Risk Factors for the Health of the Population of an Industrial City and Their Impact on Regional Features of Inflammatory Diseases

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The medical and social significance of inflammatory diseases in Ukraine is growing every year, which is associated with the deterioration of the ecological situation and the decrease in the immune response under the influence of adverse environmental factors. Acute inflammatory processes are increasingly taking a protracted course, and inflammation, having arisen evolutionarily as an adaptive reaction aimed at the formation of an immune response, due to the inconsistency of its control mechanisms leads to the development of chronic inflammatory and autoimmune diseases, therefore, it is necessary to systematize knowledge about the mechanisms and specifics of the inflammatory reaction under the influence of factors of various nature, to present their similarities and differences.

Introduction

Health is the fundamental basis of human well-being, affecting the quality and duration of life, as well as the overall economic and social development of the population. It is of vital importance for each person and for all humanity as a whole and is determined by the interaction of a number of factors: environmental quality, lifestyle, heredity, the presence of harmful habits, socio-economic and psychological well-being, as well as the availability of medical care. However, achieving good health is not universally accessible to everyone due to the complex interaction of risk factors and

preventive measures that affect the effectiveness of its formation in different population groups [1].

Risk is the perceived danger of events with undesirable consequences defined in space and time [2]. Risk factors are factors of any nature that can provoke or increase the risk of the occurrence or development of deviations in human health. Of course, risk refers to the measure of the frequency of an event, based on its probable characteristics. Currently, various interpretations and definitions of the concept of environmental risk are proposed, which must be taken into account when assessing the danger of harmful factors to public health. Risk assessment includes the probability that groups of people will be exposed to different levels of pathogenic influences, and that these individuals will necessarily experience these, and not other, adverse effects. These two elements correspond to the main aspects of risk analysis - analysis of their impact and analysis of consequences. Identification of risk factors requires identification of a connection between phenomena and evidence that it is non-random, has a stable nature and is a precursor to the disease.

Since the mechanisms of influence of harmful factors on public health are very difficult to trace, our attention, as the authors of the article, was directed precisely to the analysis of the consequences observed in public health. From these positions, risk is considered as the probability that a certain part of the population will experience negative consequences. This method of risk assessment can be detailed in terms of impact (for example, the risk of developing a certain disease) [2;3].

Features of the industrial city of Zaporozhye. Features of the industrial city of Zaporozhye. The development of all branches of industry and the increase in the number of cars in settlements leads to environmental pollution with harmful substances (**Figure 1).**

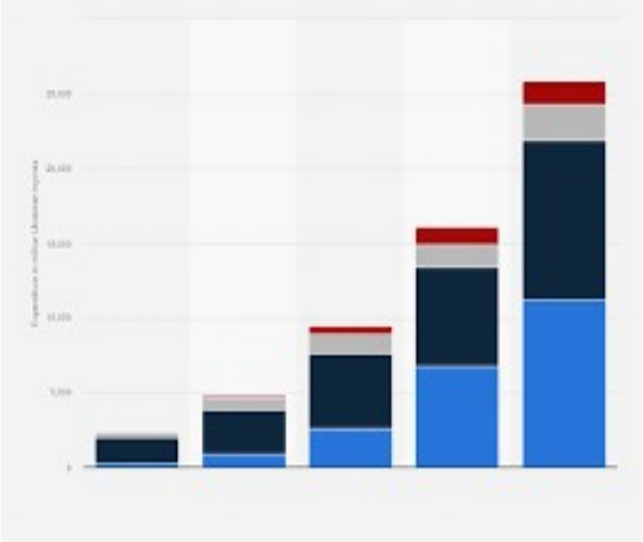

Figure 1. Ukraine: environmental protection expenditures by sector

According to the resolution of the Cabinet of Ministers of Ukraine, the industrial city of Zaporizhzhia is classified as a city of ecological disaster due to the concentration of industries that pollute the environment with harmful emissions and has specific features due to the nature of industrial production and automobile traffic in different urban areas. With prolonged exposure to adverse environmental factors, the body's immunobiological reactivity is the first to react, and this leads to an increase in the incidence of

inflammatory, allergic, autoimmune diseases in the population. The quality of the environment largely determines the level of the human body's defenses. This applies to a wide range of environmental factors, both natural and artificial. In Zaporizhzhia and the region, this is due to the large volume of pollutants entering the environment, the low level of control of industrial, agricultural and household waste

(**Figure 2**).

Figure 2. City of Zaporozhye: industrial zone.

The joint action of climatic, geophysical and technogenic factors of varying intensity affects the state of the internal environment of the human body, since nonspecific immunity is closely related to the general physiological categories of homeostasis and resistance. The criteria for factors of nonspecific immunity reflect the physiological state of the body, its potential ability to resist and adapt to various influences of the external and internal environment [4].

Indicators of the level of constitutional immunity have high sensitivity and can be used in medicine, biology for the purpose of monitoring the epidemiological situation in the region, diagnosing and predicting the course of the disease, as auxiliary tests for the prevention of chronic diseases. For a complete and correct understanding of the role of factors of natural immunity in the human body, it is necessary to know how these protective factors behave in pathological conditions, since in such cases it is possible to directly link the actual level of resistance with the indicators under study [5].

The highest level of air pollution in the city of Zaporizhia was recorded in the Voznesenivs'kyi (43% of the total number of exceedances), Zavod'skyi (37%) and Shevchenkivs'kyi (20%) districts of the city. In these districts, various combinations of unfavorable technogenic factors occur, which cause a negative impact on the health of the population. The priority risk factors for health include anthropogenic air pollution, which is undoubtedly caused by human activity. In particular, this is a change in the composition and properties of atmospheric air due to the entry into it and the environment of chemical, physical and biological compounds that negatively affect human health (**Figure 3**).

