

oxidized and cross-linked proteins and lipids, which makes it difficult to degrade and remove it from cells. To date, there is still no clear understanding of the mechanisms of its formation, its role in the body in general and in aging processes in particular.

Aim. The aim of this review is to provide an overview of the current knowledge on the mechanisms of formation and accumulation of lipofuscin based on the recent publications.

Materials and methods. Data analysis of literature and Internet sources.

Results and discussion. The presence of lysosomal enzymes (acidic phosphatases) in lipofuscin suggested that lipofuscin may appear due to oxidative stress, which results in the accumulation of “residual bodies” in the cell that are products of oxidation and peroxidation of lipids that are not susceptible to degradation by lysosomal enzymes. Mitochondrial enzymes, fragments of mitochondria and the endoplasmic reticulum are also found in lipofuscin granules. Therefore, the nature of the accumulation of lipofuscin in cells can also be associated with the destruction of cellular organelles that have not been utilized by lysosomes. So, mitochondria are most susceptible to degradation into lipofuscin granules (mitolipofuscin). It is known that with age, there is an increase in the accumulation of lipofuscin in different cells: in the cells of the brain, heart, retina, skeletal muscle, and skin. Besides, it accumulates with an increase in the functional activity of the organ, with atrophy, and decreases with dystrophy and necrosis. At the moment, drugs and substances that reduce the amount of lipofuscin can be divided into the following groups: stabilizing membranes (piracetam); activating and improving the metabolism of fats and proteins (metformin, monacolin, curcumin); protecting against reactive oxygen species (flavonoids, meclonoxate, monacolin); able to bind to lipofuscin and activate its oxidation (flavonoids, meclonoxate); autophagy (direct removal of lipofuscin by autophagosome).

Conclusions. Thus, the variability of data on the importance of lipofuscin and its role in intracellular exchange processes, in particular its place in involutive processes and in pathology, make it necessary to carry out further studies in this direction.

PROSPECTIVE USE OF GENOME EDITING TECHNOLOGIES: THE COMPLEX OF CRISPR-CAS9

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Introduction. CRISPR stands for “clustered regularly interspaced short palindromic repeats”, which are repeated short DNA sequences that are palindromes (reading the same in both directions) interspersed with short, nonrepeat “spacers”. CRISPRs originally were discovered in archaea and bacteria, where the spacers were bits of DNA from infecting viruses. The spacers are transcribed into short CRISPR RNAs that attract a cutting enzyme, such as Cas9 (CRISPR-associated protein 9). The complex of CRISPR-Cas9 then searches the DNA for matching spacer sequences and, using natural DNA repair, cuts them out by breaking the double helix across both strands. In this way, a bacterial cell can recognize bits of viral DNA in future encounters and promptly remove them, akin to an animal's immune system. Cas9 was the first DNA-cutting enzyme used with CRISPRs. Others, with differing targets, include Cas13 and Cpf1.

Aim. To analyze and study of genomic editing technologies using the complex of CRISPR-Cas9.

Materials and methods. Google Scholar, EMBASE, MEDLINE and Medscape resources have been applied for search and analysis up to March 2020 using terms “genome editing technologies” and “CRISPR-Cas9”.

Results and discussion. CRISPR systems are attractive for their high efficiency, programmability and inheritance not only for bacteria and archaea, but also for humans. The complex of

CRISPR-Cas9 can be used for labeling and typing of strains. Thanks CRISPR systems can be continued life span, limit the spread of unwanted genes localized on plasmids. In near future, apparently using CRISPR will be able to construct superphages, very specific and highly effective against severe human viral infections. Lei Xu et al. reported a successful allogeneic transplantation and long-term engraftment of CRISPR-Cas9-edited, CCR5-ablated hematopoietic stem and progenitor cells in a patient with HIV-1 infection and acute lymphoblastic leukemia. Also, CRISPR-Cas9 holds great promise in the treatment of sickle cell anemia and β -thalassemia, Duchenne myodystrophy, cystic fibrosis and tyrosinemia, cataracts, congenital blindness etc.

Conclusions. The literature data analysis shows that CRISPR-Cas9 genome editing has a wide used potential in medical field.

PROBLEM OF INCREASING STUDENTS' MOTIVATION TO LEARN

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Introduction. Motivation of students - processes, methods and tools of inducing them to cognitive activity, active learning of the content of education. Motivation for students is the most effective way to improve the learning process and is the main driving force in the behavior and activities of a human, including in the process of forming a future professional. Therefore, the question of the incentives to educational and professional activities of students is considered especially important.

Aim. The aim of this work was to study modern methods of studying and stimulating students' motivation to learn.

Materials and methods. To achieve this goal, we performed an analysis of literature and summary of received information.

Results and its discussion. The motivation of students to get an education develops under the influence of a whole complex of factors. Questionnaires are most often used to study the motivation of students. This include, as a rule, several groups of motives: professional, cognitive, self-affirmation, personal convenience, avoiding trouble. Cognitive motives are an orientation toward mastering new knowledge, facts, and patterns. Professional motivation is the action of specific motivations that determine the choice of a profession and the continuous performance of duties associated with it. The choice of moments of self-affirmation is connected with the students' desire to change opinion, assessment of themselves by the teacher and peers. The motive of personal convenience characterizes the students' desire for personal satisfaction with the results of their studies. The motive to avoid trouble is the desire to act in such a way as to avoid failure. The analysis of the questionnaire allows us to make a conclusion about students' motivation, as well as to identify risk groups, which include students with increased anxiety regarding the results of their studies. Organization of educational process should be based on the results of the study. This would maximal help to unleash inner potential of student's personality. The main role in this process belongs to the teacher, who, using various methods and methodological techniques, forms a focused educational activity of students.

Conclusions. The main thing in forming and development of students' motivation is the creation of certain conditions and situations, in which the main goal of training would be achieved – a high professional level and position in society, taking into account past experience and individuality of the student himself.