‘Biotics’

DEFENDING THE GUT

BGTHA Bristol October 2013

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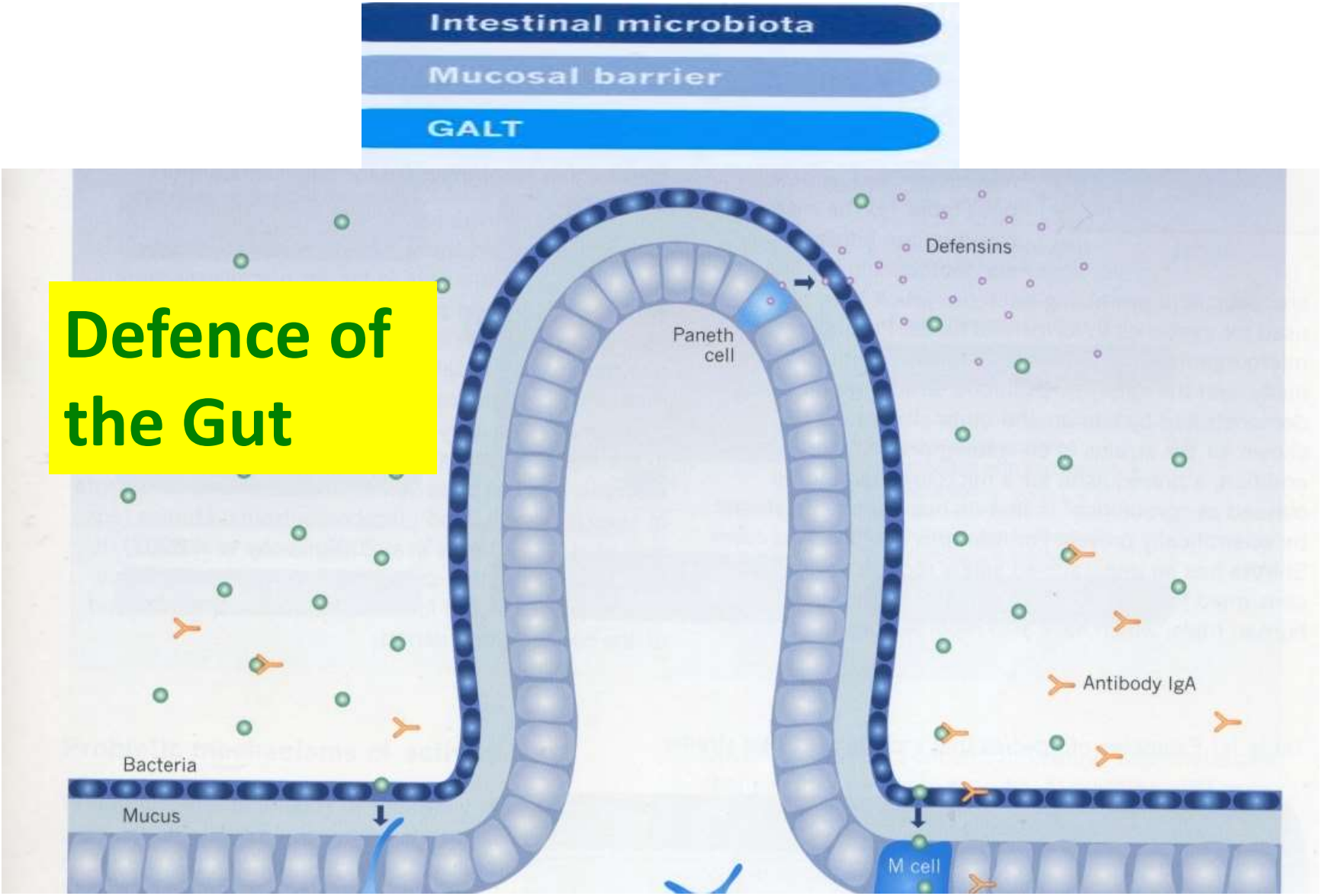
Travel Medicine Society of Ireland


Intestinal microbiota
Mucosal barrier
GALT
Defence of the Gut
Defensins
Paneth cell
Antibody IgA
Bacteria
Mucus
M cell

To put things in context

- No. of bacteria in gut > 100,000 billion.
- No. of cells in body ~ 10,000 billion.
- Wt of enterobiota is 1-2kg !!

A balance must be kept within the resident flora

- **Beneficial flora:** e.g. Bifidobacteria , Lactobacteria
- **Opportunistic flora:** e.g. Bacteroides, Clostridia, Yeasts
- **Transitional flora:** These are various microbes, which we swallow daily with food and drink Can be bad!