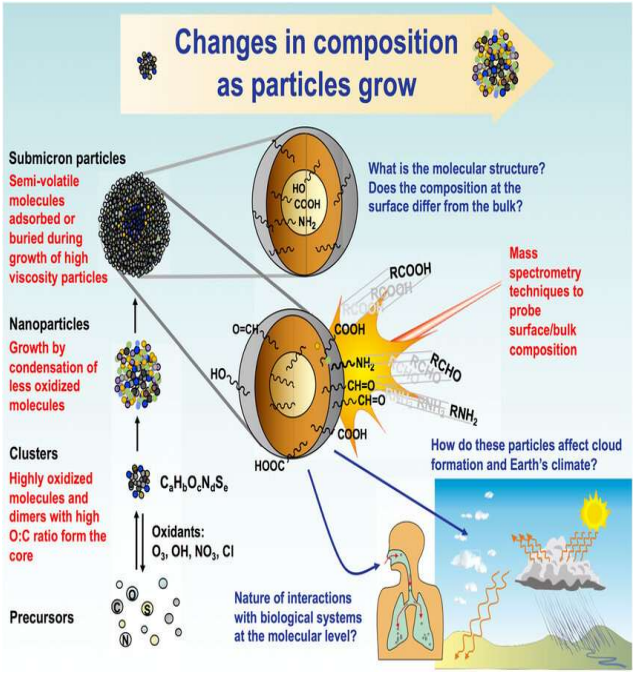

Figure 3. Scheme of the life cycle of secondary organic aerosol particles and their impact on the human body. Volatile organic precursors are oxidized in air by O3, OH, NO3, or Cl, and the resulting highly oxygenated, low-volatility products form new particles and/or condense onto existing ones to grow them. The chemical composition of these SOA particles will depend on the environmental conditions surrounding the particles (relative humidity, temperature, gas phase composition), as well as their physical properties (i.e. viscosity), which determine the absorption of trace gases. The chemical composition and size of these particles will also determine their impact on human health).

The level of atmospheric pollution depends on the volume of pollutants, the size and height of the emission, the distance from the emission source and meteorological conditions. In these epidemiologically unfavorable districts of the city, the frequency of visits to medical institutions for diseases of the respiratory tract, blood circulation and inflammatory diseases increases by 2-4 times.

This also applies to chronic inflammatory diseases of various genesis, as well as inflammations of the genitourinary system, which are largely exposed to the harmful effects of external factors.

The significance of such diseases is due to the fact that these diseases concern organs and tissues belonging to the reproductive sphere, that is, they have a direct impact on reproduction and procreation on Earth. Reproductive health is one of the main criteria for the effectiveness of the state's socio-economic policy, a factor of national security. Violations of the reproductive health of women and men are recorded in all age groups, about 350 million women fall ill in the world annually, most of whom develop chronic inflammatory diseases of the reproductive organs, which in 15% of cases lead to ectopic pregnancy, and in 40-85% of cases can lead to infertility.

Chronic inflammation of the genital tract in women is a risk factor for oncological gynecological pathology, so the connection of cervical cancer with some strains of the human papillomavirus is recognized as unconditional. Along with the microbial factor, provoking factors are also important. These include the weakening of barrier mechanisms and the general condition of the body under the influence of various risk factors [3].. This is the influence of social and behavioral factors that negatively affect the health of women and men (young age, refusal of barrier methods of contraception,

chronic stress, chronic alcoholism, smoking) and phlogogenic agents of various nature.

In the process of life, a person interacts with the environment and comes into contact with phlogogenic agents of various nature: biological, chemical and physical. **(Figure 4).**

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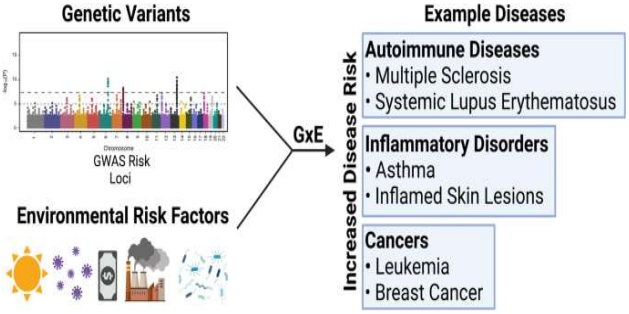

Figure 4. The impact of environmental interaction on human health.

As a result of the body's reaction to their action, both adaptive reactions are activated, accompanied by the formation of the necessary level of protection against a particular impact, and pathological processes that lead to disruption of the structure and function of organs, cell death and the development of diseases of a somatic, infectious, allergic or other nature [6].

According to available information, the predictor or trigger mechanism for the development of a pathological process when exposed to any environmental factor (group of factors) on the body **(Figure 5),** regardless of its nature, is an inflammatory reaction in the form of a local and generalized pathophysiological process that occurs in response to the action of a pathogenic stimulus or damage.

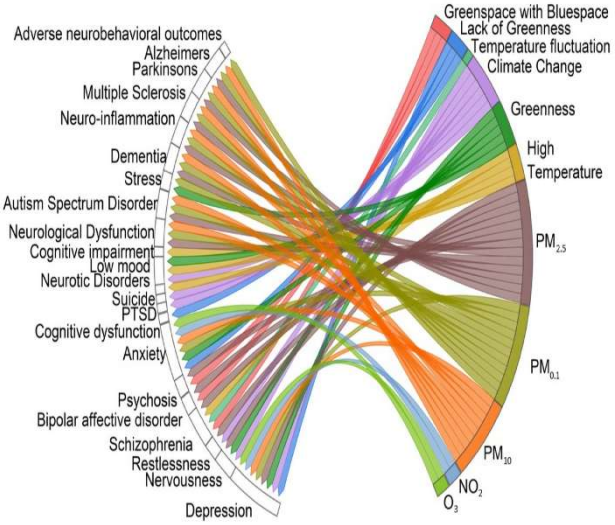

Figure 5. The effects of environmental factors on general human health: a scoping

This complex of reactions is aimed at maintaining homeostasis, eliminating products, and if possible, agents of damage, and restoring tissues in the area of damage [7]. Despite the fact that the inflammatory reaction (its intensity, level of formation, localization) depends on the nature of the damaging factor, the mechanisms of its formation and development are largely similar and can be represented by the following algorithm: 1) cell surface receptors recognize influential stimuli; 2) inflammatory pathways are activated; 3) inflammatory markers are released; 4) inflammatory cells are recruited. **(Figure 6).**

