WEB-SERVICES FOR PREDICTION OF BIOLOGICAL ACTIVITY VIA INTERNET

Vladimir Poroikov, Dmitry Filimonov, Tatyana Gloriozova, Alexey Zakharov, Alexey Lagunin, Anastasia Rudik, Dmitry Druzhilovsky

Institute of Biomedical Chemistry of Rus. Acad. Med. Sci., Moscow, 119121, Russia

Due to the progression in public availability of bioactivity databases during the past years (PubChem, ChEMBL, DrugBank, etc.) development of computational tools for predicting protein targets or biological activities of small drug-like molecules is growing as well. In addition to the commercial predictive facilities (ACDLabs, InSilicoFirst, etc.), some freely available web-services appeared recently (http://www.modelling.leeds.ac.uk/ReverseScreen3D/, http://www.opentox.org/, http://pharmaexpert.ru/passonline, http://pharmaexpert.ru/GUSAR, http://sea.bkslab.org/, http://www.dddc.ac.cn/tarfisdock/, etc.). These web-services are grounded on both target-based and ligand-based drug design approaches; they use different mathematical algorithms and chemical structure description. Prediction of bioactivity is provided for various biological end-points.

We will present a systematic overview of the currently available web-services including comparison of their particular features, accuracy of prediction and predictive ability. Prediction of bioactivity will be done by widely exploited chemical similarity assessment methods as well as with more sophisticated machine learning approaches (linear regression models, self-consistent regression, Bayes classifier, support vector machines, etc.) and by 3D molecular modelling methods (pharmacophore mapping, docking, etc.). Comparative analysis will be performed using the evaluation set created on the basis of Top200 drugs (about 150 unique drug-like structures), which represents quite diverse collection of chemical compounds in both chemical and biological space. In addition to this set we will also evaluate the quality of predictive services for some natural compounds, which are currently considered as valuable leads for design & discovery of new pharmaceuticals.

Applications of successful *in silico* bioactivity prediction will be discussed in detail. This will include the authors' own experience as well as some bright examples taken from literature. Finally, we will discuss the prospects and limitations of utilization of bioactivity predictive web-services both in pharmaceutical research and in environmental safety assessment for industrial chemicals.

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