

## Research Abstracts: psyllium, flax, chlorella, l-glutamine, aloe

### **The effect of a fibre supplement compared to a healthy diet on body composition, lipids, glucose, insulin and other metabolic syndrome risk factors in overweight and obese individuals**

Optimum levels and types of dietary fibre that provide the greatest beneficial effects on metabolic syndrome risk factors in overweight and obese individuals have yet to be determined in clinical trials. The present parallel design study compared the effects of fibre intake from a healthy diet v. a fibre supplement (psyllium) or a healthy diet plus fibre supplement on fasting lipids, glucose, insulin and body composition. Overweight/obese adults were randomised to either control (with placebo), fibre supplement (FIB), healthy eating plus placebo (HLT) or healthy eating plus fibre supplement (HLT-FIB). There was a significant increase in fibre intake in HLT-FIB, HLT and FIB groups up to 59, 31 and 55 g, respectively, at 12 weeks when compared to control (20 g). Weight, BMI and % total body fat were significantly reduced in FIB and HLT-FIB groups, with weight and BMI significantly reduced in the HLT group compared with control at 12 weeks. HLT-FIB and HLT groups had significant reductions in TAG and insulin compared with control at 6 and 12 weeks, and in insulin compared with the FIB group at 12 weeks. The HLT-FIB, HLT and FIB groups all had significant reductions in total cholesterol and LDL-cholesterol compared with control after 6 and 12 weeks. The present study demonstrated that simply adding psyllium fibre supplementation to a normal diet was sufficient to obtain beneficial effects in risk factors. However, a high-fibre diet consisting of a psyllium supplement plus fibre from a healthy diet provided the greatest improvements in metabolic syndrome risk factors. Pal S, Khossousi A, Binns C, Dhaliwal S, Ellis V. *Br J Nutr.* 2011 Jan;105(1):90-100.

### **A psyllium fiber-enriched meal strongly attenuates postprandial gastrointestinal peptide release in healthy young adults**

Dietary fiber (DF) and protein are essential constituents of a healthy diet and are well known for their high satiety impact. However, little is known about their influence on postprandial gastrointestinal (GI) peptide release. Our aim in this single-blind, randomized, cross-over study was to investigate the effects of DF and/or protein enrichments on satiety-related metabolic and hormonal responses. Sixteen healthy, nonobese volunteers participated in the study and ingested 1 of 5 isoenergetic test meals in a randomized order on separate days. The test meals were as follows: 1) low in protein (2.8 g) and fiber (7.6 g); 2) low in protein (2.6 g) and high in soluble fiber (psyllium, 23.0 g); 3) high in protein (soy, 19.7 g) and low in fiber (6.2 g); 4) high in protein (18.4 g) and fiber (23.0 g); and 5) white wheat bread. Serum insulin and plasma glucose, ghrelin, glucagon-like peptide 1 (GLP-1), and peptide YY (PYY) concentrations were determined for 2 h following the meals. In addition, hunger and satiety ratings were collected. Postprandial glucose, insulin, ghrelin, GLP-1, and PYY responses all differed among the meals ( $P \leq 0.05$ ). Fiber-enriched meals decreased glucose, insulin, ghrelin, and PYY responses; in addition, PYY secretion was prolonged compared with the other meals. The postprandial GLP-1 concentration was significantly suppressed after a fiber- and protein-rich meal, in contrast to the initial increases following the other meals. However, postprandial ratings of appetite were mostly similar after the test meals. In conclusion, solid meals enriched with psyllium fiber strongly modified postprandial

signals arising from the GI tract. Karhunen LJ, Juvonen KR, Flander SM, et al. *J Nutr.* 2010 Apr;140(4):737-44.

