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### Role of Non-Caloric Carbonated Beverage Preload During a Standardized Solid and Liquid Meal on Colecistokinin and Ghrelin Levels in Healthy Subjects

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**Background and Aim:** The effects of beverages with carbon dioxide on the gastrointestinal system mainly involve the upper digestive tract, with a possible modification of gastric physiology and change in food intake. No data are available on the relationship between non caloric carbonated beverages intake and gastrointestinal hormones levels. We aimed to verify the effect of a sugar-free carbonated beverage (CB) preload compared to a CB without CO<sub>2</sub> (DCB) and water (W), during a standardized solid (SM) and liquid (LM) meal, on colecistokinin (CCK) and ghrelin (Gh) release. **Subjects & Methods:** After 300 ml of CB, DCB and W, a standardized SM or LM was administered at constant rate (100 kcal/5 min) to ten healthy subjects (4 females, aged 22-30 years; BMI 21-24) on six days in a random order (D1: CB+SM; D2: DCB+SM; D3: W+SM; D4: CB+LM; D5: DCB+LM; D6: W+LM). Eating perceptions (desire to eat, hunger, prospective of food consumption) and maximum satiety (MS) as total kcal intake were measured. CCK and Gh were evaluated on blood samples collected at 0, 10 (after beverage), 30, 60 and 120 min. Hormones values are expressed as ratio with body area surface (BSA) and as peak and nadir for CCK and Gh respectively. All data are expressed as mean±SD. **Results:** Desire to eat, hunger and prospective of food consumption were not different among beverages and meals. Total kcal intakes at MS were significant increased during SM respect to LM for CB (774±209, 585±299, p<0.01), DCB (837±208, 585±280, p<0.01) and W (783±244, 630±353, p<0.01) respectively, without differences among beverages. No differences were found for CCK and Gh among all beverages during SM or LM. Instead, CCK after CB was higher during SM than LM (1.004±0.514, 0.513±0.243, p<0.05) but not after DCB and W (0.790±0.604, 0.849±0.595, n.s.; 0.712±0.473, 0.873±0.431, n.s.) respectively. Moreover, after all beverages, Gh was higher during SM than LM (CB: 0.314±0.100, 0.206±0.099, p<0.05; DCB: 0.288±0.060, 0.145±0.051, p<0.01; W: 0.307±0.083, 0.170±0.085, p<0.01). **Conclusions:** Liquid meal determined an earlier satiety respect to a solid meal with a parallel decrease of Ghrelin independently of the kind of beverage preload. A CCK decrease was found only during liquid meal after carbonated beverage preload without influence on kcal intake compared with DCB and W. Studies on the influence of carbon dioxide on CCK release nutrients related need to explain this data.

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### Absorptive Capacity of Fructans in Healthy Humans: A Dose Response Study

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**Introduction:** Fructan is a carbohydrate polymer present in foods such as wheat and onions. A lack of hydrolases that split fructose-fructose bonds may cause fructan malabsorption and symptoms. Subjects with unexplained GI symptoms and normal lactose/fructose absorption have fructan malabsorption (Neurogastro Mot 2009). However, the absorptive capacity of fructans in humans is not known. **Aim:** To examine the absorptive capacity of fructans in healthy humans by performing a randomized, double blind, dose response study. **Methods:** After overnight fast and fructan-restricted diet, subjects were randomized to receive a 10% solution containing 7.5, 10 or 12.5 grams of Fructan at weekly intervals over 3 weeks. Breath samples were collected at baseline and every 30 minutes after taking fructan for 5 hours, and assessed for H<sub>2</sub> and CH<sub>4</sub> (Quintron, Milwaukee). Presence of 9 common GI symptoms was assessed during the breath test and their severity scored on a Likert scale - 0 (absent) to 3 (severe). A change > 20ppm over baseline H<sub>2</sub> and CH<sub>4</sub> value was defined as malabsorption and presence of concomitant GI symptoms was defined as intolerance. Peak values and area under the curve (AUC) for H<sub>2</sub> and CH<sub>4</sub> were assessed. An interim analysis was performed after enrollment of 65% of subjects. **Results:** 14 healthy subjects participated (age range 18-70yrs). Both malabsorption and intolerance were seen at all 3 doses and there was a dose-dependent response (Table). Peak (ppm) and AUC (ppm.sec) of H<sub>2</sub> and CH<sub>4</sub> values (mean ±SEM) further confirmed that higher doses of fructan produced a greater volume of gas (Table). The peak breath H<sub>2</sub> and CH<sub>4</sub> response for all 3 doses was typically seen at 4 hours after ingestion. Predominant symptoms during the breath test were gas (57%), belching (43%), bloating (21%) and fullness (14%), but were typically mild. **Conclusion:** Fructan absorption and tolerance appears to be quite variable among healthy subjects. Both malabsorption and intolerance were dose dependent in this interim analysis. The amount of hydrogen and methane production correlated with the dose of fructan ingested. Acknowledgement: AGA foundation research award & NIH R01 DK057100

Intolerance	3 (21%)	6 (43%)	8 (57%)
Malabsorption	8 (57%)	11 (79%)	13 (93%)
Peak H <sub>2</sub> ppm	31±12	57±18	69±19
AUC H <sub>2</sub> ppm.s	76±24	121±44	136±39
Peak CH <sub>4</sub> ppm	31±22	34±18	86±34
AUC CH <sub>4</sub> ppm.s	134±42	142±72	211±82

