

## 2018 № 3

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## Editorial Board

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## Review

### INFLUENCE OF SILVER PREPARATIONS ON LIVING ORGANISMS

**Bomko T.V., Martynov A.V., Nosalskaya T.N., Manuilov A.M., Manuilov M. B.**

The fight against resistant microorganisms has recently become increasingly important. The majority of antimicrobial drugs, including antiseptics, have successfully developed multidrug resistance in many microorganisms and viruses. Among the drugs to which the microorganisms have not yet developed resistance remain silver preparations. In this review, we offer a summary of research on the silver preparations effect not only in microorganisms, but also in the human body, including the molecular-biological aspects of such effect. The article presents results of studies silver ionic forms, colloidal and metallic form influence on microorganisms, viruses and cancer cells. The effect of various silver preparations on the biochemical pathways in the human body is also shown.

**Keywords:** silver, microorganisms, viruses, immunity, cancer, biochemistry

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## Experimental works

### CLINICAL AND IMMUNOLOGICAL ASPECTS OF ELECTRICAL INSTABILITY OF A STRUCTURALLY UNCHANGED HEART

**Peremot S. D., Volianskyi A. Y., Smilianska M. V., Kashpur N. V., Klysa O.O., Klysa T. L.**

Introduction. The concept of "idiopathic ventricular arrhythmias" (IVA), i.e. arrhythmias that have arisen in the absence of structural disorders of the heart, is becoming more and more conventional. As for today, "idiopathic arrhythmia" is the main cause of sudden cardiac death at a young age. Unfortunately, there is no epidemiological data on vital rhythm disturbances in young people without organic heart damage in Ukraine. The active introduction into clinical practice of highly informative instrumental methods of myocardial examination, specific immunological tests and molecular genetic methods of investigation is the basis for revealing the hidden causes of their occurrence. The aim of the study was to search for clinical and instrumental signs of inflammation and markers of herpesvirus infection in persons with ventricular ectopic activity without structural damage to the cardiovascular system. Material & methods. Twenty-three patients (14 men and 9 women) were involved in the study based on the results of daily monitoring (1200 ventricular ectopic complexes per day) with no signs of an organic disease of the cardiovascular system at the age of 17-35 years (mean age  $25.7 \pm 6.9$  years). The control group consisted of 16 practically healthy persons, comparable in age and gender ratio with the main group of subjects. All examined patients underwent daily monitoring of ECG and blood pressure by Holter using 12 channel monitors. The study used the results of magnetic resonance imaging of the heart with intravenous contrast and determination of the viral load representatives of Herpesviridae (HHV1, 2, HHV3, HHV4, HHV5, HHV6). The study was carried out using fluorescent antibodies using specific monoclonal antibodies from Santa Cruz Biotech. Inc. (USA). The levels of the main inflammatory mediators from the group of proinflammatory interleukins IL-6 and TNF- $\alpha$  were studied by ELISA, using commercial Thermo Scientific™ kits (USA). Results & discussion. As a result of the study, the markers of herpesviruses in blood immunocytes, both in the form of a mono-infection and in a mixed infection, were found in 20 patients with ventricular extrasystole, which was almost 87%, while in the control group, similar markers were found in 4 subjects (25 % of cases). Moreover, the degree of viral load in the group of patients with ventricular ectopic activity averaged 1.4 - 1.8, CFU, which corresponds to the average and high level, but in the control group did not exceed 1.2 CFU, which corresponds to a low degree of viral load. Viruses: HHV1, 2, HHV5 and HHV3 were the most common representatives of Herpesviridae in 52% of patients with idiopathic ventricular arrhythmias. The obtained data of levels of pro-inflammatory cytokines suggest the presence of an inflammatory process that is not accompanied by severe clinical manifestations. So the concentration of mediators of inflammation in the blood serum of patients with idiopathic rhythm disturbances without structural damage to the heart was significantly higher than in the control group, which indicates the inflammatory process in these patients. The concentration of TNF- $\alpha$  in ventricular rhythm disturbances was almost 18.5 times higher than the corresponding control group, and the level of IL-6 exceeded the control one by almost 7 times. Recently, due to the introduction into clinical practice of modern methods of visualization of myocardial damage of both coronary and non-coronary genesis, it has become possible to non-invasively identify various signs of a latent inflammatory process. According to the Lake Louise Criteria (LLC), magnetic resonance imaging (MRI) is now recognized as a noninvasive diagnostic method for verifying myocarditis. When assessing early contrasting on T1-weighted images, signal strength intensification was from 3 to 5 segments in 47,8 % of patients with rhythm disturbances. Confirmation of inflammation of the myocardium is the presence of two criteria. It turned out that among patients with idiopathic ventricular arrhythmias two or more positive phenomena were registered in 10 (43.5%) patients. Obtained MRI data of individuals with ventricular arrhythmias correlate with data from studies of levels of pro-inflammatory interleukins in this group. Conclusion. Thus, the obtained results of the conducted studies indicate that the basis of non-coronary ventricular ectopic activity can be ectopic foci of excitation caused by a latent herpesviral inflammatory process in the myocardium, and MRI criteria for inflammatory foci in combination with elevated levels of TNF- $\alpha$  and IL-6 – as additional markers of subclinical myocarditis in patients without structural heart damage.

