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A Bowel Flora Protocol for Dysbiosis Management

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In previous articles in the *Townsend Letter* a protocol has been advanced for the management of autoimmune diseases.[1,2] A central part of this protocol is the management and correction of intestinal dysbiosis. Phytotherapy can play a valuable role in achieving a healthy gut flora by working with the patient's intrinsic organisms, as outlined below.

Humans coexist in an overall symbiotic relationship with a complex array of commensal bacterial flora that inhabits the gastrointestinal tract (GIT). Through processes of evolution, mammals coexist with an estimated 300 to 500 different species of commensal bacteria that colonize the GIT in a symbiotic relationship. In commensal relationships neither partner is harmed, in symbiotic relationships unique metabolic traits or other benefits are provided. The presence of intestinal bacteria plays an important role in the development of a robust intestinal immune system and protects the host against rapid colonization by intestinal pathogens.[3,4] Lactobacilli and bifidobacteria are Gram-positive lactic acid-producing bacteria constituting a major part of the normal intestinal microflora of humans.[5,6] To ensure our GIT has sufficient defense against potential pathogenic organisms, mucosal immune integrity and bowel flora need to be regulated as a treatment priority.

The GIT provides distinct niches for colonization by commensal bacteria, as indicated by qualitative and quantitative differences in the bacterial flora throughout the GIT.[3,7] The architecture in different parts of the GIT reflects its functional role in digestion and immune response. Localized differences are found with the presence and density of mucosal lymphoid structures such as Peyer's patches. It is likely that the lymphoid tissue throughout the GIT plays an important role in localized immune responses to bacteria. Development of a strong localized gastrointestinal mucosa-associated immune system is not only reliant on good mucosal lymphatic tissue and hence lymphatic support, but is also functionally dependent on the presence of the bacterial microflora.[8] The gut flora can be seen as an integral part of our immune system, and can almost be considered an organ of the human body within its own right. It is speculated that when the bowel flora colonies become dysbiotic, autoimmune conditions such as inflammatory bowel disease can result. (Dysbiosis is abnormal microbial colonization of the intestine, where the changes in quality and/or quantity are pathological.)

Bowel flora play an important role in our ability to fight infectious disease, providing a front line in our immune defense, provide a passive mechanism to prevent infection, and produce many vitamins. Acid-producing lactobacilli and bifidobacteria increase the bioavailability of minerals, which require acid for absorption – calcium, copper, iron, magnesium, manganese. Without a healthy colony of bowel flora, we cannot expect robust health and wellbeing. The age-old naturopathic principle, start your treatment with the gut, has yet again been proven to hold much truth and value.

Protocol Rationale: The Weed and Feed Theory

This program has been adapted from the protocol developed by herbalist Hein Zeylstra for the management of Crohn's disease and ulcerative colitis.

Step 1: Prepare and Weed

Prepare - Day 1

In preparation for the dysbiosis protocol, it is ideal to have the patient fast for one day prior to commencement. For an optimal pre-protocol 24-hour fast, advise the patient to exclude all food and beverages other that purified water. Vegetable juices and broths are acceptable in moderation (no more then 470 mL (16 oz) of juice during the day and ideally diluted with some purified water).

If a patient feels that they cannot go without food for 24 hours, they can include 1–2 serves of low glycemic vegetables, either raw or slightly steamed. It is essential to avoid foods containing yeast, sugar and starches, including fruit, during this 24-hour period. No alcohol or caffeine can be consumed during the fast and ideally during the dysbiosis protocol. If cravings for carbohydrates are interfering with patient compliance, the addition of Gymnema tablets (2–3 per day) or (even better) Gymnema liquid extract into the protocol for blood sugar regulation will improve patient compliance.

