Predicting Intestinal Drug Absorption Using Mucin-Drug Interaction Analysis

Podholova, Adela (School: Doctrina Podjestedske Gymnazium Liberec)

The main goal of the project is to develop a functional, inexpensive and easily reproducible method for testing the interactions of gastrointestinal glycoproteins, mucins, with a wide range of drugs. This method should allow for reliable quantification of the amount of drug that binds to mucins. The basis of the experiment was mixing the mucin solution with the drug and the subsequent separation of the bound drug onto mucins and the unbound drug. A UV–Vis spectrometer was used for final quantitative evaluation, with the key being to optimize the method and experimental procedure for separating the fractions. Centrifugation, dialysis and reverse dialysis were tested as the main methods. Centrifugation was not successful due to its limitations, so it was replaced by more efficient dialysis. In addition, reverse dialysis was tested to see if it would allow direct monitoring of drug sorption onto mucins. The optimized method and experimental procedure allowed to quantitatively determine the amount of drug bound to mucins and showed a significant reduction in its bioavailability. Using this method, a range of different drug types is being tested, which, after subsequent analysis, can help predict their permeability through the mucus layer. Results show that for some drugs, such as ibuprofen, up to half of the original amount may remain bound to mucins, which limits their absorption. Other results show relatively low binding of the drug to mucins, as with bisoprolol. These findings, measured according to the experimental procedure found, are relevant for preclinical drug evaluation, as they should allow for early identification of potential bioavailability limits.

Awards Won: