BLOATING AND GAS

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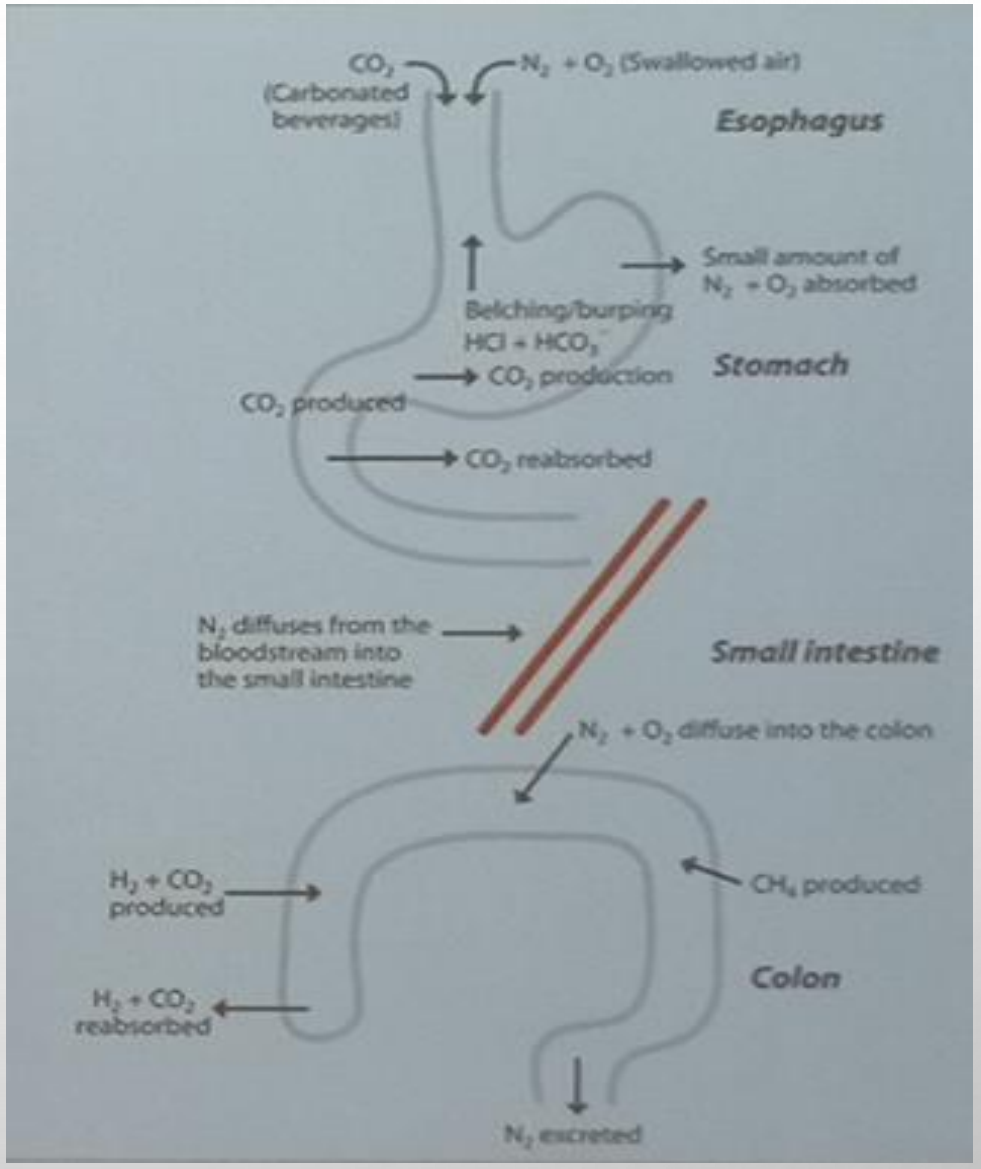
GAS- FACTS TO KNOW

- INTESTINAL GAS VOLUME- NORMALLY 200ML IN HEALTH AND GAS DISORDERS
- NITROGEN (PREDOMINANT), OXYGEN, CO2, H2, METHANE: 99% EXPELLED GASES
- NONE OF THE PRINCIPAL GASES HAS ANY ODOR!
- FLATUS ODOR FROM SULPHUR CONTAINING COMPOUNDS OR SHORT CHAIN FATTY ACIDS
- GAS ARISES FROM AIR SWALLOWING OR INTRALUMINAL PRODUCTION
- CO2 = BYPRODUCT OF DIGESTION OF FAT/PROTEIN, BACTERIAL FERMENTATION OR ACID MEETING BICARBONATE

