Lactulose – The product

Lactulose, what is that?

First identified in 1929, Lactulose came to prominence for the treatment of constipation in 1959. Lactulose is a synthetic sugar, which does not occur naturally. The disaccharide lactulose (galacto-fructose) is synthesised from lactose (galacto-glucose) by isomerisation of glucose to fructose. Each molecule of galactose is linked to a molecule of fructose. These linked monosaccharides are the reason why lactulose cannot be degraded by animal or human enzymes and reaches the colon unchanged with only few available calories.

Lactulose, how does it work?

Lactulose reaches the colon unchanged, where the bacteria of the intestines metabolise it, producing a number of short chain fatty acids. This process initiates a large number of effects in the gastrointestinal tract:

Laxative-osmotic
Ammoniac binding
Pre-biotic

Laxative-osmotic

Lactulose is a carbohydrate and energy source for colonic saccharolytical bacteria. Bifidobacteria and Lactobacilli metabolise Lactulose into several SCFA (short chain fatty acids). Total biomass, stoole volume and osmotic pressure is increased and pH is decreased resulting in a accelerated bowel movements and shorter transit time.

Ammoniac binding

Lactulose inhibits bacterial ammonia production by acidifying the content of the bowel. It promotes growth of colonic flora. The growing biomass uses ammonia and nitrogen from amino acids to synthesise bacterial protein, which in turn inhibits protein degradation to NH3. Lactulose leads to less ammonia by inhibiting bacterial urea degradation and reduces colonic transit time, thus reducing the time available for ammonia production and expediting ammonia elimination.

Pre-biotic

In the colon, undigested lactulose carbohydrates are the ideal nutritional basis for health-promoting bacteria in the bowel flora, e.g. bifidobacteria and lactobacilli. This can result in a large number of positive effects as intact intestinal barrier, stabilisation of the immune system, strengthened immune system, reduced susceptibility to illness and many more.

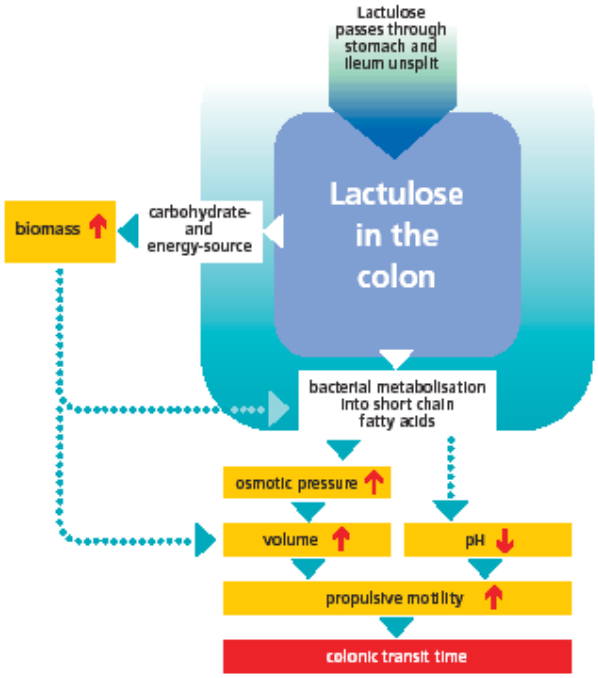
Lactulose as a drug: quality and application spectrum

In humans, the gastrointestinal tract is a highly complex eco-system which reacts sensitively to its interior and exterior environment. An intact intestinal barrier, guarantees, together with a well functioning immune system, the integrity of the body's interior. A number of influencing factors, such as stress, incorrect nutrition and lifestyle, as well as unusual hygienic conditions and food (e.g. on holiday) can upset this delicate system and lead to health difficulties. If used correctly, the prebiotic effect of lactulose can play a major role in ensuring that equilibrium is stabilized or re-established. In human medicine, lactulose has a long track record as a successful therapy against constipation, portal hepatic encephalopathy and salmonella, or as a complementary measure.

Constipation
Hepatic Encephalopathia
Salmonellose

Physiological therapy for constipation

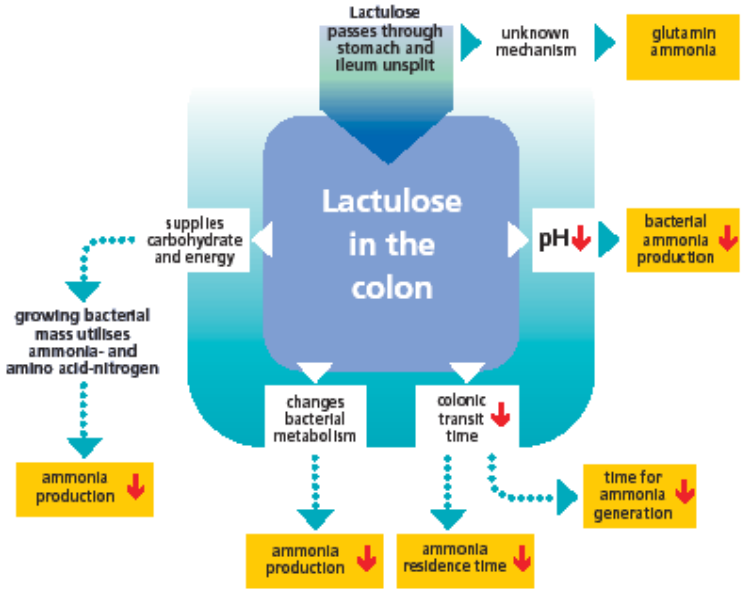
Lactulose has been successfully applied in the treatment of constipation since 1959. Lactulose has proven its efficacy as a gentle as well as highly effective medication in the regulation of intestinal activity and regular bowels. It can also play an important role to support intestinal activities in the pre- and post-operative phases.



