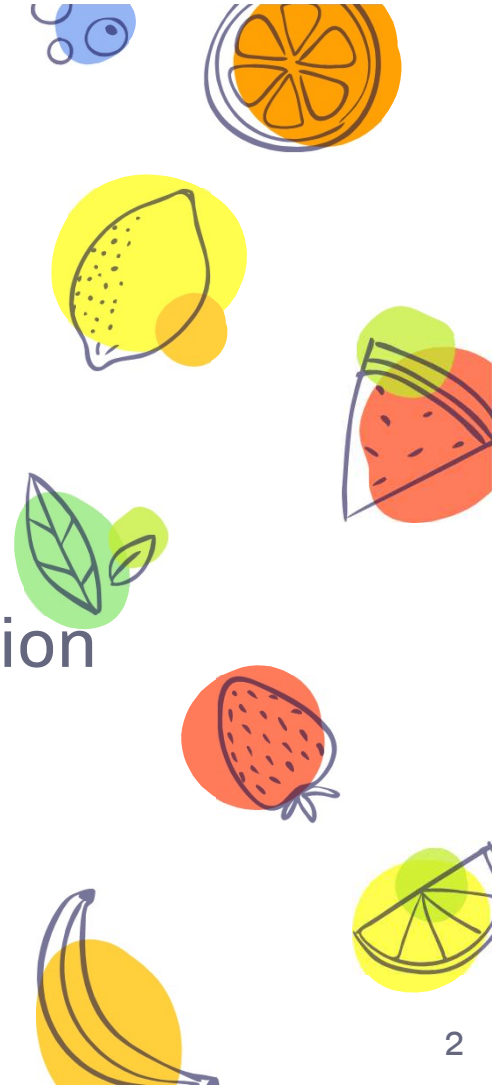
Probiotics and Prebiotics for better health

Outline

- Definition
- Sources
- Health impacts and mechanism of action



Definitions

Probiotics

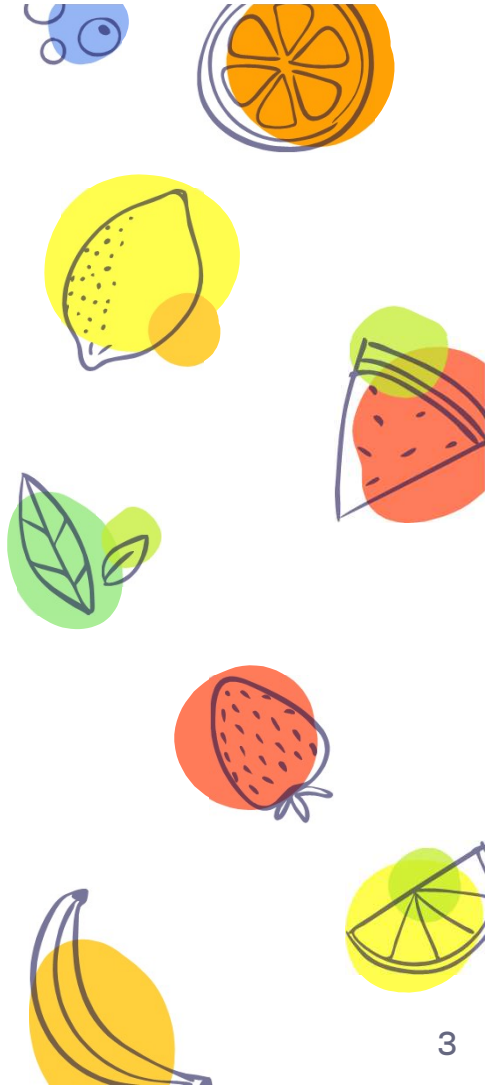
(FAO 2002)

- viable strictly selected microorganisms
- adequate amounts
- benefit on the host

Prebiotics

(FAO/WHO 2007)

- nonviable food component
- health benefit on the host
- modulation of the microbiota