Antibotics

Vitabiotics

FODMAPs

Probiotics

Symbiotics

Prebiotics

Dysbiotics

Postbiotics

Synbiotics

Definitions

Symbiotics 'the living together of two or more unlike organisms' (Heinrich de Bary 1879)

Vitabiotics

merely vitamin concentrates

Definitions

- **Antibiotics** are natural or synthetic substances that can destroy or inhibit the growth of live organisms

Definitions

- **Probiotics are *live* microorganisms that *reach the colon* where they produce beneficial effects for hosts when a sufficient amount is ingested'**

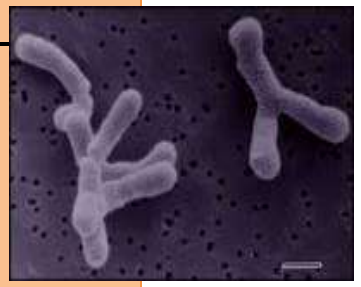
WHO/FAO 2005 *see Reid G. Current Pharmaceutical Design 2005; 11:1-6*

Definitions

- **Probiotics are *live* microorganisms ?**
- **Reach *the colon* ?**
- **exhibit *beneficial effects* for hosts ?**
- **what is a *sufficient amount* ?**
- ***which* of them for *which* condition?**

Common Probiotic Microorganisms

- **‘Bifidobacterium genus’** – Before the 1960s were collectively referred to as "*Lactobacillus bifidus*”



- **Lactobacilli** (casei, acidophilus, rhamnosus)

- **Saccharomyces**

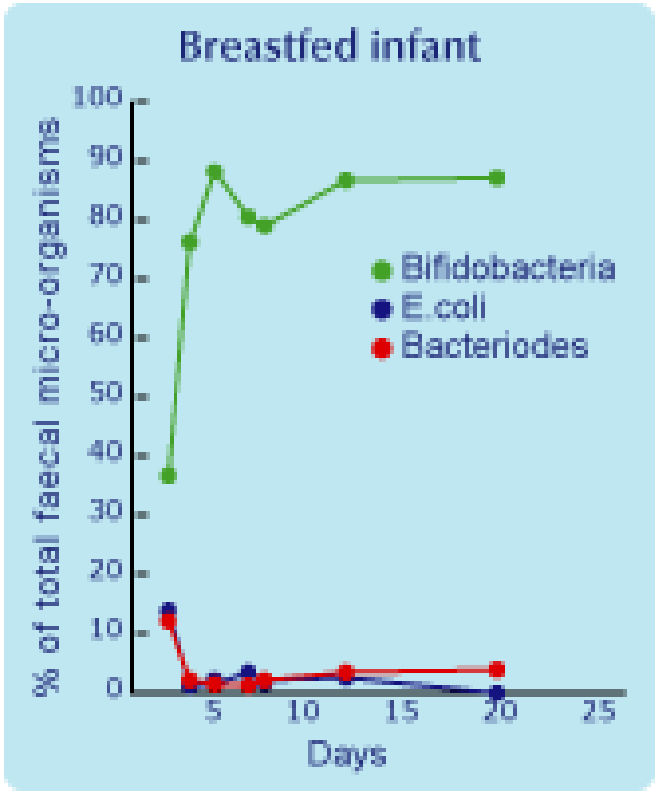
Other ‘probiotic’ bacteria

- ***Streptococcus thermophilus,*** especially in yogurt (produces lactase)
- ***Enterococcus faecium*** kills pathogens especially rotavirus

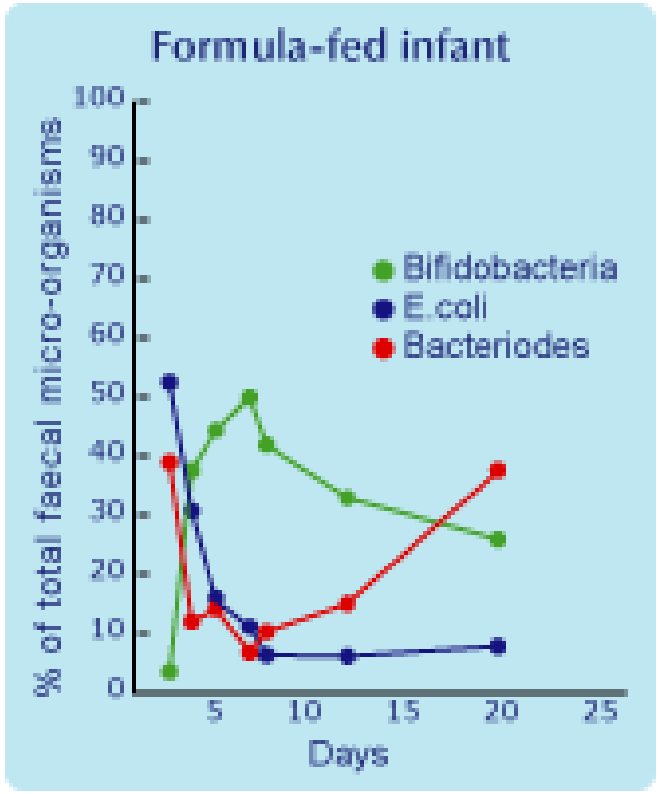
Colonization of Gut

- Starts immediately after birth
  - ➢Place of birth
  - ➢Type of Delivery
  - ➢ Breast feeding

