tics in this case makes it possible to determine an adequate amount of therapy and pharmacological correction of disorders of bone metabolism. The inclusion of bone resorption markers in the standard examination program for RA patients can reduce the risk of developing low-energy fractures and improve the quality of life of patients.

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T.P. Vasileva, I.V. Starostin, E.V. Makarova, A.M. Allenov, A.V. Vorobyeva

PERSPECTIVES FOR THE STUDY OF ACTIVE LONGEVITY AMONG RESEARCHERS

DOI 10.25789/YMJ.2021.74.32

Along with the increase in life expectancy in most countries of the world, including in Russia, the proportion of people in older age groups is growing. The authors carried out a scientific review of the problem of "active longevity" and the prospects for its study in a group of researchers. Currently various components of the question of "active longevity «are widely studied. However, in relation to researchers, most of its problems have not been studied systematically, there are practically no justified preventive measures, as well as measures to normalize the functions that have already been violated in a particular researcher. The development of the problem of active longevity of researchers will help to formulate a set of measures to extend the effective professional longevity of researchers and ensure scientific continuity.

Keywords: active longevity; professional longevity; researchers; scientists; cognitive abilities; quality of life.

VASILYEVA Tatyana Pavlovna - MD, PhD, Professor, chief research scientist at FSSBI N.A. Semashko National Research Institute of Public Health, Chief Research scientist at FSBI Ivanovo Research Institute of Motherhood and Childhood named after V.N. Gorodkov of Ministry of Health of the Russian Federation, +7 (495) 917-82-81, e-mail: vasileva_tp@mail.ru , ORCID: https://orcid.org/0000-0002-3605-8592; **STAROSTIN Ivan Vasilievich** - PhD in Medical Sciences, Deputy Chief Physician for the Polyclinic of LLC "Clinic TRI POKOLENIYA", +7 (926) 394-79-22; e-mail: ivs_01@bk.ru . ORCID: https://orcid.org/0000-0003-4974-6500; **MAKAROVA Ekaterina Vladimirovna** - PhD, research scientist at FSSBI "N.A. Semashko National Research Institute of Public Health"; +7 (915) 111-41-37; e-mail rue-royal@inbox.ru ; ORCID: https://orcid.org/0000-0003-3767-8475; **ALLENOV Andrey Mikhailovich** - PhD, professor of the Institute of Leadership and Healthcare Management of the First Moscow State Medical University named after I.M. Sechenov (Sechenov University); Chief Physician of the City Polyclinic No. 210 of the Moscow City Health Department, Moscow, Russia. Email: allenovandrey@yandex.ru; ORCID: https://orcid.org/0000-0001-8144-9421; **VOROBYEVA Anna Vladimirovna** - 1st year PhD student, Department of Public Health and Health Care at FSSBI "N.A. Semashko National Research Institute of Public Health", 8-985-511-29-95; e-mail: vorobievaanna2010@yandex.ru , ORCID: https://orcid.org/0000-0003-4609-5343

Introduction. Simultaneously with the increase in life expectancy in most countries of the world, including Russia [34-35], the share of older people in the population is growing. Since 2003, the average life expectancy in the Russian Federation for those born in 2020, according to the State Statistics Committee, is 73.4 years [30], and according to the conservative forecast, it will reach 75.4 years by 2035.

One of the areas of activity where the proportion of older workers is high is science. The development of science is one of the priority goals in the Russian Federation. In 2018, the National Project "Science" was approved, the goals of which are [30]:

1) ensuring the presence of the Russian Federation among the five leading countries of the world engaged in research and development in the field of priority areas for scientific and technological development areas;

2) ensuring the attractiveness of work in the Russian Federation for leading Russian and foreign scientists and young promising researchers;

3) outstripping the increase in domestic spending on research and development, compared with the growth of the country's gross domestic product.