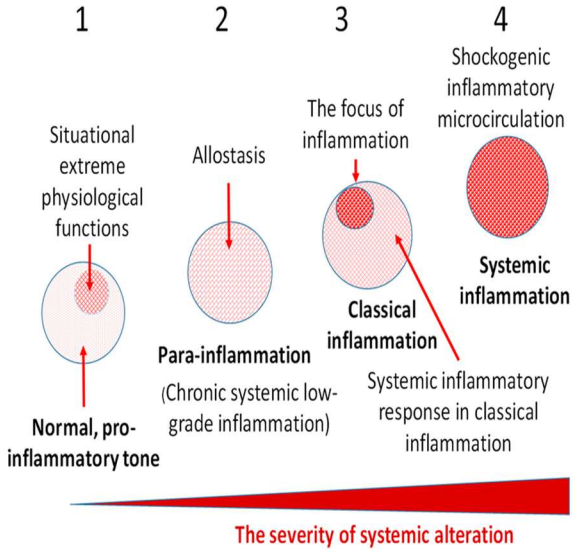

Figure 6. Variants of tissue proinflammatory stress 1. Physiological variants of tissue stress; 2. Nonclassical inflammation - at the systemic level can manifest as a stably altered homeostasis (allostasis); 3. Classical inflammation - the body's response to significant local damage) is characterized by the presence of a focus of inflammation and, possibly, a systemic inflammatory reaction aimed at restoring the focus of inflammation; 4. Life-critical systemic inflammation - a characteristic systemic microvascular reaction, comparable in intensity to the local reaction in the focus of classical inflammation.

The key factors that ensure the coordination of the processes of formation of the inflammatory reaction are: inductors, sensors, mediators and effectors of inflammation **(Figure 7)**, each of which is responsible for its component of the reaction. Inducers initiate the inflammatory reaction and activate specialized sensors (sensors), which, in turn, contribute to the production of the corresponding mediators. Mediators initiate changes in the functional state of tissues and organs of the effectors of inflammation, thereby contributing to their adaptation to the conditions that caused the appearance of the inductors of inflammation themselves [8]. That is, the development of the inflammatory reaction occurs in stages: alteration, vascular reactions, exudation, phagocytosis and proliferation [9].

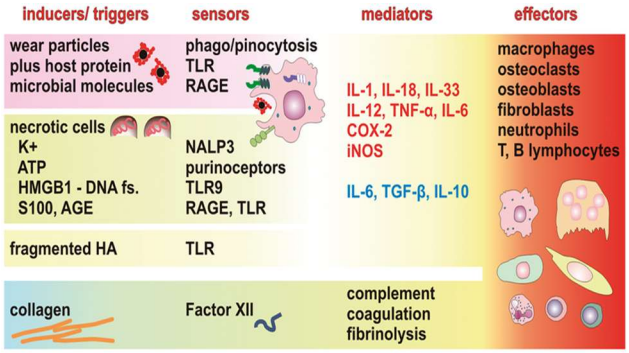

Figure 7. Components of the inflammatory response "inducers-sensors-mediators-effectors". The host reaction is initiated by triggers (inducers), which have both exogenous and endogenous origin.

There is abundant evidence in the literature of impaired systemic and local immunological reactivity in patients with inflammation of the reproductive system. In the pathogenesis of the development of the inflammatory process of the reproductive system and its complications, a large role is played by impaired blood circulation in the genitals, rheological properties of the blood, hormonal background, activity of enzyme systems, lipid peroxidation, but most of all - the state of nonspecific and specific protection of the patient's body, which is determined both in the circulatory system and in the lesion [10]. **(Figure 8).**

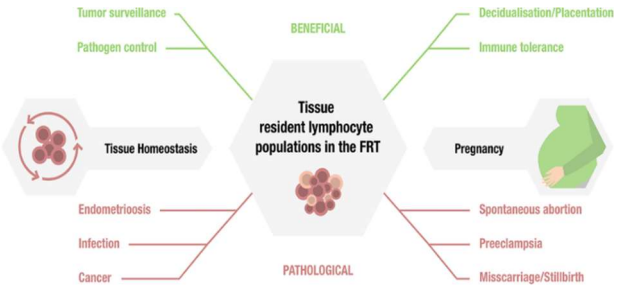

Figure 8. Tissue-resident immunity in the female and male reproductive tract. Tissue-resident immunity in the female and male reproductive tracts (FRT and MRT) involves a complex interplay of innate and adaptive immune responses, influenced by sex hormones and the unique local microenvironment. This system has evolved to balance the demands of successful reproduction with protection against pathogens

In infectious and inflammatory diseases of the reproductive system, there is a decrease in stimulated neutrophil chemiluminescence **(Figure 9),** which is an indicator of oxygen-dependent mechanisms of bactericidal function of phagocytes, a decrease in opsonic activity of blood serum, which is an essential criterion in assessing humoral factors of phagocytosis, and also changes in the activity indicators of the cellular link of specific defense have been detected both using cytochemical indicators and using rosette formation methods with sheep erythrocytes and monoclonal antibodies [11].

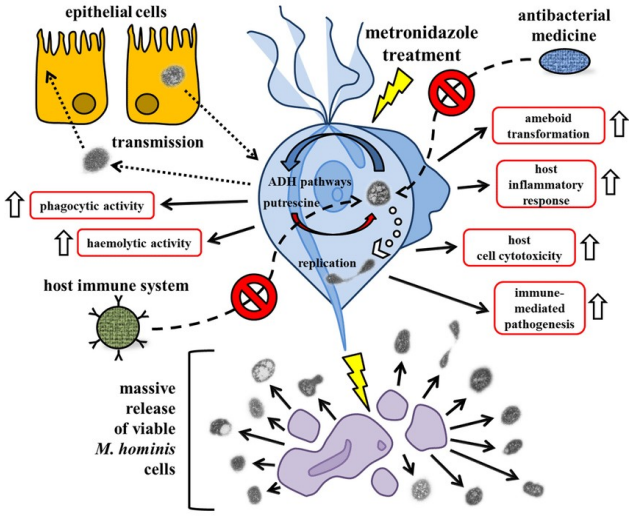

Figure 9. Neutrophil-dependent immunity during inflammations

These changes were observed both in the circulating blood system and in biomaterial from the focus of inflammation. Regarding the humoral link of specific protection, researchers have identified changes in the levels of immunoglobulins of the main classes (A, G, M), but their data are ambiguous [12]. In women with urogenital trichomoniasis, a decrease in the relative number of theophylline-resistant rosette-forming cells, E-RUKtr, probably lymphocytes with T-helper activity, was found **(Figure 10).**

