The new herbal bitters: New uses for the most ancient of tastes

TRADITIONAL ROOTS CONFERENCE
MAY 19-21 2017
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- Herbalist since 1984, Registered Herbalist with American Herbalist Guild.
- Former Associate Professor of Botanical Medicine with National College of Natural Medicine in Portland, Oregon.
- Former Assistant Professor at Bastyr University, in Kenmore Washington
- Lead Naturopathic Physician with Herb Pharm and adjunct professor at NUNM in Portland, Oregon.
Digestive Problems are Big Health Concerns

- Stress (acute, chronic)
- Cigarette smoking
- Low stomach hydrochloric acid
- Lack of exercise
- Environmental toxins, irritants, heavy metals
- Genetics
- Poor quality food
- DRUGS (prescription, over-the-counter, recreational)
- Infection (parasites, yeast, viruses, bacteria, fungi)

Digestive Concerns: In the News

- Chronic fatigue syndrome: Could altered gut bacteria be a cause?
  Researchers find that people with chronic fatigue syndrome have an altered gut microbiome, which may shed light on the cause of the elusive condition.
  28 Jun 2016

- Gut bacteria may have role in bile duct cancer
  Links between gut bacteria and gastrointestinal cancer are well established. Now, scientists reveal bacteria in the bile duct may also be linked to cancer.
  27 Jun 2016

- High-fiber diet alters gut bacteria to protect against food allergy
  A high-fiber diet rich in vitamin A may lower the risk of food allergy, suggest researchers who found that it protected against peanut allergy in mice.
  26 Jun 2016

- Food pathogen detection via handheld ‘nanoflower’ biosensor
  Researchers have created a nanoflower biosensor that recognizes and amplifies signals from E. coli so they can be seen with a simple handheld pH device.
  19 Jun 2016

- Specific gut bacteria reverse autism-like behavior in mice
  Could autistic traits be partially controlled by the bacteria in our guts? New research demonstrates that this is a genuine possibility.

- What’s the Connection Between Diabetes and Diarrhea?
  Learn about the connection between diabetes and diarrhea, including the medication and...
### Top 25 Prescription Drugs Filled 2016

1. **Atorvastatin Calcium** (generic of Lipitor)
2. **Levothyroxine** (generic of Synthroid)
3. **Lisinopril** (generic of Prinivil)
4. **Omeprazole** (generic of Prilosec)
5. **Metformin** (generic of Glucophage)
6. **Amlodipine** (generic of Norvasc)
7. **Simvastatin** (generic for Zocor)
8. **Hydrocodone/Acetaminophen** (generic for Lortab)
9. **Metoprolol ER** (generic for Toprol XL)
10. **Losartan** (generic for Cozaar)
11. **Azithromycin** (generic for Zithromax)
12. **Zolpidem** (generic for Ambien)
13. **Hydrochlorothiazide** (generic for Microzide)
14. **Furosemide** (generic for Lasix)
15. **Metoprolol** (generic for Lopressor)
16. **Pantoprazole** (generic for Protonix)
17. **Gabapentin** (generic for Neurontin)
18. **Amoxicillin** (generic for Amoxicillin)
19. **Prednisone** (generic for Deltasone)
20. **Sertraline** (generic for Zoloft)
21. **Tamsulosin** (generic for Flomax)
22. **Fluticasone** (generic for Flonase)
23. **Pravastatin** (generic for Pravachol)
24. **Tramadol** (generic for Ultram)
25. **Montelukast** (generic for Singulair)

**Source:** www.lowestmed.com

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### Special Report: Choosing a PPI

**Choosing a PPI To Treat Heartburn, Acid Reflux & GERD**

**What is GERD?**
You may know GERD as heartburn or acid reflux. GERD stands for gastroesophageal reflux disease. It occurs when the ring of muscles between your stomach and your esophagus—the tube that leads from your throat to your stomach—doesn’t work right. The muscles either don’t close all the way, or they close too often. Then acid from your stomach can back up, or reflux, into your esophagus. This causes that burning feeling that starts in your chest and moves up into your throat.

**Treatment**
Treatment depends on how often you have heartburn symptoms.
- If you don’t get heartburn often, try taking an over-the-counter antacid, like Maalox or Tums. If these do not work, you can try an H2 blocker, like Pepcid or Zantac. They work more slowly than antacids, but they provide relief for a longer time.
- If you have heartburn more than twice a week for more than four weeks and antacids don’t help, you need to see a doctor. You probably need a medicine called a proton pump inhibitor (PPI).
- Talk with your doctor about the role that dietary and lifestyle changes can play in alleviating heartburn, too. Such changes can work on their own and when taken with a PPI.