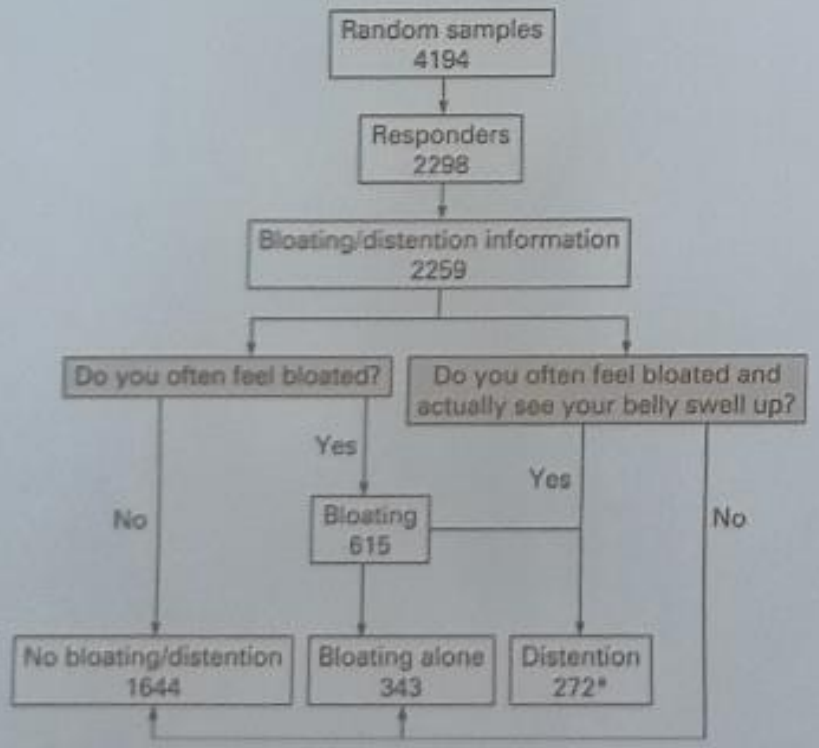
- HYDROGEN PRODUCED AND CONSUMED BY BACTERIA (LARGELY IN COLON)
- METHANOGENIC BACTERIA (M SMITHII) CONSUME H2 AND RELEASE METHANETHIOL AND HYDROGEN SULFIDE

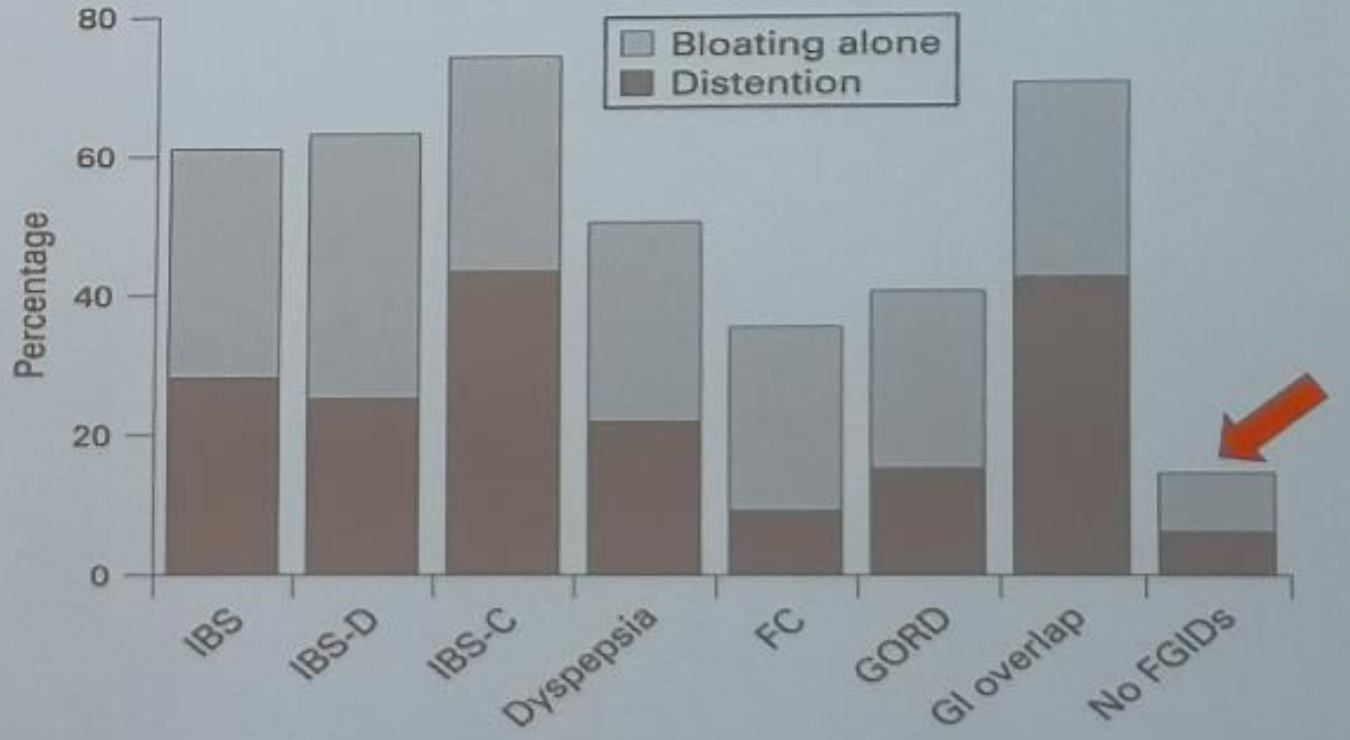


Lacy et al. Gastroenterol Hepatol (NY) 2011;7:729-39.

