

The main health indications of natural bile acids in professional literature¹

Documentation and sources of the following quotations can be found in the referenced literature and on the website www.gallmed.hu

The present information sheet serves the appropriate and detailed information of the consumers and its aim to support the sound and conscious decision making of the consumers by providing a short summary of the scientific literature on the health indications of bile acids.

During the course of drawing up this information sheet we took into account to comply with the provisions of **Directive 2011/83/EU on consumer rights, Directive on labelling, presentation and advertising of foodstuffs (2000/13/EC) and the Unfair Commercial Practices Directive (2005/29/EC) with respect to the aim of the above regulations to provide the consumers with the most possible detailed information on the product and its substances. The information provided on the ingredients of the product is of educational nature only, not referring to effects related to the product.** See your doctor in case of health problems!

1. THE ROLE OF BILE ACIDS IN DIGESTION AND THE LACK OF THEM AFTER GALL BLADDER SURGERY
The liver, *the gall bladder and the bile ducts*, the duodenum and the pancreas together form a structural and functional unit of the digestive system. These organs closely interact with each other, well *coordinated cooperation is necessary* for the perfect digestion.

In the mouth, the food is chewed up into small pieces by the teeth. Even the sight or smell of food, but even more the taste stimulates the secretion of saliva, gastric and other digestive juices *as well as a little bile flow*. The movements of the stomach help in the proper mixing of food and also help to propel it into the duodenum with a great force but in small portions. On the mechanical or chemical effect of food and drink, more and more cholecystokinin (gastrointestinal hormone, also called gut hormone) is secreted, controlling the *emptying of the gallbladder*; one hand this *opens the common sphincter of the bile and pancreatic duct forming a common pipe system*, on the other hand *contracts the bladder, so the bile and pancreatic juice flows in the duodenum*, where it is mixed with the food pulp, thirdly it stimulates increased pancreatic secretions, resulting in greatly increased volume of digestive enzymes. The gut hormone (cholecystokinin) is produced in the duodenal mucosa, its secretion is provoked by the food and drink reaching the intestines (mainly fats and oils) and it is *resulted in bile secretion*. If bile secretion, bile production or enterohepatic circulation are insufficient, then the breakdown and the digestion of fats won't be correct. *This can be favorably influenced by the administration of bile acids at mealtimes.*

After cholecystectomy, storage function of the gall bladder is lost. The bile continuously trickles, so, if there is a higher demand for bile (when having a meal containing a larger amount of fat), there isn't any bile to release because of the lack of the bladder. So, the fats are not completely digested, and when it's getting into the colon, the intestinal flora eliminates the indigestible parts along with gas formation, causing abdominal bloating, possibly diarrhea. Occasionally occurring meal-related bile deficiency, caused by gall bladder surgery, can favorably influenced by administration of bile acids.

2. PSORIASIS. Role of bile acids and endotoxins in the pathogenesis and therapy of psoriasis²
On the basis of their clinical observations (digestive disorders, ultrasonically confirmed gallbladder complaints, etc.) authors supposed that the deficiency of bile acids and the consecutive endotoxin translocation might play a role in the pathogenesis of psoriasis. Because bile acids are the trustees of physico-chemical protection against bacterial endotoxins formed in the bowels. In their absence, endotoxins can absorb (translocate), which can cause the release of cytokines. If we prevent endotoxin translocation with bile acid supplementation, then the release of inflammatory cytokines can be blocked.

3. NATURAL IMMUNITY. „The Role of Bile Acids in Physico-Chemical Host Defence^{3,4}.
The important effect of bile acids, what we have discovered (since then others have confirmed the results of our studies) is the special protection of the human body, expressing itself in the bowel system.

We have been inspired by the *in vitro* experiments of an American research group, which observed that the treatment of endotoxin with a bile acid, sodium deoxycholate, resulted in the production of small atoxic units. On the basis of these findings we considered the possibility that **bile acids may play an important role *in vivo* in the detoxification of endotoxin.**

Bacterial endotoxin chemically is a lipopolysaccharide molecule, in which the toxic moiety has been identified as the lipid A portion-rich in fatty acids. On the basis of the above observations one may suggest that bile acids detoxify endotoxin within the gastrointestinal tract.

