Therapy options with prebiotics and probiotics in overview

Changes of Microbiome

* Diversity
* Inflammation (α1AT, CP, Ly)
* Leaky Gut (Zonulin, Histamine)
* Mucus formation
* Butyrate formation
* Flora

Probiotics: Requirement

* Not necessary

Prebiotics: Requirement

* Not necessary

Nutrition

* healthy, vegetable-rich
* Flatulence: FODMAP
* Obesity: Low Carb

Changes of Microbiome

* Diversity
* Inflammation (α1AT, CP, Ly)
* Leaky Gut (Zonulin, Histamine)
* Mucus formation
* Butyrate formation
* Flora

Probiotics: Requirement

* Flora stabilisation
* Immunogenic effects

Prebiotics: Requirement

* Butyrate formation
* Flora stabilisation****

Prebiotics

*Resistant starch (RS)
* Acacia fibres
*Beta glucan

Probiotics

* Omni-Biotic 6*
* Lactobact omni Fos**
* Orthica Flora Plus
* Omni-Biotic Power

Changes of Microbiome

* Pathogenic Bacteria
* and/or Clostridum difficile
* and/or Clostridum Cluster I
* and/or potentially path. Bact.

Probiotika: Requirement

* Toxin-Inhibition
* Immunogenically effective

Probiotics

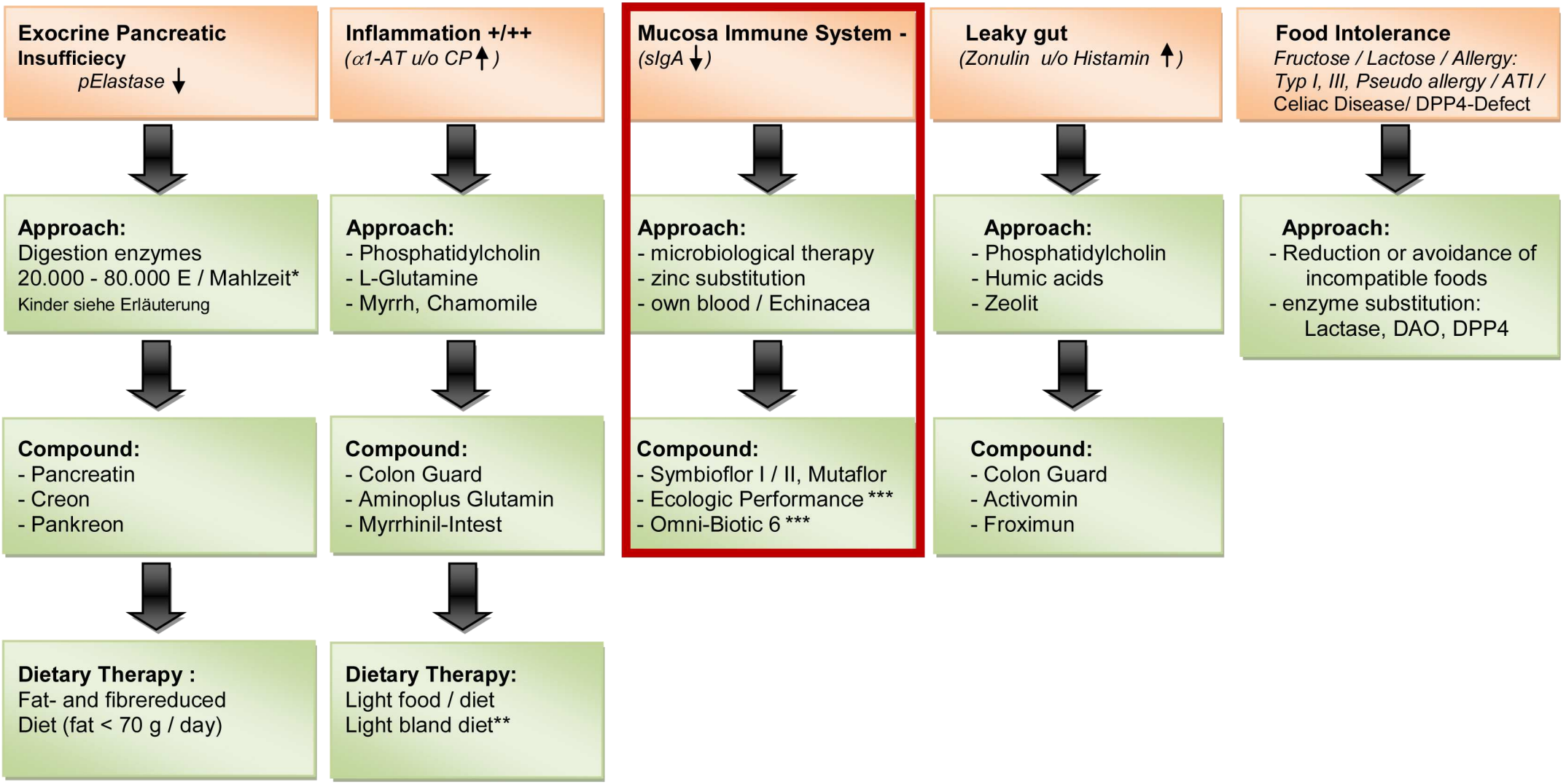
* Omni-Biotic 10***
* Ecologic AAD***
* Lactobact AAD