Prevalence of bloating and distention

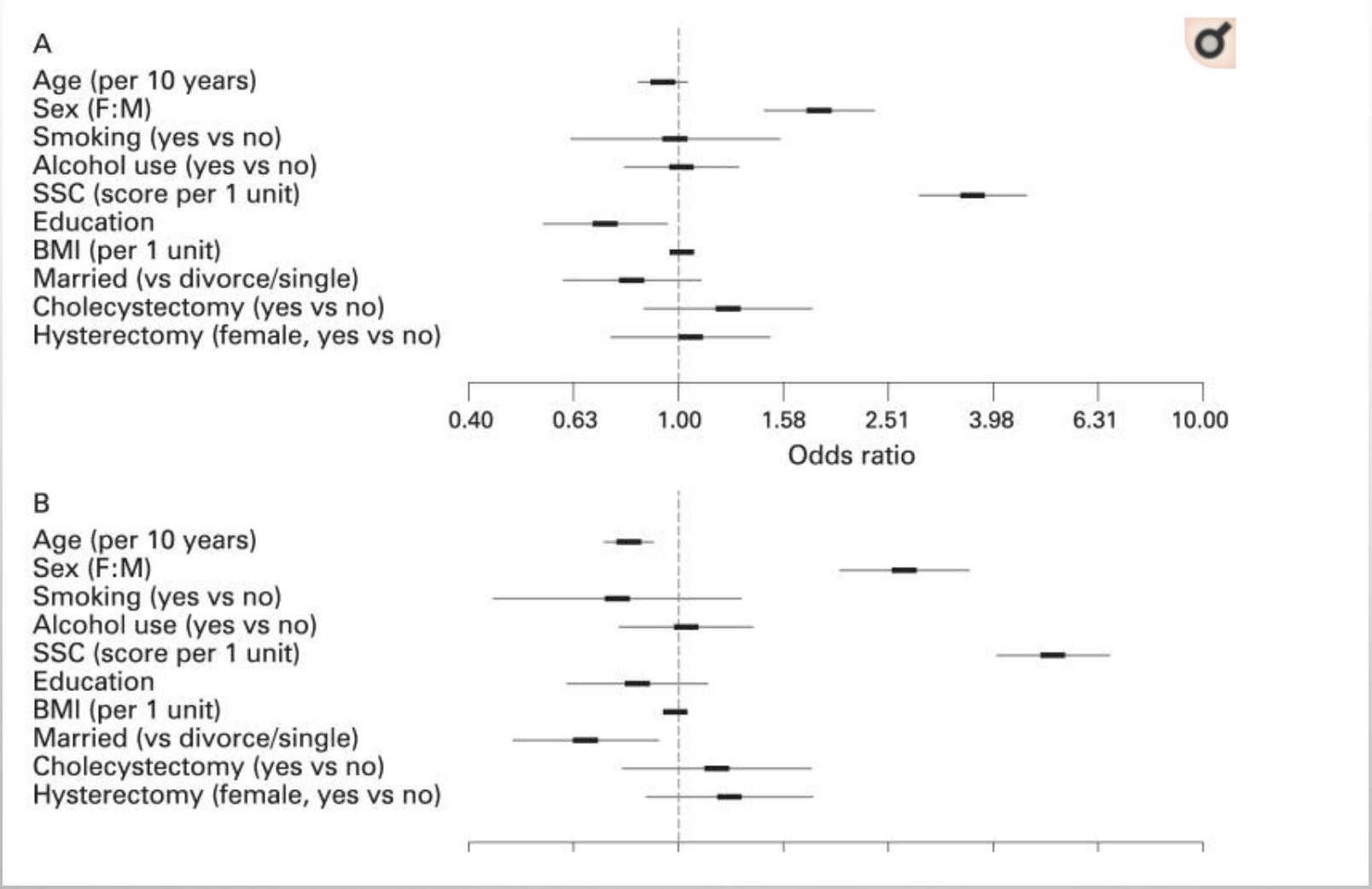
Olmsted County, USA





Jiang, Talley et al. Gut. 2008;57:756–763.

