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Anti-Heartburn Effects of a Fenugreek Fiber Product

Robert A. DiSilvestro,[1]* Marian A. Verbruggen[2] and E. Jann Offutt[3]

[1]Columbus Nutraceuticals Consulting Inc. Dublin, OH, USA
[2]Frutarom Netherlands BV, Landjuweel 5, 3905 PE, Veenendaal, The Netherlands
[3]Private medical practice, Worthington, OH, USA

Frequent heartburn occurs in many people, some of whom prefer alternative treatments over conventional drugs. In a pilot study of subjects with frequent heartburn, 2 week intake of a fenugreek fiber product, taken 30 min before two meals/day, diminished heartburn severity. This conclusion was based on symptom diary results and reduced the use of a mild antacid as a rescue medicine. Improvement for each of the 2 weeks was judged by comparison with results from a baseline week. Placebo also produced some statistically significant effects, but the fiber product's effects differed significantly from the placebo. Moreover, the fenugreek fiber effects were generally similar to the results produced by an OTC antacid medication (ranitidine at 75 mg, twice a day). This study suggests that people with certain degrees of heartburn can benefit from a fenugreek fiber product.

Keywords: heartburn; fenugreek; fiber; ranitidine; antacid.

INTRODUCTION

Heartburn usually occurs when acid from the stomach flows upward into the esophagus (Ang *et al.*, 2008; Kahrilas, 2003; Richter, 2007). The classic symptom is a painful and burning sensation in the chest and sometimes other locations. In some cases, if the condition persists for a prolonged period, it can cause a pathology called Barret's esophagus, which can raise the risk of esophageal cancer (Ang *et al.*, 2008; Kahrilas, 2003; Richter, 2007). Recurrent heartburn occurs in many people, though exact estimates depend on the definition of recurrent heartburn.

Typically, heartburn occurs when a sphincter fails to hold stomach acid away from the esophagus. However, pharmacological remedies do not act on the sphincter. Instead, stomach acid is reduced by buffering compounds as well as agents such as proton pump inhibitors that reduce stomach acid secretion (Ang *et al.*, 2008; Richter, 2007). Some people prefer not to use these approaches to treating heartburn. One reason is a concern that chronically reduced stomach acid could diminish protection against bacterial infection and cause other side effects (Richter, 2007). Therefore, the use of natural products to treat heartburn has drawn public attention, though evidence for the effectiveness of these products has been mostly limited to anecdotal evidence.

Among the natural products with anecdotal evidence for heartburn relief has been a water soluble fiber from fenugreek (*Trigonella foenum-graecum*). Fenugreek, a plant in the family Fabaceae, is cultivated worldwide as a semi-arid crop. In the anecdotal procedures for heartburn prevention, the fenugreek soluble fiber is taken 30 to 60 min before meals. The mechanism of action is speculated to involve expansion of the fiber with water to form a barrier to acid rising into the esophagus. Indirect evidence for a barrier effect can also be found based on a rat study where a fenugreek fiber extract can inhibit stomach ulcer formation (Pandian *et al.*, 2002). Possibly, in that study, the proposed barrier effect extends to the stomach mucosa.

The concept that dietary fiber in general works against heartburn is supported by two survey studies (El-Serag *et al.*, 2005; McEligot *et al.*, 2002). In one (El-Serag *et al.*, 2005), fiber intake was inversely associated with risk of acid reflux symptoms. In the other study (McEligot *et al.*, 2002), in a survey on breast cancer re-occurrence, women in a very high fiber intake group reported about 70% of the heartburn symptoms of the other subjects. However, in these two studies, the fiber association could be coincidence rather than cause and effect. On the other hand, if fiber does exert a direct effect, better actions might be seen with more attention to the type of fiber and timing of intake.

A pilot study was undertaken to see how heartburn symptoms respond to water soluble fiber from fenugreek taken before two meals per day. For comparison purposes, a conventional over-the-counter antacid, ranitidine, was used as a positive control.

MATERIALS AND METHODS

Fiber product. The fenugreek fiber material was FenuLife® from Frutarom Belgium N.V., Londerzeel, Belgium. Tempered fenugreek seeds are fractionated by roller-milling, and sifting, resulting in a fraction composed of 85% total fiber with the predominant component being galactomannan, a (1-4)-linked

* Correspondence to: Robert A. DiSilvestro, Columbus Nutraceuticals Consulting Inc., 8050 Simfield Rd, Dublin, OH 43016-9062, USA.
E-mail: studies@columbus.rr.com

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beta-D-mannopyranose backbone with branchpoints from their 6-positions linked to alpha-D-galactose, i.e. 1-6-linked alpha-D-galactopyranose. In fenugreek, the mannose:galactose ratio is approximately 1:1.