**Keywords:** idiopathic ventricular arrhythmias, criteria for inflammatory process, herpesviruses.

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### CHARACTERISTICS OF THE VIABILITY AND ACCORDANCE WITH THE TAXONOMIC STATUS OF THE LYOPHILIZED SAMPLES OF MUSEUM STRAINS OF ESCHERICHIA COLI ISOLATED IN 1946-1959 YEARS

**Popov M. M., Peretyatko O. G., Yagnuk Yu. A., Cholodna T. V.**

Effective microorganisms' conservation with the aim of long-term storage of the strains in the collection without changes in the morphological, physiological and genetical properties is provided by methods that allow the shift of the vegetative forms of bacterial cells

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into the anabiosis state. The most widespread among them is the lyophilization method. The museum of microorganisms of the State Establishment "Mechnikov Institute of microbiology and immunology of the National Academy of Medical Sciences of Ukraine" has one of the oldest bacterial collections in Europe that consists of more than 4000 lyophilized samples of microorganisms strains. **The aim** of the study was the testing of viability and species specific properties of the museum strains of *E. coli*, that were preserved in lyophilized state long-term. **Materials and methods.** The objects of the study were the 30 lyophilized samples of the 22 strains of *E. coli*. Lyophilized cultures were restored through dilution of the ampule content in the 1,0 ml nutritive broth and seeding of the microbial suspension from the 100-times dilutions onto the agar-based media (blood agar, Endo medium); the viability was determined based on the quantity of the colony forming units (CFU/ml). Re-identification of the microbial cultures was carried out with the use of API system produced by «Bio-Merieux», France (ID 32 GN – for enterobacteria identification). The phenotypic intra-strains heterogeneity of the population was evaluated by dissociation index that reflects the ratio (%) of the certain colony forms (S-, R-, D-, M- forms) compared to the total count. The statistical analysis was carried out based on the parametric statistic methods with the use of Microsoft Excel 2007 and STATISTICA 6.0 computer programs. **Results and discussion.** There were (66,7±8,6) % of the total amount of *E. coli* strains participating in the experiment that were able to be restored, and therefore those samples were selected for further studies. It was established that the quantity of the colonies on the solid nutritive media in the restored strains varied from 10<sup>4</sup> to 10<sup>9</sup> CFU/ml, the average survivability parameter was (26,7±4,6) %. During the statistical analysis of the results no correlations between the CFU count and the storage term were established (r=0). It was established that the majority of the re-cultivated strains (90,0±3,8) % was characterized by dissociation into different colonial and morphological variants. The dissociation index (ID) values in the microbial populations of the studied *Escherichia* strains varied in the range of 10,0 % to 90,0 %. The statistical analysis of the data has established the presence of correlation between the dissociation index and term of storage of the sample in the lyophilized state (r>0,95). The established colonial polymorphism of the studied strains of *E. coli*, in our opinion, is caused by adaptation to the stressful conditions and leads to the increase of the survivability of the bacterial population in course of the long-term storage in the lyophilized state. According to the re-identification results, the majority (90,0±3,5) % of the samples corresponded to the data indicated in the strains passport, except two strains that did not correspond to their initial identification based on the total of biochemical tests. **Conclusions.** The restoring of the lyophilized cultures of *E. coli* from 1946-1959 yy. of isolation the majority of samples was found to be viable and the viability varied in the range of 0,001 % to 100,0 %. It was established that the populations (90,0±3,8) % of restored strains were characterized by dissociation into different colonial and morphological variants. Based on the re-identification results of *E. coli* the correct identification of strains was carried out and corrections were put in their passports. **Further studies perspectives.** It is planned to study the sensitivity to antibiotics of the collection strains of *E. coli*, isolated in the different periods of antibiotic use.