**Taking a PPI for GERD**
We compared seven proton pump inhibitors (PPIs). This is what we found:

- **All PPIs work well.** All the PPIs completely relieved symptoms for about seven out of 10 people within four weeks. And they all healed damage to the esophagus in about eight out of 10 people within eight weeks.
- **All PPIs are generally safe for short-term use.** PPIs can cause some minor side effects, such as headache and diarrhea. But most people can use PPIs without problems. And most need a PPI for only a few months. If PPIs are used for more than a few months, there is a higher risk of pneumonia, infection, and fractures.
- **PPIs differ a lot in price.** Over-the-counter PPIs cost about $17–$24 per month. Prescription generic PPIs cost $58–$163 per month. Prescription brand-name PPIs cost $183–$374 per month.

**Our advice:**
1. We chose the following as Consumer Reports Best Buy Drugs. You can get them without a prescription.
   - **Generic omeprazole OTC**

**Source:** www.consumerreports.org
Herbal Organoleptics: The Sensory Experience

- **Organoleptic Defined:**
  - Making an impression upon an organ. Said of the effect or impression produced by any substance on the organs of touch, taste or smell, and also on the organism as a whole.
  - Herbs work well to stimulate the senses and may derive much of their therapeutic action to taste and smell.
  - Bitter tastes are common in herbs.

The Sense of Smell and Taste

- Each odor molecule fits like a lock and key onto a specific receptor site on the olfactory epithelium. When stimulated the epithelium triggers nerve cells electrical impulses to stimulate the olfactory bulb in the brain.
- The olfactory bulb stimulates impulses to the gustatory center for taste and the amygdala where emotions and memory are stored.
The Senses of Taste and Smell

This is why that a simple smell can effect mood, blood pressure, heart rate, breathing, memory, hormone levels and stress levels.

The Five Basic Tastes

5 Basic Tastes

- **Sweet** (Sugar, Chocolate, etc.)
- **Salty** (Salt, etc.)
- **Umami** (Soup Stock of Kombu and Bonito etc.)
- **Sour** (Vinegar, Lemon, etc.)
- **Bitter** (Coffee, Bitter Gourd, etc.)
How do bitters work?

- Taste buds are distributed in distinct fields in the oral, pharyngeal, and laryngeal epithelia, with each field innervated by a different cranial nerve branch.
- The taste buds of the laryngeal epithelium are thought to be involved more with protection of the airways.
- Taste receptors have also been identified in a variety of non-gustatory tissues, such as the gut, where they have been proposed to play a role in nutrient and toxin sensing.
- The taste signals course through the brain and provide input to circuits that subserve various functions, such as motor and physiological reflexes, discriminative perception, and affective processing.

Clinical Therapeutics/Volume 35, Number 8, 2013
The bitter reflex and its Gastrointestinal implications

- When a bitter substance is recognized by bitter receptors on the tongue, a chain of neural and endocrine events begins, labeled as the “bitter reflex.” Mediated by the release of the gastric hormone gastrin, this reflex results in an overall stimulation of digestive function, which over time strengthens the structure and function of all digestive organs (liver, stomach, gallbladder, pancreas, etc.)
- Starting in your mouth, you’ll notice that your salivary glands have increased their output of enzyme-rich saliva, helping to break down complex starches into smaller and more easily digested oligosaccharides.
- In the stomach, the hormone gastrin has stimulated the secretion of hydrochloric acid.
- The acidity helps break down protein, enhances the bioavailability of many minerals (especially calcium) and destroys any harmful microbes present in your food.

Many types of Mammalian Taste Receptors

<table>
<thead>
<tr>
<th>Mammalian taste receptors and cells</th>
<th>Umami</th>
<th>Sweet</th>
<th>Bitter</th>
<th>Sodium</th>
<th>Sour and carbonation cells</th>
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<td>L-amino acids</td>
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<td>Nucleotide enhancers</td>
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<td>Sugars</td>
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<td>Sucrose, fructose, glucose</td>
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<td>Artificial sweeteners</td>
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<td>CA IV</td>
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<td>Carbonated drinks</td>
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From Willow

Botanical Toxins
Many type of bitter receptors

- Type 2, bitter receptors were first characterized in 2000: TAS2R1 – TAS2R50, and TAS2R60. There are 50 + type of bitter receptors as opposed to 2-3 types of sweet receptors.
- The TAS2R proteins function as bitter taste receptors. There are 43 human TAS2R genes.
- Gustducin is the most common taste G protein subunit, having a major role in TAS2R bitter taste reception.
- Gustducin and Transducin are G proteins and have been shown to be structurally and functionally similar, leading researchers to believe that the sense of taste evolved in a similar fashion to the sense of sight.