We have named this protective process as „physico -chemical host defence”. The basis of this defence mechanism is the detergent effect of bile acids.

After all these the question whether the detergent effect of bile acids are only directed towards bacterial endotoxins arises. Max Theiler has observed that the virus of yellow fever and other atropod borne viruses (Flaviviridae-family according to present taxonomy) are inactivated when presented with monkey bile acid.

About the bile acids: Physico-Chemical Host Defence⁵

By learning the effects of the LPS (lipopolysaccharide, endotoxin, internal toxin), it has become an important issue, how does it get into the blood stream. In connection with this investigation, we found out in 1969 that **the absorption (translocation) of endotoxins from the intestinal tract is caused by bile acid deficiency.** In natural conditions, and in some pathological cases, the endotoxin's always absorbed from the intestines into the bloodstream, triggering pathological processes. However, **in natural conditions, bile acids protect the human body against endotoxins that are always present in the intestines, because they split them into nontoxic parts.** It turned out that **this defense protects against all agents with lipoid (lipoproteid) structure (e.g. enveloped viruses, so called large viruses).** We named this protection system, based on the surfactant (detergent) effect of bile acids „physico-chemical host defence” (Bertók, 2002). **Endotoxaemia caused by bile deficiency may play a stronger or a smaller role in**

disease development, e.g. In septic shock, renal failure in obstructive jaundice, intestinal ischaemia, radiation sickness, some endocrine disorders, psoriasis, atherosclerosis etc. Because of that bile acids might have an important role in supporting the human body to defend itself against some diseases. It turned out that all the effects that damage the intestinal mucosa, can reduce or completely impossible the production of a peptide, cholecystokinin (CCK). In the absence of the CCK, the gall bladder cannot empty the bile into the intestine. If this process has partially damaged, then the endotoxins, released from the outer membrane of dead Gram-negative bacteria can absorb, get in the bloodstream, causing endotoxemia or triggering shock – in severe cases Modern methods of investigating, and detailed exploration of the „physico-chemical host defence”, that based on the surface-active property of bile acids, can be the developer of a new approach to pathology, because **the fundamental issues of cholesterol metabolism are also affected, as bile acids are mostly reusable end products of this process. As all steroidal hormones are quantitatively only a fraction of the resulting bile acids, it can be rightly assumed that cholesterol-bile acid conversion can greatly influence the production and destruction of all steroidal hormones, which are important for natural or acquired immunity (Bertók, 2002).**

It can be concluded that „physico-chemical host defense”, that based on the surface-active property of bile acids is a general defense mechanism of the human body, which is not confined to bacterial endotoxins but refers to all the "agents" (such as some viruses) having lipoid or lipoprotein structure on their surface. Therefore, we can add **„physico-chemical host defence” to the lineup of general defence mechanisms of the human body, which trustees are bile acids, produced in the liver and taking part in the enterohepatic circulation.**

4. **STRESS. The negative effects of stress on bile production and on bile secretion can be reduced by bile acids⁶**

Stress is a characteristic group of symptoms manifested by the body's response to any harmful (physical or psychological) stimuli.

By now, it has become clear and accepted that Selye's general adaptation syndrome (adaptation syndrome) is equal to a largely extent, organized emergency response that often presents as a febrile illness in humans and higher animals, nowadays called acute-phase reaction (APR).

Syndrome induced by Gram-negative endotoxin LPS is the best experimental model of the acute phase response (AFV), although it is not completely equivalent to stress reaction.

According to all these facts, the role of CRP (C-reactive protein) is an important part of the development of immune system. **It cannot be ignored that stress is a major influence on the whole digestive system, so that on bile production and secretion too. Disorders of bile production and secretion reduce or suspend one of the important protective mechanisms of the human body, the “physico-chemical host defense” based on the surface-active (detergent) effect of bile acids, without which the body will become exposed to the attack of some of the toxins in the gut (e.g. endotoxins) and to so-called large viruses (such as the herpes family).**

5. **HERPES. The effects of bile acids on herpesviruses⁷**

Bile, produced by the liver, is released into the small intestine, but not the whole amount and not the same time. **A lot of bile is stored in the gall bladder located under the liver, which empties itself after having a meal, and thus it helps the continuous production of bile, i. e. most of the bile flows into the small intestine, when it's really needed.**

Those, who haven't got gall bladder (because it was surgically removed), cannot count on this support, therefore they have relative deficiency of bile acids. What they can do against that is eating smaller meals more often or supplying the missing bile acid with the appropriate supplementary. One of the causes of cold sore might be the relative deficiency of bile acids. Bile acids can break down some of the viruses, mainly viruses with lipoprotein envelopes (Sodium - deoxycholate-sensitive viruses: yellow fever virus, herpes viruses, etc.).