To achieve these goals, the project "Science" sets the following tasks [18]:

1) Creation of at least 15 world-class scientific and educational centers based on the integration of universities and scientific organizations and their cooperation with organizations operating in the real sector of the economy;

2) creation of world-class scientific centers, including a network of international mathematical centers and genomic research centers;

3) updating at least 50 percent of the instrument base of the leading organizations performing research and development;

4) development of advanced infrastructure for research and development,

innovation activities;

5) the formation of an integral system of training and professional growth of scientific and scientific-pedagogical personnel, providing conditions for the implementation of scientific research and development by young scientists, the creation of scientific laboratories and competitive teams.

According to the National Research University Higher School of Economics [11], by 2020 the Nauka national project became the leader in budget execution (50.3%, or 21.7 out of 43.1 billion rubles), especially in the sections “Development of scientific and scientific and industrial cooperation "(the budget was executed by 73.8%) and" Development of advanced infrastructure for research and development in the Russian Federation "(44.5%). However, in the section "Development of human resources in the field of research and development" there is a relative lag (15.4%), which requires understanding and analysis of the reasons. In this review article, we tried to analyze the existing scientific data on one of the most important areas in the development of human resources in science - active longevity of researchers in the context of the global problem of active longevity of the population as a whole.

The purpose of this work was to conduct a review of domestic and foreign literature related to professional longevity and analyze the receipt of data in relation to scientific activities, to indicate the prospects for studying this issue.

Materials and methods. A descriptive review of scientific publications for the last 10 years on the main scientific databases (elibrary.ru, dissercat.com, GOOGLE SCHOLAR, MEDLINE, PUBMED) related to the issue of active longevity of working people was carried out. Date of request: January 20, 2021.

Results. *Active longevity of researchers: not necessary or necessary?*

The professional activity of scientists requires a high level of education, a long time for mastering the theoretical and practical aspects of the subject, is characterized by great intellectual workload and has a high social significance. All this determines the importance of maintaining the professional health of scientists [26]. However, a search in domestic and foreign databases (elibrary.ru, dissercat.com, GOOGLE SCHOLAR, MEDLINE, PUBMED) did not allow us to find works devoted to the study of active longevity / healthy aging in individuals engaged in scientific activities. So, a number of domestic works on various aspects that can be attributed to the problem of active longevity of mental workers, included other persons - managers and administrators, engineers and operators - or did not specify at all the nature of mental work [8,21], therefore, obtained in their results can hardly be transferred to researchers. The issues related to the active longevity of scientific workers (or the problems of aging) were not considered even in the voluminous work of AG Alakhverdyan, dedicated to the current state of scientific personnel [1]. The Federal Target Program (FTP) “Scientific and Scientific-Pedagogical Personnel of Innovative Russia” for 2009–2013, as well as the scientific project of the Russian Academy of Sciences (RAS) for 2006–2008, [19] the science of young researchers and completely ignored the issues of retention in science and maintenance of the effectiveness of the work of older scientists. That is why, relying on the found literary sources, this problem can still be approached only indirectly, which will be considered below.

Physical and mental health of researchers. Professional health is a combination of psychophysiological and physiological parameters that ensure high performance and professional longevity. The greater the stock of functional reserves of the body, the higher the efficiency of professional activity and the period of professional longevity [20]. Occupational health consists of emotional, cognitive and behavioral components and directly affects the efficiency of activities, work capacity, as well as the mental, physical and social well-being of the employee [12].

Domestic works on assessing the health status of research workers as a whole, regardless of age, not to mention the elderly, are not enough. So, Savina A. A. [24] revealed an increased growth rate of general and primary morbidity among employees of the Russian Academy of Sciences (RAS), exceeding the average indicators for Russia by 2.7 and 3.2 times, respectively. Thus a high rate of growth of primary morbidity observed in endocrine diseases (61%) tumors (55%), diseases of the urogenital system and diseases, caused external causes (by 42.0%), pathology musculoskeletal system (30.0%) and circulatory system (by 28.0%). Among the reasons for hospitalizations, problems of the circulatory system were in the lead (31.9%), followed by the genitourinary system (14.1%), digestive organs (9.5%), neoplasms (8.9%), pathology of the musculoskeletal system (8.2%) and external causes (6.5%).