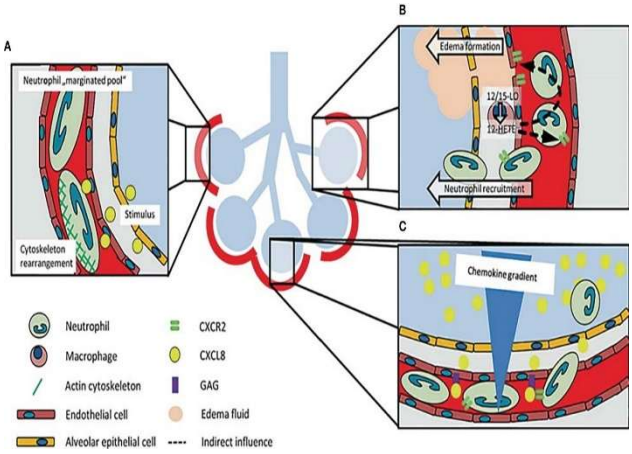

Figure 10. Symbiotic relationships between T. vaginalis and M. hominis can lead to serious diseases of the human body. ADH - arginine dihydrolase.

Chlamydial infections, including urogenital chlamydia, were accompanied by immune system disorders in 82% of women and 80% of men. These disorders were characterized by ambiguity and variability. Urogenital chlamydia is considered a significant factor in pelvic inflammatory diseases [13]. Most often, chlamydia causes chronic latent inflammation in people with reduced immunity, they can persist in the body of such people without any clinical manifestations for decades or even their entire lives, retaining pathogenic properties, their persistence includes a complex cascade of immunoinflammatory reactions, which leads to the gradual emergence of pathological areas in the affected organs [14]. Constant antigenic irritation causes a hyperreaction with subsequent depletion of the immune system. The ability of chlamydia to persist in leukocytes and lymphocytes allows them to enter any organs and tissues, where they can cause various changes. Long-term persistence of chlamydia results in chronic pelvic inflammatory disease, adhesions, organ dysfunction, and infertility [14]. **(Figure 11).**

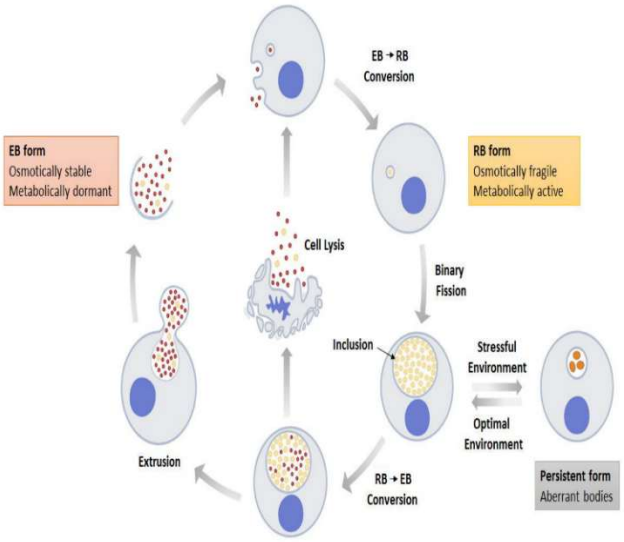

Figure 11. Schematic diagram of the developmental cycle of Chlamydia. Elementary bodies (EB; red dots) undergo conversion to reticulate bodies (RB; yellow dots) following attachment and internalization into the host cell. RB multiplies by binary fission and matures into EB before being released by lysis or extrusion processes. In the presence of growth stress such as IFN-γ, the RB enlarges and enters persistence. Optimal condition causes the enlarged RB to return to normal growth.

This complex of reactions is aimed at maintaining homeostasis, eliminating products, and if possible, agents of damage, and restoring tissues in the area of damage [15]. Despite the fact that the inflammatory reaction (its intensity, level of formation, localization) depends on the nature of the damaging factor, the mechanisms of its formation and development are largely similar and can be represented by the following algorithm: 1) cell surface receptors recognize influential stimuli; 2) inflammatory pathways are activated; 3) inflammatory markers are released; 4) inflammatory cells are recruited.

The problem of urogenital chlamydia [15] is associated with both the wide distribution and large number of foci of damage to the

genitourinary organs, and with a high incidence of severe complications [17].

It has been established that changes in immunity are observed in patients with chronic course and complications of urogenital chlamydia. In particular, a decrease in the total population of T-lymphocytes (CD3), T-helper cells (CD4), and the immunoregulatory index (CD4/CD8) is observed along with an increase in the number of CD8, NK cells, and B lymphocytes [16]. The level of IgM and IgG increases. (**Figure 12).** Regarding the concentration of IgA in patients with urogenital chlamydia, the data of different authors are contradictory.