* age related: Omni-Biotic Active

** age adapted: Lactobact 60plus

*** in combination with other probiotics

Therapy options based on results of pElastase, inflammation marker, sIgA and / or zonulin / histamine



* **Dosage** depending on fat content in stool, for **children** age and weight related dosages apply.
In case of slightly reduced pElastase values but normal fatty residues: possible administration of vegetable enzyme mixtures (e. g. Digest, Full Spectrum, Combizym).

** in case of α1-antitrypsin values > 100 mg / dl and / or calprotectin > 150 mg / l *** MIS-activating probiotics (alternatively see table „probiotics acc. to effects“)

Blastocystis hominis

Blastocystis is a parasite occurring worldwide and is now considered the most common eukaryotic organism in the human intestinal tract. Evidence is often an expression of a transient, asymptomatic occurrence. In humans, 9 different subtypes have been detected so far, of which only a few (especially subtypes I and IV) are likely to be pathologically relevant. Depending on the source, the prevalence of Blastocystis in Central Europe ranges from 14 – 30 % of the population.

The examination on Blastocystis hominis is **clearly positive**. The detection of genetic material of the protozoa in the stool sample indicates a comparatively **high colonization**. Depending on the subtype, this may be associated with a symptomatic infection. In this case, complementary therapies focus on the administration of herbal extracts and / or yeast-based probiotics.

Therapy approaches
In vitro and in vivo studies have also shown an inhibitory effect of various herbal extracts such as **oregano**, **garlic**, and **ginger oil**, as well as **black cumin extract** (Eida et al., 2016; Lepczyńska et al., 2017). Also probiotics based on **Saccharomyces boulardii** demonstrated efficacy comparable to antibiotics (Dinleyici et al., 2011).

Oregano oil: e.g. 2 x 150 mg / day depending on the patient's age for 4 to 8 weeks

Attention: *According to the current state of knowledge, antibiotic treatment is indicated only in the case of persistent clinical symptoms, as it often shows high recurrence rates, leads to resistance and additionally affects the microbiome.*

Both antibiotic therapy and therapy with herbal extracts should always be supported by a simultaneous administration of probiotics with the aim of strengthening the patient’s microbiota (e.g. Omni-Biotic 10, Lactobact AAD, Ecologic AAD, Arctibiotic Akut).

Resistance has been described for both antibiotic and herbal extract-based therapies.

In case of a conspicuous clinical situation, the parasite infection should be given priority treatment. Oregano oil has a blood-thinning effect, so people who take blood thinners should refrain from taking oregano oil. Preparations based on Saccharomyces boulardii (Saccharomyces cerevisiae HANSEN CBS 5926) are contraindicated in seriously ill or immunosuppressed patients.

Introduction

The **intestinal microbiome** (entirety of all bacteria living in the intestinal tract) has considerable influence on health or illness of humans. It modulates the immune defence, supplies the organism with vitamins (vitamin B1, B2, B6, B12, and K), participates in the digestion of food components, supplies intestinal epithelia with energy via developing short-chain fatty acids and stimulates intestinal peristalsis. The microbiome also plays an important role in the scope of xenobiotic detoxification. Shifts within the microbiome are causally relevant factors for diseases like adiposity, non-alcoholic fatty liver disease, diabetes, coronary heart disease or cancer. After the composition of the human intestinal microbiome was studied in more detail, alterations can be detected and counteracted with well-aimed measures.

Result Evaluation
With the help of the **molecular-genetic stool analysis,** the intestinal microbiome was analysed in order to assess the composition and to determine possible shifts. The evaluation yielded the following **results**:

Laboratory-Id N°.
Received
Report
Last Name
First Name
Date of Birth

Biovis Diagnostik MVZ GmbH

Evaluation of Stool Consistency, Color and pH-Value

General viewing of the stool sample showed **tough pasty stool consistency**. Healthy stool should be mushy and formed. Liquid or slurry stool indicates accelerated, doughy or solid stool samples delayed intestinal passage.

The color of the analysed stool sample was dark brown. The **pH-value** was **above normal range** at 7,2.

Evaluation of the Intestinal Diversity

More important than individual bacteria species or types is the interaction of the bacteria present in the microbiome. Manifold tasks of the intestinal flora require adequate **diversity**. The intestinal diversity of humans may vary considerably.

