**LactoTrans I - Milk Proteins As Nanocarriers**

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**Introduction**

Milk proteins naturally bind hydrophobic compounds within the milk.

Combination of bioactive food constituents and milk proteins = creation of natural and safe nanocarriers in food.

The possibilities are explained below, using β-Lactoglobulin (β-LG) as example.

**Background**

β-Lactoglobulin...

Is the main protein of the whey protein fraction of milk.

It is cheap, available and food grade.

- pH-resistant (to pH 2).
- Heat stable (to 70 °C).
- Reaches the small intestine native and intact [1].

It resembles human plasma retinol-binding proteins...

...both have an inner cavity in which fat-soluble compounds can bind and are protected.

**Experiments**

**Transporter for fatty acids and fat-soluble vitamins**

(presumed binding site in cavity)

**Aim**

Obtain clear, aqueous beverages enriched with water-insoluble vitamins and omega-3 fatty acids.

The cavity protects against degenerative processes.

**Problem**

Heat-induced denaturation (Fig. 1) or a pH drop below pH 6 closes the cavity [2].

**Solution**

Coating of the protein-ligand complex with a polysaccharide such as the dietary fiber pectin [3].

A safe transport of a β-LG bound agent in the digestive tract up to the large intestine might be possible.

**Transporter for polyphenols**

(presumed binding sites in hydrophobic pockets)

**Aim**

Enrichment of food with polyphenols like epigallocatechin gallate (EGCG) due to their beneficial health effects.

**Problem**

Polyphenols are often instable, their bioavailability in foods is very low.

**Solution**

Heat denaturized β-LG binds EGCG in hydrophobic pockets on the surface of the molecule and protects it from oxidation:

**Conclusions**

- β-LG provides a variety of ways to insert ingredients with added health benefit into foods...
- ...it solubilizes water-insoluble compounds and transports them...
- ...it protects the bound substance during processing and storage of foods...
- ...it masks undesirable odor or taste...
- ...a targeted transport to the site of absorption in the digestive tract is conceivable.

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**Figure 1:** Loss of binding sites (n) for Retinol on β-Lactoglobulin in dependence of heat denaturation of the protein.

**Figure 2:** The binding sites (n) of AITC on β-Lactoglobulin. 5 binding sites over all. Consisting of 4 binding sites at amino groups and 0,2 at thio groups.

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