### **Soluble or insoluble fibre in irritable bowel syndrome in primary care? Randomised placebo controlled trial**

**OBJECTIVE:** To determine the effectiveness of increasing the dietary content of soluble fibre (psyllium) or insoluble fibre (bran) in patients with irritable bowel syndrome. **DESIGN:** Randomised controlled trial. **SETTING:** General practice. **PARTICIPANTS:** 275 patients aged 18-65 years with irritable bowel syndrome. **INTERVENTIONS:** 12 weeks of treatment with 10 g psyllium (n=85), 10 g bran (n=97), or 10 g placebo (rice flour) (n=93). **MAIN OUTCOME MEASURES:** The primary end point was adequate symptom relief during at least two weeks in the previous month, analysed after one, two, and three months of treatment to assess both short term and sustained effectiveness. Secondary end points included irritable bowel syndrome symptom severity score, severity of abdominal pain, and irritable bowel syndrome quality of life scale. **RESULTS:** The proportion of responders was significantly greater in the psyllium group than in the placebo group during the first month (57% v 35%; relative risk 1.60, 95% confidence interval 1.13 to 2.26) and the second month of treatment (59% v 41%; 1.44, 1.02 to 2.06). Bran was more effective than placebo during the third month of treatment only (57% v 32%; 1.70, 1.12 to 2.57), but this was not statistically significant in the worst case analysis (1.45, 0.97 to 2.16). After three months of treatment, symptom severity in the psyllium group was reduced by 90 points, compared with 49 points in the placebo group (P=0.03) and 58 points in the bran group (P=0.61 versus placebo). No differences were found with respect to quality of life. Fifty four (64%) of the patients allocated to psyllium, 54 (56%) in the bran group, and 56 (60%) in the placebo group completed the three month treatment period. Early dropout was most common in the bran group; the main reason was that the symptoms of irritable bowel syndrome worsened. **CONCLUSIONS:** Psyllium offers benefits in patients with irritable bowel syndrome in primary care. Clinical trials NCT00189033. Bijkerk CJ, de Wit NJ, Muris JW, et al. *BMJ.* 2009 Aug 27;339:b3154.

### **Psyllium is superior to docusate sodium for treatment of chronic constipation**

**BACKGROUND:** Stool softening is a physician's first step in the management of chronic constipation. **AIM:** To compare stool softening (stool water content) and laxative efficacy of psyllium hydrophilic mucilloid vs. docusate sodium. **METHODS:** The multi-site, randomized, double-blind, parallel-design study of 170 subjects with chronic idiopathic constipation involved a 2-week baseline (placebo) phase followed by 2 weeks of treatment. The treatment phase compared psyllium (5.1 g b.d.) plus docusate placebo to docusate sodium (100 mg b.d.) plus psyllium placebo. Stools were collected and assessed. **RESULTS:** Compared to baseline, psyllium increased stool water content vs. docusate (psyllium 2.33% vs. docusate 0.01%, P = 0.007). Psyllium also increased stool water weight (psyllium 84.0 g/BM; docusate 71.4 g/BM; P = 0.04), total stool output (psyllium 359.9 g/week: docusate 271.9 g/week; P = 0.005), and O'Brien rank-type score combining objective measures of constipation (psyllium 475.1; docusate 403.9; P = 0.002). Bowel movement (BM) frequency was significantly greater for psyllium (3.5 BM/week) vs. docusate (2.9 BM/week) in treatment week 2 (P = 0.02), with no significant difference (P > 0.05) between treatment groups in treatment week 1 (3.3 vs. 3.1 BM/week). **CONCLUSION:** Psyllium is superior to docusate sodium for softening stools by increasing stool water content, and has greater overall laxative efficacy in subjects with chronic idiopathic constipation. McRorie JW, et al. *Aliment Pharmacol Ther.* May1998;12(5):491-7.

### **Moderation of lactulose-induced diarrhea by psyllium: effects on motility and fermentation**

Psyllium has been reported to inhibit lactulose-induced colonic mass movements and to benefit patients with irritable bowel syndrome, improving both constipation and diarrhea. Our aim was to define how psyllium modified the whole-gut transit of a radiolabeled lactulose-containing test meal by using gamma scintigraphy. Eight subjects participated in a randomized crossover study comparing gastric emptying and small bowel and colonic transit after consumption of 20 mL lactulose three times daily with or without 3.5 g psyllium three times daily. Psyllium significantly delayed gastric emptying: the time to 50% emptying increased from a control value of 69 +/- 9 to 87 +/- 11 min (mean +/- SEM;  $P < 0.05$ ,  $n = 8$ ). Small bowel transit was unaltered. However, progression through the colon was delayed with an increase in the percentage of the dose at 24 h in the ascending (control group: 2 +/- 3%, psyllium group: 11 +/- 8%;  $P < 0.02$ ) and transverse colon (control group: 5 +/- 12%, psyllium group: 21 +/- 14%) with correspondingly less in the descending colon. Although the time for 50% of the isotope to reach the colon was not significantly different with psyllium, psyllium significantly delayed the rise in breath-hydrogen concentrations, which reached 50% of their peak at 217 +/- 34 min compared with control values of 155 +/- 27 min ( $P < 0.05$ ). Psyllium delays gastric emptying, probably by increasing meal viscosity, and reduces the acceleration of colon transit, possibly by delaying the production of gaseous fermentation products. Washington N, et al. *Am J Clin Nutr.* Feb1998;67(2):317-21.