**Key words:** lyophilized samples, museum *E. Coli* strains, viability, taxonomic status.

#### ANTIBACTERIAL ACTIVITY OF PHYTOSUBSTANTS FROM VACCINIUM VITIS-IDAEA LEAVES 23-26 Tsemenko K.V

**The purpose of the work** is to study the antibacterial activity of phytosubstances from *Vaccinium vitis-idaea* leaves. **Materials and methods.** The objects of the study were 13 phytosubstances, obtained from *Vaccinium vitis-idaea* leaves. The study of antibacterial activity of the extracts was performed by the method of diffusion in agar in the laboratory of biochemistry of microorganisms and nutrient medium of the Mechnikov Institute of Microbiology and Immunology under the direction of candidate of biological sciences Osolodchenko T.P. The research and analysis of experimental data was carried out in comparison with the standard drug Inurec containing the concentrated extract of American cranberries 150 mg (manufactured by PHARMACEERY MANUFEKCHURIN SL SPAIN) **Results.** The most pronounced antibacterial effect was phytosubstance from *Vaccinium vitis-idaea* leaves, which contains a complex of phenolic compounds with arginine, dissolved in 50% alcohol. It was found that amino acids in combination with phenolic compounds of *Vaccinium vitis-idaea* have an antibacterial effect on the main uropathogens. The polysaccharide complex of *Vaccinium vitis-idaea* leaves manifested itself as an agent with a low level of antibacterial effect. The aglycones of the phenolic compounds of *Vaccinium vitis-idaea* leaf had less pronounced antibacterial effect than their glycosides. **Conclusions.** The study of antibacterial activity of 13 phytosubstances from *Vaccinium vitis-idaea* leaves was conducted. The most promising substance was a complex of glycosides of phenolic compounds from *Vaccinium vitis-idaea* leaves with arginine. It has found that aminoacids potentiate the antibacterial effect of phenolic compounds of *Vaccinium vitis-idaea*, and polysaccharides, on the contrary, were inverted. Glycosides of phenolic compounds of *Vaccinium vitis-idaea* usually have a more pronounced antibacterial effect than their aglycones.

**Keywords:** phytosubstantion, leaves, *Vaccinium vitis-idaea*, antibacterial activity

#### THE MIMICRY ANTIGENS OF BRONCHOPULMONARY SYSTEM AS FACTORS OF AUTOIMMUNE 27-32 PROCESS INITIATION IN CHILDHOOD BRONCHIAL ASTHMA

Chernuskiy V. G., Popov N. N., Govalenkova O. L., Letyago A. V., Kashina-Yarmak V. L., Tolmachova S. R., Popova A. N.

**Introduction.** Microorganisms, isolated from the sputum of children with bronchial asthma (BA) in the exacerbation period, are able to acquire mimicry antigens of the trachea, bronchi and lung tissue, and have sensitizing effect on the organism of the child not only through the truly microbial (viral) antigens, but through the acquitted mimicry antigens of the cellular and tissue structures of the bronchopulmonary system, thus shifting the pathological process towards autoimmunity. **Materials & methods.** A microbiological study of the sputum obtained from the 135 examined children with BA aged 6 to 14 years in the exacerbation period. The disease diagnosis was established according to the protocol and directive of the Ministry of Health of Ukraine from 08.10.2013 № 868. It was established that 45 children had non – atopic asthma, 46 – mixed type asthma (MTBA) and 44 – atopic form of BA (ATBA). Microbiological studies of the sputum were carried out with the help of the commonly accepted methods: plating onto the solid and liquid culture mediums with the subsequent strains isolation, microscopy, biochemical and serological identification. Strains identification was carried out according to the taxonomic tests of the Berge microorganism index. In order to determine the presence of mimicry antigens in the examined strains we have prepared hyperimmune rabbit serums to the trachea, bronchi, and lung tissue antigens. Section samples obtained from the accidentally deceased children with the I(0) blood type 2-4 hours after the moment of death served as a antigenic material. **Results & discussion.** BA in children is characterized by complex etiological structure that combines Gram-positive, Gram-negative and *Candida* spp. fungi, and their associations. A comparative study of the quantitative composition of the microorganisms isolated from the sputum of the 135 examined children aged 5 to 14 years in the exacerbation period was carried out. It was established that the following microorganisms were isolated from the sputum of the children with ATBA with the lowest frequency: *S. pyogenes* - 3 (6,8 ± 2,1%), *S. aureus* - 4 (9,1 ± 2,5%), and *E. coli* — 5 (11,4 ± 2,3%); among associations - *S. aureus* + *S. pyogenes* - 2 (4,5 ± 1,3%), *S. aureus* + *Pr. mirabilis* - 2 (4,5 ± 1,3%). The most frequent microorganisms were: *C. albicans* - 8 (18,2 ± 4,4%), *Ps. aeruginosa* - 7 (16,0 ± 4,2%), and among associations - *S. aureus* + *Ps. aeruginosa* - 4 (9,1 ± 2,5%), and *S. aureus* + *E. coli*-3(6,8 ± 2,1%). In the children with NABA, the least frequent microorganisms were: *C. albicans* fungi - 2 (4,4 ± 1,4%), as well as associations: *S. aureus* + *E. coli* - 2 (4,4 ± 1,4%), and *S. aureus* + *Pr. mirabilis* - 3 (6,7 ± 1,7%), and the most frequent - *S. aureus* 7 (15,2 ± 3,1%), *Ps. aeruginosa* - 7 (15,2 ± 3,1%), as well as associations: *S. aureus* + *S. pyogenes* - 4 (8,7 ± 2,2 %) и *S. aureus* + *Ps. aeruginosa* - 4 (8,72 ± 2,2%). In children with MTBA the lowest frequency of isolation from the sputum was observed for: *Pr. mirabilis* - 3 (6,5±1,8 %) and *Candida* spp. fungi - 5 (10,9±4,1 %), among associations - *S.aureus* + *E.coli*- 2 (4,3±1,6%); *S.aureus* + *Pr. mirabilis*- 3 (6,5±1,8 %), the most frequent microorganisms were: *S.aureus* - 7 (15,2±3,1 %), *Ps.aeruginosa* - 7 (15,2±3,1 %), and among associations:

S.aureus + S.pyogenes - 4 (8,7±2,2 %), and S.aureus + Ps. aeruginosa -4(8,7±2,2%). The participation of the microflora isolated from the sputum in the etiopathogenesis of the disease can be proven based on the determination in their structure of the mimicry antigens of the trachea, bronchi and lung tissue. It was experimentally proven in course of the study that in NABA the titers of the agglutination of the organ specific serums with Gram-positive microorganisms (Streptococcus and Staphylococcus) were 1:131 — 1:149, which points out their decisive role in the etiopathogenesis in this form of BA, while in the Gram-negative microorganisms, the background values of the titers were observed - 1:17 - 1:85. In MTBA, the agglutination titer of organ specific serums with Gram-positive microorganisms (Streptococcus and Staphylococcus) was in the range (1:128 - 1:213), in Gram-negative microorganisms (E. coli and P. aeruginosa) – (1:64 - 1:160), which points to the participation of the pyogenic and Gram-negative microflora in the etiopathogenesis of this form of BA. In ATBA, the results of agglutination reaction of organ specific serums with Gram-positive microorganisms and Gram-negative microorganisms were in the range of 1:18 - 1:44, the lowest range compared to the NABA and MTBA. It can be concluded that microorganisms, isolated from the children with BA, are able through inclusion into their structure the mimicry antigens of the trachea, bronchi and lung structure, not only to determine the induction of the pathological process, but also to shift it towards autoimmunity. **Conclusion.** 1.Independent of the BA form in children, the microbial factor has the leading role in its etiopathogenesis, and can lead to the increased severity of the disease course. 2. BA in children is characterized by complex etiological structure that combines Gram-positive, Gram-negative, Candida spp. fungi, and their associations. 3.Microorganisms isolated from the sputum of children with BA, through varying their antigenic potential, are able to include into their structure mimicry antigens of the cellular and tissue structure of the bronchopulmonary system. 4. Microorganisms, through inclusion into their structure the mimicry antigens of the trachea, bronchi and lung structure, not only determine the induction of the pathological process, but also shift it towards autoimmunity.

**Keywords:** bronchial asthma, children, microorganisms, mimicry antigens, autoimmune process.

### PRACTICAL EXPERIENCE IN USING THE MINI PARASEP SOLVENT- FREE FAECAL PARASITE CONCENTRATOR FOR THE *CRYPTOSPORIDIUM* SPP. OOCYSTS DETECTION IN STOOL 33-40