In the microbiome of healthy people one finds **300 to 500 bacteria species**, in sick persons there are often a lot less. Causes for reduced diversity are manifold. They are for example repeated **antibiotic therapies, infections,** increasing **age, unbalanced diet** or **smoking**.

Research revealed that numerous diseases come along with reduced diversity and thus presumably promote disease manifestation. Very often reduced diversity is found in patients suffering from **adiposity, fatty liver** (NAF), **diabetes type 2, Alzheimer disease, chronic inflammatory bowel disease, intestinal cancer** or **irritable colon syndrome**. Due to decreasing diversity the intestinal microbiome no longer grants adequate protection against endogenic infections. Obese patients with reduced diversity tend to gain more weight, respond worse to diets and there are often already indications of fat metabolism disorders or insulin resistance. In patients suffering from chronic inflammatory bowel disease (CIBD) reduced diversity promotes recurrence and chronicity. Research data are also available for the irritable bowel syndrome, the manifestation of which is promoted by reduced diversity.

Result

The analysis indicates **adequate biodiversity**.

Determination of the Enterotype

Recent research showed that the human microbiome can be assigned to **three main groups-** so-called enterotypes. Intestinal bacteria develop – depending on the enterotype – stable, clearly different clusters with typical metabolic properties (9). **Enterotype 1** is characterized by high **bacteroides counts** and **enterotype 2** by strong **Prevotella** population. **Enterotype 3** is only found rarely – in hardly more than 5 % of the analysis. This type shows strong **Ruminococcus** flora.

The described enterotypes show significantly differing **metabolic performance.** The bacteroides dominated flora (enterotype 1) is optimally adjusted to the utilisation of **fat, fatty acids, protein and amino acids**. **Carbohydrates**, however, are metabolized significantly worse than by Prevotella dominated flora (enterotype 2), which in turn cannot metabolize fat and protein adequately.

The enterotypes also influence the absorption of minerals like **sodium, potassium, calcium** (11) or **iron.** Enterotypes are independent of sex or age and remain stable for years. Via **long-term change of diet** and taking **prebiotics** they can be influenced (12, 13 and positively effects human sustenance and health.

Result

The microbiome analysis indicates **enterotype 2** with dominating **Prevotella flora** often accompanied by high bacteria counts of *Dorea*, *Coprococcus* and *lactobacillus*.

Prevotella dominated enterotypes are often found in people, who eat a lot of fruits and vegetables thus especially frequent in case of **vegetarians.** The probability of enterotype 2 increases with the share of **fibres** consumed with food.

Prevotella is optimally adjusted to the utilization of carbohydrates. Other than bacteroides species Prevotella is hardly able to synthesize vitamins. Only the production of **thiamine (B1)** and **folic acid (B9)** could be determined. The enterotype also influences **nutrient consumption** significantly better than enterotype 1. The poor ability to synthesize vitamins is therefore compensated by better absorption. Nevertheless one should make sure that people of enterotype 2 always have adequate **micronutrient supplies.**

Firmicutes-Bacteroidetes ratio

Patients suffering from **irritable bowel syndrome** or **obesity** often show a high share of Firmicutes.

Obesity increases the risk of diseases like e.g. diabetes, coronary heart disease and cancer. It influences life expectancy and quality of life. In studies, the influence of the microbiome on the development of overweight was evaluated. **Firmicutes** have been shown to be capable of fermenting **complex, indigestible carbohydrates** to produce short-chain fatty acids (SCFA) which are absorbed through the intestinal mucosa and serve as additional energy sourced to the host (19, 20). Due to the fermentation of carbohydrates by firmicutes **10 – 12 %** more **energy** is available (21).

Bacteroidetes are not able to utilize complex carbohydrates. If firmicutes dominate bacteroides in the microbiome one speaks of an increased **firmicutes-bacteroidetes-ratio** which may promote gaining weight.

In case of patients suffering from irritable colon syndrome increased firmicutes-bacteroidetes-ratios often come along with meteorism or flatulence.

Result

The microbiome analysis shows a balanced ratio of Firmicutes to Bacteroidetes. The Firmicutes-Bacteroidetes ratio is normal.

Frequency Scale of the Most Important Bacteria Phyla

The colon is populated by bacteria, which reach a total density of approximately $10^{11} – 10^{12}$ bacterial cells/ml colon content. This dense community of bacteria consists mainly of three or four large bacteria phyla: **Bacteroidetes, Firmicutes, Actinobacteria** and **Proteobacteria**. Other phyla (Verrucomicrobia, Fusobacteria) show smaller shares.