In another study, researchers, contact with various occupational hazards, showed an increase in disease risk in 2.6 - 4.6 times, by comparison with those, who had no occupational hazards [3], but a separate analysis of older workers and the control group of another there was no profile in the study. In a series of studies have shown, that the SRI staff, has not yet reached the pre-retirement age (mean age 48.4 and 46.7 years) were more common risk factors, like abdominal obesity, smoking and lack of exercise, while the university staff - stress and disturbance nutrition. Despite the high level of education of the respondents, they were poorly informed about the presence at such risk factors, like high cholesterol and hyperglycemia. These studies also showed a high level of stress in workers of the two studied categories, accompanied by an increase in blood pressure [10,17].

In addition, in the researchers significantly more frequently, than the university staff, it was detected high anxiety, anxious - depressive syndrome and clinically significant depression. [14] However, these studies did not provide for a comparison with similar indicators in people who are not engaged in scientific work, so it is not possible to answer the question of whether the state of health of researchers differs from the population; the older age group was also not studied. Nevertheless, when analyzing these results, it can be assumed that preventive work with the medical component of active longevity of researchers should be started long before they reach the pre-retirement and especially retirement age. Psychological work is likely to be equally important, since as high emotional stress and stress (which were identified in the discussed works) accelerate aging [25].

The importance of the psychological component for the work of researchers is also evidenced by a study on a small number of research institutes of different ages, in which the assessment of psychological well-being and satisfaction with professional achievements turned out to be low, despite the fact that they considered their health to be satisfactory and the level of cognitive functions high. At the same time, managers (and they are, presumably, older than lower-ranking employees) showed a higher level of autonomy, self-efficacy and professional well-being and naturally higher achievements in the implementation of professional goals [26]. Although this study did not specifically target older scientists, it does provide some insight into the possible psychological implications of maintaining active longevity in them.

The subjective assessment of health, based solely on physical well-being, is becoming a key parameter in the new interpretation of aging: It is much more important to feel healthy than to have formal confirmation of it. Apparently, the psychological state also has a very large influence on the subjective assessment of the state of health. When studying patients with chronic somatic diseases (diabetes mellitus, obesity, arterial hypertension) aged 45 to 80 years, it turned out that the subjective assessment of their own health was inversely related to such indicators of psycho-emotional state as the level of depression, reactive anxiety and personal anxiety [28]. Moreover, a positive orientation towards the socially active and rewarding aspect - a favorite job - was associated with a more positive and stable psycho-emotional state, lower levels of depression and anxiety, and higher social achievements. Of the options proposed (health status, family well-being, material security, favorite job, principles and beliefs), only the choice of a favorite job as the main value orientation correlated with a higher health-related QoL [28]. D.M. also speaks of a similar influence. Rogozin [23]: in his opinion, the most significant factors that determine the subjective perception of health are not age, but higher education, professional employment, and a variety of labor practices. Erudite people who manage their free time on their own (flexible hours), according to the study, assessed their state of themselves much better than those who were looking for external causes of their problems (pinning their hopes only on guardianship and care from the state).

Dynamics of the number of scientific personnel and its age structure. The number of scientists in various branches of science gradually increased in the second half of the 20th century, while in the post-Soviet period (1994-2010) the number of scientific personnel decreased significantly in almost all areas (in medical sciences by 11%, in natural sciences - by 22%, in technical sciences - by 33%, social - by 27%, agrarian - by 26%), with the exception of the humanities (an increase of 41%. [1] In the period up to 2018, the number of personnel of scientific organizations in Russia continued to decrease (by 7.3 % compared to 2010) and amounted to 682.5 thousand people, which was 3.6% compared to 2017 (Table 1) [22].