Bitter receptors

- Agonist for human bitter taste receptors are structurally diverse.
- Individual bitter agents stimulate specific bitter receptors.

Cellular and Molecular Life Sciences 63: 1501-1509, 2006
Bitter receptors are found all over the body

- Old thought was that bitter receptors were on the back of the tongue only
- Now we know bitter receptors are found all over the digestive tract and beyond
- Recent research has found them in the lungs, bronchi and in the placenta and thyroid gland
- Bitters receptors seem to be important to humans!

Polymorphisms in bitter taste receptor genes

- An important question for human bitter taste research is how individualized the perception of different bitter compounds is. It appears that humans vary greatly with regard to bitterness perception of some bitter compounds
- As more and more TAS2Rs are being deorphanized and therefore become accessible for functional analyses of receptor variants, the number of known functional polymorphisms will increase considerably in the future.
- It will then be very interesting to see how personal bitter taste perception might influence dietary habits and, ultimately, health.

Cellular and Molecular Life Sciences 63: 1501-1509, 2006
Taken together, the findings suggest that the taste transduction cascade is not restricted to taste per se or even to systems regulating food intake. The receptors mediating taste transduction evolved early in the vertebrate lineage, and were adopted widely as a chemodetection system in a variety of organ systems. Questions still remain as to what the natural ligands are for many of the nongustatory functions of the “taste” transduction system.
Bitter taste perception pre Neanderthal

Study Summary:

- The most extensively studied taste variation in humans is sensitivity to a bitter substance called phenylthiocarbamide (PTC). Although approximately 75 per cent of the world population perceives this substance as intensely bitter, it is virtually inosensitive for the remaining 25 per cent of the population (Kim & Downes 2008). This is owing to a dominant 'taster' allele that shows a similar frequency to the recessive 'non-taster' allele. PTC inos is not found in any vegetable, but chemically similar substances that produce an identical response to PTC are present in many plant foods (including Brussel sprouts, cabbage, broccoli and others). It was discovered (Kim & Downes 2008) that most of the variation in PTC sensitivity is determined by the TAS2R38 gene, which encodes the bitter taste receptors at the T1R2/3 heteromer, a single 1002 bp coding exon that encodes a 334 amino acid protein containing 12 cysteines. The TAS2R38 gene has three amino-acid changes in high frequencies that determine only the main haplotypes. These polymorphisms are found in position 49 (coding proline or alanine), 362 (alanine or valine) and 296 (valine or isoleucine) of the gene. The two most common haplotypes are proline-valine-isoleucine (PAV) and alanine-valine-isoleucine (AV). PAV is the major taster haplotype (encoding one or two copies), and AV is the major non-taster haplotype (encoding two copies). AAV PAV heterozygotes have slightly less sensitivity to PTC (Downes 2008). Of the three common variants, the isoleucine substitution at the amino-acid residue 49 (AAV) shows the strongest association with taster status, a predisposition that position does appear in PTC taste polymorphism. Downes (2008) also identified heterozygous AAV, PAV and AAV

- Neanderthal A49P heterozygote is that this polymorphism pre-dates the split of Neanderthal and modern human lineages, known to have been at least half a million years ago

Herbal bitters: Historical

- The earliest origins of bitters can be traced back as far as the ancient Egyptians, who may have infused medicinal herbs in jars of wine.
- This practice was further developed during the Middle Ages, where the availability of distilled alcohol coincided with a renaissance in pharmacognosy.
- Many of the various brands and styles of digestive bitters made today reflect herbal stomachic and tonic preparations whose roots are claimed to be traceable back to Renaissance era pharmacopeia and traditions.
- By the 19th century, the British practice of adding herbal bitters (used as preventive medicines) to Canary wine had become immensely popular in the former American colonies.
- By 1806, American publications referenced the popularity of a new preparation termed cocktail, which was described as a combination of “a stimulating liquor, composed of spirits of any kind, sugar, water, and bitters.”

Herbal bitters: A long history of Use

- Has a long historical use as medicine and drinks
- Any plant that tastes bitter is bitter
- Many herbal drinks are bitter
- Many bitters are also classified as a tonic.
- You know when it is bitter!
- Rediscovered recently in food and medicine.
- Many new studies on the action of bitters and effects on physiology.
Historical Ideas about bitters

- The bitters are considered as tonic and stomach. To improve the appetite when taken in moderation. The best time is early in the morning or an hour before meals.
- From Dick’s Encyclopedia of Practical Receipts and Processes (1872)
- The bitters only work if you taste them.