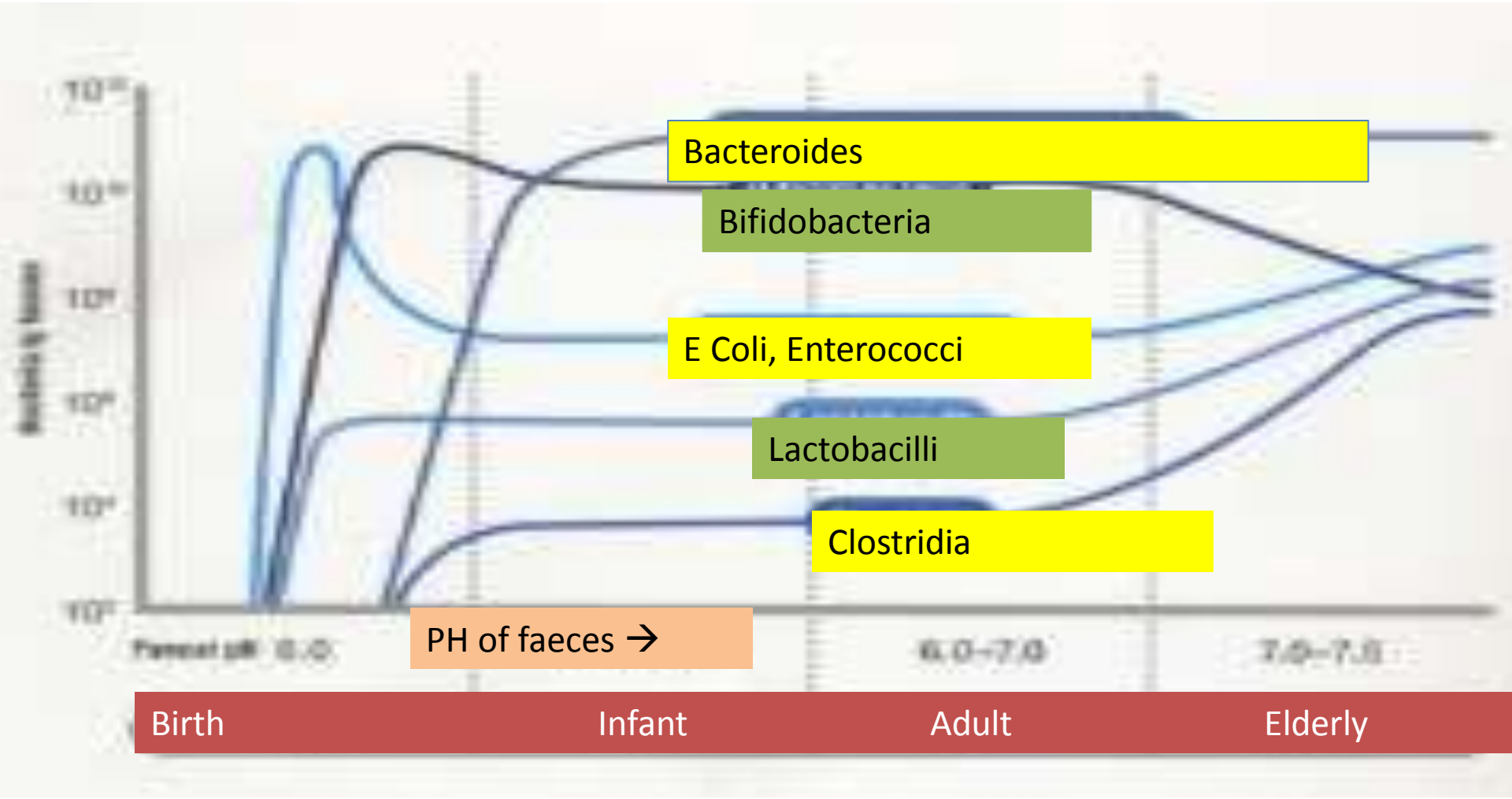
Gut Flora in Breast Fed vs Formula Fed Babies



