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Complex information system to study common energy metabolic deficiency under neurodegenerative diseases

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Motivation and Aim: Hypometabolism, characterized by decreased brain glucose consumption, is a common feature of many neurodegenerative diseases. Initial hypometabolic brain state, created by characteristic risk factors, may predispose the brain to acquired epilepsy and sporadic Alzheimer's and Parkinson's diseases. Deficient glucose metabolism is likely a primary initiating factor, and resulting neuronal dysfunction further promotes the metabolic imbalance, establishing an effective positive feedback loop. Metabolic correction leading to the normalization of abnormalities in glucose metabolism may be an efficient tool to treat the neurological disorders by counteracting their primary pathological mechanisms [1].
Methods and Algorithms: Database architecture, business logics, data analysis, and modeling programming.
Results: We develop an integrative information system to hold and analyze all the data types that originate from complex biological studies of neurodegenerative diseases model objects. These include data from differential expression and individual genome analysis, metabolic and regulatory pathways and their modeling, metabolic profiling by NMR, enzymology essays and *in vitro* and *in vivo* monitoring, mitochondria studies, electro-physiology *in vivo* and *in vitro* data and their modeling, behavioral and cognitive tests, histological and morphological data *etc &c.*
All data is collected in normal healthy stage as well as under specific diseases such as epilepsy or Alzheimer's disease and several pathology models as well as individuals treated with the energy supply metabolites (i. e. pyruvate) under the normal and pathological conditions.
That will help to reveal the underlying basis of neurodegenerative diseases and the neuroprotective effects of energy metabolic correction and further elaborate the patients treatment strategy. Another planned direction is the analysis of the information of the individual viability to the pathological factors that may reveal the weak and strong parts of the system and the potential targets to individual treatment in the frame of individualized medicine.
Conclusion: Here we propose a complex information system to accommodate all possible data from studies of common energy metabolic deficiency under neurodegenerative diseases and provide means to its complex analysis and modeling.
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References

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