### **Effectiveness of plantago seed husks in comparison with wheat bran on stool frequency and manifestations of irritable colon syndrome with constipation**

**BACKGROUND AND AIM:** The importance of dietary fibres in treatment of irritable bowel syndrome increased during the last years. Yet the results of clinical studies on the different dietary fibres are not consistent. Therefore we decided to perform a controlled trial with a well defined group of patients to compare the effectiveness of wheat bran to psyllium seeds. **PATIENTS AND METHODS:** Thirty patients each with irritable bowel syndrome group II to III were treated in an open, not controlled study design either with 3 times 3.25 g psyllium seeds or 3 times 7 g wheat bran daily. All patients entering the study had not been treated for at least 3 weeks before. The study comprised two treatment phases of two weeks each, separated by two weeks without any treatment, thus leading to a study duration of 6 weeks altogether. Parameters for evaluation were stool frequency and consistency and the symptoms pain and abdominal distention, measured by a score (1 to 4). **RESULTS:** In both treatments groups stool frequency and consistency improved apparently compared to the starting point or the two weeks treatment free time in between. The improvement of stool frequency was statistically significant ( $p < 0.0001$ ) for both substances. Furthermore the effect of psyllium seeds exceeded that of wheat bran statistically significant in week 1, 2, 3, 5 and 6 ( $p < 0.005$ ). Other symptoms such as abdominal pain improved too by therapy, psyllium seeds again tending to show better results. A significant difference between both substances could be observed on the symptom abdominal distension. Whereas abdominal distension decreased under treatment with psyllium seeds it increased with wheat bran. This led to discontinuation of the study in 5 cases, 3 of which could be changed successfully to psyllium seeds. The difference between psyllium seeds and wheat bran concerning the occurrence of abdominal distension was statistically significant ( $p < 0.01$ ). **CONCLUSION:** The results of this study demonstrate the effectiveness of psyllium seeds and wheat bran on stool frequency and consistency of patients with irritable bowel syndrome. Psyllium seeds showed to be superior to wheat bran with respect to stool frequency and abdominal distension so that it should be preferred in treatment of irritable bowel syndrome and constipation. Hotz J, et al. *Med Klin.* Dec1994;89(12):645-51.

### **Effects of flax fiber on laxation and glycemic response in healthy volunteers**

We investigated whether a flax supplement taken orally or baked in a bakery product would effect the physiological responses characteristic of soluble and insoluble fiber, i.e., laxation and glycemic response, respectively. In Study 1, 26 healthy young adults consumed up to 15 g of fiber from a proprietary flax fiber supplement or as a psyllium supplement for 2 weeks once usual fecal weights were established. Changes in dietary fiber intake and acceptability of both products were evaluated. An increase in fecal weight was found with both fiber treatments. Supplemental fiber at intakes of 9.0 g/day (flax) and 10.4 g/day (psyllium) gave fecal bulking capacity of about 2.9 and 4.8 g of fecal weight/g of fiber, respectively. In Study 2, the effect of flax bread versus control white bread on glycemic response was studied. Eleven fasting subjects completed four test periods (duplicate trials of each bread) under standardized glycemic testing conditions. Paired t tests were used to analyze test compared with control peak blood glucose values (6.6 +/- 0.9 mmol/L compared with 6.9 +/- 0.7 mmol/L,  $P < .05$ , respectively) and area under the curve (AUC) (669 +/- 53 compared with 693 +/- 57,  $P = .015$ , respectively). Peak blood glucose values and AUC were improved by ingestion of flax fiber in healthy subjects. In conclusion, a flax fiber supplement provides the benefits of soluble and insoluble fiber. Dahl WJ, Lockert EA, Cammer AL, Whiting SJ. *J Med Food*. 2005 Winter;8(4):508-11.

### **Reducing atherogenic risk in hyperlipemic humans with flax seed supplementation: a preliminary report**

The effect on serum lipids of a flax seed supplement consisting of three slices of flax seed-containing bread and 15 g of ground flax seed was studied in 15 hyperlipemic subjects on long-term intake (800 IU/day) of vitamin E. The flax seed, which was high in alpha-linolenic acid and fiber, and which has been reported to lower serum cholesterol in elderly subjects, was provided in a 3-month feeding trial. Serum total and low-density lipoprotein cholesterol levels were reduced significantly; high-density lipoprotein cholesterol did not change during flax seed consumption. Thrombin-stimulated platelet aggregation decreased with the supplement. Serum lipid oxidation products decreased significantly during the washout period. Bierenbaum ML, Reichstein R, Watkins TR. *J Am Coll Nutr*. 1993 Oct;12(5):501-4.