We can see in the table that, although there is a decline in headcount across all categories, it has affected support personnel more, which may be due to low wages and growing skill requirements. Due to the outflow of young personnel in the period from 1990 to 2010, among Russian scientists, the share of researchers in the older age group increased significantly, while the percentage of young and middle-aged scientists decreased. At the time of 2010, 25.2% of scientists in the Russian Federation were aged 60 and older [1]. The main reason for this age bias is the outflow of a young and active part of research workers abroad or, if they stayed in Russia, leaving science as an industry funded on a leftover basis and having unclear development prospects. However, this is not the subject of this article; we will be more interested in the trends of the last decade. In the past three years, the number of researchers with higher scientific qualifications - candidates and doctors of sciences - has also decreased: in 2016 compared to 2020 - by 2.8%, in 2017 - by 4.7% and in 2018 by 2.9%. 2010 to 2018 this indicator decreased from 105.1 to 100.3 thousand people. (by 4.6%). Ratay and Tarasenko believe that since 2010, the average age of researchers has decreased from 48 to 47 years (candidates of sciences - from 53 to 51 years, persons without a scientific degree - from 45 to 44 years), and doctors of sciences - increased from 62 to 63 years old [22]. We believe that the age difference of 1 or 2 years is unlikely to indicate a trend that has taken shape.

2010 to 2018 the number of the age group of 30-39 years increased by 1.5 times, and the share of scientists of this age in the total number of researchers - from 16.2 to 26.5%. The share of the age group under 39 years old has remained practically unchanged since 2017 (Table 1) [22]. According to other data, by 2018 scientists under 39 years old accounted for almost 44%, the share of scientists over 60 years old was not much less, but the share of the middle generation (40 - 59 years old) was characterized by a "failure" [2]. By 2018, the number of researchers over the age of 70 was 33.5 thousand out of 360 thousand, that is, at least a tenth of all researchers, or 3.5 thousand more than in 2008 [6].

The number of employees of scientific organizations by category, taking into account the dynamics of age groups [22]

	Number of pateints (n)			Growth rate, percent	
	2010	2017	2018	2018 к 2010	2018 к 2017
Total	736 540	707 887	682 541	-7.3	-3.6
Researchers	368 915	359 793	347 847	-5.7	-3.3
Technicians	59 276	59 690	57 716	-2.6	-3.3
Support staff	183 713	170 347	160 577	-12.6	-5.7
Other personnel	124 636	118 057	116 401	-6.6	-1.4
Age groups of researchers					
Total	368915	359793	347847	-5.7	-3.3
≤ 29 years old	71194	66376	60634	-14.8	-8.7
30-39 years old	59910	91429	92106	+53.7	+0.7
40-49 years old	54113	51149	52800	-2.4	+3.2
50-59 years old	88362	59893	54830	-37.9	-8.5
60-69 years old	60997	57414	54076	-11.3	-5.8
≥ 70 years old	34339	33532	33401	-2.7	-0.4

Age-related aspects of scientific activity. The aging problem can be viewed from different points of view: passport age, biological age, social age, mental age. They do not always coincide. For different work activities, the age defining an employee as “elderly” is apparently not the same and can vary over a wide range. In particular, mental and social old age among mental workers and creative professions can occur at a rather old age [32]. The influence of the general workload and the level of education on the professional longevity of older people is clearly traced [7], hence the potential for continuing professional activity among researchers is undoubtedly higher than among people of many other professions. Indeed, employment of older people is higher in areas with a high level of utilization of advances in science and technology, and science workers, along with doctors and teachers, have high employment rates for older people [31].

Sociologists and psychologists of science have actively studied the relationship between aging and scientific performance [42]. The work of researchers may be assessed by several criteria, the main of which are:

1) creativity is large ("breakthrough") scientific achievements and the creation of new directions in science; 2) productivity; 3) influence on other scientists and (often judged by citation).