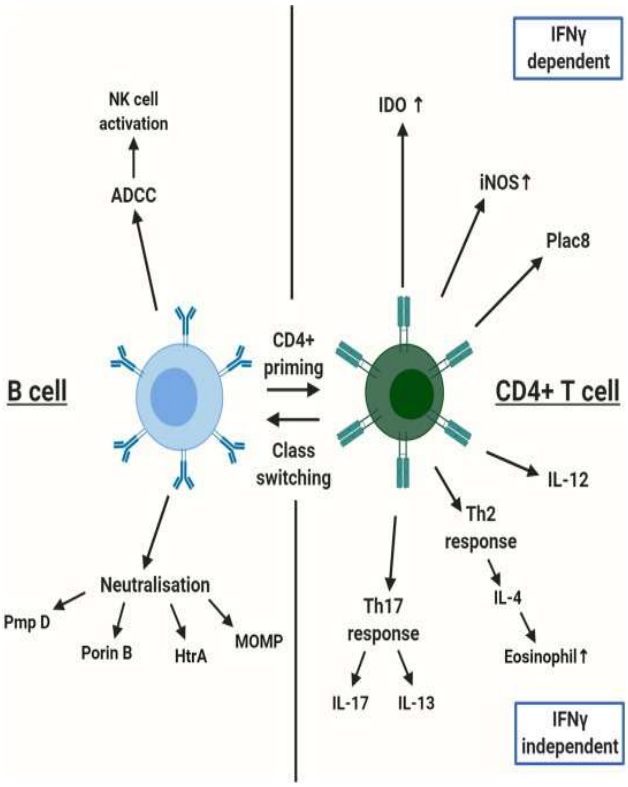

Figure 12. Chlamydia trachomatis: effect on immunity

Mycoplasma infection is characterized by the fact that it develops against the background of immunosuppression, is accompanied by various immunopathological reactions, mycoplasmas can escape the host's immune surveillance, which causes generalization of infection, chronic course of the lesion or long-term persistence of the microorganism [18]. Moreover, in vitro experiments have shown that mycoplasmas can induce apoptosis in leukemic cells of the lymphoid and myeloid lineages, but data on normal cells of the blood system are insufficient [20].

Experimental part

Materials and methods. In our work, 95 clinically healthy individuals (control group) and 180 patients with chronic inflammation aged 18-50 years (90 men and 90 women) from the industrial city of Zaporizhzhia were examined. The control group (CG) of the examined consisted of 95 clinically healthy individuals (donors), of whom 50 were men and 45 women.

Individuals of the control and study groups are residents of the industrial city of Zaporizhzhia (99%), the most polluted districts - Voznensenivs'kyi, Zavod'skyi and Shevchenkivs'kyi, most of them (86%) are engaged in intellectual and administrative activities, the demographic and clinical characteristics of all groups of patients were approximately the same. According to the living conditions, the patients were divided into homogeneous groups. When selecting patients for the study group, patients who received systemic or local antimicrobial treatment within the last 3 months, patients with impaired liver or

kidney function, gastrointestinal pathology, diabetes mellitus, pregnant women and those who are breastfeeding were excluded. In patients with inflammatory diseases of the urogenital tract, antimicrobial and immunomodulatory drugs were discontinued 2 weeks before the examination.

The composition of the control group by age was as follows: 18-28 years - 30 people, 29-39 years - 35 and 41-50 years - 30 people, and the patients were distributed as follows: 18-28 years - 60, 29-39 years - 58 and 40-50 years - 44 patients **(Table 1).** The clinical condition was assessed based on the history, examination of the skin of the genitals, and in women - the vaginal mucosa using a gynecological speculum together with a doctor of the city hospital [18].

The examined individuals were also divided into groups depending on the type of pathogen of the inflammatory process **(Table 2).**

Table 1. Groups of patients distributed by age and sex

Group	CG 1	CG2	CG3	1	2	3
Age	18-28	29-39	40-50	18-28	29-39	40-50
Men	15	20	15	28	30	25
Women	15	15	15	32	28	19

Table 2. Groups of subjects, and distributed by type of infectious agent

Indicator	CG	1	2	3	4	5	6
Pathogen	NBF	Bacteria	Trichomonas	Fungus	Chlamydia	Virus	Mixed flora
Average age	35.3±7.2	31 ±7.4	28.3± 6.8	34.3 ± 8.1	34.2 ± 8.8	31.3± 6.4	31.6±7.1
Total number	45	36	26	30	28	19	41
Men	24	16	11	13	14	9	20
Women	21	20	15	17	14	10	21

All patients underwent mandatory examinations: complete blood count; complete urine test; blood test for glucose; stool test for helminths; RW; immunodeficiency virus (with the patient's consent); fluorography. Glucose in the urine was not determined in any patient, the blood glucose level was within normal limits. The results of the examination for helminths, syphilis and immunodeficiency virus were negative. The results of fluorography were also normal. In the patients studied, the duration of inflammatory diseases was 2-20 years and was compared with age. Thus, in patients of the 1st group, the average duration of the disease was 2.0 years, in patients of the 2nd group - 5.5, and in the 3rd group - 13 years. All patients complained of the ineffectiveness of previous local or systemic antimicrobial treatment, short-term remissions.

Bacterioscopic and cytological studies. Bacterioscopic and cytological studies were performed on preparations of scrapings from the mucous membrane, stained by the Romanovsky-Giems method. Against the background of epithelial elements and leukocytes, bacterial flora, fungal elements, trichomonads were found. (**Figure 13).** Signs of intracellular parasitism (chlamydial, viral infection) were determined cytoscopically. If necessary, Gram-negative flora was determined, smears of scrapings of the mucous membrane of the genital system were stained according to the Gram method.

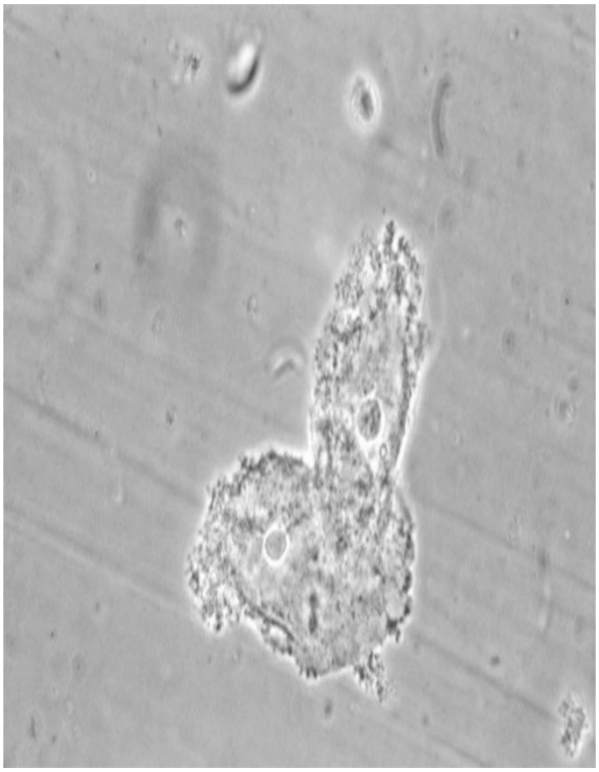

Figure 13. Epithelial cells with clusters of bacteria clustered on their surface. These cells indicate bacterial vaginosis. (Courtesy of M. Rein, Public Health Image Library, Centers for Disease Control and Prevention.)