In breastfed babies there are high levels of friendly bacteria

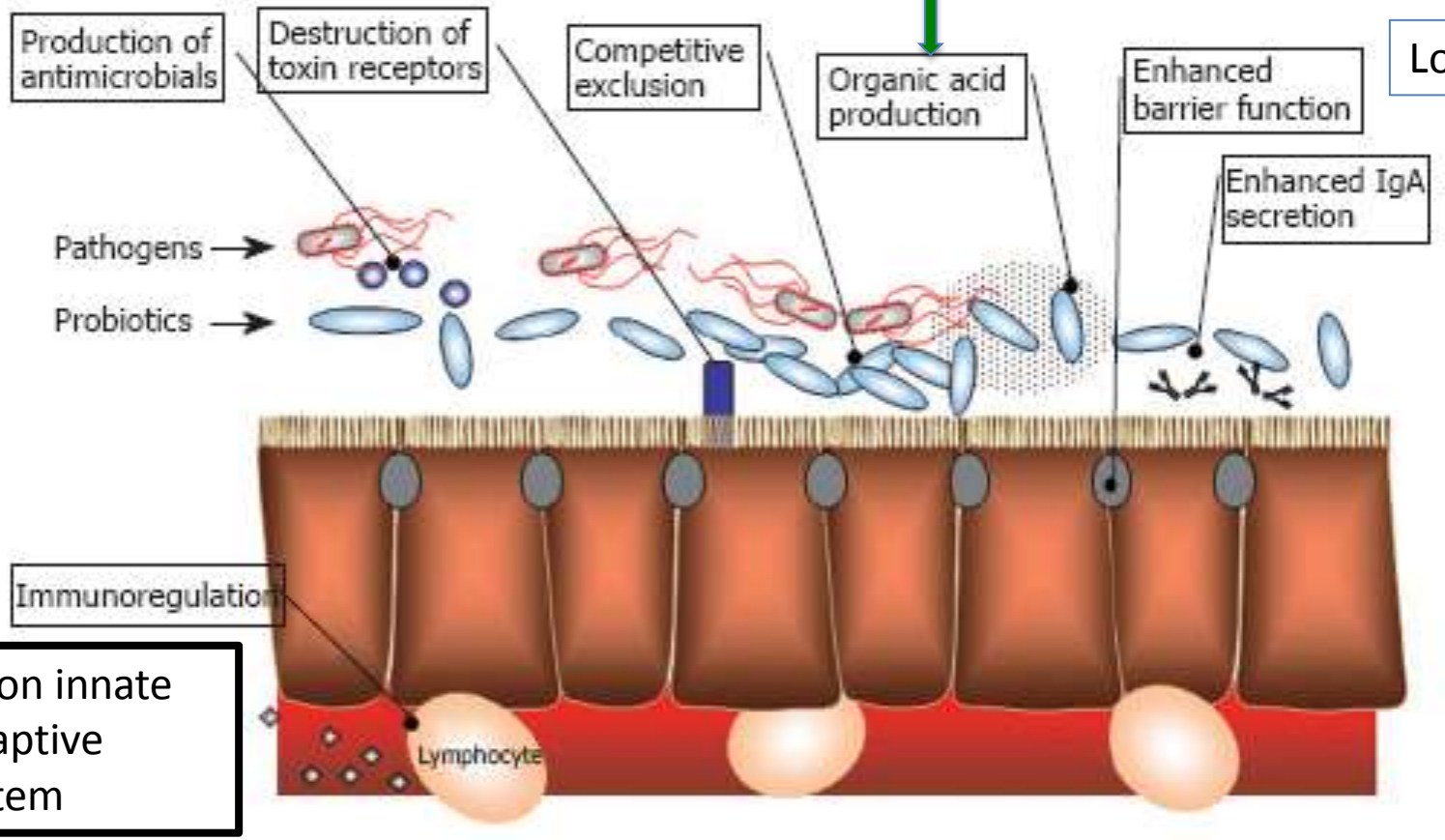


In contrast, babies fed infant formulas without prebiotics have lower levels of friendly bacteria


Bacteroides
Bifidobacteria
E Coli, Enterococci
Lactobacilli
Clostridia
PH of faeces →
Birth
Infant
Adult
Elderly

MOA of Probiotics

See Postbiotics below



More effect on innate than on adaptive Immune System

Figure 3 Mechanisms of probiotic activity.

Prebiotics

Fermentable

Non digestible

Non absorbable

dietary ingredients

Modified Criteria for eligibility as Prebiotic

(after Gibson et al., 2007)

1) **Resistance to gastric acidity and to GIT absorption**
2) **Selective stimulation of 'good' intestinal bacteria**
3) **Fermentation by intestinal microflora to produce lactic acid, SCFAs & gas**
4) **Direct positive effect on 'immune, epithelial and mucosal cells'** *After Blackwood & McIntosh 2009*

- **Top 10 Foods Containing Prebiotics**
- **Food Prebiotic Fibre Content by Weight**
- Raw Chicory Root 64.6%
- Raw Jerusalem Artichoke 31.5%
- Raw Dandelion Greens 24.3%
- Raw Garlic 17.5%
- Raw Leek 11.7%
- Raw Onion 8.6%
- Cooked Onion 5%
- Raw Asparagus 5%
- Raw Wheat bran 5%
- Whole Wheat flour, 4.8%
- Raw Banana 1%

