterine tube walls in 15 month-age heifers near the mucous membrane presents a smooth-muscle tissue with wide layers of loose connective tissue. Myocytes are pushed apart. Myocytes are more closely spaced deep in muscle layer. Among them are plasmacytes, histiocytes and fibrocytes located in loose connective tissue. Serous tunic has a typical structure, it contains a loose connective tissue and mesothelium.

**At 18-month age**, the mucous membrane tissues of uterine horns become more solid. Epithelial cells of surface epithelium tightly adjoin each other. There are few cells with two nuclei, while absolute majority of epithelial cell cores contain one nucleus. Hyperchromic neutrophilic cores are located at various heights from basal membrane. Apical surface has an edging formed by cytoplasmic projections (figure 1c).

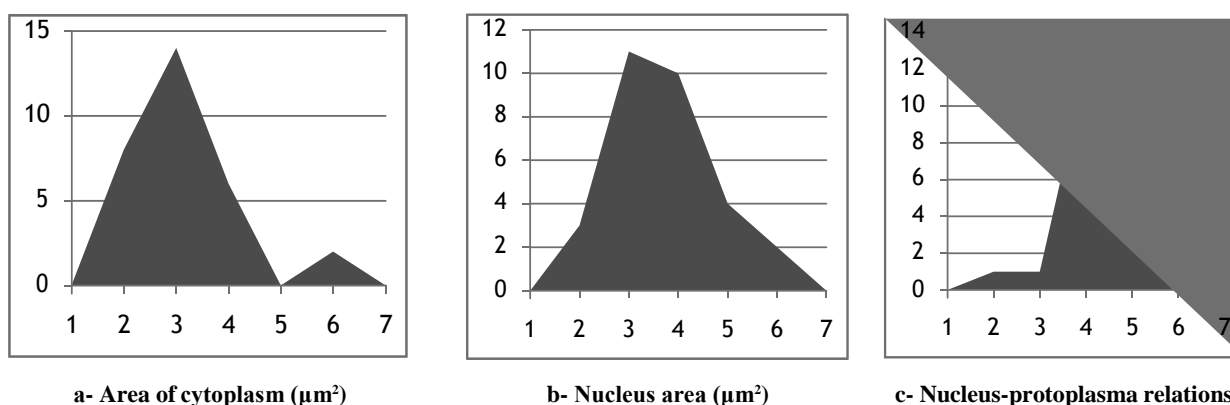
So, we studied the histological structure of uterine horn walls in mixed-bred black-and-white replacement heifers at the age of 15 months, and found that mucous, muscular and serous tunics of this organ correspond to the uterine horn walls of mature cows. At the age of 15 months, differentiation of surface epithelium in mucous tunic of uterine tubes is complete.

*Cytometric analysis* of the uterine horn surface epithelium showed that at the age of 12 months the epithelial cells are large, with large cores. Linear analysis of the cell sizes detected one large generation of epithelial cells and cores with center modality (figure 2-a, b). Functional activity of epithelial cells in the uterine horn surface epithelium is inferior to the respective parameters of 15-month heifers. The linear analysis detected two generations of epithelial cells: small group of cells with low functional activity, and the main group with average value of core-cytoplasm ratio (figure 2 c).



**Fig. 2. Cytometric characteristics of the integumentary epithelium of the uterus horns of heifers at the age of 12 months**

Sizes of epithelial cells and cores in the uterine horn surface epithelium of mixed-bred heifers are smaller at the age of 15 months than 12 months. Most of them are the cells which are smaller than average.

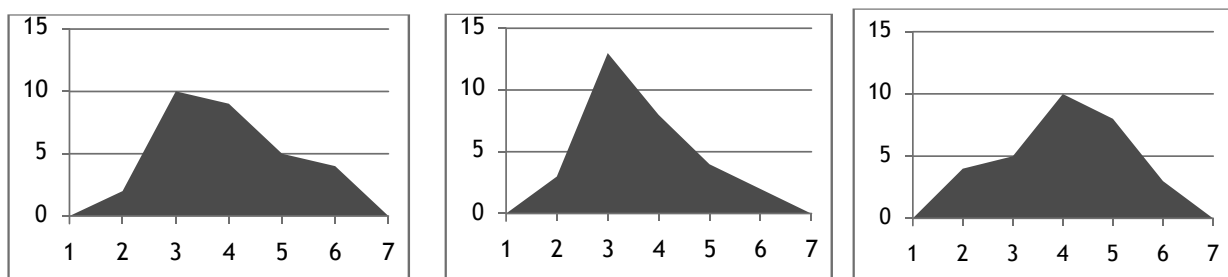


**Fig. 3. Cytometric characteristics of the integumentary epithelium of the uterus horns of heifers at the age of 15 months**

However, a small generation of large epithelial cells appears which is clearly defined with the linear analysis (figure 3a).

Study of the surface epithelium of uterine horns in 18-month heifers showed that epithelial cells and their cores became smaller. However their functional activity increased (figure 4 a, b, c).





a- Area of cytoplasm ( $\mu\text{m}^2$ )

b- Nucleus area ( $\mu\text{m}^2$ )

c- Nucleus-protoplasm relations

**Fig. 4. Cytometric characteristics of the integumentary epithelium of the uterus horns of heifers at the age of 18 months**

Linear analysis of the area of epithelial cells detected two generations of epithelial cells: large generation - cells with left-shifted modality, minor generation - a group of large cells.

Linear analysis of the area of cores detected one generation of cores with left-shifted modality. Generally, functional activity of the surface epithelium increased, as compared to the former age.

**Conclusion.** So, the study of the surface epithelium of uterine horns in mixed-bred heifers showed that up to the age of 15 months the morphological and cytometric characteristic of epithelial cells undergoes noticeable changes, from 15 to 18 months age these parameters slightly change which implies deceleration of metabolism in tissues. Morphological, histological structure, cytometric parameters and functional activity of the surface epithelium of uterine horns in 15-month heifers are complete and came up to their optimal level, which indicates the readiness of reproductive organ tissues for full-scale implementation of reproductive function.

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**TRADITIONAL AND EXPERIMENTAL METHODS OF STUDYING AND OVERCOMING  
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