POTENTIAL RISK FACTORS FOR BLOATING ALONE (A) VS NORMAL, (B) VISIBLE DISTENSION VS NORMAL



DIFFERENTIAL DIAGNOSIS OF BLOATING

- FUNCTIONAL BLOATING
- FUNCTIONAL DYSPEPSIA
- DIETARY FACTORS – LACTOSE INTOLERANCE, FRUCTOSE INTOLERANCE, FRUCTAN CONSUMPTION, SORBITOL CONSUMPTION, CARBOHYDRATE INTAKE, GLUTEN SENSITIVITY
- CHRONIC CONSTIPATION
- IBS
- CELIAC DISEASE
- SMALL INTESTINAL BACTERIAL OVERGROWTH
- ABNORMAL COLONIC TRANSIT
- EVACUATION DISORDERS OF PELVIC FLOOR
- GASTROPARESIS
- GASTRIC OUTLET OBSTRUCTION (PARTIAL OR COMPLETE)

Lacy et al. Gastroenterol Hepatol (NY) 2011;7:729-39.

FRUCTANS

- WHEAT PRODUCTS
- ONIONS
- GARLIC
- BARLEY
- CABBAGE
- BROCCOLI
- PISTACHIO
- ARTICHOKE
- ASPARAGUS

SORBITOL









ABDOMINAL GIRTH CHANGES

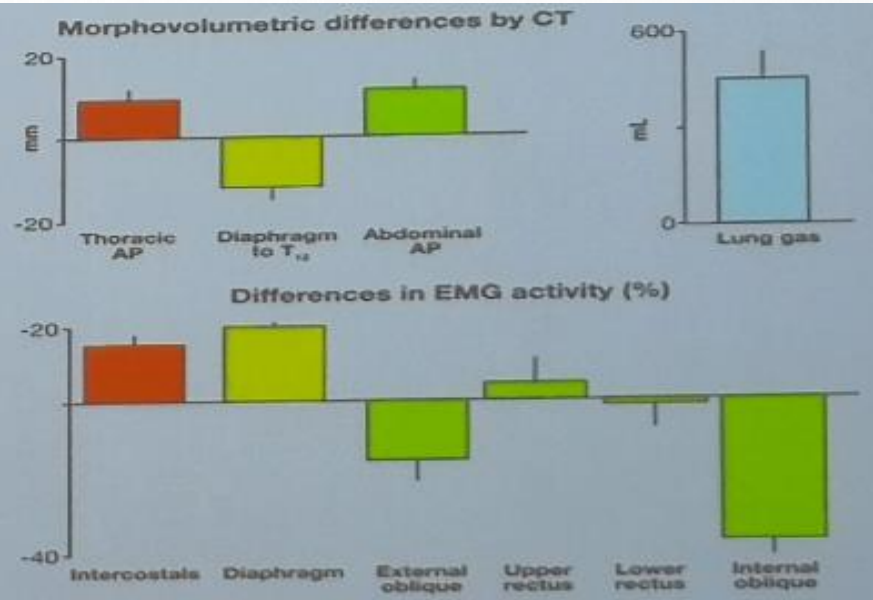
- ABDOMINAL GIRTH RECORDED BY AIP (ABDOMINAL INDUCTANCE PLETHYSMOGRAPHY) FOR 24 HOURS
- IBS-C PATIENTS START THE DAY FEELING BLOATED; IBS-D PATIENTS DO NOT
- INCREASE IN GIRTH WITH MEAL INGESTION FOR ALL, BUT MOST PARTICULARLY IN IBS-D
- SLOW REDUCTION IN GIRTH DURING SLEEP

Houghton et al. Gastroenterology 2006;131:1003-10.

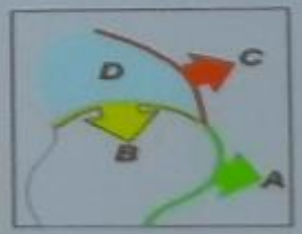
FAILURE OF DIAPHRAGM TO RELAX

Visible distention and abdominal contraction

- N= 45 patients (42 women): 27 IBS constipation, 15 functional bloating, and 3 IBS mixed suffering *discrete episodes of visible abdominal distension*
- Assessed by abdominothoracic CT and EMG of abdominothoracic wall
- Episodes of abdominal distension associated with:
  - diaphragm contraction (19% ± 3% increase in EMG score and 12 ± 2 mm descent; $P < .001$ vs. basal values) and intercostal contraction, increased lung volume



Barba et al. Gastroenterology 2015;148:732-9



Morpho-functional integration: schematic representation

Abdominothoracic differences (mean ± SE) measured in same patients during abdominal distention vs basal conditions

- (*A*) Anterior wall protrusion (increased antero-posterior diameter) and relaxation (decreased EMG activity in external and internal obliques).
- (*B*) Diaphragmatic descent (referenced to T_{12}) and contraction (increased EMG activity).
- (*C*) Costal expansion (increased antero-posterior diameter), intercostal contraction (increased EMG)