Historical Sayings about bitters

- Sweet to the taste buds, bitter to the stomach
- Bitter to the tongue, then sweet to the stomach
- The bitters are a tonic for all digestion and especially promote acid secretion
Traditional indications for bitters

- Loss of appetite, low HCL
- Indigestion, bloating, gas
- Nausea, diarrhea, constipation
- Abdominal distention
- Malnutrition, malabsorption
- Weakness, pale skin with edema
- Yellow or white tongue coating
- Atonic digestion and elimination
- Depression and or mood disorders
- Digestive issues that come with aging.

Traditional contra-indications of bitters

CONTRA-INDICATIONS

- Avoid in cases of acute GI inflammation, irritation
- Avoid in pregnancy
- Avoid in children under 5
Types of Herbal bitters

- **True bitters: Only bitter**
  - Centaurium umbellatum
  - Gentiana lutea
  - Hydrastis canadensis
  - Mahonia aquifolium
  - Aloe spp. Bitter Aloe

- **Aromatic bitters: bitter with flavor**
  - Artemisia absinthium
  - Achillea millefolium
  - Humulus lupulus

- **Nutritional bitters with Prebiotics**
  - Taraxacum
  - Articum
  - Inula
  - Angelica
  - Cynara

Current summary of how bitters improve digestion

- **Cephalic Vagal Response**
- **Better Digestion**
- **Hyperemia, increase abdominal blood flow**
- **Alcohol (with bitters) improves digestion**
- **Local reflex, increase secretions**
New bitter concepts

- The bitter receptors TR2 a family of G protein coupled receptors
- Can sense over 100 types of bitters based on testing
- Can have effects without tasting the bitterness
- Chronic inflammation can over express TR2 receptors leading to adverse response to bitters
- The bitters stimulate natural incretins and hence stimulate insulin and lower glucose
- The bitters may act directly as endocrine triggers, by passing the CNS
- Stimulate Hyperemia increasing GI blood flow
- The bitter may lead to less obesity and improve metabolic syndrome via increase fullness, and hormone stimulation
- Lack of bitter sensitivity may contribute to alcoholism

The bitter truth: It is good for us!

- The effect of bitters also extends to the pancreas. With bitters, digestive enzyme secretions are increased, helping to promote the complete breakdown of nutrients into their absorbable units, preventing gas formation when large molecules are acted upon by bacteria further down the small intestine.
- The complete breakdown of proteins is particularly important, as the cross reactivity of immune cells between undigested protein molecules and intestinal cells plays an important role in the etiology of conditions such as celiac disease and allergies
- Insulin and glucagon secretions are stimulated, helping to normalize blood sugar levels.
- Our cravings for sweetness may mask cravings for bitterness.
- Thus, the taste of bitter can be used to strengthen the most fundamental aspect of our health—the ability to extract the nutrients from our foods and nourish our bodies. Over time, they will lessen symptoms of poor digestive function such as gas and bloating, constipation, loose stools and food allergies; enhance vitamin and mineral absorption; promote balanced blood sugar levels; protect the liver and strengthen eliminatory function; moderate inflammatory damage to the gut wall; and reduce the incidence of allergic.
New actions for bitters

- Blood Sugar Support
  - Incretin effect
  - Probiotics from bitter herbs
- Cardiovascular effects
  - Lipid Moderating
  - Metabolic syndrome
- Supports decrease craving for alcohol
- Thyroid Balance
  - The bitter receptors found in thyrocytes
  - Can block or enhance TSH production
- Vascular effect increase gut circulation, increase BP
- Neuronal effects
  - Stimulate endocrine hormones via gut
  - Improved digestion, absorption
  - Appetite stimulant, but increase satiety and weight loss
- Chronic Inflammation
  - Pro inflammatory compounds serve to over express T2Rs. Leading to adverse bitter response
  - The bitters can down regulate Tumor Necrosis factor receptors

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*Review Article*

**Bitters: Time for a New Paradigm**

Michael K. McMullen,1,2 Julie M. Whitehouse,3 and Anthony Towell3

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2Department of Life Sciences, Faculty of Science and Technology, University of Westminster, London W1B 2HW, UK
3Department of Psychology, Faculty of Science and Technology, University of Westminster, London W1B 2HW, UK

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Changes in systolic blood pressure

![Graph showing changes in systolic blood pressure](image)
Bitters can influence all phases of digestion

- Cephalic, Taste
- Gastric
- Intestinal

Facial reactions to bitter foods

The results indicated that high BMI (Body mass index) participants reacted to bitter stimuli showing more profound changes from baseline in neutral and disgust facial expressions compared with low BMI. No differences between groups were detected from the subjective pleasantness and familiarity.
THE INCRETIN EFFECT

- This phenomenon has been dubbed the 'incretin effect' and is estimated to account for approximately 50-70% of the total insulin secreted following oral glucose administration.
- Thus, incretins are hormones that are secreted from the gastrointestinal tract into the circulation in response to nutrient ingestion that enhance glucose-stimulated insulin secretion.
- The term 'incretin' was subsequently used to denote these glucose-lowering, intestinal-derived factors.
- The bitters stimulate natural incretins and hence stimulate insulin and lower glucose.