‘Commercial’ Prebiotics : Bimuno

- Contains a 2nd generation (B-GOS) which causes
- **A highly selective proliferation of beneficial bacteria especially bifida (within 7 days)***
- **A stimulation the GALT**
- **A blocking of the attachment and colonisation of ETEC and *S. typhimurium*****

- *March 2013 issue of The Journal of Nutrition
- ** *BGTHA Journal Vol. XIX 2012* Blackwood T I & McIntosh P A

University of Reading 2009

- A double blind, placebo controlled trial in the prevention of TD by B-GOS in 159 healthy volunteers
- *A Drakoularakou, G Tzortzis, RA Rastall and GR Gibson*
  European Journal of Clinical Nutrition (2009) *Caveat: conflict of interests*

In this study

- Expect TD in 50%
- Overall 31% of persons who took part reported diarrhoea during the holiday period.
- Of those, **62% were in the placebo group** and **38% in the B-GOS group**
- **Significant differences between the B-GOS and the placebo group in the incidence ($P<0.05$) and duration ($P<0.05$) of TD.**

Definitions

- **Synbiotics are preparations containing at least one probiotic and one prebiotic**
-

Common synbiotic

- **AKSB** (Agri-King) contains **1st generation prebiotic** (FOS) **and 2 probiotics** (*Enterococcus faecium* and *S. cerevisiae)*
- Virk et al Mayo Clinic *J Tr Med 2013* showed that **Agri-King does not reduce the risk of TD or decrease the duration of TD or decrease the use of antibiotics in TD**

Flaws….

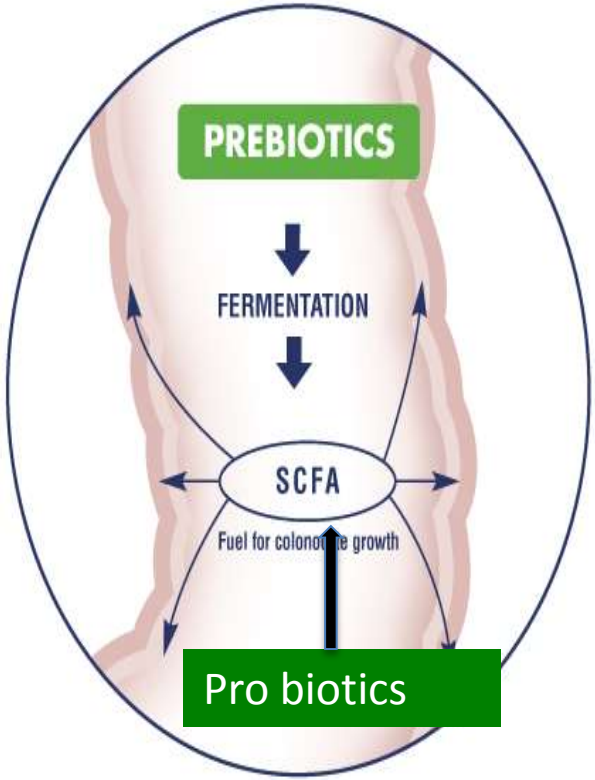
- First generation prebiotic
- Of 252 only 196 participated
- Huge diversity of locations (31 listed)
- Severity of diarrhoea not mentioned
- Almost half the returned capsules had decrease in probiotic numbers but ½ of these had >1.5 billion organisms / capsule
- Adherence to protocol only 114/196
- Leftover capsules got from 43% (86 people)