**Pokhil S.I., Tymchenko O.M., Iakovenko D.V., Chigirinskaya N.A., Kostyia I.A., Nesterenko A.M.**

**Introduction.** Cryptosporidiosis is a protozoan illness caused by the protozoans of genus *Cryptosporidium* (type *Apicomplexa*), that are able to parasitize in the enterocytes of the intestinal mucosa villi, causing a specific infectious process with such manifestations as “watery diarrhea”. The efficacy of prophylaxis and treatment of this parasitosis is based on the timely and quality laboratory diagnostics that is most often carried out with the help of microscopic methods. In order to increase the productivity of oocysts determination in the fecal samples different methods of enrichment in the latter are being used. **The aim of the study** – evaluation of the efficacy of application of Mini Parasep® Solvent Free Faecal Parasite Concentrator compared to the traditional method of concentration (centrifugation in the formalin ethyl - acetate mix) in course of focused study of the fecal samples for *Cryptosporidium* spp. oocysts presence. **Materials and methods.** The object of the study were 102 fecal samples (with 10,0 % aqueous formalin at the ratio 1:1) from children with diarrhea aged from one month to 17 years that were provided with regular medical aid. Purification and concentration of cryptosporidia oocysts was carried out with the help of centrifugation in formalin ethyl-acetate mix was carried out according to the widely accepted method. During the application of Mini Parasep® Solvent Free Faecal Parasite Concentrator (“Apacor Ltd.”, England) the method recommended by the provider was adhered to, except the sedimentation by centrifugation stage that was carried out at 1100g for 3 minutes instead of 1 minute. Smears were prepared from the supernatant that were stained with the modified (cold) Ziehl-Neelsen staining method. The oocyst purification and concentration procedure was carried out by different specialists with taking into account of each stage chronometry. During microscopy of the stained smears of enriched fecal sediment the following parameters were evaluated: cryptosporidia oocysts presence, size, shape, typical inner structure, as well as the probability of concealment of the oocysts that was calculated by the number of big conglomerates ( $\geq 1/5$  field of vision of the microscope). **Results and discussion.** In the studies 102 fecal samples from children during parallel application of both methods complete coincidence of parameters of quality oocysts determination/non-determination ( $r_{\phi}=1$ ) was established. Oocysts were found in 4 (3,9 %) studied samples that was in the range of this parameter values in similar groups of increased risk in developed world countries. Despite such drawbacks of Mini Parasep® Solvent Free Faecal Parasite Concentrator application as the almost two-fold increase in overall study cost and the 3,8 increase in quantity of the big sized conglomerates that could potentially conceal the parasitic types being sought, this method had a number of significant rating advantages compared to the traditional method of centrifugation in formalin ethyl acetate mix: the low material cost and significantly lesser (2,2-2,6 times) labor cost, the moderate validity level, high biosafety and higher (1,5 times) productivity of the microscopic determination of the general quantity of cryptosporidia oocysts. **Conclusions.** The advantages and disadvantages of cryptosporidia oocysts purification and concentration procedures in application of traditional variant of centrifugation in formalin ethyl acetate mix and in application of Mini Parasep® Solvent Free Faecal Parasite Concentrator determined in course of the study do not contradict the topic data from foreign scientists. It is expedient to optimize the cryptosporidia oocysts purification and concentration procedures for determination of the latter in the fecal samples with the help of microscopy with the help of parasitological concentrator of the Parasep® type.

**Keywords:** *Cryptosporidium*, Parasep® Faecal Parasite Concentrator, detection, oocysts.

### FORENSIC AND PHARMACEUTICAL ANALYSIS OF ADDICTIVE MORBIDITY BECAUSE OF THE USE OF PSYCHOTROPIC PSYCHOACTIVE SUBSTANCES IN UKRAINE (RETROSPECTIVE ASPECT) 41-44

**Shapovalov V.V. (jr.), Gudzenko A. A., Zbrozhek S. I., Negretskiy S.N., Shapovalova V.A., Shapovalov V.V.**

**Introduction.** The use of psychoactive substances is one of the leading factors in the deterioration of the mental health of the population. The dynamics of addictive morbidity in recent years is closely correlated with each other, as well as with other manifestations of social problems: the general mortality of the population; the number of suicides; the number of crimes committed, which in general affects the development of the country. **Materials and methods.** The material of the study was statistical data, scientific literature, regulatory documents, and Internet sources. In studying of the problem, used retrospective, documentary, normative and legal, forensic and pharmaceutical methods of analysis. **Results and discussion.** The article presents the results of the forensic and pharmaceutical analysis of the addictive morbidity in Ukraine for the period of 2005–2008 based on example of psychotropic psychoactive substances. Distinguished three codes of the International Classification of Diseases of the 10<sup>th</sup> revision, which correspond to the addictive morbidity due to the use of psychotropic substances: F13 – hypnotics and sedatives (diazepam, phenobarbital); F15 – psychostimulants (amphetamine); F16 – hallucinogens (LSD, psilocybin, mescaline). Given the indicators of the listed types of addictive morbidity in Ukraine (per 100 thousand population) in a retrospective aspect. **Conclusions.** Established, that psychoactive substances from the classification and legal group “psychotropic substances” refer to substances whose circulation is limited at the legislative level. The results of the analysis of the registered addictive morbidity in Ukraine for the period of 2005–2008 because of the use of psychotropic psychoactive substances testify the following. Stability of the index of addictive morbidity because of the use of hypnotic and sedative substances (F13) and hallucinogens (F16) in 2008 in comparison with 2005; about a 24% reduction in the addictive morbidity because of the use of psychostimulants (F15) in 2008 compared with 2005.