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### Gastrointestinal-Specific Anxiety Mediates the Relationship Between Posttraumatic Stress Disorder (PTSD) and Reduced IBS-Related Quality of Life

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**Background:** Persons with PTSD have increased rates of IBS. PTSD is characterized by hypervigilance and exaggerated reactivity to the external environment. It has been hypothesized that in the setting of PTSD, IBS may represent hypervigilance and exaggerated reactivity to the internal environment, with resulting fear of GI sensations and the contexts in which they occur, which is termed GI-specific anxiety. **Aims:** To assess whether PTSD results in more severe IBS symptoms or lower quality of life, and whether increased GI-specific anxiety mediates a relationship between PTSD and IBS symptoms or quality of life. **Methods:** 125 subjects completed measures of IBS status (Rome III criteria), PTSD symptom severity/ diagnostic status (PTSD checklist - PCL), bowel symptoms (IBS Symptom Severity Score, IBS-SSS), IBS-Quality of Life (IBS-QOL), and GI-specific anxiety (Visceral Sensitivity Index, VSI). Pairwise correlation coefficients of summary scores and groupings based on PTSD and IBS status (PTSD+IBS, PTSD only, IBS only, neither PTSD nor IBS) using ANOVA, were considered statistically significant at p<0.05. Mediation analyses (Baron and Kenney criteria) were performed to assess if GI-specific anxiety mediates a link between PTSD symptoms and IBS symptoms and IBS quality of life. **Results:** 125 patients (mean age 52 years, 72% male) were enrolled. 45% of patients met criteria for IBS and 78% met criteria for PTSD. PTSD diagnostic status was not associated with IBS diagnostic status. When mean scores were compared according to PTSD and IBS diagnostic status, IBS symptom severity was not significantly different (p=0.10), but IBS-QOL was lower for patients with both PTSD and IBS than in other diagnostic groups (p<0.001). PTSD symptom severity (PCL) was not significantly correlated with IBS-SSS, but PTSD symptom severity (PCL) was significantly correlated with lower IBS quality of life (IBS-QOL). Patients meeting diagnostic criteria for PTSD had significantly higher GI-specific anxiety as compared to patients not meeting diagnostic criteria for PTSD (mean VSI 25 ± 21.4 vs. 15 ± 16.2, p = 0.028). Mediation analyses suggested that GI-specific anxiety mediates the relationship between PTSD symptoms and IBS quality of life. **Conclusions:** Our results from this cross-sectional data set indicate that patients with PTSD and IBS experience lower IBS-related quality of life as compared to patients with IBS who do not have PTSD, and that this decrease in quality of life is mediated by increased GI-specific anxiety. Future studies involving longitudinal study designs are needed to further investigate these relationships.

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### Mindfulness, Experiential Avoidance, and Irritable Bowel Syndrome

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**Background:** Mindfulness has been defined as the ability to intentionally pay attention, without judgment, to present-moment experience and sustain this attention over time. Mindfulness training has been shown to be beneficial for chronic pain, but has not been specifically studied for IBS. Mindfulness has been suggested as an intervention that may be beneficial for individuals with IBS. (Naliboff, 2007). Prior research also suggests that worry functions as an 'experiential avoidance' strategy in IBS, and that worry is associated with worse pain suffering (Lackner, 2005). **Aim:** To examine the relationship between mindfulness, experiential avoidance and IBS symptom severity and IBS-related quality of life. **Methods:** Measures were obtained from 125 subjects as part of baseline assessments for two clinical studies of a mindfulness intervention. Measures included IBS status (Rome III criteria), bowel symptoms (IBS Symptom Severity Score, IBS-SSS), IBS-Quality of Life (IBS-QOL), experiential avoidance (Acceptance and Action Questionnaire-AAQ), gastrointestinal symptom-specific anxiety (Visceral Sensitivity Index, VSI) and mindfulness (Five Facet Mindfulness Questionnaire-FFMQ). Mean FFMQ and AAQ scores were compared according to IBS diagnostic status using one-way ANOVA. Pairwise correlation coefficients were considered significant if p<0.05. **Results:** 125 patients (mean age 52 years, 72% male) were enrolled. 56/125 (44.8%) patients met Rome III criteria for IBS. There were no significant differences in mean scores for mindfulness or experiential avoidance according to IBS status. Neither IBS-SSS nor IBS-QOL were significantly correlated with FFMQ, both for all patients in the study and when the analysis was limited to patients with IBS. GI-specific anxiety (VSI) was not significantly correlated with mindfulness (FFMQ) in patients with IBS. Experiential avoidance (AAQ) was not significantly correlated with IBS symptoms (IBS-SSS), both for all patients in the study and when the analysis was limited to patients with IBS. However, IBS quality of life (IBS-QOL) was found to be significantly associated with less experiential avoidance (P<0.05) for patients with IBS. **Conclusions:** Our results do not suggest a relationship between mindfulness and IBS diagnostic status, symptom severity, or quality of life. Our findings also do not support experiential avoidance as a significant factor in IBS diagnostic status or symptom severity, but suggest that it may play a role in IBS quality of life.