

ly, in assessing the NHL risk associated with taking a particular carotenoid, none of the included studies took into account the effects of other carotenoids.

Thus, higher intake of alpha-carotene, beta-carotene, and lutein / zeaxanthin, but not lycopene or Delta-cryptoxanthine, is associated with reduced risks of NHL. Further cohort studies are needed to confirm this link.

#### BIBLIOGRAPHY

1. *Besson, H.* Tobacco smoking, alcohol drinking and non-Hodgkin's lymphoma: a European multicenter case-control study (Epilymph) / H. Besson, P. Brennan, N. Becker, A. Nieters, S. De Sanjose, Font R, M. Maynadie, L. Foretova, PL. Cocco, A. Staines, M. Vornanen, P. Boffetta // *Int J Cancer J Int du cancer.* – 2006. – № 119 (4). – P. 901–908. Doi:10.1002/ijc.21913.

2. *Krinsky, N. I.* Carotenoid actions and their relation to health and disease / N. I. Krinsky, E. J. Johnson // *Mol Asp Med.* – 2005. – № 26 (6). – P. 459–516. Doi:10.1016/j.mam.2005.10.001.

3. *Siegel, R. L., Jemal A.* Cancer statistics, 2016 / R. L. Siegel, K. D. Miller // *CA Cancer J. Clin.* – 2016. – № 66(1). – P. 7–30. Doi:10.3322/caac.21332.

### GENDER AND AGE SPECIFIC FEATURES OF THE CIRCULATORY SYSTEM DISEASES OF THE POPULATION IN MINSK REGION

---

**V. Cheplya**

*Belarusian State University, ISEI BSU,  
Minsk, Republic Belarus  
vlad1997.cheplya@gmail.com*

Cardiovascular disease (CVD) is the leading cause of mortality and disability in Belarus. Among the causes of mortality, diseases of the circulatory system occupy a leading place, in the structure of general morbidity - the second place. The continuing increase in the incidence rate, the defeat of people of an increasingly young age, make cardiovascular diseases a major medical and social health problem.

*Keywords:* myocardial infarction, angina pectoris, cardiovascular diseases, morbidity.

The work is devoted to the analysis of the morbidity of the population of the Minsk region, including different age groups, diseases of the circulatory system in the period from 2012 to 2018. Based on the reported data of the Minsk Regional Clinical Hospital on the number of cases of registered diseases in the class “Diseases of the circulatory system” and the population of the Minsk region, the relative intensive and extensive coefficients were calculated, the error was calculated and the reliability of the relative values was calculated, the method of analyzing the long-term dynamics of the population morbidity indicators was used.

According to the results of the study, it was found that the incidence of diseases of the cardiovascular system in the Minsk region population had a steady increase by 15 % until 2016, from 2016 to 2018. incidence decreased by 10 %. The overall increase in incidence was 3,4 %.

In the structure of the morbidity of the population of the Minsk region with cardiovascular pathologies, the main place is occupied by arterial hypertension, myocardial infarction, atherosclerosis, acute heart failure.

Among patients with AH, both in men and women, persons aged 18-35 years old, 35-48-65 years old (working age) predominate. A decrease in the incidence of hypertension was detected at the age of > 65 years by 5,82 %. These changes are statistically significant.

Three age groups prevail among AS patients: 48-68 years old and 35-48, > 65 years old. They account for 32,62, 26,74 and 21,54 %, respectively, of all cases of diseases of this nosology.

The incidence of myocardial infarction has increased in all age groups, except for persons > 65 years old. The incidence in the age groups of working age by this pathology has a less pronounced increase.

Acute heart failure has the smallest increase over the study period (8,36 %). Persons over 65 are most susceptible to this disease. The increase was 24,41 %.

An analysis of the incidence of male and female populations has shown that in men of younger and middle age, cardiovascular diseases are recorded by 9,48 % more often than in women. In older age groups, men and women suffer from this pathology equally.

Statistically significant differences in indicators at the end of the observation period relative to the initial year of the study with a probability of > 0,999 were determined for:

- for arterial hypertension –  $t = 3,79$ ;
- for atherosclerosis –  $t = 3,46$ ;
- for acute heart failure –  $t = 3,9$ ;

Differences in indicators were statistically insignificant (random)  
– for myocardial infarction ( $t = 0,36$ );  
– for angina pectoris ( $t = 1,05$ ).