**Keywords:** forensic pharmacy, psychoactive substances, addictive morbidity, classification and legal groups, psychotropic substances.

## PHAGOCYTOLOGICAL ACTIVITY OF NEUTROPHILS AND PERIPHERAL BLOOD MONOCYTES IN PATIENTS WITH HBV INFECTION

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Sklyar A.I., Popov M.M., Melentyeva K.V., Popova N.G., Toryanik I.I., Kalinichenko S.V., Popova L.O.

**Introduction.** Treatment of HBV infection is one of the global problems of modern medicine, which is confirmed by the extraordinary prevalence and high mortality from this disease. Elimination of acute hepatitis B (GHB) from the human body cannot be achieved without an effective antiviral immune response. Infiltration into the body, infectious agents collide with the innate structures of the immune system, among which phagocytes are on the first line of defense. The purpose of the work – study of the functional state of polymorphonuclear neutrophils and indicators of phagocytic activity of monocytes in the blood of patients with HBV of varying degrees of severity in the dynamics of conventional treatment and after the appointment of a symbiotic. **Material & methods.** Under supervision were 108 patients with HBV, from 18 to 69 years, of which 56 men and 52 women, the overall average age of patients was  $34 \pm 1.88$  years. The control group consisted of 17 healthy individuals. To evaluate phagocytic activity of neutrophils (PAN) was determined by the neutrophils phagocytic index (NPI) and the phagocytic count of neutrophils (PCN). The monocytes phagocytic index of (MPI) and phagocytic count of monocytes (PCM) were determined for evaluation of phagocytic activity of monocytes (PAM). Three incubation periods of 30, 60 and 180 minutes were used. **Results & discussion.** Discussing the results obtained, it is possible to state that polymorphonuclear neutrophils do not remain inert foreign cells in the antiviral process, they are involved in HBV infection. However, what role does neutrophils play – have a direct antiviral effect or indirectly participate in the elimination of viruses, or vice versa, HBV uses the functionality of phagocytes to replicate and spread, yet to be clarified. It is known that in the process of absorption, a phagosome is formed, which is then connected to the lysosomes of the cell, thus ensuring the implementation of monocytes as effective killing of microorganisms and the cleavage of antigens. Therefore, determining the duration and stability of contact of the object of phagocytosis with lysosomal enzymes monocytes, exhibiting an exposure of 180 minutes, is an important criterion for determining the reliable absorbing function of phagocytic monocytes. Analyzing the absorbing function of monocytes in patients with moderate severity in the period of convalescence, it can be stated that the indicated ability of monocytes in patients of 3 groups is significantly increased in the period from 30 to 60 minutes, which presumably indicates significant compensatory reserves of monocytes. But in the future at an exposure of 180 minutes obviously there is a depletion of the functional capabilities of phagocytic cells, which manifests itself as a sharp decrease in absorbent capacity against the background of a decrease in the total number of phagocytic monocytes. Patients in the 4 groups taking symbiotic demonstrate stable levels of monocyte absorption capacity in all exposure periods that do not differ from healthy subjects. The use of a symbiotic increases both the intensity of phagocytosis and regulates the absorption capacity of microphages in patients with mild severity and especially in patients with moderate severity, thereby maintaining the PAN at HBV at an optimal level. **Conclusions.** In patients with mild to moderate hepatitis, a significant activation of polymorphonuclear neutrophils during the active phase of HBV infection has been detected, which is characterized by an increase in the levels of NPI and AFN in 1.1-1.8 times and 1.5-1.9 times, respectively, in comparison with the control group. While indicators of MPI in HBV were reduced by 1.1-3.2 times compared with the control group, possibly due to a decrease in the number of phagocytic monocytes in the blood of patients with HBV infection. The intensity of reduction of phagocytic reactions of monocytes correlates with the degree of severity of HBV. It is possible to assume that a significant reduction in the number of phagocytes in the peripheral blood of infected persons is due to the redistribution of monocyte phenotypes and the recruitment of these immune cells in the inflammatory site. In patients with moderate severity in different periods of the disease, there is a significant inhibition of phagocytosis, which manifested by a decrease in the number of neutrophils that are involved in phagocytic reactions (1.2-1.5 times compared with the control group). However, despite the significant inhibition of the intensity of phagocytosis, the absorption capacity of neutrophils in these patients is elevated or is at the level of healthy individuals. Increasing the PCM to 1.8 times in patients with HBV may indicate significant compensatory opportunities for monocytes by increasing their absorption capacity. Thus, it is possible to assume that the patients with HBV infection of moderate severity increase the functionality of activated neutrophils by mobilizing the reserve properties of each eukaryotic immune cell that has undergone active phagocytosis. The use of symbiotic in the complex therapy of patients with GHB increases the intensity of phagocytosis, as due to an increase in the number of monocytes (however, their level does not reach the values of the control group) and neutrophils (in 1,2 - 1,4 times).