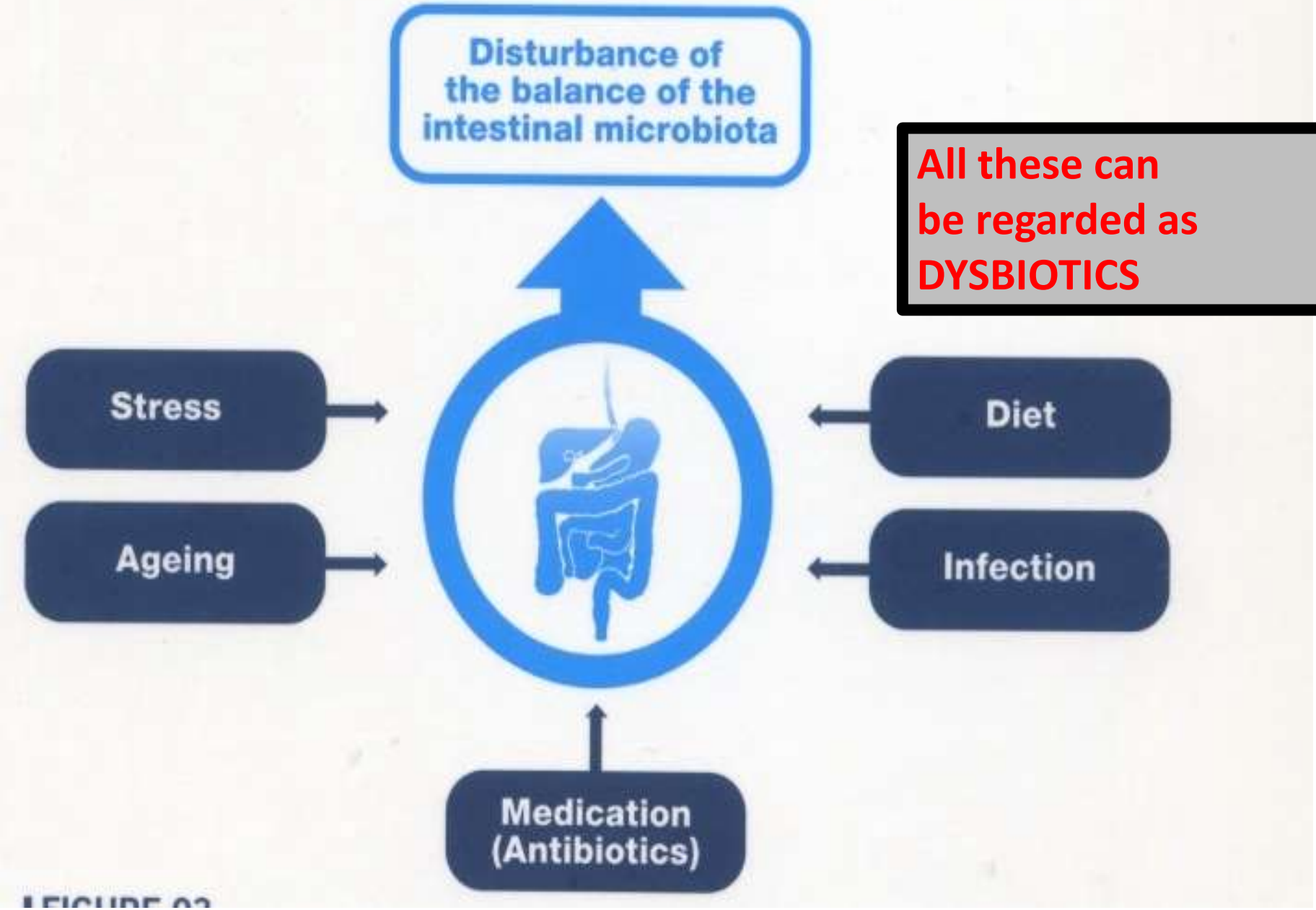
Definitions

- **Postbiotics** are the products of probiotic degradation and of prebiotic fermentation in the ileum and colon

Short chain fatty acids, SCFAs

Acetate, Propionate, and **Butyrate** and Lactic acid





All these can be regarded as DYSBIOTICS

Definitions

- **FODMAPS are short-chain carbohydrates and polyols that are**
- **Readily fermented – by most people**
- **Readily digested – by most people**
- **Readily absorbed – by most people,**
- ***Modified from Clinical and Systematic Review 2009***

FODMAP Foods

- **Vegetables**
- **Garlic – avoid entirely if possible**
- **Onions – avoid entirely if possible**

- **Fruits** can contain high fructose
- Apples
- **Apricots**
- **Blackberries**
- **Cherries**
- **apple / pear juice**
- **Watermelon**
-

- **Cereals, Grains, Breads, Biscuits, Pasta, Nuts and Cakes**
- Wheat containing products such (be sure to check labels):
- **Biscuits**
- **Breadcrumbs**
- **Cakes**

-

- **Sweets and sweeteners**
- **Sugar free sweets**
- Agavae
- **Fructose**
- **Honey**
- High fructose corn syrup (HFCS)
- Inulin
- Isomalt
- Maltitol
- Mannitol
- Sorbitol
- Xylitol

Low FODMAP foods

Low FODMAP food (good to eat food)

Vegetables

- Bok choy / pak choi
- Bean sprouts
- Butternut squash
- Carrots
- Celery
- Corn – if tolerable
- Courgette
- Chilli – if tolerable
- Chives
- Cucumber
- Eggplant / aubergine
- Green beans
- Ginger
- Lettuce
- Olives
- Parsnip
- Parley
- Red peppers (red bell pepper)
- Potato
- Pumpkin
- Scallions / spring onions (green part)
- Spinach
- Sweet potato
- Tomato – avoid cherry tomato
- Zucchini – if tolerable