6. **CHOLESTEROL. The cholesterol question: high or low?⁸**

Bile acids represent a large group of cholesterol compounds. Bile acids are made by the liver, and in addition to their role in the digestion and absorption of fats, they are also important in detoxification, and meaning the only physiological way of get rid of cholesterol.

The role of forming an optimal amount of bile has great importance and low bile acid secretion rate can cause several diseases.

Their primary role is to help the human body to get rid of unnecessary cholesterol becoming harmful. If the liver produces fewer bile acids (caused by the stagnant, poorly and irregularly secreted bile), then when we eat less foods with cholagogue effect, there will be less bile produced. In this case more unnecessary cholesterol stays in the body, fat digestion will be more imperfect, so fats absorbed in this way raise the cholesterol and triglyceride levels in the plasma, accumulate on the wall of blood vessels, narrowing their internal lumen, thereby they may cause situations leading to cardiovascular catastrophe or heart attack. A part of the bile acids got into the intestines reabsorbs, allowing the absorption of fat-soluble vitamins. Then, with the help of bile acids, circulating in the blood, they take the fat-soluble vitamins to their place of use nearby the cells. Moreover, they enable the vitamins to get through the cell wall (it consists of a double lipid layer with proteins embedded) to their place of use inside the cells. Therefore, if there aren't enough bile acid molecules in the intestines, because we don't eat enough choleric foods (e.g. fats and oils), then the absorption and utilization of fat-soluble vitamins (A, D, E, K vitamins) will be disturbed. Although we get enough fat-soluble vitamins, they won't reabsorb because of their poor utilization and deficiency symptoms may occur despite the seemingly appropriate vitamin supply.

Two-thirds of bile acids reached into the intestines, reabsorbs to the blood stream then gets to the liver, where it takes part in the enterohepatic circulation (between gut – blood – liver – gut), fulfilling the physiological functions imposed on it. **If the gall bladder isn't emptied regularly, then the digestion becomes imperfect, which affects not only the lipids, but the carbohydrates and the proteins too, because less secretion - containing less digestive enzymes - is secreted from the pancreas, and it also reaches irregularly into the duodenum. The stagnant bile can cause gallstone formation and bile that flows into the pancreas, can cause inflammation of the gland with all the unforeseeable and unpleasant consequences that follow.**

Irregular bile depletion is associated with many more negative consequences:

- **In normal conditions, bile salts kill the harmful bacteria in the small intestine, originated from the**

pharyngeal flora, if the gastric acid production is diminished. Without this, the harmful bacteria cause abdominal bloating, flatulence, possibly diarrhea because of their putrefactive, gas-forming properties. Anyway, in normal conditions, the small intestine is sterile, there aren't any bacteria.

- **Bile acids, that reached the latest stage of the small intestine, are the most important factors of triggering the defecation reflex. Therefore, if there are not enough bile acids in the small intestine, i. e. if the undiluted bile isn't emptied from the bladder, regularly every day, then constipation can occur. At first, patients don't have regular stool, because there will be more and more water and toxic compound absorption from the stagnant stool, poisoning the human body (autointoxication), well formed stools become hard and dry. Bile pigments in concentrated bile give the stool dark brown color. The darker or lighter color of the stools marks exactly the amount of emptied pigments.**
- **Bile acids can kill viruses with outer protein envelope (peplon) in the large intestine. They destroy, disarm and fragment the endotoxins of the inhabitant microflora. Endotoxins (own internal toxins) are allergizing agents due to their large molecules. They can cause cardiac arrhythmia, fever, general blood toxicity after surgery (septicemia) and they may also assist in male infertility. Consequently, bile acids play an important role in avoiding the harmful effects, those affect the physical and physiological status of the human body.**

7. THE ROLE OF LIPID PROCESSING IN DISEASES. „Bile flow dysfunction affects almost all of the diseases⁹

The team of doctors, set up by Dr. Péter Légrády, tried out a new kind of approach and they achieved new results after 8 years of investigation. They studied the turnover, the metabolism and the functional disorders of bile and bile acids, which are important in the turnover of fats, fat-like and fat-soluble materials, in simpler words they analyzed the dysfunctions of the hepatobiliary system.