Weed – Eradicate Dysbiotic Organisms using Garlic (Days 2–3)

The main components of garlic are the sulfur compounds, including alliin. Allicin is produced from alliin (via the action of the enzyme allinase) when garlic is crushed or chopped. Allicin is rather unstable and decomposes further producing a range of compounds including diallyl sulfides, ajoenes and vinyldithiins.[9] Allicin and its decomposition products are thought to be the major antimicrobial factors in garlic.[10]

If fresh garlic is used in this protocol, it should be crushed first and taken with enough water to flush the garlic through the stomach quickly so the antimicrobial substances can act in the intestine. Enteric coated garlic tablets will ensure that the maximum potency of garlic is delivered to the site of dysbiosis.

Garlic was used in World War I as an anti-infective agent for various infectious intestinal diseases, including cases of cholera and dysentery. It also had a protective antibacterial effect: soldiers whose diet included garlic suffered less frequently from dysentery than those who did not eat garlic. *In vitro* and *in vivo* studies indicate that garlic has both antibacterial and antifungal activity, giving it broad spectrum antimicrobial activity in the GIT.[11] Broad spectrum antimicrobials are best for weeding as they do not create imbalance in the microflora.

Golden seal tablets or liquid extract equivalent to 2–3 g of golden seal root (in divided doses) could be added to this weeding protocol. Golden seal, like garlic, is a broad spectrum antimicrobial.

Other broad-spectrum antimicrobial herbs can be included in this phase. For example, pau d'arco is an herb which possesses a broad spectrum of antimicrobial activity, especially against protozoa and fungi, and appears to have a capacity to kill micro-organisms, rather than merely inhibit their growth. It consists of the inner bark of several species of Tabebuia, in particular *T. avellanedae* and *T. ipe*. Pau d'arco contains naphthoquinones, and while much research has focussed on lapachol, this particular compound is not the major naphthoquinone found in the inner bark. The compound of β–lapachone is more important in the context of the use of the inner bark.[12]

Step 2: Feed (Days 4–15)

Step 2a: Provide Prebiotic to Feed the Bowel Flora with Slippery Elm powder

The growth of endogenous beneficial bowel flora can be encouraged by administering prebiotics. Prebiotics are food for probiotics (beneficial bowel flora), and include herbs and foods containing mucilages, polysaccharides and fructooligosaccharides (FOS). FOS, otherwise referred to as fructans, are complex carbohydrates found in several common foods and a number of medicinal herbs. Foods containing FOS include Jerusalem artichokes, globe artichoke, onions, bananas, asparagus, leeks, garlic, wheat and barley. FOS taste sweet, however unlike sugar and starch, they add no calories to the diet because they are not digested or absorbed in humans. Inclusion of these in the diet can enhance GIT health by providing an energy source for bowel flora and thereby improve nutrient absorption and assist in reducing inflammation. FOS enhance mineral absorption and counteract the deleterious effects of phytic acids.

The most common mucilage-containing herb historically used for GIT disorders is slippery elm (*Ulmus rubra*). Slippery elm contains mucilage (a polysaccharide), starch and minerals. The main water-soluble polysaccharide is a linear polymer of galacturonic acid and rhamnose residues with side branches of galactose or 3-methyl-galactose. It is demulcent, emollient and nutrient and provides a simple physical soothing action.[13,14]

Mucilaginous herbs will also encourage the growth of beneficial bowel flora and are more simple, clinically effective and inexpensive when compared to probiotic supplementation.

Step 2b: Inhibit the Regrowth of Pathogenic Flora

Use selective gastrointestinal antiseptics to restore normal bowel flora, such as green tea and grape seed extract. The use of polyphenols and oligomeric procyanidins from grape seed extract and green tea selectively inhibit the regrowth of pathogenic bowel flora. The addition of these herbs into step 2 of the protocol improves dysbiosis management, dramatically reduces flatulence and abdominal bloating, and provides powerful antioxidant activity.