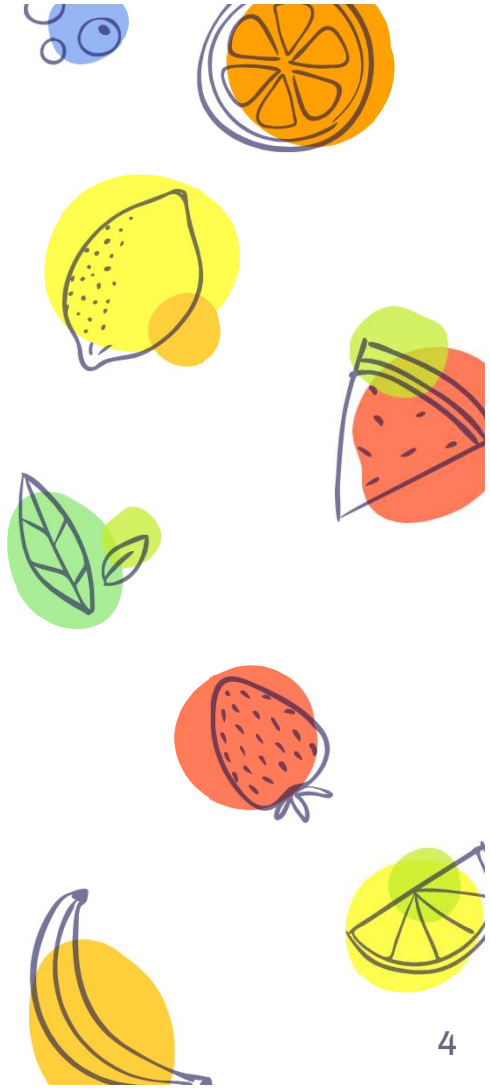
Definitions

Synbiotics

A combination of synergistically acting probiotics and prebiotics

Microbiota / Microbiome

the collection of genomes from all the microorganisms found in a particular environment



1. Dietary fiber ?

A. Prebiotics

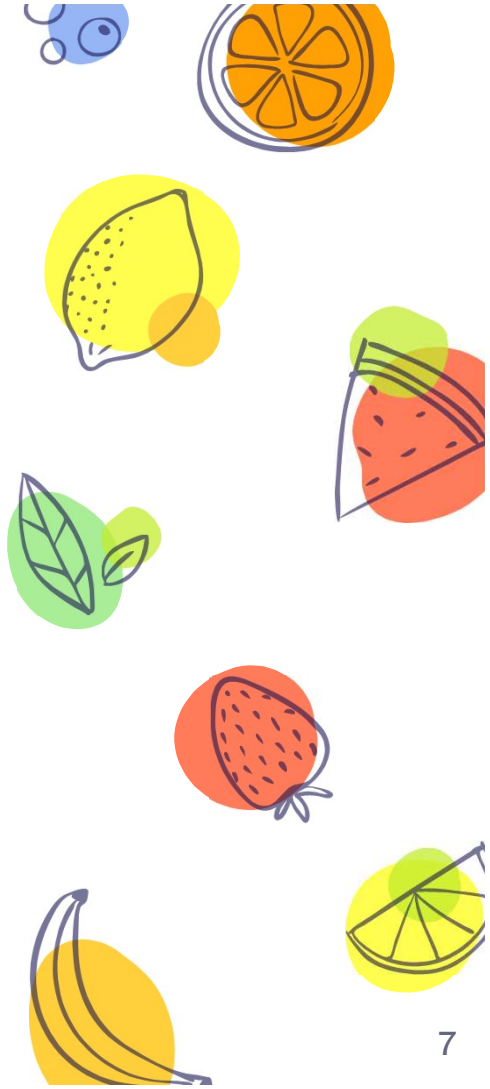
B. Probiotics

C. Synbiotics

1. Probiotics

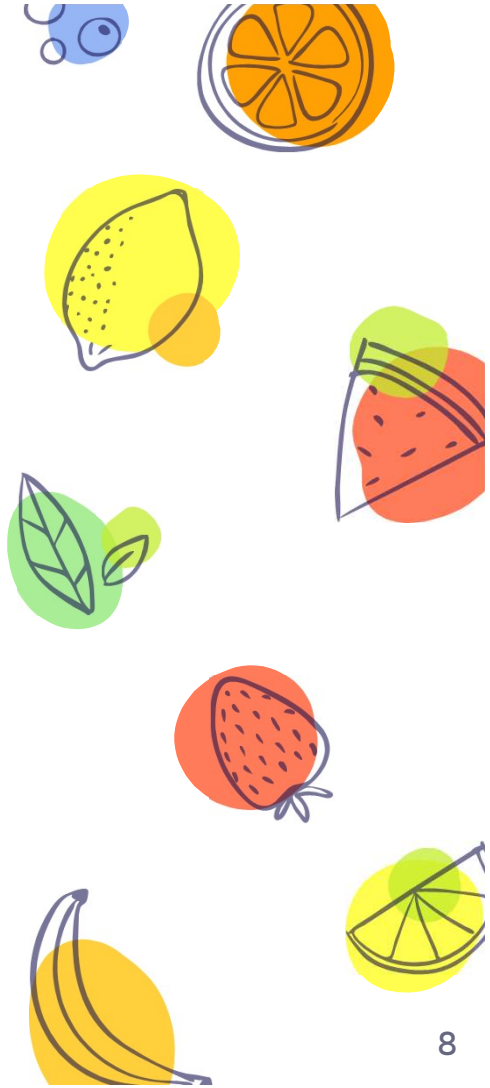
Common probiotics

- Lactobacillus, Bifidobacterium, and Lactococcus
- Streptococcus, Enterococcus
- Bacillus
- Saccharomyces (yeast)



Sources

- Yogurt
- Miso / Nutto
- Sauerkraut
- Kimchi
- Some cheeses



Probiotic characteristics

- No association with the genus or species
- Specially selected strains of a particular species

Safety

1. its origin
2. No association with pathogenic cultures
3. Antibiotic resistance profile.

