general a larger volume of healthy tissue receives a significant dose. Brachytherapy is usually performed with remote afterloading equipment, for the safe transport of sealed sources to and from the patient and for the protection of staff. Brachytherapy is performed in many radiotherapy institutions. Often brachytherapy is used for the application of a boost dose, in combination with or as an alternative to (a part of) the external beam therapy.

For a safe and accurate dose delivery using brachytherapy many aspects need to be carefully considered. Furthermore, the general safety aspects for the patient, the personnel, and the environment are important issues. In order to ensure the optimal treatment of patients much effort is required during the commissioning phase of new brachytherapy equipment, and afterwards during its clinical lifetime. The institution must therefore develop a proper QA program for sources and equipment [2].

Currently, quality control of brachytherapy procedures is carried out on the basis of instructions issued in 2007 by the Ministry of Health of the Republic of Belarus [3]. For more than 10 years since its publication, brachytherapy equipment has developed rapidly along with the introduction of new treatment and planning methods. The idea is to improve the quality control methods of this equipment.

The existing quality assurance protocol for brachytherapy afterloaders includes condition monitoring of brachytherapy afterloaders, as well as monitoring of these devices after installation, repair or radiation source replacement [4].

According to modern international requirements for cancer patients treatment, it is necessary to renew the existing protocol and supplement it with the following sections: quality control of the X-ray (IBU) unit used in obtaining X-ray images for planning, and quality control of CPS. The instructions need to take into account the requirements of current regulatory documents for the radiotherapy departments.

The development of a new quality control program of brachytherapy equipment will allow us to summarize the planned dose to the patient and thus increase the level of its radiation safety. Regular quality control of brachytherapy equipment and CPS is a necessary condition for providing high-quality medical care to oncological patients in the Republic of Belarus.

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ENGINEERING OF *ESCHERICHIA COLI* STRAINS – PRODUCERS OF GUANOSINE MONOPHOSPHATE – AND CYTIDINE MONOPHOSPHATE KINASES

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Escherichia coli pGMK and pCMK strains producing cytidine monophosphate kinase and guanosine monophosphate kinase, respectively were genetically engineered. The enzymes catalyze synthesis of nucleoside diphosphates from the corresponding nucleoside monophosphates. The productive capacity of strains *E. coli* pGMK and pCMK constitutes 3.3 and 4.2 thousand units of enzyme activity per 1 liter of cultural liquid, respectively.

Keywords: cytidine monophosphate kinase, guanosine monophosphate kinase, nucleoside triphosphates, *in vitro* transcription.

Transcription *in vitro* – is an artificial method of RNA synthesis in cell-free system using purified DNA molecule as a matrix. This method is used to investigate transcription mechanisms in pro- and eukaryotes, RNA recombination processes, to produce RNA-based aptamers, for mRNA transcription in systems envisaging cell-free protein synthesis. Transcription *in vitro* necessitates application of expensive nucleoside triphosphates (NTP),

DNA-dependent RNA polymerases and other reagents [1]. It appears that development of technology for producing components indispensable for implementation of transcription *in vitro* is likely to reduce the cost of reagent purchase.

NTPs act as precursors of RNA molecule. There are four kinds of NTP engaged in transcription *in vitro*: ATP, GTP, CTP and UTP. A large variety of chemical and enzymatic methods was proposed for NTP production [2; 3]. Enzyme-mediated NTP manufacturing scheme is presented as follows:

Nucleoside monophosphate (NMP) → Nucleoside diphosphate (NDP) → NTP.

NDP synthesis from NMP proceeds using nucleoside monophosphate kinases. Guanosine monophosphate kinase (GMP kinase) is involved in GDP synthesis from GMP, while cytidine monophosphate kinase (CMP kinase) catalyzes production of NDP from NMP of pyrimidine series. NTPs are derived from NDPs with the aid of non-specific enzyme nucleoside diphosphate kinase, promoting phosphorylation reaction for all four NDPs.

Taking into account the preamble, the present study was aimed at engineering of strains – sources of GMP kinase and CMP kinase.

The research resulted in novel recombinant *E. coli* strains pGMK and pCMK demonstrating heterologous expression of *Saccharomyces cerevisiae* enzymes GMP-kinase and CMP-kinase, respectively. The structure of the above-mentioned proteins contains complementary octahistidine oligopeptide at C-terminus, allowing to recover enzymes in a single stage using affinity chromatography on Ni-NTA resin. Following SDS gel electrophoresis the target proteins accounted for 20 % of total protein fraction. Enzyme-generating capacity of strains *E. coli* pGMK and pCMK equaled 3,3 and 4,2 thousand units per 1 liter of cultural liquid, respectively.

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INDICATORS OF GLYCATED HEMOGLOBIN AND BLOOD GLUCOSE IN TYPE 2 DIABETES MELLITUS IN PATIENTS OF SMORGON

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The study involved patients Smorgon district clinic. The study involved 20 volunteers. Patients were invited for control examinations once a month for 3 months. The study revealed a direct positive relationship between the level of blood glucose level and glycated hemoglobin: the higher the indicators for one criterion, the higher, and compare with it.

Keywords: diabetes mellitus, glycated hemoglobin, glucose.

Diabetes is a disease that is characterized by a chronic increase of sugar level (glucose) in the blood.

In the Republic of Belarus at the beginning of this year at the dispensary, there were about 288 thousand patients with diabetes, including the 2nd type – more than 268 thousand people.

The main causes of diabetes mellitus type 2 are: genetic predisposition; obesity, particularly Central or abdominal it type; age (the degree of disruption of glucose tolerance is constantly increasing with age), physical inactivity (loss of muscle leads to increased glucose levels in the body).

The purpose of the study is based on experimental data to study the performance of glycated hemoglobin and blood glucose and their relationship with diabetes 2 type patients the city of Smorgon.

Were investigated patients Smorgon district clinic. The study involved 20 volunteers. Patients were invited for control examinations once a month for 3 months. The study involved 12 people are female (60,0 %) and 8 males (40,0 %). The average age of patients was 53,5 years. Identified the diagnosis of diabetes mellitus of the 2nd type.

The study volunteers revealed that among patients with diabetes mellitus of the 2nd type, the level of glycated hemoglobin is between 7 to 8 % inclusive have 40,0 % of the patients of the clinic, from 8 to 9 % inclusive –