Mechanism of action in constipation

Golden Standard in Portal - Systemic Encephalopathy

Lactulose has been the Gold Standard in PSE therapy since 1966. Lactulose has an inhibiting action on ammonia production in the ileum and reduces the ammonia level in portal circulation.



Mechanism of action in hepatic encephalopathy

Salmonella infections

Lactulose has been applied in the treatment of intestinal infections since 1975. Lactulose reduces the pH value to make the milieu less favourable for salmonella and expedites transit time. Both actions are important pre-conditions for the regeneration of intestinal flora.

Lactulose for healthy livestock breeding

Lactulose and Livestock Health
Lactulose as supplement for livestock feed
The many effects of lactulose:

- For example during peripartus
- For example in the prevention of salmonella
- For example osmotic protective function

Lactulose and livestock health

Across the world, the great increases in livestock production have been achieved by quickly digestible feeds with high levels of carbohydrates, proteins and fats. However the fundamental needs of ruminants

are insufficiently met by such regimes, which lack raw fibres, resulting inevitably in metabolic diseases. In the case of pigs and poultry, the discrepancy between low-age and finalweights is particularly apparent. The condition of the digestive organs due to husbandry developments is widely off the performance targets.The concomitant loss of the immunological function of the gastro-intestinal tract causes major livestock and economic problems. Only more frequent veterinary intervention can uphold stable health scenarios, which are being jeopardized by the rapid increases in antibiotic resistance with concomitant high costs. The public acceptance of animal feeds with "turbo effects" is therefore falling world-wide. The prohibition of the use of antibiotics to maintain performance parameters means that preventive measures which do not impact on performance are now more necessary than ever.

Lactulose as supplement for livestock feed

The trend in livestock breeding not only continues to take the important factor of quantity into account, but now also focuses on quality – the health of the animals must be ensured if the target of economic breeding taking all parameters into account is to be achieved.In the future, lactulose, with its diverse pre-biotic effects will play an important role in prophylactics for and health maintenance of the gastrointestinal tract.

The many effects of lactulose:

For example during peripartus

During the peripartus phase, it is particularly vital that livestock is given adequate feeding. The oral ingestion of lactulose can help by considerably reducing infections during this sensitive period. Delays in delivery caused by endotoxins released during metabolism and the formation of nitrogen monoxide are two factors which can lead to an increasing probability of still births or weakness. Lactulose has been successfully investigated as a preventive measure in these cases. The application of lactulose during food change-over in the peripartus period as well as at weaning may help positively effect the gastro-intestinal flora of the mother animal at the right time, and also helps the brood via the colostral milk.

For example in the prevention of salmonella

In the swine and poultry industry only large numbers are economic. The use of lactulose as a nutritional supplement can help in salmonella prevention and be a general aid to maintaining the health of the gastrointestinal tract as an immuno organ.

For example osmotic protective function

In many cases, destruction of the microbial ecological equilibrium of the gastro-intestinal flora leads to damaged intestinal cells. The osmotic protective function of lactulose makes it the ideal additive to feed in concentrations which are effective pre-biotically.

Lactulose as a logical food additive

Lactulose in prophylactic therapy
Pre-biotic Effect
The food design trend
Health Care needs health food
Lactulose in the food industry

Lactulose in prophylactic therapy

It is now known that many bowel irritation symptoms and illnesses are closely related to the living and eating habits common in modern society. On the other hand, fitness and health are also part of our present day lifestyles. Health has therefore more than simple medicinal aspects. Our mobility and our enjoyment of travel, sport etc. depends on personal well-being, for which we must each play our part. Food, metabolism and the immune system must be seen as an interactive process. If we can balance our food and digestion with this background in mind, we can contribute to stabilising health.

Pre-biotic effect

The pre-biotic effect of lactulose can play its part not only in therapy but also as a sensible preventive agent in order to maintain the health of the immune system, the gastro-intestinal tract and hence to underpin and enhance general well-being. In the future, lactulose will therefore be increasingly added to foods as a nutritional supplement because of its preventive actions.

The food design trend

The trend in the food industry is moving towards clearly defined ingredients, put together according to nutritional/scientific food design specifications as a sensible nutrition supplement. Obviously, the safety of the product in both its effect and its interaction are of primary importance. Lactulose has a very high safety profile even over long ingestion periods. Food design is feasible for individual target groups and market niches: For children and young people of various ages, for expectant and breast-feeding mothers, for high-performance sportsmen and women and more cerebral workers as well as for senior citizens: each with their specific and special requirements. The ability to positively influence the digestive and immune systems makes lactulose a key player in food design, as an agent between nutrition and health.

Health Care needs health food

In food production, health aspects are gaining in importance. Today the gastrointestinal tract has been identified as a central organ of the immune system, and consequently food research and production have gained more significance. Growing health awareness and the desire and the will for illness prevention are broad-based social movements. The prevention of illnesses in the gastrointestinal tract is the field in which lactulose plays an outstanding role: in its liquid form it can be easily and unproblematically added to many food to promote overall health and quality of life.

Lactulose in the food industry

Following the successful introduction of minerals, electrolytes and vitamins as nutritional supplements in the production of health food, lactulose, with its high safety profile and its health-promoting pre-biotic effects can also now become a very interesting product for the industry.

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