Green tea and grape seed contain tannins which are defined as vegetable substances capable of tanning animal hides to produce leather. (This is used as a method to preserve the hide and at a molecular level is effected via the crosslinking of hide proteins by the tannins.) This definition is prescriptive and powdered hide is still used as a phytochemical test for tannins. Like flavonoids, tannins are polyphenolic compounds which have an affinity for proteins. However, the higher number of phenolic groups and the larger molecular size of tannins mean that they are capable of binding strongly to proteins at several sites and can precipitate them from solution.

The advantage of tannins in the context of this article is that they are poorly absorbed in the gastrointestinal tract. Hence, through their capacity to bind proteins, they can inhibit the growth of micro-organisms, especially in the colon.

One of the most notable effects of tannins in the gut is their dramatic effect on diarrhea. It can be proposed that the effect of tannins is to produce a protective (if temporary) layer of coagulated protein on the mucosa along the upper levels of the gut wall, so numbing the sensory nerve endings and reducing provocative stimuli to additional peristaltic activity. Supporting this central astringent activity, tannins will also inhibit the viability of infecting micro-organisms, check fluid hypersecretion and neutralize inflammatory proteins. Because of their affinity for free protein, they will concentrate in damaged areas. Condensed tannins were able to bind to and inactivate the hypersecretory activity of cholera toxin.[15] Hence tannins can help to improve gut wall integrity.

Tannins also can affect bowel flora composition. A methanol extract of green tea was found to moderately enhance the growth of some bifidobacteria and selectively inhibit the growth of some clostridia *in vitro*.[6] The polyphenols containing gallate (such as epigallocatechin gallate) had the strongest activity.[16] Experimental *in vivo* studies have indicated that tea catechins improve intestinal flora. In chickens, ingestion of tea catechins resulted in a significant increase in the number of lactobacilli and decreased Enterobacteriaceae population. Putrefactive products also decreased. Similar results were demonstrated in pigs.[17] Grape seed oligomeric and polymeric procyanidins demonstrated a beneficial effect on cecal fermentation in rats. Caecal pH decreased, and fermentative activity was stimulated without an increase of deleterious enzymatic activity.[18] In Japan, patented tablets containing green tea tannins are sold in pet stores for use in dogs. Because of their effect on bowel flora they have a deodorizing effect on dog stools which is a great boon for owners keeping indoor pets in that country.

Green tea (a rich source of tannins) appears to be much more potent as an antimicrobial agent than black tea.[19] *Bacillus subtilis*, *Escherichia coli*, *Proteus vulgaris*, *Pseudomonas fluorescens*, *Salmonella sp.* and *Staphylococcus aureus* were used to test the antimicrobial activity of extracts of various tea products. Among the six test organisms, *P. fluorescens* was the most sensitive to the extracts, while *B. subtilis* was the least sensitive. In general, antimicrobial activity decreased when the extent of tea fermentation increased. The antimicrobial activities of extracts of tea products with different extents of fermentation also varied with test organisms. Green tea, the unfermented tea, exerted the strongest antimicrobial activity followed by the partially fermented tea products such as Longjing, Tieh-Kuan-Ying, Paochung, and Oolong teas. On the other hand, black tea, the completely fermented tea, showed the least antimicrobial activity.

A small clinical study in Japan demonstrated a green tea catechin preparation was able to positively affect intestinal dysbiosis in nursing home patients by raising levels of lactobacilli and bifidobacteria, lowering levels of Enterobacteriaceae, Bacteroidaceae, and eubacteria, and decreasing odorous compounds. Levels of pathogenic bacterial metabolites were also decreased.[17,20] A further study found that supplementation with tea catechins produced favorable improvements in the participant's bowel conditions as evidenced by a reduction in fecal moisture, pH, ammonia, sulfide and oxidation-reduction potential.[21] In both trials the dosage was 300 mg/day of tea catechins, which is equivalent to about 6 cups of green tea.