DIAPHRAGMATIC BREATHING

- SIT OR LIE IN A COMFORTABLE PLACE. CLOSE YOUR EYES.
- PLACE ONE HAND ON YOUR CHEST AND ONE HAND ON YOUR ABDOMEN. THE BOTTOM HAND SHOULD DO THE MOVING. THE TOP HAND SHOULD REMAIN STILL OR ONLY MOVE AS THE BOTTOM HAND MOVES.
- INHALE **THROUGH YOUR NOSE** FOR ABOUT 4 SECONDS, FEELING YOUR ABDOMEN EXPAND. (YOU MAY FEEL SLIGHT TENSION THE FIRST FEW TIMES YOU INHALE.)
- HOLD YOUR BREATH FOR 2 SECONDS.
- EXHALE VERY SLOWLY AND STEADILY **THROUGH YOUR MOUTH** FOR ABOUT 6 SECONDS. THE MOUTH SHOULD BE RELAXED.
- REPEAT FOR 5-15 MINUTES.

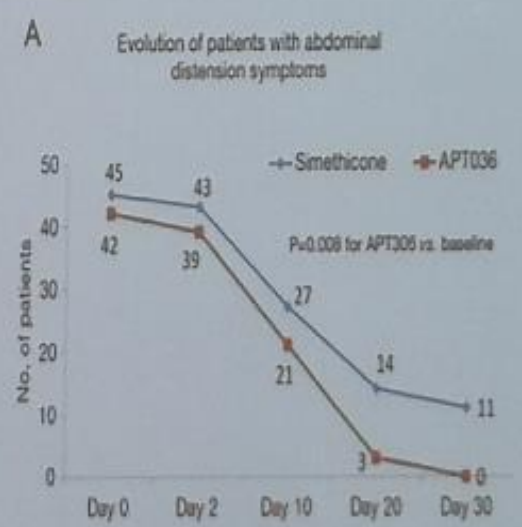
PROBIOTICS FOR IBS

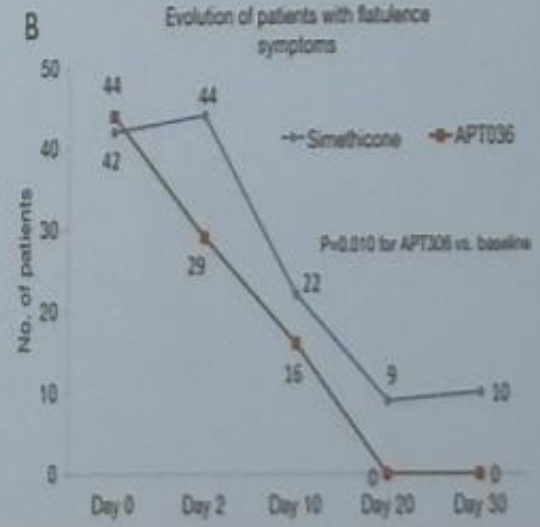
- META-ANALYSIS OF 43 RCTS
- RR OF IBS SYMPTOMS PERSISTING WITH PROBIOTICS VS PLACEBO = 0.79 (95% CI 0.70-0.89)
- PROBIOTICS HAD BENEFICIAL EFFECTS ON GLOBAL IBS, ABDOMINAL PAIN, BLOATING, FLATULENCE SCORES
- PROBIOTICS MAY ALSO HAVE BENEFICIAL EFFECTS IN CHRONIC IDIOPATHIC CONSTIPATION (MEAN INCREASE IN NUMBER OF STOOLS PER WEEK = 1.49, 95% CI 1.02-1.96), BUT ONLY 2 RCTS
- NOT ENOUGH EVIDENCE FOR ANY PARTICULAR SPECIES/STRAIN

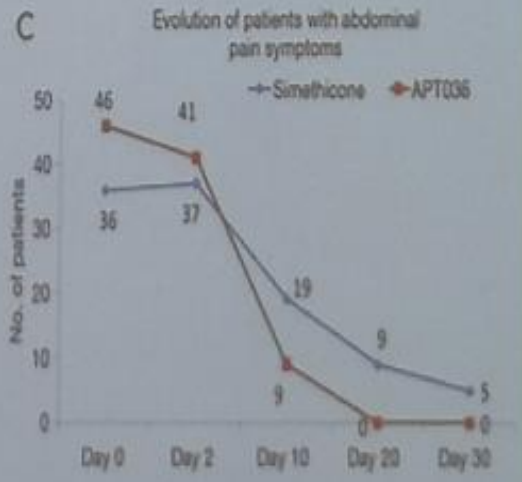
Ford AC, Quigley E, Lacy BE et al. Am J Gastroenterol 2014;109_1547-61.

