Analyses & Recherche
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Our Lab Book

NUTRIENT INTESTINAL PERMEABILITY *EX VIVO* ASSAY

using intestinal epithelium-like Caco-2 cell model

Bioavailability of a compound is defined as the amount of compound which reaches blood circulation compared to the initial dose. More simply, bioavailability of a nutrient present in food corresponds to its potential to be used by the organism.

In the natural orall way of feeding, bioavailability will depend on physical and chemical characteristics of the nutrients (solubility, polarity, hydrophobicity, structure), on their quantity and on their interactions with other nutritive substances and with the matrix…

To reach the blood system, compounds must cross the intestinal epithelium. This stage - also known as absorption - is a fundamental phase of the process leading the nutrients to be available for the organism.

Our *ex vivo* test can evaluate the intestinal permeability of a nutrient, *i.e.* its capacity to cross the intestinal wall to be available in blood circulation.

This test can determine if a compound is able to cross the intestinal wall keeping its biological properties, but it can also compare the former compound with an analog or even estimate the influence of various matrices on the permeability of a biomolecule.

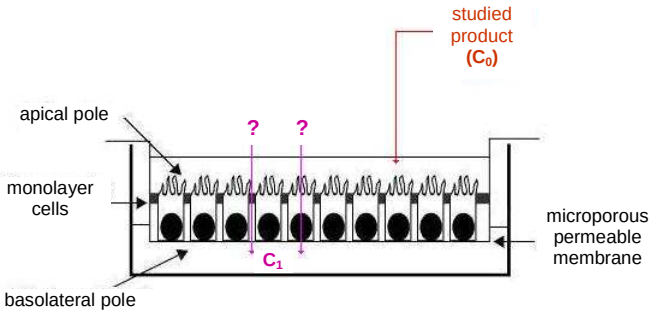
This test is based on Caco-2 cells, an intestinal human cell line : monolayer Caco-2 cultures can differentiate to form an intestinal epithelium-like barrier*. Cells express morphological and functional markers of the intestinal epithelium (microvillosities, tight junctions, specific enzymes...).

Due to the good existing correlation between *ex vivo* studies carried out with this model and the data reported *in vivo*, Caco-2 reconstituted intestinal epithelium can be considered as a reliable and low-cost tool for the study of compound intestinal permeability.**

Method : in our system, Caco-2 cells are seeded in culture rooms, on a microporous membrane allowing exchanges between the top chamber - representing the outer (apical) intestinal medium - and the lower compartment representing the inner (basolateral) medium.

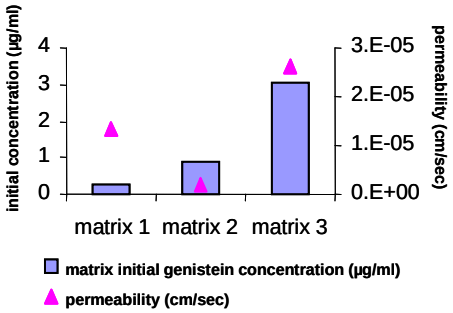
The studied products are dropped on the apical surface. After incubation, a differential analysis of the two compartment contents will give information about efficiency of the apical-to-basolateral transport of the targeted compound and about speed .

This approach leads to a three-level classification of biomolecules regarding their *in vivo* expected absorption : weakly, meanly and strongly absorbed**.



C_0 : initial compound concentration
C_1 : transfered compound concentration

Application case : intestinal permeability comparative study of *genistein soya isoflavone* included in three different matrices.



The system predicts a good intestinal permeability of genistein for matrices 1 and 3. Therefore, matrix 1 requires a smaller initial concentration of genistein to lead to a good permeability. Matrix 2 allows a very weak transport of the genistein through the epithelial wall.

In conclusion, matrix 1 seems to be the best compromise to obtain a high intestinal permeability even with a small initial amount of active compound.

** Hildalgo I.J. et al. (1989) Characterization of the human colon carcinoma cell line (Caco-2) as a model for intestinal permeability. Gastroenterology.*
*** Artursson P., Karlsson J., (1991) Correlation between oral drug absorption in humans and apparent drug permeability coefficients in human intestinal epithelial (Caco-2)cells. Biochem. Biophys. Res. Commun.*