

Mills and Bone Academy

Educational Article

A New Insight into Bitter Herbs – Kerry Bone

In the past it was thought bitters mainly acted to stimulate the digestive processes of the upper gastrointestinal tract by a reflex initiated from the bitter taste buds on the tongue. In other words, the interaction of the bitter tasting phytochemicals in the herb with receptors on the tongue stimulated nervous impulses to the brain, which in turn initiated facilitatory signals via the vagus nerve to the upper digestive organs, especially the stomach. Hence, tasting a bitter herb before eating was essential to its activity and primed the digestive process by stimulating the release of gastric acid, digestive enzymes and bile.

Since then, there have been several important new discoveries. Firstly, we know much more about the bitter taste receptors themselves. A family of around 30 receptors (denoted as TAS2R, previously T2R) has been identified.ⁱ Most TAS2Rs are broadly tuned to each detect a range of bitter substances, explaining how we can recognise hundreds of bitter compounds with only this limited set of receptors. Also, some very bitter molecules simultaneously stimulate more than one receptor. For example, amarogentin from gentian stimulates seven receptors: TAS2R1, 4, 39, 43, 46, 47 and 50. Absinthin from wormwood stimulates four: TAS2R10, 14, 46

and 47.ⁱⁱ This could explain why herbs like gentian and wormwood are particularly good at boosting digestion.

However, the most intriguing new discovery is that bitter taste receptors are not restricted to the mouth.ⁱⁱⁱ There are numerous reports of TAS2Rs being present further down in the gut in certain cells lining the gastrointestinal wall, including in the stomach. Cells with these receptors appear to be wired to elicit an aversive behavior, probably as a defensive mechanism because many toxic chemicals are bitter in taste.ⁱ As a result of this defensive response of the digestive system, bitter taste receptors in the gastrointestinal tract appear to upregulate several metabolic and digestive functions.

In particular, bitter receptors have been found on enteroendocrine cells, the specialised hormone-releasing cells of the upper digestive tract.^{iv} When stimulated, these cells release a variety of gut hormones, but in particular cholecystokinin (CCK) and glucagon-like peptide 1 (GLP-1). CCK has numerous important functions in the digestive tract: it promotes secretion of pancreatic enzymes and bile, slows down stomach emptying, increases gastric digestive mixing and

secretions, and creates a sense of fullness, so you stop eating. GLP-1 also slows gastric emptying and creates a sense of fullness, but most importantly it stimulates the release of insulin. In fact, there is a new class of diabetes drugs (the gliptins) based on enhancing the action of GLP-1. We now know that bitters can stimulate the release of these important hormones from enteroendocrine cells.

The new research above suggests that bitters can create a sense of fullness (satiety) and hence might actually help with weight loss. How does this sit with the traditional notion that bitters improve appetite? The answer is there is no contradiction, because bitters only seem to promote appetite when it is below par.^v

The discovery that bitter receptors occur throughout the gastrointestinal tract and appear to regulate a number of physiological functions has the potential to change our understanding of bitter herbs. Firstly, it means that bitter herbs do not need to be tasted to boost upper digestive function. While tasting may be desirable for optimum effects, it is not essential. In fact, clinical research on gentian dating from 1998^{vi} supports this concept, but now we understand why. This means that tablets or capsules containing bitter herbs will be clinically active, although higher doses are probably necessary. As noted above, support for this concept of direct activity in the stomach also comes from a multicentre, uncontrolled study of gentian capsules involving 205 patients.^{vi} Patients took on average about five capsules per day, each containing 120 mg of a 5:1 dry extract of gentian root, and achieved rapid and dramatic relief of symptoms, including constipation, flatulence, appetite loss, vomiting, heartburn, abdominal pain and nausea. As early as 1956,

Wolf and Mack carried out an excellent study on the direct action of various bitters on the stomach of their patient Tom (who had an occluded oesophagus and a gastric fistula), with golden seal (*Hydrastis canadensis*) proving to be the most potent direct-acting bitter.^{vii}

Research has shown that the capacity to sense bitterness varies from person to person. Some people are highly sensitive and are known as supertasters. Since the stimulation of bitter receptors could exert a range of important health benefits, could people who have a low sensitivity to bitters be at a health disadvantage? Epidemiological research suggests this could be the case. In fact, functional variants in bitter taste receptor sensitivity have been linked to alcohol dependency,^{viii} adiposity,^{ix} eating behavior disinhibition^x and high body-mass index (BMI).^{xi} People with a lower bitter tasting sensitivity exhibited the poorer health measure.

The new research also suggests a role for bitter herbs in blood sugar control and managing insulin resistance. In support of this, 94 patients with prediabetes exhibited improvements in BMI, blood glucose control and body fat when given just 16 to 48 mg/day of isohumulones (hop bitter acids) as capsules in a double blind, placebo-controlled clinical trial.^{xii} However, it is early days here and more research is needed.

Blending bitters together will have more clinical impact, as a wider range of bitter receptors will be stimulated. This will help to overcome the genetic variations in a person's capacity to taste and respond to bitters. For example, a combination of gentian,

wormwood and feverfew will stimulate 12 out of the known 29 human bitter taste receptors.

In a sense, with our modern dietary focus on sweet, sour, savoury and salty foods, bitter has become the neglected taste. The latest research provides a compelling argument that we can all benefit from adding back bitter herbs and foods into our diet. Perhaps by including bitterness in our diet we might avoid bitterness in our life (in terms of physical health)?

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