The bitters stimulate natural incretins
Research on bitters

**TAS1R-** and **TAS2R-type taste receptors** are expressed in the gustatory system, where they detect sweet- and bitter-tasting stimuli, respectively. These receptors are also expressed in subsets of cells within the mammalian gastrointestinal tract, where they mediate nutrient assimilation and endocrine responses. These findings suggest that a functionally compromised **TAS2R receptor negatively impacts glucose homeostasis**, providing an important link between alimentary chemosensation and metabolic imbalance.

Together with recent findings by others provide evidence that prebiotics could be a useful tool for controlling food intake and glucose homeostasis and promising agents for maintaining or restoring both glucose and energy homeostasis.
Bitters and Thyroid Function

Our findings indicate that TAS2Rs couple the detection of bitter-tasting compounds to changes in thyrocyte function and T3/T4 production. Thus, TAS2Rs may mediate a protective response to over ingestion of toxic materials and could serve as new targets for therapeutic treatment of hypo- or hyperthyroidism.

Bitters and Alcohol Consumption

In summary, taste perception is a complex trait influenced by numerous genes. Further, there are European American and African-American population differences in the frequency of these variants. We have observed modest findings with 2 genes, which contribute to bitter-taste sensitivity and influence alcohol consumption. As alcohol consumption is a necessary precursor leading to alcohol dependence, taste perception may represent one of the many pathways that contribute to the development of or protection against alcohol dependence.
Bitters in Formulation

- True bitters are commonly and historically mixed in combination with aromatic and carminative herbs
- Lessens the ability of bitters to cause bowel cramping
- Warms the formula
- Commonly use mints, fennel, anise, calamus, Ginger or aromatic bitter herbs in combinations

Dosing bitters

- Generally small doses, repeated frequently
- 15-30 drops of extract, or 0.5-1.0 ml
- Larger doses may improve action, but increase slowly
- Before meals or after
- Present to the taste buds as tea or extract
- Capsule and tablet of bitters have been found to be useful for GI tract bitter receptors and general systemic effects
Take the 30 day bitter Challenge!

- To improve your digestion and overall health, take the 30 day bitter challenge.
- Find a bitter formula, herb or combination that has one of the true bitters or Eupeptic Bitters.
- Take 10-30 drops of the bitter before meals, ideally 10 minutes, or after meals.
- Take enough to get strong bitter sensation and "bitter shudder".
- Continue for 30 days, moving the dose up or down depending on reaction.
- Assess your health before or after.

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**Metabolic Detoxification Questionnaire**

**Part 1: Symptoms**

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<tr>
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<td>Black or dark circles under eyes</td>
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<td>Discharge from ear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ringing in ears, hearing loss</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Scale</th>
<th>Total</th>
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<tbody>
<tr>
<td>Stuffy nose</td>
<td></td>
<td></td>
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<tr>
<td>Sore throat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sore throat, hoarseness, loss of voice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swollen or discolored tongue, pain, or taste</td>
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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Scale</th>
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<tbody>
<tr>
<td>Digestive Tract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea, vomiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diarrhea</td>
<td></td>
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<tr>
<td>Constipation</td>
<td></td>
<td></td>
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<tr>
<td>Blurred thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birchling, passing gas</td>
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<td></td>
</tr>
<tr>
<td>Headaches, pressure on face</td>
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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Scale</th>
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<tbody>
<tr>
<td>Intestine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain or aches in joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stiffness or limitation of movement</td>
<td></td>
<td></td>
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<tr>
<td>Pain or aches in muscles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling of weakness or tiredness</td>
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</table>

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Scale</th>
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<tbody>
<tr>
<td>Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slim and asthenic</td>
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<td></td>
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<tr>
<td>Drooping or drooping</td>
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</tr>
<tr>
<td>Increased weight</td>
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<tr>
<td>Constipated eating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water retention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Scale</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy/Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue, sluggishness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apathy, lethargy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache(s), dizziness</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Scale</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor memory</td>
<td></td>
<td></td>
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<tr>
<td>Confusion, poor comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor concentration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor physical coordination</td>
<td></td>
<td></td>
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<tr>
<td>Physical and mental depression</td>
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</tbody>
</table>
Our famous bitters (Eupeptic)