In most cases 30 – 60 % of the microbiota are Bacteroidetes. The Firmicutes have the same share and mainly consist of Lachnospiraceae and Ruminococcaceae families. Actinobacteria have significantly lower bacteria counts. Mainly Bifidobacteria make up the Actinobacteria phylum. In the microbiome of healthy people Proteobacteria have a share of 1.5 – 5 %, which can, however, after repeated antibiotic therapies or in case of inflammatory bowel diseases, increase significantly.

Result

The distribution of the bacteria strains (phyla) **is inconspicuous**. The determined frequencies largely correspond with those of a control group of healthy donors.

Equol

The current findings indicate a **sufficient number of equol-forming bacteria**.

To clarify whether the existing bacteria really produce equol, a quantitative equol diagnostic is recommended.

As a bacterial metabolic product, equol is mainly synthesized upon consumption of soy products.

Its binding affinity to oestrogen receptors has been associated with beneficial effects in menopausal disorders and may protect against artherosclerosis, osteoporosis or neuroinflammatory diseases.

Mainly species such as Adlercreutzia, Eggerthella and Slackia are able to form equol. The bacterial formation, however, varies greatly between individuals. While in Europe, only about 20 – 30 % of the population is able to form equol, in Asia it is 50 – 60 %.

Actinobacteria

Bifido bacteria are gram-positive anaerobic rod-shaped bacteria, which utilize starch, but mainly oligosaccharides. Mostly acetic and lactic acid are developed.

By developing short-chained fatty acids and related pH-value reduction in the intestinal lumen bifido bacteria do not only counteract proliferation of pathogenic bacteria (colonisation resistance), they also have anti-inflammatory effects.

Result

In case of the bifido bacteria count is **within the norm.** The most common representative in the microbiome is B. longum. The second common species was B. adolescentis. A strong bifido bacteria flora protects against endogenous infections and has an anti-inflammatory effect.

Bacteroidetes

Bacteroides and **Prevotella** are particularly common genera in the microbiome of many people and regularly reach > 40 % of the total intestinal microbiota. As distinct biomarkers for nutrition they define enterotypes 1 and 2.

Result

In case of Patient 3 12 % are **Bacteroides**, which equals a **reduced bacteria count**.

The total bacteria count of **Prevotella** 2,5 x 10^11 CFU / g stool lies within normal range.

The genus **Prevotella** contains several species which have an influence on inflammatory diseases.

According to recent studies (52) ***Prevotella copri*** participates in the development of **rheumatoid arthritis (RA).** This is indicated by studies with RA patients, which in case of disease manifestation often showed high *P. copri* counts. Experiments showed that *P.copri* population may not be the consequence but the cause of **systemic inflammations** and **autoimmune diseases**.

There were **high *Prevotella copri* counts** in the tested stool sample.

Firmicutes

Development of Butyrate and Short-Chain Fatty Acids by Firmicutes

Carbohydrate fermentation in the colon leads to the development of short-chain fatty acids (SCFA) (37) and gases (H_2, CO_2, methane). SFCA detectable in stool samples are mainly **formic acid, acetic acid, propionic acid** and **butyric acid**. Dietary changes lead to altered production rates of short-chain fatty acids. **Low-**

tic spectrum disorders and are not rarely the cause of **autism associated intestinal** and frequently also **extra-intestinal complaints.**

Result

The microbiome analysis of showed **inconspicuous clostridia counts**.

Toxin developing clostridia (Cluster I) could also not be detected during sequencing. But only the most important representatives C. perfringens, C. sporogenes und C. histolyticum are considered.

Additional Relevant Firmicutes

Fusobacterium spp.

In humans Fusobacteria occur as part of the physiological microbiota of the oral cavity and are regularly detected in small amounts in the intestinal microbiotia. Fusobacteria are obligatory anaerobic growing, spindle-shaped bacilli. Especially Fusobacterium nucleatum and Fusobacterium necrophorum have a pathological potential in the infectiology and in the oral cavity they are associated with caries and periodontitis.

Already in 2012, in metagenomic analysis an accumulation of Fusobacterium nucleatum in **colorectal carcinoma (CRC)** has been detected. If Fusobacteria are actually able to cause a tumour or if they use the decayed tumour tissue as “food source”, has not been clarified yet. However, an etiological relevance does not seem unlikely.

In the present case, **Fusobacterium spp. could not be detected or just in low concentration.**

Proteobacteria

Like microbiome analyses show there is decreasing digestive performance in older age, which often leads to an increase of *Enterobacteriaceae* (***Escherichia coli, Klebsiella, Enterobacter, Proteus***) or *pasteurellaceae* (e.g. ***haemophilus***). There are also alterations of the obligatory anaerobic flora. Increases of **clostridia** are suspicious. **Bifido bacteria** and **lactobacilli** on the other hand reduce.

