

Honey, I Taught the Kid New Tricks!

Research Revelations of New Uses for Nature's First Sweetener

By Anthony L. Almada, BSc, MSc

Back when hypoglycemia was the cocktail malady du jour in the 70s and early 80s, honey was considered by many as the acceptable sweetener, the liquid gold to cure the sugar blues. Honey was the springboard for "natural" candies, healthier cereals (even a signature for some of the "big brands" seeking the nascent health conscious consumer), a featured element on granola boxes, and a sweetener for yogurts and even some beverages. Honey became the *pre-commodity sweetener* for a nation loved by dentists: the Sweet Toothed USA. But what of this natural tagline? Does honey — a cocktail of sugars, enzymes and phytochemicals — truly possess super-sweetener powers and soften the blood sugar excursion that, for some, is like a big roller coaster ride producing more Gs than a crash test dummy hitting a wall at 65 mph?

SKIN DEEP SWEETNESS

One of the most under-appreciated "application" areas of honey is the skin, despite its legacy of use. Numerous investigations have shown various types of honey to display wound healing activity, with a focus on its antibacterial activity. Recent work suggests that honey's antibacterial efficacy is, in part, related to the amount of hydrogen peroxide produced by the honey matrix. The prominence of glucose in honey allows for an enzymatic reaction (glucose oxidase) producing hydrogen peroxide. Dilution of honey accelerates this enzyme-driven process. When human immune cells (monocytes) were exposed to manuka or New Zealand floral honeys *in vitro*, increases in the production of a cytokine (TNF-alpha) involved in

"revving up" immune function, and a reduction in pro-oxidants/free radicals were noted. These honeys were compared to a faux honey, comprised of a mixture of sugars representative of those found in honey. The superiority of the honeys suggests that the sugar mixture itself does not mediate the immune modulating effects.

These data suggest that honey could exert a wound healing effect by



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promoting vigilance against pathogenic microbes that could cause infections and mitigating the overproduction of pro-oxidants (and possible tissue damage) often associated with hyperstimulated immune cells. Recent investigations have made attempts at producing a honey "extract" with superior antimicrobial activity, presumably a super honey for wound dressings. Additional

studies have shown a simple mixture of honey diluted in water and applied once weekly to the scalp of individuals with seborrheic dermatitis produced a marked improvement in scaling and hair loss, and prevented relapse.

GUT WARS

On a related front — but venturing into the dark, over-populated region of the intestinal tract — we find a gurgling broth of bugs, struggling for dominance and clinging to *anything they can*. Welcome to the world of the gut microflora. One of the principal foods for these single-celled minions is sugars. *In vitro* studies have shown honey capable of supporting the growth of *Lactobacillus* species (including *acidophilus*). In this same paper, *in vivo* feeding studies in rats revealed honey to yield greater viable *Lactobacillus* counts in both the small and large intestines, compared to animals fed an equivalent amount of sucrose or no additional carbohydrate. It is unclear as to what component(s) in honey was responsible for the prebiotic effect seen in this study. Research published this year has also shown the honey may be a superior prebiotic agent for the production of lactic acid by *Bifidobacterium* in skim milk, an effect not attributed to fructose (the predominant sugar in honey). These authors suggested the prebiotic effect was due to the presence of oligosaccharides, short chains of sugars not dissimilar from fructooligosaccharides and galactooligosaccharides, and also found in honey. A simple and elegant study to conduct in humans would be feeding a genuine honey or faux honey mixture, and examining

stool bacterial profiles before and after supplementation.

Honey's duplicitous nature in the gut manifests when it comes to bad gut bugs, namely *Helicobacter pylori* (Hp), the bacterium closely associated with the development and recurrence of stomach ulcers. Several *in vitro* studies have shown honey to inhibit the growth of *H. pylori*. However, more recent studies suggest that this effect is not unique to honey, but due to the concentrated amounts of sugars (osmolality) present in honey or faux honey "syrops."

Honey also has been shown to exert a stomach shielding effect against alcohol (ethanol) and the prescription anti-inflammatory drug indomethacin, but again, this has recently been attributed to the concentration of sugars in honey, rather than honey per se. Nonetheless, a spoonful of honey may be an easy companion to help the (gut erosive) medicines go down, with less harm to the stomach. One possible concern for some people is the laxative effect that large doses of honey may induce, due in part to incomplete absorption of the abundant fructose found in this golden syrup. Of all food sources of fructose, honey has the highest ratio of fructose to glucose. In Greece, for example, honey is widely prescribed as a laxative, explained at least in part by the less than complete absorption of honey's sugars. One study showed "normal" adults do not absorb approximately 10 percent of the sugars in a 50 g dose of honey.

