Abstract

One of the modern therapeutic approaches is the application of *in vitro* transcribed mRNA into the target cells to produce the required target proteins. This method has prooved to be more effective than therapeutic application of proteins prepared in advance, because their insertion into the organism lead to denaturation. The main task of this work was to prepare mRNA *in vitro* and mRNA transfection into the cells and monitoring the expression of target proteins with the method of Western blotting. The target proteins were from families of cyclins and cyclin-dependent kinases, which play an important role in cell cycle regulation. The mRNAs for 8 types of molecules have been prepared, including non-mutated forms of cyclins D1, D2, and D3, and cyclin-dependent kinase 6, as well were synthesized mutated versions of cyclins D1 T286AT288A, D2 T280A, D3 T283A and cyclin-dependent kinase 4 R24C. As for cyclins, there was a substitution of aminoacid threonine for alanine. This substitution could cause slowdown degradation of proteins in comparision with those existing in natural form. Regarding the cyclin-dependent kinase 4 the exchange of aminoacid arginine for cysteine causes its bigger stability *in vivo*. The prepared mRNA which encodes mentioned regulators of cell cycle was transfected into isolated pancreatic cells of rats. This method could be used as one of the options in treatment of type 1 diabetes in the future.