Protocol

Day	Protocol	Dietary Guidelines
Day 1	Prescribed medicines and supplements are to be taken as normal if the patient is currently on a protocol	▪ Fasting – no food and plenty of water; if the patient cannot fast, recommend to eat light, fresh meals of vegetables and salads only. ▪ No consumption of yeast, sugar or starches is essential. This includes fruits. Vegetable juices and broths are acceptable. ▪ No alcohol or caffeine. ▪ If cravings for carbohydrates are interfering with patient compliance, add Gymnema tablets (3 per day) into the protocol for blood sugar regulation.
Day 2 and Day 3	▪ Garlic: 1–2 fresh crushed cloves of garlic twice daily *or* 2 high quality, enterically-coated garlic tablets. If fresh garlic is used, it should be taken with a copious quantity of water. This has the effect of flushing the fresh garlic quickly into the small intestine. ▪ Golden seal could be taken here as well: 4 tablets containing at least 500 mg of root per day	▪ Fasting is ideal; if the patient cannot fast, recommend very light, fresh meals of vegetables and salads. ▪ No consumption of yeast, sugar or starches is essential. This includes fruits and fruit juices. Vegetable juices and broths are acceptable. ▪ No alcohol or caffeine.
Days 4 to 15	▪ Slippery elm powder: 1–2 heaped teaspoons of slippery elm powder with copious (240 mL) water, to allow it to swell in the GIT. ▪ Herbal antioxidant (green tea, grape seed extract, turmeric, rosemary): 2 tablets at night before bed or on an empty stomach, at least 2 hours away from food	▪ Gradually introduce clean, fresh foods ▪ Daily consumption of green tea
Day 15	Repeat protocol for another 14 day cycle if desired	

Case Study

A 42-year-old male presented with chronic digestive issues (probably a version of irritable bowel syndrome) as a result of long-term antibiotic use 6 years prior for chronic sinus infections. He had taken amoxicillin for 2 continual years, with no improvement in his sinus health over this time. The patient presented with chronic bloating, foul flatulence, constant nausea, joint pain and intense itchiness of the skin, particularly of the anus. He experienced heartburn after each meal, regardless of what he had eaten, had marked carbohydrate cravings, despite feeling fatigue and abdominal spasms after fruit, bread, rice and pasta consumption. He craved beer and consumed two glasses on a daily basis. His mood fluctuated between depression and irritability. He was about 18 kg overweight for his height, and had slowly gained the weight over the past 10 years. He was sedentary in lifestyle, due to a lack of energy although he wished to be more physically active.

He emptied his bowels up to four times daily, with variability in form from looseness to constipation, accompanied by sharp pain. Urgency in both bowel and bladder use were concerning him. His prostate was evaluated as normal in size and function. He noted an aching pain in his kidney area and has experienced unusual loss of patches of hair within his beard.

Comprehensive Diagnostic Stool Analysis (CDSA) results indicated positive markers for dysbiosis and suboptimal digestion and absorption. Bacteriology revealed no detectable growth of Lactobacillus species and a low level growth of bifidobacteria with moderate levels of growth of streptococcus, *Hafnia alvei* and *E. coli*. He was positive for *Helicobacter pylori*. Inflammation markers were high, but no ova or parasites were detected. Urinary organic acid testing revealed poor fatty acid and carbohydrate metabolism, poor citric acid cycle (resulting in key symptom of depression and fatigue) with high inflammation and intestinal dysbiosis markers of bacteria, yeast and fungi. The patient was also exhibiting classic features of adrenal fatigue (which was not confirmed at this stage by testing.)

The following treatment was advised.