Gentiana lutea (Gentian)

- **Common names:** Bitter Root, Bitterwort, Gall Weed, Gentiana, Gentianae radix, Pale Gentian, Stemless Gentian, Yellow Gentian, Wild Gentian, Qin Jiao.
- **Family:** Gentianaceae
- **Listed in:** USP 1820-1955, and the NF 1955-1965
- **Medicinal parts:** root and rhizome
- **Preparations:** dried root may be decocted or powdered and encapsulated. Dried or fresh root may be tinctured
Gentiana lutea

CHEMICAL CONSTITUENTS

- Gentiopicroside - a bitter principle. One of the most bitter substances known. Comprises 1-2% of the fresh root.
- Genistic Acid (Genistin) - an organic acid
- Tannic acid - tiny amounts
- Quinonic acid - minute amounts
- Isovitexin
- Vanillic acid
- Gentian contains very little tannin and is considered a pure peptic bitter.

Chromatographic Evaluation and Characterization of Components of Gentian Root Extract Used as Food Additives

Yoshiaki Amakura,⁎,⁎,⁎ Morio Yoshimura,⁎,⁎ Sara Morimoto,⁎ Takashi Yoshida,⁎ Atsuko Tada,⁎ Yusai Ito,⁎ Takeshi Yamazaki,⁎ Naoki Sugimoto,⁎ and Hiroshi Akinyama⁎

⁎College of Pharmaceutical Sciences, Matsuyama University; 4-2 Bunkyo-cho, Matsuyama, Ehime 790–8578, Japan
⁎⁎National Institute of Health Sciences; 1–18–1 Kamiyoga, Setagaya-ku, Tokyo 158–8501, Japan
⁎⁎⁎Faculty of Home Economics, Kyoritsu Women's University; 2–1–1 Hizasaishita, Chiyoda-ku, Tokyo 101–8437, Japan
and ⁣Faculty of Human Life Sciences, Jissen Women's University; 4–1–1 Osakawa, Hino, Tokyo 191–8510, Japan.
Received October 9, 2015; accepted November 9, 2015.

Gentian root extract is used as a bitter food additive in Japan. We investigated the constituents of this extract to acquire the chemical data needed for standardized specifications. Fourteen known compounds were isolated in addition to a mixture of gentisin and isogenisin: anoficanic acid, 2-methoxyanoficanic acid, furan-2-carboxylic acid, 5-hydroxymethyl-2-fural, 2,3-dihydrorubenzonic acid, isovitexin, gentiopicroside, loganic acid, sweroside, vanillic acid, gentisin 7-O-primoverside, isogenisin 3-O-primoverside, 6'-O-glucosylgentiopicroside, and swertiamaroside D. Moreover, a new compound, loganic acid 7-(2'-hydroxy-3'-O-β-D-glucopyranosyl)benzoate (1), was also isolated. HPLC was used to analyze gentiopicroside and amarogentin, defined as the main constituents of gentian root extract in the List of Existing Food Additives in Japan.

Key words gentian root extract; Gentiana lutea; food additive; bittering agent; iridoid

Chem Pharm Bull (Tokyo) 2016;64(1):78-82
Gentian Root

**ACTIONS**
- Cholagogue
- Bitter tonic
- Gentian is stimulating to digestive organs, mucosal tissues, and portal circulation.

**INDICATIONS**
- GI atony, poor digestion, low stomach acidity.*
- Portal Congestion
- General GI debility, atony, flatulence, anorexia *

**CONTRAINDICATIONS**
- Avoid in cases of acute GI inflammation
- Avoid in pregnancy

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Gentian Root: *Specific Indications*
*(Felter Materia Medica 1922)*

- **Action and Therapy.**—One of the best of the simple bitter tonics. However, large doses can produce nausea, vomiting, and diarrhea, and fullness of the pulse, with headache.
- Chief use is to promote appetite and improve digestion in states of chronic debility.
- For atony of the stomach and bowels, with feeble or slow digestion, it is an ideal stimulating tonic; and after prolonged fevers and infections, when the forces of life are greatly depressed and recovery depends upon increased power to assimilate foods, gentian may be used to improve gastric digestion and thus hasten the convalescence.
- Gentian is especially useful in anorexia, in the dyspepsia of malarial origin, and in subacute gastritis and intestinal catarrh.
However, a trend for a higher response of glucagon-like peptide-1 after EBIP than after CP was observed. EBIP determined a significant 30% lower energy intake over the post-lunch period compared with CP. These findings were consistent with the tailored release of bitter-tasting compounds from EBIP along the gastrointestinal tract. This study demonstrated that microencapsulated bitter secoiridoids were effective in reducing daily energy intake in humans.