If necessary, confirmation of the etiological diagnosis was carried out by culture studies, polymerase chain reaction, immunological tests, etc. in the bacteriological laboratory.

The state of epithelial cells of the mucous membrane of the urogenital organs was studied by light microscopy in smears of epithelial scrapings after fixation with ethyl alcohol and staining according to Romanovsky-Giemsa [18].

One of the most frequently detected infections of the reproductive system is trichomoniasis. This disease was detected in 14% of patients. A thorough microscopic examination was sufficient to make a diagnosis. In native preparations of secretions, a single-celled microorganism of pear-shaped or oval shape was detected, which was equal in size to or larger than a neutrophil; atypical forms of Trichomonas were most often found: microforms the size of a leukocyte, or macroforms similar to cells of the intermediate layer of the squamous epithelium. The inflammatory background, as a rule, was manifested by a neutrophilic reaction with a large amount of detritus and mucus; in patients of the third group (both men and women), the frequency of detection of Trichomonas (7 out of 44) was significantly lower than in patients of the first (19 out of 60) and second (16 out of 58) groups.

Fungal lesions of the genitals were found in 18% of women and 16% of men (except for men of the first age group). In women of the third age group, fungal lesions (7 out of 22) were observed significantly more often than in women of the first (9 out of 38) group. No significant difference in the frequency of fungal lesions was found in different age groups of men.

Suspicion of the presence of gonorrhea arose in 16% of men and 6% of women when large diplococci were detected, which stained gram-negative, had the appearance of coffee beans, with the concave side directed towards each other. Microscopic examination of smears from scrapings from the mucous membrane of the genitals revealed that the etiological factor in 23% of cases was mixed infection **(Table 3),** while monoinfection was observed in 77% of cases.

Table 3. Results of microscopic examination of infectious agents in the examined

Group	Number in the group	The number of patients in whom:								
		Trichom	Fungus	Gonococci	Bacteria	Chlamydia	Herpes virus	Cytomegalovirus	Papilloma virus	Mycoplasmosis
1	M	22	9	0	10	0	9	2	0	0
	W	38	10	9	9	6	17	5	1	0
2	M	30	9	1	12	1	14	4	1	1
	W	28	7	7	7	9	13	4	1	0
3	M	22	4*	2	5*	1	12	3	1	1

Note. * - $p<0.05$, in comparison with the data of the first group

The inflammatory reaction was usually pronounced, the presence of a large number of polymorphonuclear leukocytes with signs of degeneration of varying degrees and phagocytized diplococci was determined. **(Figure 14).**

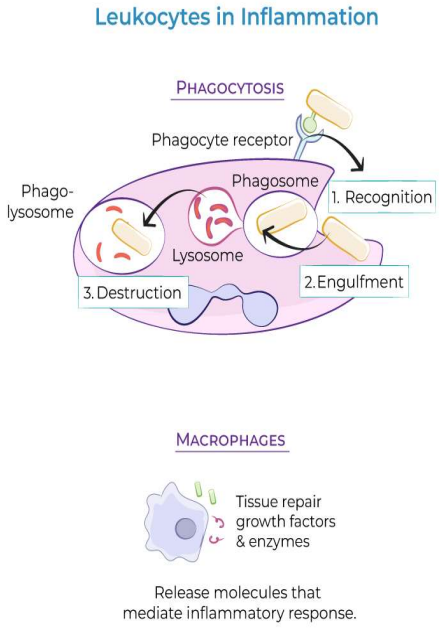

Figure 14. The process of phagocytosis, carried out by leukocytes (macrophages) in response to inflammation. Phagocytosis is a process in which phagocytes (for example, macrophages) absorb and destroy foreign particles, such as bacteria, or damaged cells.

In some patients, diplococci lost their morphological properties, stained gram-variably, the inflammatory reaction was unexpressed, with the presence of a large number of lymphocytes and monocytes, which is characteristic of a sluggish course of the disease and chronicity of the inflammatory process. In male and female patients of the third (9 out of 44) group, gonococci were detected significantly less often than in patients of the first (19 out of 60) and second (19 out of 58) groups.

Bacterial vaginosis in women of reproductive age was observed in more than 30% of cases. The diagnosis of microscopic examination of the smear was based on the detection of small coccal flora and the presence of key cells. Inflammatory reaction is not characteristic. In smears of scrapings from the urethra of men, microflora associated with bacterial vaginosis was detected in 3% of cases, local inflammatory reaction was absent. In women of the third group, bacterial vaginosis

was observed significantly more often (10 out of 22) than in women of the first (6 out of 38) group.

Urogenital chlamydia was suspected in 16% of cases, and direct and indirect cytological signs of intracellular infection were also determined. Elementary bodies and reticular bodies were considered direct cytopathogenic signs, nuclear fragmentation, cytoplasmic vacuolization was considered indirect signs. These signs were most often detected in the cells of the cylindrical epithelium of the cervical canal of women or the middle section of the urethra of men.

The inflammatory reaction was not pronounced, manifested by the presence of a relatively large number of mononuclear cells (10-15% of the total pool of tissue leukocytes). In men and women, no significant difference in the frequency of chlamydia lesions in different age groups was found. In cytological examination of smears from scrapings from the genitals of men and women, genital herpes was suspected in 10% of cases. The morphological changes induced by the virus were most clearly manifested in the cells of the intermediate layer of the squamous epithelium or in the cells of the cylindrical epithelium, there was a characteristic increase in the size of the cells, the presence of basophilic inclusions in the nucleus, surrounded by a zone of enlightenment, multinucleated cells were found. A characteristic lymphoplasmacytic reaction was noted, but no difference in the frequency of lesions between age groups was observed.

Signs of papillomavirus and cytomegalovirus infection were determined in single patients of the second and third groups. The presence of koilocytes (large, more often rounded cells) with pyknotic nuclei and wide areas of vacuolation or enlightenment, which are surrounded by a ring of dense cytoplasm, multinucleated cells was noted.