Fruit

- Bananas
- Blueberries
- Boysenberry
- Canteloupe
- Cranberry
- Honeydew and Galia melons
- Clementine
- Dates
- Grapes
- Grapefruit
- Kiwifruit
- Lemon
- Lime
- Mandarin
- Orange
- Passion fruit
- Papaya
- Pineapple
- Raspberry
- Strawberry

Cereals, Grains, Breads, Biscuits, Pasta, Nuts and Cakes

- Wheat free or gluten free breads
- Bread made from oats, rice, corn, barley and potato flours
- Wheat free or gluten free pasta
- Buckwheat noodles
- Rice noodles
- Porridge and oat based cereals
- Cornflakes
- Rice bran
- Rice Krispies
- Almonds – max of 15
- Amaranth
- Barley
- Buckwheat
- Crispbread
- Corncakes
- Macadamia – max of 10
- Millet
- Oats
- Oatcakes
- Peanuts – max of 15
- Pecans – max of 15
- Pine nuts – max of 15
- Polenta
- Potato chips
- Pumpkin seeds – max of 1 – 2 tbsp
- Quioa
- Rice cakes
- Rice crackers
- Sesame seeds – max of 1 – 2 tbsp
- Sunflower seeds – max of 1 – 2 tbsp
- Sorgum
- Tortilla chips
- Walnuts – max of 10
- White rice
- Wheat free rye

Sweets and sweeteners

- Golden syrup
- Glucose
- Maple syrup
- Sugar – also called sucrose
- Aspartame
- Saccharine
- Sucralose

Drinks

- Clear spirits such as Vodka
- Fruit and herbal tea – ensure no apple added
- Lemonade – in low quantities
- 'Sugar' Fizzy drinks (i.e. not diet/sugar free version) – such as lemonade, cola
- Wine and beer – limited to 1 drink
- Water

Dairy Foods

- Brie cheese
- Butter
- Camembert cheese
- Cream
- Dairy free chocolate pudding
- Feta cheese
- Gelato
- Hard cheese – such as cheddar
- Lactose free milk
- Mozzarella cheese
- Oat milk
- Parmesan cheese
- Rice milk
- Sorbet
- Swiss cheese
- Tofu

Gibson & Shepherd

2009 Monash University, Victoria.

- A FODMAP-free diet is the treatment of choice in patients with functional gut symptoms.
- **The evidence base is now sufficiently strong to recommend its widespread application.**

Summary

- **PROBIOTICS** live organisms

  Lactobacilli, Bifida bacteria Saccharomyces

- **PREBIOTICS** Fermentable
  Not digested
  Not absorbed

  Fibre, synthetic GOS

FODMAPS Fermentable
Digestible
Absorbed

Lactose, fructose, inulin , manitol

Probiotics

and diarrhoea

Some common probiotic products

- Yogurt
- Smoothies
- Cottage Chee
- Cheese

Optifit

Yakult
Yakult

DANNON
WITH BIFIDUS REGULARIS
ACTIVIA
HELPS REGULATE YOUR DIGESTIVE SYSTEM

Duneen
Duneen
FARMHOUS
strawberr

ACIDOPHI
EXTRA
10
Nature's Best
ACIDOPHILUS
EXTRA
10

Bad or no proper labelling*

- **YAKULT** *Lactobacillus casei* Shirota**, 6.5 billion live** cells of this strain per bottle (on product wrapping only)
- ***DANONE ACTIMEL** *L. casei & vit B6 + D.* (maker information: **10 billion/bottle**)
- **DANONE ACTIVIA** - just says *bifidus actiregularis*
- **NATURES BEST** probiotic capsules *Lactobacilllus acidophilus* (LA-5) and *Bifidobacterium bifidus* (BB-12) in equal quantities. Total **4 billion per capsule**
- ***GLENISK** (organic low fat) 'yogurt cultures (*S.thermophilus*, *L. bulgaricus*) live culture (*L.casei, Bifidus*)'

TRAVELER'S DIARRHOEA

- **Suggested regimen in Travel Medicine**
- **Probiotic: 1-2 billion/day**
- **Prebiotic: 5.5g per day**

Give a probiotic and/or a prebiotic daily One week before, during travel and one week after completion of travel.