### **A review of recent clinical trials of the nutritional supplement *Chlorella pyrenoidosa* in the treatment of fibromyalgia, hypertension, and ulcerative colitis**

CONTEXT: It has been suggested that the consumption of natural "whole foods" rich in macronutrients has many healthful benefits for those who otherwise ingest a normal, nonvegetarian diet. One example is dietary supplements derived from *Chlorella pyrenoidosa*, a unicellular fresh water green alga rich in proteins, vitamins, and minerals. OBJECTIVE: To find evidence of the potential of chlorella dietary supplements to relieve signs and symptoms, improve quality of life, and normalize body functions in people with chronic illnesses, specifically fibromyalgia, hypertension, and ulcerative colitis. DESIGN: Double-blind, placebo-controlled, randomized clinical trials. SETTING: Virginia Commonwealth University's Medical College of Virginia. PATIENTS: Fifty-five subjects with fibromyalgia, 33 with hypertension, and 9 with ulcerative colitis. INTERVENTION: Subjects consumed 10 g of pure chlorella in tablet form and 100 mL of a liquid containing an extract of chlorella each day for 2 or 3 months. MAIN OUTCOME MEASURES: For fibromyalgia patients, assessments of pain and overall quality of life. For hypertensive patients, measurements of sitting diastolic blood pressure and serum lipid levels. For patients with ulcerative colitis, determination of state of disease using the Disease Activity Index. RESULTS: Daily dietary supplementation with chlorella may reduce high blood pressure, lower serum cholesterol levels, accelerate wound healing, and enhance immune

functions. **CONCLUSIONS:** The potential of chlorella to relieve symptoms, improve quality of life, and normalize body functions in patients with fibromyalgia, hypertension, or ulcerative colitis suggests that larger, more comprehensive clinical trials of chlorella are warranted. Merchant RE, Andre CA. *Altern Ther Health Med.* 2001 May-Jun;7(3):79-91.

### **Glutamine and the preservation of gut integrity**

Parenteral glutamine dipeptide improves nitrogen balance in postoperative patients on total parenteral nutrition (TPN). Animal studies show that the structure and function of the gut is preserved by glutamine. It is not known if this is the case in human beings. 20 patients admitted to hospital for total parenteral nutrition were randomly allocated to receive parenteral nutrition enriched with glycyl-L-glutamine (Gln TPN), or standard parenteral nutrition (STPN). Mucosal biopsy specimens were taken from the second part of the duodenum before starting parenteral nutrition, and after two weeks. The ratio between the urine concentrations of lactulose and mannitol after enteral administration was used to measure intestinal permeability. After two weeks of parenteral nutrition in the GlnTPN group, intestinal permeability was unchanged, whereas permeability in the STPN group increased. Villus height was unaltered in the GlnTPN group but in the STPN group it decreased. The addition of glutamine to parenteral nutrition prevents deterioration of gut permeability and preserves mucosal structure. van der Hulst RR, van Kreel BK, von Meyenfeldt MF, et al. *Lancet.* 1993 May 29;341(8857):1363-5.

### **Effect of glutamine on change in early postoperative intestinal permeability and its relation to systemic inflammatory response**

**AIM:** To study the effects of glutamine (Gln) on the change of intestinal permeability and its relationship to systemic inflammatory response in early abdominal postoperative patients. **METHODS:** A prospective, randomized, double-blind and controlled trial was taken. Twenty patients undergoing abdominal surgery were randomized into Gln group (oral administration of glutamine, 30 g/d, for 7 d, n=10) and placebo group (oral administration of placebo, 30 g/d, for 7 d, n=10). Temperatures and heart rates of all patients were daily recorded. White blood cell counts(WBC) and biochemical variables were measured before operation and 4 and 7 d after drug administration. Serum concentrations of glutamine, endotoxin, diamine oxidase and malondialdehyde and urine lactulose/mannito (L/M) ratio were measured before and 7 d after drug administration. **RESULTS:** The patients in the 2 groups were comparable prior to drug administration. Serum Gln concentration was significantly decreased in the placebo group and increased in the Gln group 7 d after drug administration. Urine L/M ratio was significantly increased in the placebo group and decreased in the Gln group. The serum concentration of endotoxin, diamine oxidase and malondialdehyde was significantly decreased in the Gln group compared with those in the placebo group. Temperatures, heart rates and WBC counts were significantly lower in the Gln group than those in the placebo group. **CONCLUSION:** Gut is one of the sources of systemic inflammatory response in abdominal postoperative patients and glutamine can decrease intestinal permeability, maintain intestinal barrier and attenuate systemic inflammatory response in early postoperative patients. Quan ZF, Yang C, Li N, Li JS. *World J Gastroenterol.* 2004 Jul 1;10(13):1992-4.