#### BIBLIOGRAPHY

1. *Бабанов, С.* Профессиональные поражения сердечно-сосудистой системы / С. Бабанов, Р. Бараева // *Врач.* – 2015. – № 3. – С. 7–10.
2. *Герасимов, А.* Медицинская статистика / А. Герасимов. – Минск: МИА, 2007. – 480 с.
3. *Кардиология. Рук. для врачей.* В 2 т / Под ред. Н. Б. Перепеча, С. И. Рябова. – СПб: Спецлит, 2008.
4. *Клинические рекомендации. Ревматология* / гл. ред. Е. Л. Насонов. – М.: ГЭОТАР-Медиа, 2006. – 288 с.

### CREATION OF GENETIC CONSTRUCTION CARRYING XANTHOSINE PHOSPHORYLASE GENE

---

**A. Daineko<sup>1</sup>, A. Bulatovski<sup>2</sup>, I. Kazlouski<sup>2</sup>, A. Zinchenko<sup>1,2</sup>**

<sup>1</sup>*Belarusian State University, ISEI BSU,*

*Minsk, Republic of Belarus,*

<sup>2</sup>*Institute of Microbiology, NAS,*

*Minsk, Republic of Belarus*

*daineko1999@list.ru*

As a result of this study, plasmid pET42a-xapA, carrying the gene xapA of the Escherichia coli xanthosine phosphorylase, was constructed. In the course of further investigations, we are planning to transform bacterial cells with the obtained genetic construction.

*Keywords:* xanthosine phosphorylase, nicotinamide riboside, Escherichia coli.

Nicotinamide adenine dinucleotide (NAD<sup>+</sup>) is one of the most important cofactors for numerous enzymes involved in cellular energy metabolism. NAD<sup>+</sup> level is known to decrease with aging, while the reduced activity of enzymes consuming NAD<sup>+</sup> contributes to a wide range of senile diseases [1].

There are several ways of synthesizing this cofactor, but one of the most important is the salvage pathway. On this route, NAD<sup>+</sup> is produced from its precursors, such as nicotinamide, nicotinamide riboside, nicotinamide mononucleotide [1]. It is possible to promote the level of the precursors to compensate NAD<sup>+</sup> losses during aging of the body [2]. Studies of foreign authors have shown that nicotinamide riboside is the most effective precursor of this cofactor. Biochemical and genetic investigations confirmed that xanthosine phosphorilase was capable to synthesize nicotinamide from nicotinamide riboside [3].

Therefore, the aim of this work was to derive a recombinant vector, which carries the gene of the enzyme xanthosine phosphorylase of E. coli. This enzyme is able to catalyze synthesis of nicotinamide riboside, acting as the main intermediate of the essential coenzyme NAD<sup>+</sup>.

In our study, we used the xapA gene consisting of 834 nucleotides and coding for the enzyme xanthosine phosphorylase, isolated from the E. coli K-12 strain by the method of polymerase chain reaction (PCR). The plasmid pET42a(+) (Invitrogen, USA) was linearized by PCR for further cloning of the xapA gene. The gene insertion into the linearized plasmid was performed by circular polymerase extension cloning technique [4]. The obtained genetic construction pET42a-xapA was analyzed in the course of agarose gel electrophoresis.

#### BIBLIOGRAPHY

1. *Fang, E. F.* NAD<sup>+</sup> in aging: molecular mechanisms and translational implications / E. F. Fang [et al.] // *Trends Mol. Med.* – 2017. – Vol. 23, № 10. – P. 899–916.
2. *Yoshino, J.* NAD<sup>+</sup> Intermediates: the biology and therapeutic potential of NMN and NR / J. Yoshino, B. A. Joseph, S. Imai // *Cell Metabol.* – 2018. – Vol. 27, № 3. – P. 513–528.
3. *Dong, W.* New function for Escherichia coli xanthosine phosphorylase (xapA): genetic and biochemical evidences on its participation in NAD<sup>+</sup> salvage from nicotinamide / W. Dong [et al.] // *BMC Microbiol.* – 2014. – Vol. 14, № 29. – P. 1471–2180.
4. *Quan, J.* Circular polymerase extension cloning of complex gene libraries and pathways / J. Quan, J. Tian // *PLoS ONE.* – 2009. – Vol. 4, № 7. – Art. e6441.