Summary Of TNO-Report On Fat Binding Capacity Of Patented Fibre Complex Of *Opuntia Ficus Indica*

The TNO-report is based on a gastrointestinal model simulating very closely the dynamic processes in the gastrointestinal tract such as the pH curves and concentrations of (pro)enzymes in the stomach and small intestine, concentration of bile salts in the different parts of the gut, and the kinetics of passage of chime through the stomach and intestine. This model was developed to study the digestibility and availability for absorption of nutrients as well as the stability of specific ingredients. Validation experiments with various types of food products showed the reproducibility and reliability of the results for the digestibility and the absorption of nutrients in comparison to *in vivo* experiments[1]. Specific absorption systems have been developed for this model to study the absorption of fat digestion products and fat-soluble nutrients such as fat-soluble vitamins.

Aim of this study was to determine the fat binding capacity of patented fibre complex from Opuntia ficus indica during passage through a dynamic, computer-controlled model of the stomach and small intestine.

Test products and diet:
Two grams of the test product patented fibre complex of *Opuntia ficus indica* was added to a standardised meal. The meal consisted of 20 grams of sunflower oil, homogenised with 144 g of skimmed yoghurt by gently stirring during 2 minutes. The mixture of patented fibre complex from Opuntia ficus indica and standardised meal was fed quantitatively to the model.

In vitro gastrointestinal model:
The experiments in the model were performed under the average physiological conditions of the gastro-intestinal tract as described for healthy young adults after the intake of a semi-liquid food.
The set-points in the computer-protocol dictated the transport of the meal, secretion products (e.g. gastric juice with enzymes, electrolytes, bile, pancreatic juice) were freshly prepared, the pH electrodes calibrated and the membranes replaced. The food was digested during passage through the gastrointestinal tract. A specific absorption system was used to remove products of lipid digestion and lipophilic compounds that are incorporated in mixed micelles. The “absorbed” material was collected to determine the bio-accessible fraction. The model was flushed with nitrogen and kept under yellow light to avoid oxidation and light-degradation of the products.

Sampling and analysis:
The digestion and absorption of fat was tested during 4 hours in the model. The following fractions were collected:

- Pooled residual material from the gastric and duodenal compartment at the end of the experiment.
- Pooled residual material from the small intestinal compartments at the end of the experiment.
- Hourly samples of the absorbed fraction. Aliquots of these samples are pooled to obtain a sample of the total absorbed fraction.

The volume of the different fractions was measured and samples were stored in duplicate at -20°C for analysis.
The fatty acids in each fraction were analysed by gas chromatography after transesterification, the sum of the analysed fatty acids is expressed as total fatty acids (TFA).

Results:
The experiments showed that two grams of patented fibre complex from *Opuntia ficus indica* prevented the absorption of 2.7 grams of fatty acids during the four hours of experiment in the gastrointestinal model. Furthermore it was proved that the fat binding to patented fibre complex of *Opuntia ficus indica* is not selective for specific fatty acids, but in regard to the percentage similar for each individual fatty acid (72 ± 7%).

Conclusion:
Patented fibre complex of *Opuntia ficus indica* is able to bind to fat and thus prevent the absorption in the gastrointestinal tract. Since the described model simulates very closely the dynamic digestive processes, it can be expected that the product will reach similar results in vivo as shown in the in vitro experiments.

1 Minekus, M., Development and validation of a dynamic model of the gastrointestinal tract. PhD Thesis, University of Utrecht; Elinkwyk b.v., Utrecht, NL, (1998).