**Gentian Summary**

- Gentian is the quintessential bitter. It is one of the most bitter substances on the planet.
- Gentian has tonic effect on the entire constitution. It has the classic "sweet taste, followed by bitter taste" characteristic of many constitutional tonics (example: ginsengs).
- Gentians are found all over the planet. Every indigenous people has had access to a gentiana.
- A true bitter can taste in a 1 to 30,000 dilution.
- Cold and drying nature.
The Green Fairy

ARTEMISIA ABSINTHIUM (WORMWOOD)

Wormwood

- Wormwood
- The Green Fairy
- La fee verte
- The Green Muse
- From Greek work “apsinthion” meaning undrinkable
Historical Uses of Wormwood

- In the Bible, grew in the Garden of Eden.
- Ebers Papyrus 1550 B.C earliest written use.
- Pliny the Elder noted its use against worms.
- John Gerald 1597 Herbal, noted gastric tonic.
- 18th century use as popular drink Absinthe.

Chemistry of Wormwood

- Volatile Oils: monoterpenes alpha and beta thujone, chamazulene.
- Sesquiterpene lactones (bitters) including, absinthin and others.
- Acetylenes: In the root.
- Flavonoids: quercetin and others
- Phenolic Acids: coumaric and vanillic
- Lignans.
Traditional Clinical Uses

- Choleretic
- Anthelmintic, antiparasitic
- Stomachic, bitter
- Stimulates appetite
- Sweet smell contrasts to bitter taste.
- Bittersweet medicines use to promote balance.
- Good for integration of physical and emotional levels.
- Useful for breaking the cycle of destructive behavior.

Wormwood: Keys

- Long history of medicinal use and abuse
- Used to shift human thoughts
- Powerful nervine herb that affects consciousness
- Used to bring emotion and spiritual balance
- A bittersweet medicine
Quassia: Quassia amara

Quassia amara
Formaly as: Picraena excelsa (LINDL.)
Family: N.O. Simarubaceae

- Synonyms—Bitter Wood, Jamaica Quassia, Bitter Ash, Quassia Amara (Linn.), Quassia Lignum, B.P.
- Part Used—Wood of trunks and branches.
- Habitat—Jamaica.

Quassia, also known as Jamaica Quassia and Bitter Wood, is a small, shrubby tree native to the West Indies. Its species name, amara, is derived from the Spanish word amargo, which means “bitter.”

- The name fits since the bark of the tree contains quassin, a substance 50 times more bitter than quinine. In fact, it’s the bitterest naturally-occurring chemical known to exist.

Quassia amara: Tropical bitter

- In the wood a share of 0.09 to 0.17% of quassin and 0.05 to 0.11% of neoquassin was detected in Costa Rican plants.
- Quassin is one of the most bitter substances found in nature.

- Other identified components of bitterwood are: beta-carbolines, beta-sitostenone, beta-sitosterol, dehydroquassins, gallic acid, gentisic acid,
Dandelion: Earth Nail

**Family:** Asteraceae

**Habitat:** Found throughout most of the world, particularly the Northern hemisphere

**Collection:** The roots are best collected between June and August when they are at their most bitter. Split longitudinally before drying. The young leaves may be collected at any time, although those collected in the spring are less bitter.

**Part Used:** Root and/or leaf

**Taste:** Bitter, salty, sweet

**Temperature:** Cold

**Channels:** Liver, Gall Bladder, Spleen, Bladder
**Taraxacum officinale**

- **Actions:**
  - Diuretic (leaf), hepatorestorative, hepatoprotective
  - Choleretic, cholagogue, anti-inflammatory
  - Anti-rheumatic, gentle laxative, alterative,
  - Anti-hypertensive, stomachic, tonic, bitter

- Root is for liver, leaves are for kidney
- Leaves are a potassium rich diuretic. Supportive in blood pressure
- Root is a choleretic and cholagogue. Useful for liver and biliary problems of all kinds.
Taraxacum officinale

- **Preparations & Dosage:**
- Decoction: put 1-3 teaspoonful's of the root into one cup of water, decoct for 10-15 minutes.
- If using leaves, infuse rather than decoct for 10-15 minutes. This should be drunk three times a day.
- The leaves may also be eaten raw in salads or steamed as a spring green.
- Juice of the pureed leaves: sig up to 20 ml/ day
- Extract (1:5 40 % EtOH): 2.8 ml of the root and/or leaf