Consequently, they studied not only the diseases of the hepatobiliary system (e.g. gallstones), but the diseases, that originate from or rather playing a role in the functional disorders of this system, for example, rheumatic diseases, migraine, functional infertility. **The relationship between migraine and biliary tract disorders is a well-known phenomenon too.** They studied and investigated allergic diseases too, and they searched for the role of the hepatobiliary system in the development or in the curability of some-more prolonged or chronic illnesses. This is a new, different approach.

Defects of the bile acid metabolism can be located at 5-7 places. Depending on which place is it, can we decide what treatment should be used. They have observed two thousand patients that means more than five thousand files including control. After 8 years of research, the followings can be clarified from their work: **The turnover of fat-like and fat-soluble materials is present at most diseases. And the turnover of bile acids is a crucial part of it. If the normal rate can be set up, the patients are improving.**”

8. CANDIDA ALBICANS. (CANDIDIASIS)

Candidiasis: real danger or large business¹⁰ **Candida yeast** is a fungus that can produce pseudohyphae and comes from the fungus family of Saccharomycetaceae. **It lives on the human mucosa, on the skin and in the GI tract.** The **Candida yeasts** are also involved in the utilization of degradation products formed in the human body as the other microorganisms living in the intestinal tract. The starting point of **candidiasis** usually means the point when some of the environmental effects (e.g. antibiotics, poor diet, irregularity, stress) reduces intestinal immunity, therefore **C. albicans** fungi can reproduce ourselves. **Candida** fungi **attack our organs from many sides and they do it in a comprehensive manner.** If the reproduction of **C. Albicans** has been started in the cavity of the intestinal, genital and urogenital tract, at the surface of the skin and in the mouth, then it is **followed by the break-through of the intestinal wall.** In this case, fungi are able to reabsorb and they could get in the blood stream, causing **systemic candidiasis (it affects the whole body).** These conditions come true in many cases if we study the modern life of people, so fungal diseases could become endemic. The general health status becomes weaker more than ever; broad-spectrum antibiotics and long time administration of some types of antibiotics (penicillin, tetracycline, and erythromycin) may cause damage to the sensitive balance of microbial intestinal flora. Antibiotics can be present **in products of animal origin** (milk, dairy products, meat) too. The risk of candidiasis is essentially increased by eating fat and protein dominant foods paired with poor cellulose and pectin intake. Effects of stress, weakening the central immune system and suppressing the immunity in the intestinal tract are widely known, therefore it is extremely important to achieve balance and peace of mind in order to improve the patient's condition. There are a couple of relationships between candidiasis and allergic conditions. The immune system weakened by allergy turns into extremely vulnerable, so it becomes an easy target for fungal infection. In many cases there are general fungal infections behind allergies, therefore the prevalence of rhinitis (hay fever), asthma, eczema and food allergy is dramatically increased among patients with **Candida.** Long-term fight against fungal infections, hyper-sensitize the immune system causing hyper-allergenic responses to invading cells, cell materials and metabolites, therefore chronic allergic symptoms develop. There isn't any part of the living fungal cells that are absolutely responsible for all symptoms of allergy, symptoms are caused by dead fungal cells and the chemicals of living fungal cells.

What you have to know about candidiasis¹¹. The systemic candidiasis can be a severe systemic disease (affecting the whole body) that develops in the presence of the appropriate risk factors and in some clinical situations. Systemic candidiasis is a severe life-threatening disease among immunodeficient patients, after major abdominal surgeries, among ICU patients, after post surgical interventions...Some kinds of the well-known disorders attacks the skin and skin appendices, others affect the mucous membranes. Much more surgical and systemic candidiasis is recognized as before as there is a growth in the number of patients with a weakened immune system. **Candida** and other mycoses mean a big challenge for bone marrow and organ recipients, patients with hematological diseases who are receiving aggressive chemotherapy, patients treated in intensive care, long-term intravascular catheter wearers, major abdominal surgery patients and for HIV-positives. Vaginal candidiasis can occur and re-occur in women with intact immune system even in the absence of predisposing factors. New candidiasis affecting the whole body can be accompanied by many symptoms and complaints. These can be: itching on various parts of the body, visual impairment, lump in the throat sensation, nasal congestion, fatigue, concentration difficulties, abdominal bloating, carbohydrate appetite, constipation, diarrhea, menstrual cramps etc. Some of the patients have or have had skin,