The described alterations can also be caused by other factors. Reapplied **antibiotic therapies** lead to increasing enterobacteria, enterococci and clostridia counts as well as to significantly decreasing bifido bacteria. (62). Similar can be observed in case of **chronic inflammatory bowel diseases or irritable colon syndromes** (63, 64).

Determination of Pathogenic or Potentially Pathogenic Bacteria

No potentially pathogenic Proteobacteria could be found in the microbiome of

Histamine-forming bacteria

In the stool sample no histamine-producing bacteria such as Hafnia alvei, Klebsiella pneumoniae or Morganella morganii could be detected.

Damage of the Intestinal Mucosa due to Hydrogen Sulphide Development (H_2S)

Hydrogen sulphide is a toxic metabolic product, which – in case of higher concentrations – leads to damage of intestinal epithelia and such promotes the occurrence of cellular atypia. H_2S is produced in the colon by **sulphate reducing bacteria** – especially by **Bilophila wadsworthii**, **Desulfomonas pigra** and **Desulfovibrio piger**. Meat is an important source of sulphur, which promotes the growth of sulphate reducing bacteria. The **cancer promoting potential** of hydrogen sulphide is based on the formation of **free radicals** (oxidative stress) and up-regulation of **cyclooxygenase-2** activity in the epithelia cells.

Gut bacteria can also produce N-nitroso compounds. Their quantity increases in case of high-protein diets, especially if a lot a meat is consumed. Cooking meat produces heterocyclic amines, which can be transformed to cancer promoting intermediate products.

Result

The total bacteria count of **sulphate reducing bacteria is increased** indicating increased **H_2S production**.

Bacteria with an Immunogenic Effect

E. coli and enterococci have an **immunogenic effect** and are in interaction with other bacteria mainly responsible for the **immune modulating effect of the microbiota**.
And at last **lactobacilli** together with enterococci are the main representatives of the small intestine flora. Furthermore they have an **immunogenic effect**, are **anti-inflammatory** and **stabilize the milieu.** They are able to develop substances similar to antibiotics (**bacteriocins**), which counteract proliferation of endogenic pathogens.

***E.coli*, enterococci** and **lactobacilli** were the major pillars of intestinal flora analysis; therefore they are also taken into consideration in this context.

Result

We found normal **lactobacilli** and **enterococci** counts in the microbiome of

Escherichia coli, Enterococci and Mucosa Immune System

Microbiome alterations may under certain circumstances also allow conclusions about the mucosa immune system (MIS) activity level.

Result

Increased *E.coli* bacteria counts may – aside from above described causes – also be due to **deficient mucosa immunity.**

Mucin Development and Mucosa Barrier

In the healthy large intenstine a layer of mucosa mucus (**mucin layer**) protects the epithelial cells. If the mucin layer is damaged or insufficient mucin is formed, pathogens, pollutants or allergens can come into direct contact with the mucosa and lead to inflammation. Mucin formation and mucosal barrier are therefore closely connected. The maintenance of an intact mucosal barrier protects against bacterial translocation (LPS) and thus against inflammation. Bacteria such as **A. muciniphila** are significantly involved in maintaining the mucin layer. They emit mediator substances that stimulate the goblet cells to form mucosal mucus.

Result

The **Akkermansia muciniphila** counts in the microbiome of indicate **sufficient mucin formation**.

The **Faecalibacterium prausnitzii count** in stool was **normal**.

Mycological Stool Analysis

We found **no facultative pathogenic yeasts** in the stool sample of Therefore not therapeutic measures are required.

Increased ***Geotrichum candidum*** counts were found.
Geotrichum candidum is a saprophyte, which can be isolated from soil, waste, spoiled vegetables fruits and fermenting milk products. Also this yeast is often found in saliva and stool.
In case of weak immune defence, long-term antibiotic therapy or immune suppressing therapies diseases caused by *Geotrichum* may occur (=> **geotrichosis**). Aside from the intestines before all also oral cavities, tonsils and bronchia are concerned.
Due to **missing reproducibility at 37 °C** pathogenic relevance can be largely excluded in this case.

Supplementary Parameters

Determination of Digestive Disorders

Raised **concentrations** of **fat** were found. An increased occurrence of undigested food residues may be due to ***nutritional errors*** (high-fat diet) or ***digestive disorders***. The low water content of the stool sample indicates a **retarded passage through the intestine** or **constipation**.

Determination of Malabsorption

Mucosa Integrity and Permeability
The inconspicuous inflammation marker **calprotectin** and **α-1-antitrypsin** indicate intact mucosa conditions. There no indications of malabsorption.

Mucosa Immunity

Mucosa Integrity and Permeability
The sIgA concentration indicates reduced mucosa immune system activity.
Secretory immune globulin A neutralizes allergens and prevents the attachment of pathogenic bacteria, viruses or fungi on the surface receptors of the intestinal mucosa. Reduced sIgA leads to **increased antigen load** of the downstream systemic body defence. Additionally occurring infections cannot be handled any longer or only insufficiently. This results in **chronic susceptibility to infections**.