Week 1

- Diet: Fast and consume only steamed or lightly stir fried nonstarchy vegetables, with a focus on the Brassica group; no alcohol and caffeine
- Garlic tablets: 3 tablets per day on the weekends
- Slippery elm powder: 1 rounded tablespoon mixed briskly into 200 mL purified water morning and night on weekday only
- Herbal antioxidant (green tea, grape seed extract, turmeric, rosemary): 2 tablets at night before bed during the weekdays only

Weeks 2–6

- Garlic tablets: 3 tablets per day on the weekends
- Slippery elm powder: 1 rounded tablespoon mixed briskly into 200 mL purified water morning and night on weekday only
- Herbal antioxidant (green tea, grape seed extract, turmeric, rosemary): 2 tablets at night before bed during the weekdays only
- Diet: Anticandida dietary guidelines (no sugar, starch, refined carbohydrates, caffeine or alcohol)

After the initial 7 days on the protocol, the bowel flora program was repeated, with the addition of an herbal formula to further support the mucosal immunity in the GI tract. The anticandida diet of was to be implemented for 12 weeks.

Herbal Formula

Hydrastis canadensis	1:3	30 mL
Arctostaphylos uva-ursi	1:2	40 mL
Gymnema sylvestre	1:1	40 mL
Calendula officinalis	1:2	30 mL
Glycyrrhiza glabra HG	1:2	20 mL
Echinacea root blend	1:2	20 mL
		200 mL

Dose: 8 mL twice daily 15 minutes before meals.

Treatment Rationale

With the positive diagnosis of advanced intestinal dysbiosis the first step was the implementation of a bowel flora protocol. As the sinus infections were unresolved with antibiotic therapy it was possible they were due to chronic fungal infection, compounded by food sensitivity due to low GI mucosal immunity.

- Golden seal was included for its trophorestorative action on the mucous membranes of both the GI and sinus, and for its antimicrobial activity.
- Uva ursi was included for its high tannin content, as an antibacterial to inhibit the growth of *Hafnia alvei* in the GIT.
- Gymnema was selected to manage pancreatic function and assist in the reduction of sugar cravings. Gymnema can dramatically improve patient dietary compliance, which is central to long-term management of dysbiosis.
- Calendula was incorporated as an anti-inflammatory and vulnerary for the GIT.
- Licorice was added also to reduce the inflammatory response, to soothe the irritated mucous membranes and to support adrenal function.
- Echinacea root blend to improve mucosal immunity and as a general immune modulator, given the history of recurrent infections.

In addition to the benefit in the bowel flora protocol the turmeric in the herbal antioxidant tablet provides liver support for detoxification of the endotoxin liberation from bacterial and fungal die off. This helps in reducing the associated muscle ache, headaches and nausea.

Second Consultation (6 weeks later)

The patient had achieved remarked improvement. He had lost 11 kg in weight as a result of dysbiosis management, frequency of bowel motions improved (twice daily) and occurred without any pain. Stools were of normal color and reduced odor; flatulence had improved by approximately 80% and there was no odor to the gas. The rectal itching had resolved, as had the itchiness of the skin. Reflux had improved dramatically after 3–4 weeks in the program. The sinuses were less congested, such that he could breathe clearly at night. As a result of better quality sleep and adrenal support, he was waking feeling refreshed and had more sustained energy throughout the day. The aching in the kidney area was resolved, as was most of the joint ache.

Despite the difficulty in the first week of the program with the dietary changes and fasting, he now has a more controlled appetite, yet able to eat more and feel less full after eating. His craving for carbohydrates had dissipated.

The protocol remained unchanged for a further 6 weeks before CDSA and urinary organic acid analysis was performed.

Conclusion of Care

Test results came back illustrating a significant improvement in bowel flora and resultant digestive health. There was strong growth of both Lactobacillus species and bifidobacteria with negligible levels of growth of streptococcus, *Hafnia alvei* and *E. coli*. He was now testing negative for *Helicobacter pylori*. Inflammation markers were now within normal ranges.

He is maintained on the following:

- Herbal antioxidant: 2 tablets each night before bed to inhibit the regrowth of pathogenic flora, anti-inflammatory, liver support and antioxidant for general preventative medicine.
- *Echinacea angustifolia* and *E. purpurea* root: 2 tablets each morning for general immune support.
- Tablets containing *Withania somnifera* and *Panax ginseng*: 2 tablets a day for adrenal support and stress management.

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