Double-blind, randomized study of APT036 (xyloglucan plus tyndallized *Lactobacillus reuteri* and *Bifidobacterium brevis*) vs. simethicone in functional bloating

- APT036 or simethicone were administered orally (3 times/day) for 20 consecutive days, n=108
- APT036 significantly reduced abdominal distension (P=0.008) and flatulence (P=0.010) from baseline to Day 30 vs. simethicone
- The baseline glucose hydrogen breath test suggested the presence of small intestinal bacterial overgrowth (SIBO) in all subjects
  - At Day 20, mean hydrogen gas elevation was below the threshold for a diagnosis of SIBO (<12 ppm above basal on glucose administration) in both study arms!
- No placebo arm!







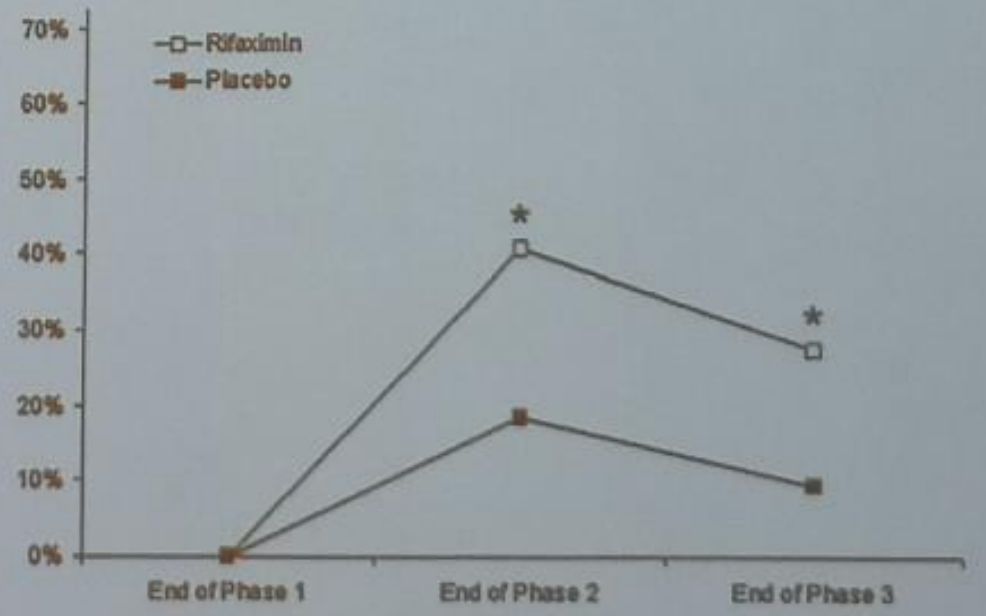
Xyloglucan, a natural polysaccharide derived from tamarind seeds, possesses a "mucin-like" molecular structure that confers mucoadhesive properties, to act as a barrier capable of reducing bacterial adherence and invasion and to preserve tight junctions and paracellular flux

Burta et al. Transl Gastroenterol Hepatol. 2018; 3: 72

Rifaximin for bloating

- Randomized double-blind placebo-controlled trial
- > 12-wk history of bloating and/or excessive flatulence and any of the following: chronic abdominal pain or discomfort, disturbances in bowel movements, or abnormal stool consistency
- 10-day phases: baseline (phase 1), rifaximin 400 mg b.i.d. or placebo (phase 2), and post-treatment (phase 3)
- n=124 enrolled (63 rifaximin and 61 placebo)
- At the end of phase 2, there was a significant difference in global symptom relief with rifaximin versus placebo (41.3%vs 22.9%, p= 0.03) maintained end of phase 3 (28.6%vs 11.5%, p= 0.02)
- Mean cumulative and bloating-specific scores dropped significantly in the rifaximin group (p <0.05)
- H2-breath excretion dropped significantly among rifaximin responders and correlated with improvement in bloating and overall symptom scores (p= 0.01)

Sharara et al. Am J Gastroenterol. 2006; 101(2):326-333.



Subjective global relief at the end of the study in irritable bowel syndrome ($* p \leq 0.05$)

RIFAXIMIN FOR BLOATING- IS IT EFFECTIVE ON RETREATMENT?

- RECURRENCE DEFINED AS LOSS OF RESPONSE FOR >3-4 WEEKS
- FIRST RETREATMENT SUCCESSFUL IN 33% RIFAXIMIN VS 25% PLACEBO (P=0.02)
- 2^{ND} RETREATMENT SUCCESSFUL IN 36.9% VS 29.3% PLACEBO (P= 0.04)
- URGENCY, ABDOMINAL PAIN AND BLOATING IMPROVED SIGNIFICANTLY WITH BOTH RETREATMENTS

GLOBAL RELIEF OF IBS WITH TCA/SSRI

- TCAS: 9 STUDIES (N = 319 DRUG VS 256 CONTROL)
  - IMIPRAMINE, DESIPRAMINE, AMITRYPTILINE, DOXEPIN*; DOSES 10-150MG
  - META-ANALYSIS FAVOURS TREATMENT