Subjects and treatments. The human subject protocol was approved by the New England Institutional Review Board. At the completion of each subject's study participation, the investigators recommended that the subject consult a physician to explore causes and treatments of the subject's condition. The recruitment goal was 15 subjects per group. Subjects were recruited by advertisement and given an eligibility questionnaire. Based on responses to the questionnaire, included subjects were non-smoking males and non-pregnant females who were experiencing heartburn after 3–8 meals per week for at least a month, but were not taking prescription drugs intended to treat this condition. Subjects were not included if their answers to the questionnaire indicated any of the following characteristics: heavy alcohol intake, regular use of OTC antacids in a prophylactic fashion, gastrointestinal diseases, other diseases that indirectly affect digestion, use of medications that can cause heartburn (including chronic low dose aspirin use), other major health issues that can affect appetite such as active cancer or gastric bypass surgery, or problems that can limit food intake or cause a physician to prescribe a restricted diet. Problems such as asthma or hay fever that do not greatly affect diet were not used for exclusion. Subjects who started, but did not complete the study were replaced.

Subjects had a 1 week baseline period which was used for the pre-treatment characterization of heartburn symptoms. Subjects were then randomly assigned to one of three treatments to be followed for the 2 weeks post baseline. Treatments were: Placebo (starch capsules, four capsules taken twice/day).

Ranitidine (Zantac 75®, 75 mg per pill, one pill taken twice/day, 150 mg total daily dose)

Fenugreek fiber (FenuLife™, Frutarom Belgium N.V., 500 mg per capsule, four capsules taken twice/day, 4 g total daily dose).

The placebo and fenugreek fiber groups were blinded to their assignment. The ranitidine group, which served as a positive control, was unblinded. All subjects were instructed to take the assigned product 30 min before their two biggest meals of the day with the other meal to be a bland meal. For that meal, subjects were given written guidelines and a list of examples. This meal omitted fatty meats, fried foods, highly acidic foods, heavily spiced foods, dried beans/peas, high vinegar foods, cabbage family vegetables, chocolate, carbonated beverages, coffee and tea. Examples of bland meals were scrambled eggs + one slice of toast + a small amount of butter, and canned liquid vanilla meal replacement products.

Symptom evaluations. Subjects kept a diary for heartburn frequency and severity of symptoms for the baseline period of 1 week and for each of the 2 weeks of the intervention period. Severity was based on a scale as follows: 0, no symptoms; 1, minor; 2, mild; 3, moderate; 4, somewhat severe; 5, severe; 6, very severe symptoms. If there was more than one heartburn incidence in a day, each incident was rated 1–6. During the baseline and intervention periods, subjects were allowed to use 2–4 tablets of chewable calcium carbonate (TUMS E-X®, 750 mg $CaCO_3$ per tablet), supplied free of charge, as a rescue for very severe heartburn. The decision to use the rescue procedure rested entirely with the subject's discretion and did not require consultation with study personnel. The number of rescue uses was entered into the diary.

Statistical analysis. Statistical significance was set at $p < 0.05$. For each measure of heartburn symptoms, for each intervention group, the baseline week was compared with each of the intervention weeks by paired t-test. Also, each intervention group result was compared with the other two at each of the two intervention weeks by ANOVA + Tukey analysis. To analyse the subject number of those not completing the study, fenugreek fiber and ranitidine groups were compared with placebo by a one-way, statistical hypothesis test with the following assumptions: each subject independently decided to complete the study, each had the same probability of dropping out, and the dropouts within each group followed a negative binomial distribution with size parameter 15 (the number of finishers required). The test statistic used was the difference between the highest and lowest number of dropouts, which takes a value of 6 in this case. A p value was calculated by a Monte Carlo method.

RESULTS

There were 45 people who completed the study (21 males, 24 females. The age range was 32–62 years with a mean ± SD of 43 ± 8. There were 12 subjects that started but did not complete participation and were replaced. One offered an explanation, but the others simply did not turn in diaries nor respond to email messages about completing participation. For the non-finishers, 8 were from the placebo group and 2 from each of the treatment groups. The difference in the number of non-finishers in each of the treatment groups was statistically different from the placebo using an approach described in the Materials and Methods ($p < 0.05$).