**Keywords:** HBV infection, immunity, neutrophils, phagocytosis

## EFFECT OF HERPESVIRUS PERSISTENCE ON THE FORMATION OF A SPECIFIC IMMUNE RESPONSE IN CHILDREN

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Smilianska M.V., Volianskyi A.Y., Peremot S.D., Kashpur N.V., Klysa A.A., Klysa T.L., Kuchma M.V.

**Introduction.** The best way to reduce the incidence of vaccine-preventable infections is to create a population of highly immune individuals. This is achieved through the implementation of immunization programs. The main focus of most immunization programs are young children, for whom WHO offers routine immunization against diphtheria, tetanus, whooping cough, measles, epidparotitis, rubella, and poliomyelitis in developed countries. According to the WHO forecasts, the diseases caused by herpesvirus infections (HVI) in the near future are defined as "the global problem of mankind". A feature of HVI is that the immune system responds to the extracellular location of free virus particles or antigenic determinants, rather than to latent viruses in nerve ganglia, macrophages, lymphocytes, etc.: immune system reactions are not observed. HVI can provoke functional disorders in the cells of the immune system: macrophages, T-lymphocytes, violation of the blast-cell transformation of lymphocytes. Hence, apparently, there is a clinically sluggish state with seemingly normal (numerically) indices of cellular immunity, which requires immune therapy to activate the function of immunocompetent cells. According to, the problem of herpesvirus infections is most acute in pediatrics, which is associated with a poor knowledge of epidemiology, immunopathogenesis, clinical manifestations, therapy and, most importantly, prevention of exacerbations of HVI. The frequency of occurrence is now more than 40%. The most, perhaps, unpleasant is the increased number of relapsing forms in early school age (6-7 years). Recently there has been an increase in the number of people with secondary immunodeficiency, whose active immunization is ineffective. The purpose of the study. We studied the relationship between the formation of specific postvaccinal immunity and the persistence of various representatives of the Herpesviridae family in children under 7 years old who received the first vaccine of the PDA according to the vaccination schedule of Ukraine. **Material and methods.** 145 children aged 1 to 7 years were examined. Antibodies (Ab) of class G to measles, rubella and mumps viruses were determined by the ELISA method. The threshold concentration of Ab was calculated in IU/ml according to the instructions for the test systems that were used. Immunofluorescence and PCR were used to detect viral antigens (Ag) and DNA, respectively. **Results and discussion.** When analyzing the relationship between the persistence of herpesviruses and the imbalance of a specific immune response, it was noted that the absence of vaccinal immunity on the MMR correlates with the high viral load and the presence in the body of the child more than 3 representatives of herpes viruses. With hyperreactivity of a specific immune response, a direct relationship is observed with the detection of a combination of VEB + CMV + HHV6. It is precisely this combination of these herpesviruses that has always been detected in children with superhigh titers of Ab in the MMR vaccine. Our studies showed that, on average,  $17 \pm 3.4\%$  of children immunized against measles and rubella were vaccinated against measles and rubella, and 1.7 times more did not respond with the production of specific Ab in the mumps component of the vaccine. Especially it is necessary to pay attention to the fact that more than half of the children after the first vaccination have hypersensitizations Ab to rubella and, almost every third child, to measles and mumps. Especially the percentage of hyperreactivity increases in children 5-6 years, i.e. by the time the MMR is revaccinated, according to the vaccination schedule. At the time of vaccination, the child must be healthy. Ideally, and even more so when there are doubts, on the eve of the vaccination, a general blood test