Cynara scolymus (Artichoke) Fruit and Leaf
**Cynara scolymus (Artichoke)**

- Common names: Artichoke, globe artichoke, Fruit eaten as a vegetable
- Member of the daisy (Asteraceae) family
- Pleasantly bitter taste in fruit
- Leaves extremely bitter
- Combines both liver and gallbladder action
- Well research to support liver and lipid levels

**Cynara**

- Anti-toxic
- Liver tonic, restorative, stimulates bile production, relieves gas, relieves cramping, relieves nausea
  - Promotes liver cell regeneration
  - Promotes blood flow to the liver
  - Stimulates bile production (Caffeoylquinic acids, e.g. Cynarin)
- Aids in metabolism of blood lipids
- Decreases cholinesterase and supports healthy liver composition.
- Classic remedy for indigestion
Cynara

Chemical constituents
- Up to 2% phenolic acids, mainly 3-caffeoylquinic acid (chlorogenic acid)
- 1,5-di-O-caffeoylquinic acid (cynarin)
- Caffeic acid
- 0–4% bitter sesquiterpene lactones of which 47–83% is cynaropicrin
- 0.1–1.0% flavonoids including glycosides
- Phytosterols (taraxasterol)
- Sugars
- Inulin
- Enzymes
- Volatile oil consisting mainly of sesquiterpenes
  - β-selinene
  - Caryophyllene

Humulus lupulus: Wolf plant

As the ancients said, hops grew "wild among willows, like a wolf among sheep," hence the name *Humulus lupulus*
Hops: Strobile

*Humulus lupulus*: Hops

- Family: Cannabaceae
- Same family as Cannabis
- Part Used: Female Strobiles
- The plants are unisexual (separate male and female plants).
- Both plants contain a resin that has strong physiologic properties.
- Marijuana contains THC (tetrahydrocannabinol) and Hops contains Lupulin.
Hops: Chemistry

- **Volatile oil** (humulene, myrcene, caryophyllene, farnesene);
- 15-25% resinous bitter principles
- **Organic Acids** known as alpha acids and beta acids
- **Estrogenic substances** (Phytosterols).
  - 8-prenylnaringenin, 6-prenylnaringenin, and isoxanthohumol
- The oil and bitter resins together are known as lupulin. Lupulin is a yellow powder. Found in the strobile.

Hops: Action

- *Humulus* is stated to possess sedative, hypnotic, diuretic (like beer) and topical bactericidal properties. Phytoestrogenic.
- The German Commission E approved use for mood disturbances such as restlessness and anxiety as well as sleep disturbances. Has a high level of phytosterols. Has been used like soy and flax for hot flashes and menopausal symptoms. In men it may be an anaphrodisiac (lowers sex drive).
- Bitter agent: Stimulates digestion.
Specific Indications for Hops (Fyfe 1903)

- Nervousness, irritability, insomnia, irritation of bladder, fermentative indigestion with acid eructation's. (Lloyd Dose Book)

- Impairment of the digestive organs, resulting from abuse; exhaustion and irritability of the stomach; flatulent colic; incontinence of urine; priapism and involuntary seminal emissions; deranged conditions of the brain and nervous system. (Fyfe)

Aperitif, digestif and bitters

- Apéritifs and digestifs are drinks, typically alcoholic, that are normally served before (apéritif) or after (digestif) a meal.

- Apéritif may also refer to a snack that precedes a meal. This includes, chocolate, crackers, cheese, pâté or olives.

- "Apéritif" is a French word derived from the Latin verb aperire, which means "to open." The French slang word for aperitif is "apro."

- Bitters are botanical drinks that are bitter and are often used as Aperitifs or Digestifs to support digestion.
Summary: How bitters improve digestion (Traditional)

- Cephalic Vagal Response
- Better Digestion
- Alcohol with bitters improves digestion
- Local reflex: increase secretions
- Hyperemia, increase abdominal blood flow

Summary: New bitter understanding

- Blood sugar moderating via incretin effect
- Cardiovascular support
- Metabolic syndrome
- Supports healthy inflammation response
- Obesity and weight issues
- Decrease cravings for alcohol
- Thyroid dysfunction support
- The New Faces of Bitters
Resources for bitters

- Books
  - *A Spirited History of a Classic Cure All: Bitters* by Brad Thomas Parsons, 2011
  - *DIY Bitters: Reviving the Forgotten Flavor* by Jovial King and Guido Mase, 2016
  - *Bitterman’s Field Guide to Bitters & Amari* by Mark Bitterman, 2015

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Thank You!

- Contacts:
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  - (503) 451-6954