With regard to scientific creativity, two categories of research can be distinguished with completely opposite results. The first group of studies examined extraordinary scientific achievements such as Nobel Prize winners; they showed that the studies subsequently awarded these prizes were mainly performed by people under 40 [41,52,55]. When analyzing 414 Nobel prizes for the period from 1901 to 1992, it was proved that over the years the age distribution of laureates in the field of physics, chemistry, medicine in different years is approximately the same [51]. In physics, the time of maximum creativity occurs at the age of 31-35 years, in medicine - 31-35 years, in chemistry - 36-40 years. About 7% of the physics laureates make their discoveries before the age of 25. Only 6% of all Nobel laureates have made breakthrough discoveries after the age of 50. In the 19th century, the psychologist Beard [38] studied the relationship between creativity and age and concluded that young people have a lot of enthusiasm, but little experience, and the old enthusiasm has little, but experience more than enough, therefore, creativity will reach its maximum at the intersection of these two factors - experience and enthusiasm. This partly explains why the peak of creativity in different fields of activity occurs at different ages. It is possible that there is an age shift from scientific research to fulfilling other roles in science (for example, transfer of experience, teaching), more typical for researchers of the "average" and less typical for the most prominent scientists [51].

In terms of scientific productivity, some studies have also shown that young researchers are more productive than older researchers [43,45,50]. However, there are other results as well. Thus, even in the early works of Lehmann [47-48], it was established that the peak of productivity of scientists falls on 30-39 years, although in different branches of science it differs somewhat: physicists - 32-33 years, mathematicians - 23 years, physiologists - 35 -39 years old, astronomers - 40-44 years old. In the future, no fewer studies have shown that the most productive and most influential on science are not young researchers, but middle-aged and older scientists [37,39,40,46,53,54].

The influence of scientists on the professional environment through publications is the main factor of recognition in the scientific community and a direct consequence of the activity and effectiveness of scientific activity; subsequently, the citation index and the so-called impact factor were added to the number of publications. In an international project in the late 1970s. with the participation of more than 10,000 researchers, two peaks of the publication activity of scientists in the natural sciences were identified - at the age of 45-49 and 55 [16]. In some studies, higher productivity and impact factor were noted among young scientists. However, others have shown a higher productivity and impact on the scientific environment among older scientists, confirms Merton's theory of "accumulation of benefits": researchers who are active in scientific work from a young age accumulate more "scientific capital" and thereby subsequently get the opportunity to do better. access to finance, equipment, etc., which in turn help them stay productive longer [44,49]. Recently, it turned out that middle-aged scientists publish no fewer high-quality papers, but at the same time, they publish as co-authors a lot of papers with a lower impact factor, which in general somewhat “dilutes” their average performance. After 50 years, researchers reduce the number of publications, but their scientific influence (impact factor) rises again. In other words, if a researcher does not leave his scientific activity, then his productivity, measured by the number of high-quality publications, only increases throughout his career [44]. All the precipitated work was carried out on foreign scientific material. In domestic scientometrics, this direction has been studied extremely insufficiently. Thus, the position, length of scientific work and the Hirsch index were identified as predictors of the 5-year publication activity of domestic medical scientists; although the contribution of scientific work experience was about 10%, this can be considered an indirect confirmation of the fact that persons working in science for a long time do not lose their effectiveness [29].

Advantages and importance of older age in the research team. A large number of researchers in older age groups are employed in research institutes, departments of universities, institutions of postgraduate education and often constitute the "backbone" of scientific schools [4]. For obvious reasons, the level of scientific qualifications and research experience among employees of older age groups, on average, exceeds that of young people [5]. To ensure scientific continuity and transfer of experience without loss, professional growth of young people, mentoring by the older generation of researchers is necessary [9, 15], and to create full-fledged scientific schools, 2-3 generations are required [21].

