

GlucoGenes®: database of genes and proteins associated with hyperglycemia, hypoglycemia and glucose variability in diabetes

Shishin K.S., Lashin S.A., Klimontov V.V.*

Research Institute of Clinical and Experimental Lymphology – Branch of the Institute of Cytology and Genetics, SB RAS, Novosibirsk, Russia

* klimontov@mail.ru

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Motivation and Aim: The search for genes associated with diabetes and glucose fluctuations is important for deciphering the mechanisms of diabetes development and its complications, as well as for identifying promising targets for therapy [1, 2]. The aim of this work was to develop a database for searching and visualizing the information on genes associated with hyperglycemia, hypoglycemia, and both.

Methods and Algorithms: The results of our previous studies analyzing gene networks associated with hyperglycemia, hypoglycemia, and glucose variability (GV) [3–5] were used to create the database. These mentioned studies involved a bioinformatic analysis of the gene networks and text mining of PubMed-indexed publications with the use of the ANDSystem, a bioinformatic tool developed at the Institute of Cytology and Genetics, Siberian Branch of the Russian Academy of Sciences. The ANDSystem knowledge base contains data about gene regulation, gene associations with diseases, protein-protein interactions, transport pathways, etc., extracted from the Pubmed abstract collection [6, 7]. REST technology was used to control access to the database. The graphical user interface was developed using Vue.js. The database is based on PostgreSQL database management system.

Results: The GlucoGenes® database includes six key tables reflecting genes and corresponding proteins, glucose metabolism disorders (hyperglycemia, hypoglycemia, GV), patterns of associations between genes/proteins and glucose metabolism disorders, references and summary data.

The GlucoGenes® database graphical user interface is available at <https://glucogenes.sysbio.ru/genes>. It includes the following functional sections:

- Home page: contains general information about GlucoGenes®;
- Catalog of diabetes-associated genes: a gene name, description, and association with glucose disorders;
- Catalog of proteins encoded by the genes contains information about the proteins and their associations with glucose disorders. There are hyperlinks to other catalogs and references.
- Download page.

The search can be performed by gene name, NCBI gene identifier and a kind of glucose disorders.

The database currently contains data on 561 genes associated with glucose disorders and 2115 records describing these relationships.

Conclusion: GlucoGenes® can be accessed at: <https://glucogenes.sysbio.ru/genes>. It contains information on genes associated with hyperglycemia, hypoglycemia and

increased glucose variability (both hyperglycemia and hypoglycemia). GlucoGenes® may be used in studies of the molecular genetics of diabetes and associated diseases. *Funding:* The study was funded by Russian Science Foundation (grant No. 20-15-00057-II).

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