Heartburn severity (Table 1) and the number of days with at least one heartburn incidence (Table 2) were significantly affected by treatment with either fenugreek fiber or the positive control (ranitidine). The placebo also produced statistically significant effects for the second, but not the first intervention week. For the severity score, the placebo effect in week 2 was not as great as for the treatment with fenugreek fiber or positive control (Table 1). For the incidence rate (Table 2), the placebo effect in week 2 was not as great as for the fenugreek fiber, but the difference compared with positive control was just outside the significant range.

Most subjects in the fenugreek group showed 2–3 symptom-free days at the end of the second intervention week. The number of symptom-free days at the end differed significantly between the fenugreek and placebo groups (Table 3). This was not the case for the placebo versus the positive control, though the SEM for the positive control group was high due to two subjects showing high values. For rescue medication use, all three interventions produced statistically significant reduc-

Table 1. Total score per week

	Baseline week	Intervention week 1	Intervention week 2
Placebo	20.3 ± 2.9	16.7 ± 2.7	13.3 ± 3.1[a]
Fenugreek	16.0 ± 1.8	9.5 ± 1.5[b]	7.7 ± 1.4[b]
Ranitidine	15.9 ± 1.9	9.4 ± 1.7[b]	6.0 ± 1.4[b]

Values are mean ± SEM.
Scores = sum of scores for heartburn severity for each heartburn incident (could be >1 incident/day); 0, no symptoms; 1, minor; 2, mild; 3, moderate; 4, somewhat severe; 5, severe; 6, very severe symptoms.
[a] Significantly different from baseline week, paired *t*-test ($p < 0.01$).
[b] Significantly different from baseline week, paired *t*-test ($p < 0.001$).
By ANOVA+ Tukey:
For intervention week 1 or 2: placebo vs ranitidine or fenugreek, $p < 0.05$.
For intervention week 1 or 2, ranitidine vs fenugreek $p > 0.05$.

Table 2. Days with score of >0 for each week

	Baseline week	Intervention week 1	Intervention week 2
Placebo	5.6 ± 0.5	5.5 ± 0.5	4.6 ± 0.6[b]
Fenugreek	5.3 ± 0.3	4.0 ± 0.4[b]	3.5 ± 0.5[c]
Ranitidine	5.3 ± 0.5	4.3 ± 0.6[a]	3.5 ± 0.7[b]

Values are mean ± SEM.
[a] Significantly different from baseline week, paired *t*-test ($p < 0.05$).
[b] Significantly different from baseline week, paired *t*-test ($p < 0.01$).
[c] Significantly different from baseline week, paired *t*-test ($p < 0.001$).
By ANOVA + Tukey:
For intervention week 1 or 2: placebo vs fenugreek, $p < 0.05$.
For intervention week 1: placebo vs ranitidine, $p < 0.05$; for week 2, $p > 0.05$.
For intervention week 1 or 2, ranitidine vs fenugreek $p > 0.05$.

Table 3. Days with no symptoms at the end of 2 weeks

Placebo	0.73 ± 0.33
Fenugreek	1.87 ± 0.52
Ranitidine	2.21 ± 1.09

Values are mean ± SEM.
Placebo vs Fenugreek, unpaired *t*-test, $p < 0.05$.
Placebo vs ranitidine, unpaired *t*-test, $p > 0.05$.

tions in both intervention weeks (Table 4). However, the fenugreek results differed from the placebo for both intervention weeks, while the positive control differed from the placebo only for week 1.

DISCUSSION

In this study, for multiple types of assessments of heartburn symptom prevention, a water soluble fiber fraction of fenugreek was more effective than placebo, and similarly effective as a positive control (ranitidine). Thus, this study raises the possibility that the intake of fenugreek fiber provides a natural alternative to over the counter antacids for preventing certain degrees of heartburn.

The placebo did have statistically significant effects on some measures, particularly for the second intervention week. Some of the placebo effects may have been due to subject adaptations to the protocol. For example, during the early to middle stage of participation, a person may have some tendency to overrate symptom severity. After becoming more aware of how symptom severity actually varies, a person may start rating some incidents as less severe. Similarly, for rescue medication use, a person may become more resistant to using the medication as the person gets more aware that some incidents are not as severe as others.