### **Anti-inflammatory effects of aloe vera gel in human colorectal mucosa in vitro**

**BACKGROUND:** Oral aloe vera gel is widely used by patients with inflammatory bowel disease and is under therapeutic evaluation for this condition. **AIM:** To assess the effects of aloe vera in vitro on the production of reactive oxygen metabolites, eicosanoids and interleukin-8, all of which may be pathogenic in inflammatory bowel disease. **METHODS:** The anti-oxidant activity

of aloe vera was assessed in two cell-free, radical-generating systems and by the chemiluminescence of incubated colorectal mucosal biopsies. Eicosanoid production by biopsies and interleukin-8 release by CaCo2 epithelial cells in the presence of aloe vera were measured by enzyme-linked immunosorbent assay. RESULTS: Aloe vera gel had a dose-dependent inhibitory effect on reactive oxygen metabolite production; 50% inhibition occurred at 1 in 1000 dilution in the phycoerythrin assay and at 1 in 10-50 dilution with biopsies. Aloe vera inhibited the production of prostaglandin E2 by 30% at 1 in 50 dilution (P = 0.03), but had no effect on thromboxane B2 production. The release of interleukin-8 by CaCo2 cells fell by 20% (P < 0.05) with aloe vera diluted at 1 in 100, but not at 1 in 10 or 1 in 1000 dilutions. CONCLUSION: The anti-inflammatory actions of aloe vera gel in vitro provide support for the proposal that it may have a therapeutic effect in inflammatory bowel disease. Langmead L, Makins RJ, Rampton DS. *Aliment Pharmacol Ther.* 2004 Mar 1;19(5):521-7.

### **Randomized, double-blind, placebo-controlled trial of oral aloe vera gel for active ulcerative colitis**

BACKGROUND: The herbal preparation, aloe vera, has been claimed to have anti-inflammatory effects and, despite a lack of evidence of its therapeutic efficacy, is widely used by patients with inflammatory bowel disease. AIM: To perform a double-blind, randomized, placebo-controlled trial of the efficacy and safety of aloe vera gel for the treatment of mildly to moderately active ulcerative colitis. METHODS: Forty-four evaluable hospital out-patients were randomly given oral aloe vera gel or placebo, 100 mL twice daily for 4 weeks, in a 2 : 1 ratio. The primary outcome measures were clinical remission (Simple Clinical Colitis Activity Index  $\leq$  2), sigmoidoscopic remission (Baron score  $\leq$  1) and histological remission (Saverymuttu score  $\leq$  1). Secondary outcome measures included changes in the Simple Clinical Colitis Activity Index (improvement was defined as a decrease of  $\geq$  3 points; response was defined as remission or improvement), Baron score, histology score, haemoglobin, platelet count, erythrocyte sedimentation rate, C-reactive protein and albumin. RESULTS: Clinical remission, improvement and response occurred in nine (30%), 11 (37%) and 14 (47%), respectively, of 30 patients given aloe vera, compared with one (7%) [P = 0.09; odds ratio, 5.6 (0.6-49)], one (7%) [P = 0.06; odds ratio, 7.5 (0.9-66)] and two (14%) [P < 0.05; odds ratio, 5.3 (1.0-27)], respectively, of 14 patients taking placebo. The Simple Clinical Colitis Activity Index and histological scores decreased significantly during treatment with aloe vera (P = 0.01 and P = 0.03, respectively), but not with placebo. Sigmoidoscopic scores and laboratory variables showed no significant differences between aloe vera and placebo. Adverse events were minor and similar in both groups of patients. CONCLUSION: Oral aloe vera taken for 4 weeks produced a clinical response more often than placebo; it also reduced the histological disease activity and appeared to be safe. Further evaluation of the therapeutic potential of aloe vera gel in inflammatory bowel disease is needed. Langmead L, Feakins RM, Goldthorpe S, et al. *Aliment Pharmacol Ther.* 2004;19(7):739-47.

*The preceding abstracts were obtained from the Medline service maintained by the National Institutes of Health.*