The experience of teamwork in a team, the ability to independently make important decisions and be responsible for them are associated with the activation of business potential, which increases in some employees with age, while others do not, depending on psychological characteristics [33]; this position can be fully attributed to the peculiarities of scientific activity. Compared to young people, older people are better prepared for the development of complex multi-level projects, multifactorial expert assessment, making informed decisions, counseling, etc. Changes can make a significant contribution to improving the effectiveness of scientific work of older age groups and increasing their professional activity. working conditions: for example, the expansion of digitalization, the possibility of "remote work", the formation of working teams from people from different regions and countries, as well as the expansion of access to databases and information resources. Young, but less qualified workers (secretaries, assistants, trainees, junior employees) can undertake support and technical support for the work of such specialists [27]. So, the scientific potential and efficiency of a researcher may depend not only and not so much on the calendar age, but on his “professional health” and the ability to restructure the priorities of his scientific activity in accordance with changing age abilities and experience. Interestingly, the change in the role of a particular scientist in the scientific hierarchy abroad is traced in the fact that with age, scientists (professors) in the list of co-authors of publications move from the first position to the last, since the first author, as a rule, is the main performer of the work, and the leader more often it is indicated by the last [27,36] in Russia such a tendency in the list of authors is just being formed. In this regard, perhaps one of the indicators of achieving the goals in the national project "Science" is not optimal, which says that with the advanced development of science, it is planned to rely exclusively on the young. According to the project, the share of scientists under the age of 39 should reach 50.1%. However, according to experts, the age structure of “effective” science should be different, with the dominance of the 40-60 age group and equivalent, approximately 20%, groups under

39 and over 60 [2]. All the arguments in favor of the high importance of senior researchers, presented by us above, also confirm this point of view.

Conclusion. Thus, productivity and impact on the scientific environment is not a simple function that diminishes with age. Effective strategies for the development of science must take into account the characteristics of scientific research as a collective activity and focus not only on the ability of individuals to "enlighten" and discover. Science has come a long way from the individual talents and properties of individual great scientists to teamwork, coordinated work, the dynamic progress of which depends on researchers of all ages. Currently, there is a fairly large proportion of interested youth in the composition of scientists and a significant group of elderly people with qualifications, degrees and titles, while a relatively small section of middle-aged people. But it is the smaller link that is considered the most productive, having both strength and sufficient experience in the profession.

Moreover, in ten years - this small link of middle age will move into the category of older age, which, accordingly, will become more and more small in number. This will make it more relevant than ever to preserve the active longevity of this group of scientists, to preserve the active working capacity of researchers as long as possible, which requires an effective solution to the following problems: maintaining a satisfactory state of physical health, high working capacity, reducing fatigue, maintaining a high quality of life, preventing and reducing the severity of disorders anxiety-depressive circle; special attention is required to maintain high mental performance, that is, the preservation of cognitive functions.

Conclusions. Currently various components of the issue of "active aging" are being actively studied. However, in relation to research workers, most of his problems have not been studied systematically, there are practically no justified preventive measures, as well as measures to normalize functions that have already been impaired in a particular researcher. Working out the problem of active longevity of research workers will help formulate a set of measures to prolong the effective professional longevity of research workers and ensure scientific continuity.

In connection with the active longevity of researchers, further study of the following aspects is necessary to develop sound, expedient and effective methods of prevention and rehabilitation:

1. The state of health and measures to maintain it: a) risk factors and diseases common to the population of pre-retirement age b) nosological units and risk factors more typical of researchers of pre-retirement and retirement ages c) organizational, methodological and medical measures for protection health of researchers

2. The state of functions associated with the implementation of scientific activities, such as performance and fatigue, cognition, disorders and disorders of the anxiety-depressive circle, professional burnout, knowledge of computer technology, knowledge of foreign languages

3. The state of the adaptation reserve: effective interaction with colleagues and communicative competence, satisfaction with the position in the team, financial well-being, recognition in the scientific community (correspondence of the position / title to ambitions, achievements), the attitude of colleagues (presence of the label "old man"), leadership and organizational qualities, mentoring and transfer of scientific skills to young employees.

A holistic vision of the above processes, their impact on life expectancy, risk factors and triggers, as well as measures for their prevention among researchers has yet to be studied and developed.