GO GEL

Back when I was a 130-lb. weakling on the high school swim team, a few of my teammates packed "honey bears" into their swim bags and "kissed the honey bear" between events at swim meets. This may have been the original energy bottle that now is fitted to many endurance cyclists bicycle frames. The advent of carbohydrate gels, ushered in by the quest for convenience and portability, compelled us to undertake a variety of studies comparing honey to other carbohydrates. Led by Dr. Richard Kreider, director of the University of Memphis Exercise and Sport Nutrition Laboratory, we first evaluated the impact of a single 50 g dose of different carb sources on glycemic index (GI) and blood insulin changes. Seventy-one male and female college students received glucose (dextrose), sucrose, fructose, maltodextrin, a flavored non-caloric placebo, or a popular branded carb



Photo courtesy of the National Honey Board

gel. Honey, along with fructose, the carb gel and placebo (of course), showed significantly lower glycemic zeniths and GI profiles during the first 60 minutes after ingestion. Dextrose had a GI score of 100 (by definition), with sucrose at 71, fructose at 5, maltodextrin at 96, honey at 35, the placebo at 8, and the carb gel at 43 (the lower the score, the less pronounced the elevation in blood sugar). For the insulin response index (IRI), the values were dextrose 100 (as a reference), sucrose at 147, fructose at 41, maltodextrin at 191, honey at 59, the placebo at 3, and the carb gel at 113. This study suggests honey is "easy" on blood sugar and not prone to elicit sharp increases in blood insulin compared to other carbohydrates in fit, college age persons, with the exception of fructose.

Our second study was focused on the effects of combining honey in a powdered form with protein, and evaluating the influence of this combo upon blood glucose and insulin after an intense weight training workout. Several studies have addressed the impact of a combo of carbs + protein upon post-exercise muscle glycogen repletion, apparently in part due to the augmented insulin secretion following ingestion. In this study 39 male and female collegiate, weight trained subjects received 120 g of either sucrose, honey powder or maltodextrin, combined with 40 g of whey protein (concentrate) or no supplement immediately after a 60-minute whole body resistance exercise workout. At 30, 60, 90 and 120 minutes after ingestion of the supplement, blood was withdrawn and measured for insulin and glucose. All groups showed similar increases in blood insulin. Only the honey powder group showed a significant increase in

blood sugar and maintenance of glucose at concentrations equal to or above those seen at pre- or post-workout, pre-supplementation time points. In essence, the other carb sources produced increases in blood sugar, followed by a fall below baseline.

The final study looked for an impact of honey supplementation on endurance performance, the true test of a carbohydrate's "potency." Nine competitive endurance cyclists underwent a placebo controlled, randomized crossover study; all subjects tried experienced all supplements, interspersed by one week intervals. Subjects were given 15 g of a carbohydrate (honey, dextrose, or low-calorie placebo) prepared in a gel form, plus 250 ml of water, both before and every 16 km during a 64 km time trial ride. Each subject rode their own racing bicycle fixed to a calibrated and computerized race simulator. Both dextrose and honey gels produced significantly greater increases in average muscular power over the entire duration and significantly shorter times to complete the simulated race. Honey gel fared as well as the dextrose gel in both respects. Because of the ease, convenience, taste and modest price of honey, individuals seeking a carbohydrate source before, during or after exercise may find honey to be a superior selection.

CONCLUSION

Honey is a diverse natural product with a variety of bioactivities, spanning a variety of different organ systems. The common perception of honey being a preferred carbohydrate may be borne out by recent clinical studies. Given the diversity of honey's applications, this carbo cocktail plus may earn a place in both the medicine chest and the training bag of fitness enthusiasts and athletes. (HPB)

Anthony L. Almada, Bsc., Msc., is a nutritional and exercise biochemist, and is the co-founder and past president of Experimental Applied Sciences (EAS). He is also the founder of IMAGINutrition Inc., a nutritional technology creation and marketing think tank; and MetaResponse Sciences, a university research alliance network that specializes in designing and collaborating on university studies validating dietary supplements, nutraceuticals and medical food products. Disclosure: IMAGINutrition is a paid consultant to the National Honey Board. For a complete list of references, visit HPB's Web site at: www.healthproductsbusiness.com.