Determination of a gluten-sensitive enteropathy

Clarification of Gluten Intolerance

The antibody concentrations against gliadin and transglutaminase were within normal range. For this reason it is not likely that the patient suffers from gluten enteropathy (synonyms: celiac disease, local sprue).

Zonulin IDK (Properdin)

Zonulin level is within **normal**.
Latest research findings lead to a reclassification of the protein measured here into **properdin** that activates the alternative complement pathway. Functionally and structurally, properdin belongs to a **"zonulin family"** of boundary surface permeability mediators that influence the t**ight junctions.**

High levels are associated with increased intestinal permeability. Low levels indicate a stable and tight intestinal mucosa. Increased intestinal permeability may induce inflammatory mucosa reactions and sensitizations. Increased values are often measured in patients with coeliac disease, diabetes mellitus type 1 or numerous other autoimmune diseases.

Therapeutic Approaches

The results of the microbiome analysis require therapeutic approaches, which protect the microflora against negative consequences or ease existing complaints by supporting the microflora.

Successful therapies, however, also take basics into consideration, which practicably apply for everyone and often already lead to significant improvement of ailments. These basic therapies are based on decade-long experiences. They are listed in short form below and can be found under www.biovis.de.

Basics for healthy intestines:

Diet Healthy diets consist of a plentiful breakfast, a main meal at lunch and a modest dinner. It should be varied and diverse.

Giving Psyllium seed husks (dosage 1 – 2 tablespoons) should lead to 1 – 2 formed stools per day. They are tolerated well and may also be given in case of obstipation or diarrhoea.

Wheat Avoid or significantly reduce wheat. Wheat is often not tolerated well, even if there is no evidence of intolerance. This is caused by amylase-trypsin inhibitors (ATI), which inhibit digestive enzymes and promote mucosa irritations.

Sugar Radical reduction of sugar consumption (maximum 1 g / day)

Chewing Thoroughly chewing and salivating of food is the first step to healthy digestion and nutrient absorption. Chewing 30 – 40 times leads to optimal preparation of food for intestinal processes.

Exercise Adequate moderate exercise

Relaxation Keep adequate resting phases

Detoxification Drink enough (2-3 l water / unsweetened herbal teas) – this provides for improved intestinal passage and excretion of foreign matters. Possibly drainage of toxic substances via zeolite and/ or humic acids may be sensible.

Substitution Consumption high-value herbal oils (e.g. linseed oil) and/or fish, possibly curcumin or aloe vera, which have an anti-inflammatory effect respectively promote butyrate development.

Because of the increased sugar residues in stool possible carbohydrate intolerances should be excluded. This can first be checked via **provocation** with 0.5 l whole milk (indication of lactose intolerance) and 10 – 15 dried plus (indication of fructose malabsorption). If the provocation leads to **abdominal** (meteorism, diarrhoea, tenesmuses etc.) or **extra-intestinal complaint patterns** (migraine, depression etc.), which indicate carbohydrate intolerances the diagnosis should be confirmed with the aid of **breath gas analyses**.

Due to the **low sIgA values** in stool one should try to increase sIgA production and secretions. Very suitable is in this case the microbiological therapy applying preparations with viable (Symbioflor I, II, Mutaflor) or inactivated bacteria (ProSymbioflor). Preparations with viable bacteria principally have a stronger simulating effect than those with inactivated bacteria.

Diversity

The microbiome analysis indicates **adequate biodiversity**.

Please make sure to keep a **balanced diet** to provide for the maintenance of the microbiome diversity. An antibiotic therapy should always be accompanied by taking **probiotics.** They not only counteract proliferation of resistant pathogens, but also further reduction of bacteria diversity. Please keep in mind that also **smoking, aging, imbalanced high-fat diets** ("Western Diet") or diseases coming along with inflammatory mucosa irritations ("**low grade inflammation**") or medication (NSAR) lead to a biodiversity reduction. Therefore therapies should always start here and fight against causal factors.

Enterotype

The *Prevotella* flora dominating in **enterotype 2** is – different from that of bacteroides species – hardly able to synthesize vitamins (exception: thiamine, folic acid). The minor ability for nutrient synthesis is partly compensated by better nutrient resorption; nevertheless humans with enterotype 2 always have to make sure their **micronutrient supply** suffices.