  - SSRIS: 5 STUDIES (N=113 DRUG VS 117 CONTROL)
  - FLUOXETINE, PAROXETINE, CITALOPRAM*; DOSE 10-40MG
  - META-ANALYSIS FAVOURS TREATMENT

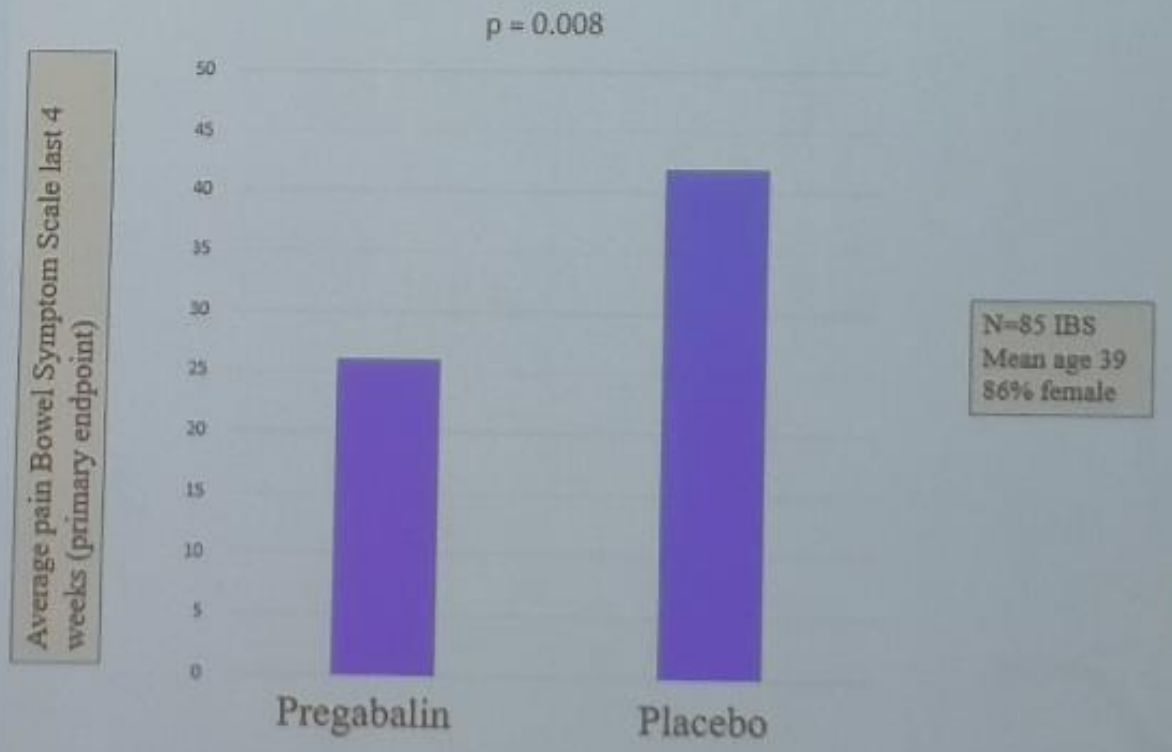
  - TCAS HAVE MORE ANALGESIC PROPERTIES
  - SSRI EFFICACY MOST LIKELY IN PATIENTS WITH SIGNIFICANT ANXIETY/DEPRESSION

  - *OFF LABEL USE, NOT FDA APPROVED FOR IBS-D
  - QUALITY OF EVIDENCE: HIGH

Ford, Quigley, Lacy et al. Am J Gastroenterol 2014;109:1350-65.

Randomised Controlled Trial of Pregabalin for IBS

- A double-blind, placebo-controlled trial
- IBS Rome III criteria ≥3 pain attacks per month
- Randomized to pregabalin 225 mg vs placebo twice daily 12 weeks
- N=85 mean age 39.4 (SD = 14.6); 73 (86%) female; 37 (44%) IBS-D, 29 (35%) IBS-M, 18 (21%) IBS-C
- Overall IBS BSS severity score lower in pregabalin arm vs. placebo (26 vs 42, P = 0.009)
- **Differences observed diarrhea-BSS & bloating-BSS scores (P = 0.049 & 0.016)**
- No differences between groups in constipation
- Adequate relief not different between the two arms (46% vs 36%, P = 0.35)
- 63% pregabalin vs 45% placebo change in pain score ≥30 at week 12 from baseline (P = 0.10)