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T.V.Polivanova, V.A.Vshivkov

FEATURES OF CLINICAL MANIFESTATIONS AND CYTOKINE REGULATION IN GASTRITIS IN SCHOOLCHILDREN WITH FAMILIAL PREDISPOSITION TO THE PEPTIC ULCER DISEASE

DOI 10.25789/YMJ.2021.73.33

Aim: To study the features of clinical manifestations and indicators of circulating cytokines in gastritis in schoolchildren with a family predisposition to peptic ulcer disease.

Material and Methods: 3343 schoolchildren of 7-17 years old were examined in Siberia (Tyva, Evenkia, Aginsky Buryat National District, Krasnoyarsk). 463 children with gastrointestinal complaints underwent esophagogastroduodenoscopy with biopsy of the gastric mucosa. In accordance with the Sydney classification, the morphological diagnosis of gastritis and the presence of Helicobacter pylori was carried out. Blood serum was also taken to determine the level of cytokines (IL-2, IL-4, IL-8, IL-18, IL-1β, IFN-α, TNM-α) by ELISA. The studies were approved by the ethics committee and the consent of the patients and their parents was obtained.

Results: Schoolchildren with family predisposition to peptic ulcer disease with gastritis more often have dyspeptic manifestations. It was found that in children with a familial predisposition, gastritis proceeds with the involvement of the systemic level of cytokine regulation (expression of IL-4, IFN-α). Moreover, in children with H. pylori infection, the cytokine regulation of the inflammatory process is specific (TNM-α expression).

Conclusion: The features of the course of gastritis in children with a familial predisposition to peptic ulcer disease have been established, and they can be considered markers of the unfavorable course of the pathology.

Keywords: children; gastritis; peptic ulcer; hereditary predisposition; cytokines; DS; GERD.

The problem of diseases of the stomach and duodenum in childhood does not lose its relevance [7], which is largely due to the lack of dynamics to reduce their prevalence and weighting the course. The age of formation of the pathology of the gastroduodenal zone in the majority falls on the school and preschool periods of life, which is represented mainly by gastritis [2, 5, 7], which is, with further progression, the morphological basis of diseases such as peptic ulcer (PUD). YaB belongs to the category of multifactorial. The most unfavorable stage in children, characterized by the growth of the disease, is the period of schooling [1]. Familial predisposition to pathology also has a pronounced negative effect on the formation of ulcer [14]. Predisposition to ulcer, as shown by numerous studies, is based on the features of neurohumoral regulation and morpho-functional characteristics of the stomach, which have a genetic basis. As such, an increase in the formation of pepsinogen-1, an increase in the mass of parietal cells and their hypersensitivity to gastrin, congenital deficiency of mucus fukomucoproteins, and a number of others are considered [3]. In recent years, the features of the cytokine profile in persons with peptic ulcer disease have been shown [10, 11]. The participation of cytokines in the inflammatory process is multifaceted: it is also the regulation of intercellular and intersystem interactions that determine the differentiation and survival of cells, the functional activity of proliferation and apoptosis [4]. There are features of the course of the inflammatory process in the gastric mucosa (GM), initiated by Helicobacter pylori (H. pylori) infection, which induces the production of a number of cytokines. It is known that IL-1β, IL-6, tumor necrosis factor (TNF) -α, TGF-β1, IL-17, IL-18, IL-21 and IL-22 are actively involved in this pathological process [19].

In persons with a family predisposition to peptic ulcer disease, morpho-function-

POLIVANOVA Tamara Vladimirovna – Doctor of Medicine, Chief Researcher of Clinical Department of the Pathology of Digestion System in Adults and Children of Scientific Research Institute for Medical Problems of the North of Federal Research Centre «Krasnoyarsk Scientific Centre» of Siberian Division of Russian Academy of Sciences; e-mail: tamara-polivanova@yandex.ru; **VSHIVKOV Vitaliy Alekseevich** - PhD (Medicine), Senior Researcher of Clinical Department of the Pathology of Digestion System in Adults and Children of Scientific Research Institute for Medical Problems of the North of Federal Research Centre «Krasnoyarsk Scientific Centre» of Siberian Division of Russian Academy of Sciences; e-mail: vitali1983@mail.ru