In single cases, signs suspicious for myco-ureaplasmosis were also observed. At the same time, the presence of small, rounded cavities of the same size with smooth edges was noted in the cells. Intracellular infections were usually accompanied by inflammatory reactions with a significant number of mononuclear cells in the focus of inflammation (**Figure 15).**

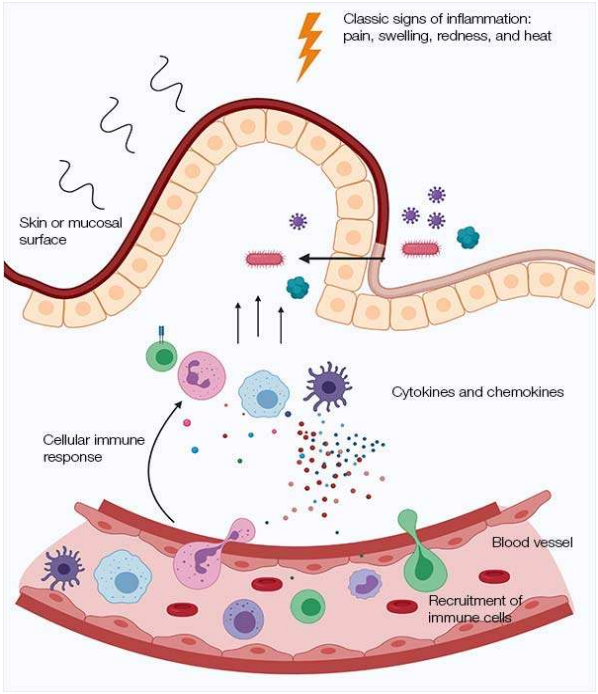

Figure 15. The beginning of inflammation**.** Our cells can cause an inflammatory response adapted to a certain type of threat

Inflammatory diseases in 23% developed as a result of mixed infections. The most frequently identified associates are chlamydia and gonorrhea, gonorrhea and trichomoniasis, bacterial vaginosis and herpes infection. Pronounced dystrophy of the epithelium of the mucous membrane of the reproductive system was detected in isolated cases.

Weak dystrophy manifested itself as vacuolization of the cytoplasm, fatty degeneration of cells, with moderate dystrophy, degenerative changes in the nuclei (vacuolization, fragmentation, lysis, chromatin coagulation) were also observed. Two patients of the third group showed pronounced dystrophy of the epithelium: a large amount of epithelial detritus and necrobiosis were found in the preparation.

In male patients of the third group, signs of mild dystrophy were observed significantly more often (14 out of 22) compared to men of the first group (9 out of 22). In women of the third group, the frequency of both mild and moderate dystrophy of the epithelium of the genital mucosa was significantly higher (21 out of 22) than in women of the first group (26 out of 38). In addition, one man and one woman of the third group showed pronounced dystrophy of the epithelial cells of the mucous membrane.

Thus, in men of the third, the oldest group, lesions with trichomonads and gonococci were significantly less frequent than in men of the first, the youngest group. No significant difference in the frequency of fungal, chlamydial, viral and other infections was found. However, signs of mild dystrophy of the urethral mucosa in men of the third group were observed significantly more often, and in the first case, signs of severe dystrophy were found. In sick women of the third group, infections such as trichomoniasis and gonorrhea were detected significantly less often than in women of the first group. However, fungal lesions and bacterial vaginosis were detected in significantly more cases. Dystrophy of the vaginal epithelium of the first and second degrees of severity was observed significantly more often, and in one woman, severe dystrophy of the mucous membrane cells was found.

A cytological assessment of the state of the epithelium of the mucous membrane, the cervical canal in women and the urethral mucosa in the studied men with an inflammatory process caused by various infectious agents was carried out. These patients found mild or moderately pronounced epithelial dystrophy **(Table 4).**

When analyzing the frequency and degree of dystrophy of the epithelium of the organs of the reproductive system in patients depending on the type of inflammatory pathogen, no significant differences were found **(Table 5).**

Table 4. Degree of dystrophy of the epithelium of the mucous membrane of the organs of the reproductive system caused by sexually transmitted infections

Group	Number of people in the group	The number of patients in whom:		
		first degree of dystrophy	second degree of dystrophy	third degree of dystrophy
1	36	14	13	-
2	26	11	11	1
3	30	18	6*	-
4	28	15	4*	-
5	19	10	5*	-
6	41	19	13	1

Note. * - $p<0.05$, compared with the data of the first group.

Table 5. Degree of dystrophy of the epithelium of the mucous membrane of the organs of the reproductive system caused by sexually transmitted infections depending on the inflammatory pathogen

Group		The number of patients in whom:			
		Number of people in the group	first degree of dystrophy	second degree of dystrophy	third degree of dystrophy
1	M	22	9	6	0
	W	38	15	11	0
2	M	30	16	10	0
	W	28	20	8	0
3	M	22	14*	8	1
	W	22	12*	9*	1

Note. * - $p<0.05$, compared with the data of the first group.

It can be concluded and assumed that the studied difference in the frequency of detection of various infections, as well as dystrophy of the epithelium of the organs of the reproductive system, is associated with the age characteristics of the subjects, the influence of lifestyle characteristics and exogenous factors, hormonal background, metabolism, general reactivity of the body, previous treatment with antimicrobial and anti-inflammatory agents, etc.

Biochemical and clinical laboratory research methods. Biochemical and clinical laboratory research methods were performed in an accredited clinical diagnostic laboratory, with informed consent. To confirm the etiological diagnosis, serological studies were performed in the laboratory of the Zaporizhzhia City Dermatological and Venereological Dispensary with the participation of laboratory staff.

All examined persons underwent a general clinical blood test: counting erythrocytes, leukocytes, platelets in the Goryaev counting chamber, determining the concentration of hemoglobin in the blood, color index, calculating the leukogram by a unified method, determining the erythrocyte sedimentation rate (ESR). A morphological study of blood plasma cells in smears stained by the Romanovsky-Giems method was performed. To assess the local systemic reactivity of the body, a complex of cytochemical indicators of leukocytes was used. Myeloperoxidase activity (MP) of polymorphonuclear leukocytes (PMNL), which

characterizes oxygen-dependent mechanisms of phagocytosis, was studied by the Graham-Knollier method, the average cytochemical coefficient (SCC) was calculated. Assessing the activity of oxygen-independent killing mechanisms of PMNL, the content of cationic proteins (CP) was studied by the method of V.G. Shubitch, average cytochemical quotient was calculated, monocyte activity was assessed, and the activity of the enzyme naphthylesterase (NE) was determined by the method of Loeffler.