This especially applies for minerals and vitamins developed by bacteroides:

- **biotin**
- **riboflavin**
- **pantothenic acid**
- **vitamin C**

Individual prebiotic or probiotic therapies

Prebiotics

Prebiotics can promote diversity and achieve targeted changes in the composition and metabolism of the gut microbiota. Prebiotics consist of hard-to-digest carbohydrates, such as **resistant starches**, which lead to the proliferation of firmicutes and some bifidobacteria. **Oligosaccharides** such as XOS, AXOS, FOS, GOS or acacia fibers also show a bifidogenic effect. They too lead to an increase in butyrate formers. In addition, Faecalibacterium prausnitzii or Akkermansia muciniphila can be propagated via FOS / GOS or acacia fibers, resulting in a stabilization of the mucus layer and the membrane barrier.

Probiotics

Probiotics are selected, living microorganisms that positively affect the environment in the intestine. Above all, strains of bifidobacteria and lactobacilli, but also E. coli, and enterococci are used. Whereas in the past it used to work predominantly with **individual strains**, it is now known that combinations of several potentiating probiotic strains can achieve significantly stronger effects. **Modern multispecies probiotics** can stimulate the mucosal immune system or have an immunomodulating effect. Depending on the selection and composition of the strains used, probiotics can stabilize the mucosal barrier in the intestine by stabilizing mast cell membranes and counteract a leaky gut. Modern multispecies probiotics have an anti-inflammatory effect and lead to a significant reduction of proinflammatory cytokines.

Pre- and probiotics should be used as specifically as possible in order to achieve an optimal effect. The selection is based on the following criteria:

- Patient age
- Complaint image
- Diversity
- Mikrobiota changes
- Butyrate and mucin formation
- Existing pathogenic / potential-pathogenic germs
- Existing facultatively pathogenic yeasts
- Inflammatory mucosal changes
- Leaky Gut (disturbed mucous membrane barrier)
- Mucosal immune system
- Incompatibilities / intolerances
- Overweight or underweight

Nutritional forms, such as **FODMAP** or **low carb** have an impact on diversity and microbiota composition. Therefore, they are also taken into account in the following compilations.

Pre- and probiotics should be used as **specifically** as possible in order to achieve an **optimal effect**. The following tables allow you to determine suitable pre- and probiotics according to fixed criteria. If prebiotics can easily be restricted to the naming of active substances, this is practically impossible with probiotics, since even the same named bacterial species can vary greatly in their abilities. Even if products are named for these reasons, a claim for completeness cannot be guaranteed due to the large number of products offered. However, attempts were made above all to include probiotics which can substantiate the indication and efficacy with studies. If the listing is based only on similar parent compositions or indications by the manufacturer, this is marked in color. For further explanations, please refer to the tables.

has a **sufficient bacterial count** of equol-producing bacteria and therefore is capable of converting soy to a relevant extent into bioactive secondary plant materials.

Equol leads to numerous positive effects, it alleviates menopausal symptoms, protects against chronic diseases, osteoporosis or complications of a metabolic syndrome.

Dietetic Treatment

The microbiome composition is significantly influenced by the diet. Long-term change of diet alters the distribution of the bacteria-phyla (e.g. of firmicutes or bacteroidetes) just like the bacteria count of bacteria species important for intestinal health.

Resistant starch promotes growth of valuable butyrate developing bacteria in the intestines. At the same time the proliferation of toxin developers and putrefactive bacteria is inhibited. The following foods provide appreciable amounts of resistant starch: bananas (not too ripe), potatoes, corn products (cornflakes, tortillas etc.), cooked white beans, lentils and peas. If tolerated also bread, bread crusts or popped cereal products (e.g. cornflakes, spelt flakes, millet pops, wheat pops – best not sweetened) have positive influence.

With kind regards

Your Biovis-Diagnostik

Attention: *The recommendations given are only advice based on the compiled findings and possible clinical information. They are exclusively addressed to the therapist/physician and are* ***not intended*** *for direct transfer to the patient. They cannot replace diagnosis and therapy of the treating therapist. The recommendations for therapy are a suggestion. The responsibility for the final selection/measure/dosage lies with the medical professional/therapist responsible for each individual case. Please also note that there may be contraindications/interactions associated with the recommended medication/nutritional supplements for pre-existing primary diseases and when taking certain medication. These must be investigated by the medical professional/therapist before starting therapy.*

To achieve a special medical purpose, the dosing recommendations for individual substances may be higher than those of EU Regulation 2016/128.