Saito, Talley et al. Aliment Pharmacol Ther 2019;49:389-397

TREATMENT OPTIONS FOR BLOATING

- DIET- LOW FODMAP, GLUTEN FREE
- EXERCISE AND POSTURE (DON'T LIE DOWN)
- OTC MEDICATIONS- CHARCOAL, SIMETHICONE (USELESS), HERBALS
- PROBIOTICS
- NON-ABSORBABLE ANTIBIOTIC- RIFAXIMIN (NOT FUNDED IN NZ)
- SMOOTH MUSCLE ANTISPASMODICS- MAY WORSEN GAS RETENTION
- OSMOTIC LAXATIVES- IF CONSTIPATED MIGHT HELP
- CHLORIDE CHANNEL ACTIVATORS- LUBIPROSTONE (NOT FUNDED)- MODEST BENEFIT FOR BLOATING IF CONSTIPATED
- PROKINETIC AGENTS- DOMPERIDONE, TEGASEROD (5HT4 AGONIST)
- TRICYCLIC ANTIDEPRESSANTS – POSSIBLE BENEFIT

FLATULENCE

- NORMAL VOLUME PASSED 500-1500ML: FLATUS 10-20 TIMES PER DAY
- EXCESSIVE FLATUS OR FOUL FLATUS RARELY PATHOLOGICAL
- NO NEED TO INVESTIGATE IF NO ALARM FEATURES
- ROLE OF MICROBIOME?

PREBIOTICS

- 2016 DEFINITION: A SUBSTRATE THAT IS SELECTIVELY USED BY HOST MICROORGANISMS TO PRODUCE A HEALTH BENEFIT.
- COMPOUNDS THAT CAN BE CLASSIFIED AS PREBIOTICS MUST ALSO MEET THE FOLLOWING CRITERIA:
- NON-DIGESTIBLE AND RESISTANT TO BREAKDOWN BY STOMACH ACID AND ENZYMES IN THE HUMAN GASTROINTESTINAL TRACT
- SELECTIVELY FERMENTED BY INTESTINAL MICROORGANISMS
- SELECTIVELY TARGET AND STIMULATE THE GROWTH AND ACTIVITY OF BENEFICIAL BACTERIA

PREBIOTICS- FLATULENCE

- FLATULENCE SEVERITY IMPROVED BY PREBIOTICS AT DOSES <6G/D (P=0.05)
- INCREASED ABSOLUTE ABUNDANCE OF BIFIDOBACTERIAL, P=0.04

- NO DIFFERENCES IN SEVERITY OF PAIN OR BLOATING BETWEEN PREBIOTICS AND PLACEBO

Wilson et al. Am J Clin Nutr 2019;109:1098-1111.

PREBIOTICS VS LOW FODMAP DIET: WOULD INTERMITTENT PREBIOTICS BE PREFERRED?

- RCT OF PATIENTS WITH FGID PLUS FLATULENCE.
- PREBIOTIC SUPPLEMENT PLUS A PLACEBO (MEDITERRANEAN TYPE DIET)- N =19 (PREBIOTIC GROUP)
- VS PLACEBO SUPPLEMENT PLUS A LOW FODMAP DIET, N= 21
- RCT FOR 4 WEEKS, FOLLOW UP FOR 2 WEEKS AFTER
- AFTER 4 WEEKS, BIFIDOBACTERIUM (INCREASE IN THE PREBIOTIC GROUP AND DECREASE IN THE LOW FODMAP GROUP, P=0.042)
- AFTER 4 WEEKS, BOTH GROUP HAD SIGNIFICANT REDUCTIONS IN ALL SYMPTOM SCORES
- DECREASE IN SYMPTOMS PERSISTED FOR 2 WEEKS AFTER DISCONTINUED PREBIOTIC
- SYMPTOMS REAPPEARED IMMEDIATELY AFTER PATIENTS DISCONTINUED LOW FODMAP

Huaman et al. Gastroenterology 2018;155:1004-7.

FLATULENCE

- DIET IMPORTANT EG PORK AND FOUL SMELLING GAS, FODMAPS
- PREBIOTICS
- ANTIFLATULENCE OTC DRUGS EG SIMETHICONE, CHARCOAL: USELESS!
- BISMUTH REDUCES HYDROGEN SULPHIDE ODOR (CANT USE LONG TERM)
- CHARCOAL LINED CUSHION, UNDERWEAR- DEODORIZE

Suarez et al. Am J Gastroenterol 1999;94:208; Friis et al. Digestion 1991;49:227

TAKE HOME POINTS

- COMMON IN IBS AND OTHER FGIDS: MICROBIOME FERMENTATION OF FOOD WITH SMALL AMOUNTS OF GAS RELEASE
- SYMPTOMS IN THOSE WITH UNDERLYING INTESTINAL HYPERSENSITIVITY
- DIET
- TREAT CONSTIPATION/IMPROVE BOWEL EMPTYING!
- CONSIDER RIFAXIMIN
- FLATULENCE NORMAL, MICROBIOME AND DIET PLAY A ROLE, CERTAIN PREBIOTICS MAY HELP, TREAT ODOUR ISSUES IF POSSIBLE