For and against Probiotics in TD

- In 1989 Kollaritisch, Wiedeman et al 1989 ***S cerevisiae Little or* No use.** Tr Med Int.
- In 1993 Kollaritisch, Holmes et al 1993 ***S boulardii useful*** Fortschr Med
- In 2012 Kollaritsch H, Paulke-Korinek M, Wiedermann U

  Yes, ***some probiotics are useful in some places*** Infect Dis Clin North Am

Tested Probiotic Effect on Traveller's Diarrhoea

Finnish Trial:

820 Finnish travellers going to Turkey

One *L. rhamnosus* GG capsule daily

Decreased the incidence of TD up to 39.5%

No side effects

Tested Probiotic Effect on Traveller's Diarrhoea (1993)

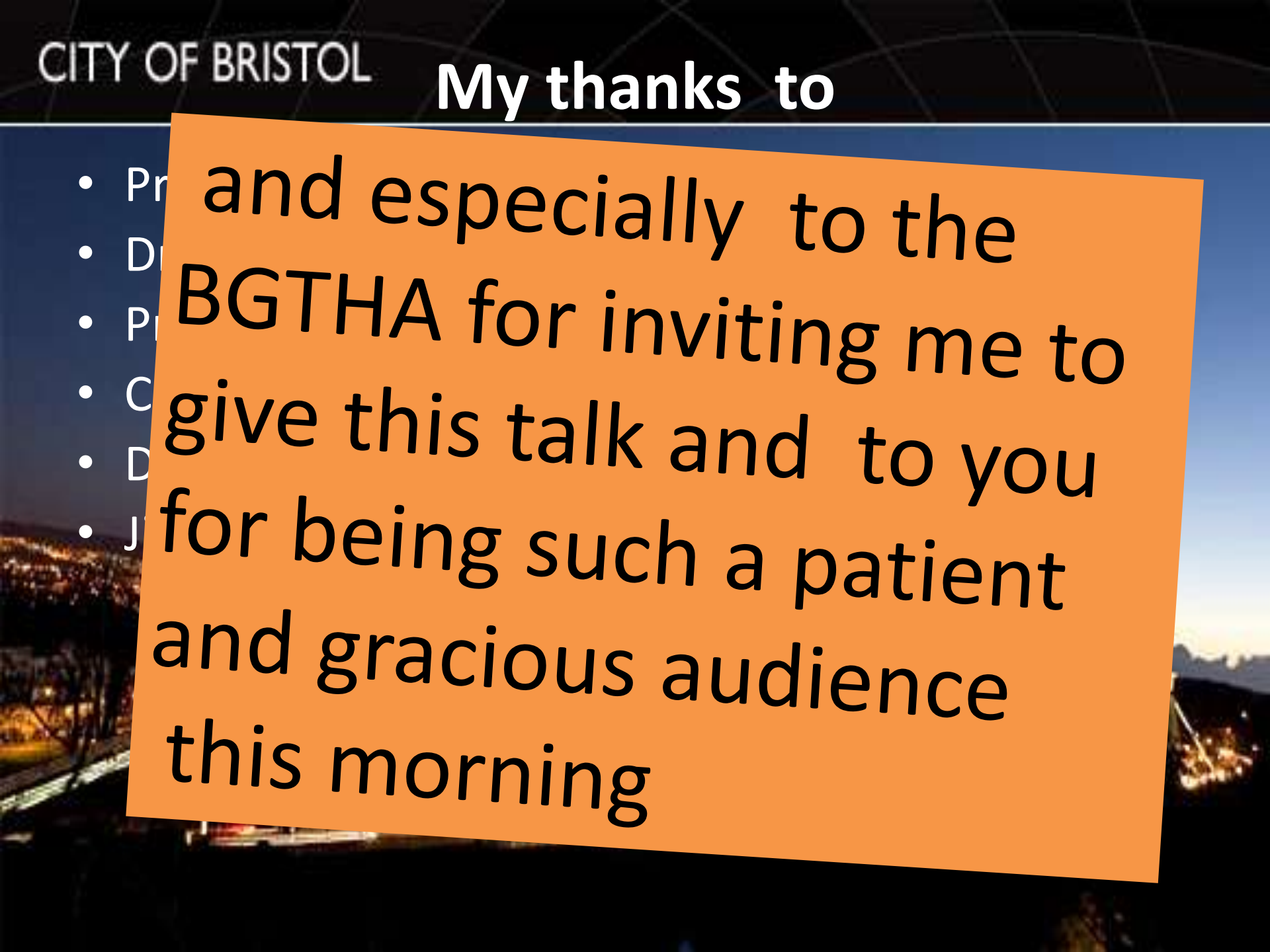
- 47% of Americans travelling to Mexico avoided Traveller's diarrhea when *Lactobacillus* was administered daily.

Meta-analysis 2007 Lynne McFarland
Tr Med Infect Dis

- 940 trials examined . Only 12 fulfilled strict criteria
- *S. boulardii, L. acidophilus* and *B. bifidum* significantly prevent TD. $P<0.001$
- **No serious adverse reactions were reported in these 12 random controlled trials.**

The Chochrane Collaboration Stephen Allen (Swansea) intervention review 2010

- Examined 63 trials, >8000 people mainly children .
- Risk of diarrhoea lasting >4days reduced by 59%
- No adverse effects


CITY OF BRISTOL
My thanks to
and especially to the BGTHA for inviting me to give this talk and to you for being such a patient and gracious audience this morning