Prebiotics	Butyrate formation	Anti-inflammatory	Fp and/or Am	Bifidogenic effects	F/B-Ratio	LI	FM	Flatulence*	Diversity
RS	+	(+)	-	(+)[1)]	+	yes	yes	**40**	+
PPb	+	+	+	+	+	yes	yes	**60**	+
scFOS/scGOS	+	+	+	+ +	(+)	**no**	**no**	**100**	+
FOS	+	+	+	+	(+)	yes	**no**	**100**	+
Inulin	+	+	+	(+)[2)]	(+)	yes	**no**	**100**	+
Acacia fibres	+	+	+	+	- -	yes	yes	**20**	+
XOS / AXOS	+	+	-	+	?	yes	yes	**50**	+
Butyrate	+	+	-	-	+/-	yes	yes	**10**	+/-
FODMAP	-	-	- -	- -	- -	yes	yes	- -	- -
Low Carb	-	-	+/- [3)]	+/- [3)]	- - [3)]	yes	yes	- -	- -

Note:

* Relative occurrence of flatulence compared to FOS/GOS (100 %)

+ Promoting effect | **-** no detectable or only very little effect | **+/-** no influence | **- -** reduction | **yes** compatible | **not** necessarily compatible, gradually increase dosage (start: 1 g / day)

[1)] Decomposition of RS by B. breve and B. adolescentis (Aliment Pharmacol Ther 2015; 42:158-179); [2)] depending on phenotype, incomplete decomposition of inulin (Appl Environ Microbiol 2009; 75:454-461); [3)] Decreasing numbers of bacteria such as A. muciniphila (Clin Nutr Experiment 2016; 6: 39-58), F. prausnitzii- and Bifidobacteria are described with a protein- and fat-rich low-carb-diet. (Proc Nutr Soc 2015; 74: 23 – 36). Low Carb diets can contain between 25 and 250 g carbohydrates per day.

RS: Resistant Starch
PPb: „Pro Prebioma“ (combination of several prebiotic substances)
FOS/GOS: **F**ructo-/**G**alacto**o**ligo**s**accharides: short chain variants (**sc**FOS / **sc**GOS) show significantly better compatibility
XOS/AXOS: **X**ylo-, **A**rabino**x**ylo**o**ligo**s**accharides: Butyrate formation mainly through bifidogenic effect („Cross-Feeding“)
FODMAP: **F**ermentable **O**ligo-, **D**i-, **M**onosaccharides and **P**olyols“ (Polyols: polyvalent alcohols)
Fp / Am: Reproduction of Faecalibacterium prausnitzii / Akkermansia muciniphila
F/B-Ratio: Firmicutes-Bacteroidetes-Ratio
LI: Compatibility for people with lactose intolerance
FM: Compatibility for people with fructose malabsorption
Diversity: Diversity promoting effect

Probiotics Indications	OB Panda Ec. Panda OF Start Lb.Junior[2)] AB Start	OB 6[4)] Lb. omni Fos OF Plus pb pur	OB Active Lb. 60 plus OF Senior	OB 10[4)] Ec. AAD[4)] pb protect Lb. AAD AB Akut	OB Stress rp. Ec. 825 Lb. Forte[1)]	OB Power Ec. Perform.	OB Hetox Ec. Barrier[5)]	OB Hetox light Ec. Barrier Ec. Sense	OB Flora plus+ OF Fem
Babies	+ + +	8 - 12 week							
Children	+ + +[2)]			*/+ +	*	*	*	*	
Adults		+ + +	+	+ +	+ +	+ +	+ +	+ +	+ +
Seniors		+	+ + +	+ +	+ +	+ +	+ +	+ +	+ +
Antibiotics				+ + +					
Lack of Butyrate					+ + +	+ +			
C. albicans	+	+ +		+ +					+ +
C. krusei /glabrata		+		+					+ + +
Diversity low	+ +[3)]				+ +		+ +	+	
Inflammation					+ + + +[1)]	+ +	+ +	+ +	
Flora (pH +)		+ + +	+ + +		+	+			
MIS-Activity - [6)]	+ +	+ + +	+ +	+ +	+	+ + +	+ +	+	
Lack of Mucin									+ +
Leaky Gut	+ +[3)]				+ + +	+ + +	+ + +	+ + + +	
PO / PPO		+		+ + + +	+ +			+	
SRB		+ + +	+ +		+				

Notes:

+ + + / + + + + Method of choice | + + appropriate | + slight effect detectable | * from 8 years on

[1)] Lb. Forte: Indication: inflammatory mucosa reactions, CED (Interval); [2)] from 2nd year of life on; [3)] detected for OB Panda and Ec. Panda;
[4)] OB 6, OB 10 AAD, Ec. AAD also for children from 2nd year of life on, until 3 years half of dosage; [5)] Ec. Barrier double dosage; [6)] see introductory paragraph

OB: Omni-Biotic | Ec.: Ecologic | Lb.: Lactobact | OF: Orthica Flora / Orthiflor | pb: Probiotik | AB: Arctibiotic

MIS: Mucosal immune system | PO / PPO: pathogens / potentially pathogenic bacteria | SRB: sulfate-reducing bacteria

Important:

Information based on scientific studies or on indication statements of manufacturers. Due to the large quantity of probiotics available, there is no claim for completeness.
Black: based on study | **Violet**: manufacturer's specification