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Title:

Filtering What Matters: Achieving Realistic Nutrient Absorption in In-Vitro Gut Models



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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text into it.)

Preparation of Your Abstract

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word **ONLY** (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract

Methods: Describe your selection of observations or experimental subjects clearly

Results: Present your results in a logical sequence

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

In-vitro models for systems such as the human gastrointestinal tract are increasingly used by researchers who seek to better understand the complex interactions between food and the human body. Within these systems, small intestine in-vitro models make use of membranes to optimise nutrient flow and imitate the intestinal wall's selective permeability. The use of membranes offers a functional alternative while preserving controlled experimental conditions. For the membrane to be effective, it must be able to hinder the absorption of larger nutrients by means of molecular weight cut-off and only permitting the absorption of simple nutrients with a small molecular weight. For instance, in the small intestine, starch, a polysaccharide, is enzymatically broken down into glucose, a simple sugar, before it can be absorbed. For this reason, an ideal membrane should only allow glucose absorption while restricting larger molecular weight hydrolysis intermediates. Characterisation of commonly used membranes in in-vitro intestinal systems (dialysis tubing-1350Da and 8000Da) and other membranes (pore size-200nm, 300nm, 450nm) revealed that have an average glucose permeance which is within range of the permeance observed in the small intestine (3.1×10^{-6} vs $0.093 \times 10^{-6} \text{ m/s}$). Though the desired permeability can be achieved using these membranes, we also found that they are not selective allowing macromolecules such as maltose, maltotriose, smaller oligosaccharides to be absorbed. This then compromises the physiological significance of the model. To prevail over this, we need to develop methods to modify the membranes so that we can end up with one that inhibits absorption of macromolecules while maintaining glucose permeability. Considering that the membranes under investigation have different materials which may all respond differently to modification, we need to choose the method carefully as this the next key step in reconciling in-vitro membrane efficiency with in-vivo intestinal absorption process.