These rationales for how placebo effects might occur would not apply to the significant effect found for week 2, symptom free day counts (symptom score of 0). Here, changes in subject severity rating perceptions were not an issue; a subject is only distinguishing between symptoms and no symptoms. This placebo effect could possibly be explained by the subject becoming more aware of what foods tend to cause heartburn symptoms, which could cause more avoidance of the food. There could also be a true placebo effect that causes a person to become more symptom resistant. These two explanations could also contribute to the placebo effects in severity score and rescue medication use.

Whatever the cause for the placebo group experiencing some effects on heartburn symptom scores, it should be reiterated that the fenugreek treatment still showed differences from placebo for various measures in each of the two intervention weeks. The same was true for some, but not all of the comparisons with the positive control (ranitidine). The more consistent separation of fenugreek from placebo versus ranitidine from placebo might lead to the conclusion that fenugreek fiber worked better than the ranitidine treatment. However, for

Table 4. Number of tablets used for rescue antacid medication

	Baseline week	Intervention week 1	Intervention week 2
Placebo	6.6 ± 1.2	4.9 ± 0.9[a]	3.8 ± 1.1[b]
Fenugreek	5.3 ± 1.0	2.5 ± 0.5[b]	2.3 ± 0.6[b]
Ranitidine	4.6 ± 0.8	2.1 ± 0.5[b]	1.1 ± 0.3[c]

Values are mean ± SEM.
[a]Significantly different from baseline week, paired *t*-test ($p < 0.05$).
[b]Significantly different from baseline week, paired *t*-test ($p < 0.01$).
[c]Significantly different from baseline week, paired *t*-test ($p < 0.001$).
By ANOVA + Tukey:
For intervention week 1 or 2: placebo vs fenugreek, $p < 0.01$.
For intervention week 1 or 2: placebo vs ranitidine, $p < 0.01$.
For intervention week 1 or 2, ranitidine vs fenugreek, $p > 0.05$.

measures used in this study, the fenugreek fiber and ranitidine did not give statistically different results. Nonetheless, even equivalent results would be useful to someone looking for alternatives to a conventional antacid treatment.

The practical question that arises from this study is: Can fenugreek fiber present an effective option for dealing with heartburn? The presented data suggest that the answer is yes based on the observations that the fenugreek product showed similar effectiveness to ranitidine. Still, it can be noted that physicians can prescribe higher doses of ranitidine than the dose used here, or prescribe drugs that show stronger effects than ranitidine (i.e. Wesdorp *et al.*, 1983). Similarly, it is not known if higher doses of fenugreek fiber would lead to further improvement.

In the present study, neither fenugreek fiber nor ranitidine completely eliminated symptoms during the second week of treatment. Possibly, in subjects with milder heartburn, such an effect would have been seen. There is also the possibility that a longer treatment time could have produced complete, or close to complete symptom remission in the subjects studied here. In this pilot study, the intervention time was limited to 2 weeks because this was the first study with fenugreek fiber in this area. Thus, from an ethics standpoint, the investigators felt that the intervention had to be kept short in case little or no relief was given by the fenugreek. Also, subjects given placebo had only the rescue medication for direct heartburn treatment. Moreover, since it is hypothesized that the mechanism of action of the fenugreek fiber is direct and local in the stomach, an effect should be noticeable in a short timeframe. Even so, a longer intervention study with fenugreek fiber versus low dose ranitidine could now be justified based on the observation that the fenugreek fiber was at least as good as ranitidine for a 2 week period.

The concept that a longer study might show increased improvement of symptoms with fenugreek fiber is supported by an early study of ranitidine (Havelund *et al.*, 1988). In that work, better improvement was seen in some subjects at week 12 compared with week 6. The present study intervention lasted considerably less than either of these times. Also, the present study gave an indication that a longer intervention could bring complete or near complete symptom remission. In specific, the fenugreek fiber group showed a mean of over 2 days with no symptoms at the end of the 2 week intervention. This may have been the start of a long period of time when no symptoms would have been seen with further treatment.

In summary, a water soluble fiber extract of fenugreek improved heartburn symptoms when the fiber was taken before two meals per day. More research is needed to establish whether complete, or near complete remission can be achieved with this intervention.

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Conflict of Interest

The authors have declared that there is no conflict of interest.

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