The percentage of positively charged esterase-positive lymphocyte (Li) cells (probably T-Li) in the total Li pool was also calculated.

The data of the leukogram and ESR of peripheral blood were used to calculate hematological integral indicators using mathematical formulas.

After statistical processing of variation series, criteria for the reliability of distinctions between two phenomena were determined, the statistical criterion of Student's "t" was used for two unrelated samples and for samples with pairwise related variants. Correlation analysis was used to numerically characterize the relationship between different parameters. The Excel and Statistikal software packages were used for calculations.

Results and discussion

Most often, in the examined residents of the industrial city of Zaporizhzhia, we found bacterial vaginitis, urethral chlamydia, trichomoniasis, herpes, fungal diseases. Bacterial vaginitis is a pathology of the vaginal microbiocenosis, which is caused by the increased growth of mainly obligate anaerobic bacteria and the suppression of the growth of normal vaginal microflora. Vaginal dysbiosis can be a consequence of various exogenous and endogenous factors: hormonal disorders, infectious processes, decreased immune system function due to the action of external factors, i.e. the influence of environmental factors. If previously bacterial vaginitis was considered a variant of the norm, if there is no pronounced inflammatory process, now there is evidence of the occurrence of complications. Bacterial vaginitis has a very long, persistent course, is difficult to treat and quickly recurs. In the examined women, bacterial vaginitis was observed in more than 30% of cases. The diagnosis during microscopic examination of the smear was made on the basis of the determination of small rod-shaped flora and the presence of “key” cells. In women of group 3, bacterial vaginitis was observed significantly more often than in women of group 1. Suspicion of urethral chlamydia arose in 16% of cases of the examined patients. At the same time, direct and indirect cytological signs of intracellular infection were determined. Urogenital chlamydia is considered a significant factor in inflammatory diseases of the pelvic organs. Most often, chlamydia cause chronic latent inflammation in people with low immunity, can persist in the body of such people without any clinical manifestations for decades

or even their entire lives, retaining pathogenic properties. However, chlamydia is not simply found in the body. Their persistence includes a complex cascade of immunoinflammatory reactions, which leads to the gradual emergence of pathological areas in the affected organs. Constant antigenic irritation causes a hyperreaction with subsequent depletion of the immune system. The ability of chlamydia to persist in leukocytes and lymphocytes allows them to reach any organs and tissues, where they can cause various changes. The outcome of prolonged persistence of chlamydia is chronic pelvic inflammatory disease, adhesion formation processes, organ dysfunction and infertility. The problem of trichomoniasis is due to both the wide distribution and large number of foci of damage to the genitourinary organs, and the high frequency of severe complications. This disease was identified in 14% of the examined individuals. A thorough microscopic examination is sufficient to make a diagnosis. In patients of group 3, the frequency of detection of trichomonads was significantly lower than in patients of groups 1 and 2. With a decrease in the activity of the body's protective properties, trichomoniasis acquires a chronic, sluggish, prolonged course. The prostate gland, seminal vesicles, epididymis and urinary bladder are affected. In women, trichomoniasis manifests as colpitis, vaginitis, and when the infection progresses, urethritis, cystitis, endometritis, and adnexitis may develop. In men, these complications manifest as erectile dysfunction and infertility. Genital herpes was detected in 10% of cases during cytological examination of smears from the genitals of men and women. Morphological changes induced by the virus were most pronounced in the cells of the intermediate layer of the squamous epithelium or in the cells of the cylindrical epithelium. The causative agent of herpetic diseases of the genital organs is the herpes simplex virus, which comes in two types: herpes simplex virus-1 and herpes simplex virus-2, and the genitals are most often affected by type 2 viruses. The herpetic process usually begins with damage to the external genital organs, and later the internal genital organs and urinary organs are affected. The herpes simplex virus is oncogenic, atherogenic, neurotropic, and immunotropic, and has teratogenic properties. It is the cause of neonatal infection, intrauterine pathology, fetal death, premature abortion. Fungal lesions of the genitals occurred in 18% of women and 16% of men (except for men of the 1st age group). Pseudomycelium, fungal spores were determined against the background of a more or less pronounced inflammatory reaction with a relatively large number of mononuclear cells. The occurrence of fungal diseases can be promoted by both exogenous and endogenous factors, including the weakening of the body's immunoprotective processes. Fungal diseases have been detected more and more often in recent years, they are poorly treatable. With a weakened

immune system, fungal agents can spread in the body and cause the development of disseminated or systemic forms of mycoses, and even fungal sepsis.

Conclusions

1. In the residents of the industrial city of Zaporizhzhia from the three most polluted areas, inflammatory diseases have a protracted chronic course (the examined patients have been ill for 2–13 years) without a clear effect from treatment, there is a tendency to those inflammatory diseases of the reproductive system that arise against the background of reduced nonspecific reactivity of the organism.

2. We obtained an idea of the state of systemic nonspecific reactivity of the body by analyzing the quantitative and qualitative indicators of the composition of leukocytes and the erythrocyte sedimentation rate, using these hematological indicators, we were able to approximately assess the activity of various links of the nonspecific reactivity system without complex additional examinations. Conducting a comprehensive analysis of changes in these indicators, we can assume the presence of autointoxication in the examined patients, the predominance of the macrophagocytic link in the phagocytosis system and a tendency to a hypersensitivity reaction, which indicates a violation of nonspecific protective mechanisms.

3. Control of the inflammatory reaction is possible by influencing all components responsible for its development: inductors, sensors, mediators and effectors of inflammation.

Further implementation. The inflammatory reaction of the body to adverse risk factors develops even before significant pathological changes, therefore, the use of pharmacologically active substances [19], in our opinion. which can block the pathogenetic links of the development of excessive inflammatory reaction, along with traditional anti-inflammatory agents, should probably be started as early as possible from the moment of exposure, with the simultaneous use of specific preventive and treatment agents for each of the phlogogenic factors.

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