should be done. As our studies show, it is also necessary to conduct a study to identify the persistence of herpes simplex viruses in the child's blood cells. The depth of functional immunodeficiency is caused not only by the magnitude of the viral load, but also by the combination of herpetic infections. Excess immunization is unjustified in terms of medical ethics and economy. Some of them have a high initial level of antibodies and do not need to be vaccinated. Other individuals genetically produce high antibody titers during vaccination and do not require revaccination. It should be borne in mind that with intensive antibody formation, revaccination is unnecessary and undesirable. **Conclusion.** Therefore, it is desirable, but impossible for everyone today, to have a pre-vaccination screening - a serological examination of person's subject to vaccination for the presence of immunity to the infection. Typically, the goal of pre-vaccination screening is to identify non-immune (seronegative for the causative agent of a specific infection) individuals. In rare cases, pre-vaccination screening is conducted because of the undesirability of exposing immune individuals to additional allergies associated with vaccination. This makes it possible to determine the need for immunization, to cancel further vaccination in persons with strained immunity or, conversely, to take measures to strengthen the immune response in the vaccinated person. First of all, the principles of individual vaccination should be extended to risk groups, which we believe should be attributed to children with persistent herpesvirus infection, which causes both the development of secondary immunodeficiency and allergic organism.

**Keywords:** vaccine-preventable infections, herpesvirus infections, vaccination

## DEFINITION OF MATHEMATICAL MODELS OF SHOTS DISTANCE DETERMINATION USING BIOLOGICAL IMITATORS OF HUMAN TISSUES

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**Introduction.** One of the most common tasks in expert practice which is solved during investigation of almost all the facts of firearms usage is determination of shots distance. To realize this aim laboratory diagnostic methods are widely used mainly based on identifying of shot products and their effects. The traditional and most accessible way for an expert to achieve it is visual comparison of a remote track with some experimental samples of shot marks from the similar weapon model. The main advantages of the method are its simplicity and accessibility; however, it has some disadvantages that can lead to a mistake in determining specific shooting distance. Determination of shots distance based on statistical analysis of interdependence, frequency of occurrence and shot trace signs variation does not require appliance of full-scale collections, albums and descriptions of shots marks and allows to get conclusion with known probability of error. **Materials & Methods.** The shots were carried out from pistols "Fort-12" and "Fort-14TP" produced by the Science Industrial Association "FORT" of the Ministry of Internal Affairs of Ukraine (Vinnitsa City) with standard 9 x 18 mm caliber ammunition. Skin-muscular flaps of large white pig corpses with thickness from 1 cm to 4.5 cm were used as biological imitators of human body tissues. Series of five shots were conducted from a distance of 1 cm to 300 cm. Obtained objects were examined visually and with the complex of laboratory methods. All calculations of the research indicators were made with the help of a spreadsheet of "Microsoft EXCEL". When modeling dependencies, licensed statistical packages Statistica 10.0 Enterprise and IBM SPSS 20 were used. Based on the results of statistical processing of the experiment, using pistols "Fort-12" and "Fort-14TP", paired and multiple linear regression models were built to determine shorts distance depending on parameters of shot products distribution on the skin surface of biological human tissue imitators. A qualitative assessment of statistical data using correlation and regression analysis has been made. **Results & discussion.** Construction of regression models for skin damage. The obtained results of calculations of the characteristics of paired regression models of distance of shots from 3 cm to 150 cm depending on the diameter of the peripheral zone of gunpowder deposits in the "Statistica" system for "Fort-12" pistols and "Fort-14TP" pistols are shown. The indicators of multiplex and paired linear models of shots distance calculation ( $\hat{y}$ ) from the parameters  $x_1, x_2, x_3$  have been analyzed.

Confidence intervals of 95% reliability for predicted values of shots distances for pistols "Fort-12" and "Fort-14TP" have been built. The conclusions drawn, obtained shots distance models are adequate and statistically significant both in individual parameters and in general, therefore the equations obtained can be used for determination of predicted values of the shots distance for "Fort-12" and "Fort-14TP" pistols. **Conclusion.** Thus, based on generalization of the obtained data using correlation-regression analysis, the most significant factors that can be considered as diagnostic criteria for determining of the shot distance from pistols "Fort-12" and "Fort-14TP" have been revealed. Statistically valid linear multi-factor and pair regression models that allow to calculate shorts distance from "Fort-12" and "Fort-14TP" pistols for skin lesion based on experimental data have been made. Using the correlation-regression analysis statistical verification of regression models based on the Student's *t*-criteria and Fisher's *F* criteria has been made. It allowed to reveal the statistical significance of the obtained models. Close correlation link between determined parameters and shot distance allowed to establish that the models of the regression equation are adequate and can be used to predict shots distance.

**Keywords:** gunshot injuries, pistols «Fort», statistical analysis, forensic expertise