nails or vaginal candidiasis, or they came through on other fungal process. New patients are actually suffering from candidiasis. Patient's general discomfort and abdominal complaints can sign the disorders of the large intestine, irritable bowel syndrome and tumor also.

"Nowadays, by the heightened number of temporarily or permanently immunodeficient patients, importance of fungal infections has significantly increased."¹² Granulocytes and monocytes play main role in antifungal defense; therefore patients with lesser (neutropenia) will be more sensitive for generalized infections.

According to autopsy studies (Jehn, 1988), systemic fungal infections cause 50 percent of deaths in the neutropenic period of cancer patients (when neutrophil cells would have to be responsible for the resistance to fungal infections). Patients who are deficient in neutrophil cells that are ensuring the defense against fungal infections, often dies in systemic fungal diseases, in spite of the treatment. It isn't indifferent, what kind of further damages will be caused by the medicines used to the already depressed bone marrow. This can be as important question as the administration of bone-marrow toxic antibiotics in bacterial infections to neutropenic patients.

Aspects of the effect of bile salts on *Candida albicans*¹³ ".....Cholic acid, chenodeoxycholic acid, deoxycholic acid, glycocholic acid, glycodeoxycholic acid, hyodeoxycholic acid and lithocholic acid as their sodium salts, were fungistatic to the growth of *Candida albicans*..... the bile salts promote formation of the yeast form of *Candida albicans*."

„Antifungal utility of bile acids¹⁴: ... It has now been found, very surprisingly, that bile acids and their simple derivatives have anti-*Candida* activity...The discovery that bile acids inhibit the growth of *Candida* fungus species was surprising in the light of the previous statements.

"Ecology of *Candida albicans* Gut Colonization¹⁵: ... Antibiotic-treated and untreated Syrian hamsters were inoculated intragastrically with *Candida albicans* to determine whether *C. albicans* could opportunistically colonize the gastrointestinal tract and disseminate to visceral organs. Antibiotic treatment decreased the total population levels of the indigenous bacterial flora and predisposed hamsters to gastrointestinal overgrowth and subsequent systemic dissemination by *C. albicans* in 86% of the animals... Our findings, then, clearly demonstrate the importance of the intestinal microflora in the suppression of gut colonization and dissemination by *C. albicans*... **Secondary bile acids and VFA may have reduced the mucosal association of *C. albicans* by modifying *Candida* adhesin(s) or mucosal receptor(s), or both, thus rendering *Candida* cells un- able to attach to intestinal tissues."**

9. HEALTH-Metabolism-DIABETES Fountain of Youth in Bile?^{16,17}

The human quest for longer life may be one step closer. **Concordia University published in the journal *Aging*, a new study is the first to identify the role of a bile acid, called lithocholic acid (LCA), in extending the lifespan.** The findings may have significant implications for human longevity and health, as yeast shares some common elements with people.

"We do know from previous studies, however, that bile acids are beneficial to health and longevity. For example, they have shown to accumulate in the serum of long living mice and play a role in improving rodent liver and pancreatic function. This leads us to believe that bile acids have potential as pharmaceutical agents for the treatment of disorders which are age-related," continues Titorenko. **"They may indeed offer hope for a healthy aging life."**

¹ G.A.D. Haslewood (Emirius Professor of Biochemistry in the University of London) : **The Biological Importance of Bile Salts**, 1978, North-Holland Research Monographs Frontiers of Biology - Volume 47., ISBN 0-7204-0662-5.

² Dr Lóránd Bertók PhD/DVM, DSc/MD (Doctor of the Hungarian Academy of Sciences, Honorary Professor, He is in 500 Greatest Geniuses Of the 21st Century – American Biographical Institute) and Dr. Klara Gyurcsovics - **Role of bile acids and endotoxins in the pathogenesis and therapy of psoriasis** <http://www.vitalitas.hu/olvasosarok/online/oh/2000/17/5.htm>; <http://www.ncbi.nlm.nih.gov/pubmed/10827473>

³ Dr Lóránd Bertók PhD/DVM, DSc/MD (Doctor of the Hungarian Academy of Sciences, Honorary Professor, He is in 500 Greatest Geniuses Of the 21st Century – American Biographical Institute): **Bile acids in physico-chemical host defence**, Hungarian Science 2008/07, pp. 844.

⁴ Dr Lóránd Bertók PhD/DVM, DSc/MD (He is in 500 Greatest Geniuses Of the 21st Century – American Biographical Institute), Dr István Berczi: **Natural Immune Mechanisms and of Species Specific Resistance**, Advances in Neuroimmune Biology 1 (2011) 11-24, DOI 10.3233/NIB-2011-002, IOS Press

⁵ Dr Lóránd Bertók PhD/DVM, DSc/MD (Doctor of the Hungarian Academy of Sciences, Honorary Professor, He is in 500 Greatest Geniuses Of the 21st Century – American Biographical Institute): **Role of endotoxins in Natural Immunity**, Hungarian Science, 2004 No. 10, pp. 1130)

⁶ Lóránd Bertók PhD/DVM, DSc/MD (Doctor of the Hungarian Academy of Sciences, Honorary Professor, He is in 500 Greatest Geniuses Of the 21st Century – American Biographical Institute): **New Aspects in the Pathophysiology of Stress** - János Selye was Born 100 Years Ago–Hungarian Science 2007 No 5 pp 607.

⁷ István Tihanyi MD: **Detoxification (Méregtelenítés)**, http://bolhely.hu/drtihanyi/oldal/egyeni&id=4a4a78362b0f5_Meregtelenites

⁸ Tibor Gere MD: **The cholesterol issue: high or low? (A koleszterin kérdés: sok vagy kevés)** <http://www.termeszegyogyaszat-1.eoldal.hu/cikkek/a-koleszterin-problemarol/a-koleszterin-problemarol>

⁹ Péter Légrády MD: **Bile acids and cholesterol, (Epesavak és koleszterin)**, *Heti Patika* 17/03/1992.

¹⁰ Gábor Tóth: **Guideline for the treatment of allergy and Candida, (Allergia és Candida kalauz)** *Pilis-Vet Bt.*, 2005, ISBN 963 214 184 9

¹¹ Gyula Princz MD (St. Laszlo Hospital, Budapest): **What we need to know about Candida, (Amit a candidiasisról tudni kell)** *MEDICINA* 2000 VI. Outpatients Care Conference, Clinical Publications, IME 10/01/2005 Vol 3 No 10

¹² Ilona Benkő MD: **Effect of Antifungal Azole-Derivatives and Cytokines on Colony Formation by Normal and Leukemic Hematopoietic Cells**, Thesis For PhD, Debrecen, 2001

¹³ SUSAN E. MARSHALL, B. A. MARPLES, W. G. SALT and R. J. STRETTON: **Aspects of the effect of bile salts on *Candida albicans***, *Journal of Medical and Veterinary Mycology* (1987) 25, 307-318.

¹⁴ Marples; Brian A., Stretton; Reginald J.: **Antifungal utility of bile acids, U.S. Patent Documents: 4164573; 4434159; 4440688; 4579730, Foreign Patent Documents: 683192; 848333; 1430324; 1563311; 1601613; 2116036A**

¹⁵ MICHAEL J. KENNEDY and PAUL A. VOLZ: **Ecology of *Candida albicans* Gut Colonization**, *INFECTION AND IMMUNITY*, Sept. 1985, p. 654-663, American Society for Microbiology.

¹⁶ Richárd Balázs **Is the fountain of youth in bile? (Az epében keresendő a fiatalság forrása?)**, 16/09/2010 http://www.sg.hu/cikkek/77024/az_epeben_keresendo_a_fiatalsag_forrasa

¹⁷ **Bile acids may be beneficial to health**, <http://www.sciencedaily.com/releases/2010/09/100915100935.htm>

This set of information been reviewed and checked by an international law agency with regards to the following key aspects: food safety, advertising and sales of dietary supplements, protection of customer / consumer interests, relevant EU legislation.