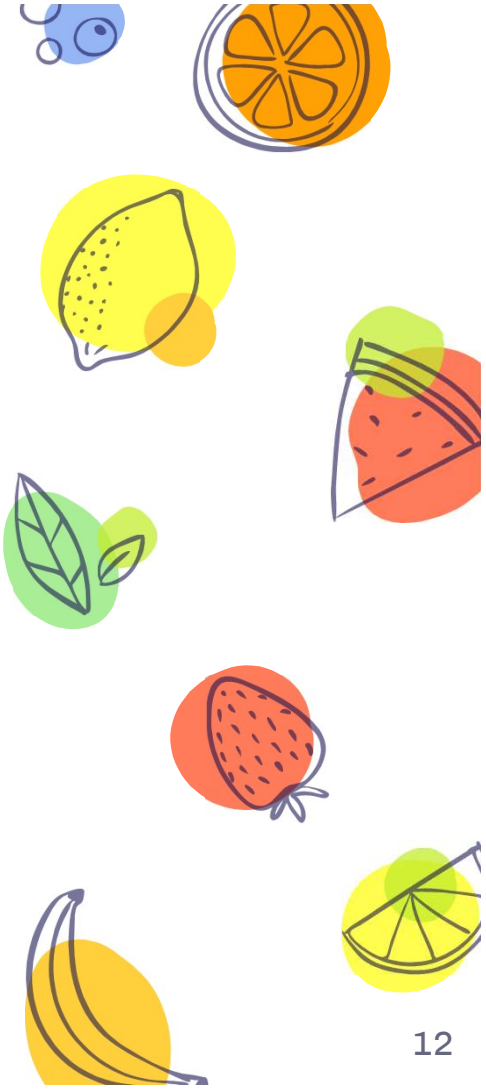
Functional aspects

1. Survive in the GI tract
2. Exert immunomodulatory effect

2. Prebiotics

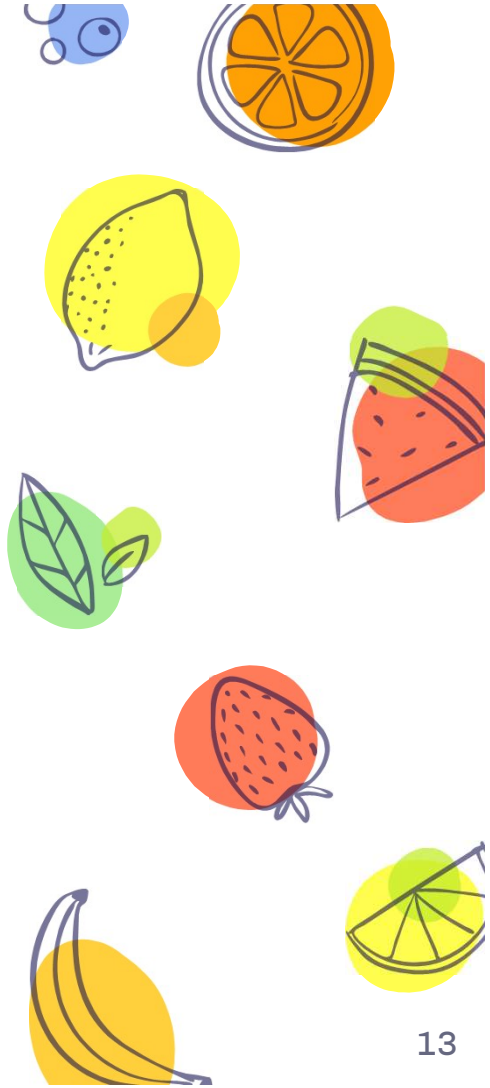
Common prebiotics

- Oligosaccharides: Fructooligosaccharides (FOS)
  - Galactooligosaccharides (GOS)
  - Isomaltooligosaccharides (IMO)
  - Xylooligosaccharides (XOS)
  - Transgalactooligosaccharides (TOS)
  - Soybean oligosaccharides (SBOS)
- Polysaccharides: inulin, reflux starch, cellulose, hemicellulose, or pectin
- Disaccharides: Lactulose



Sources

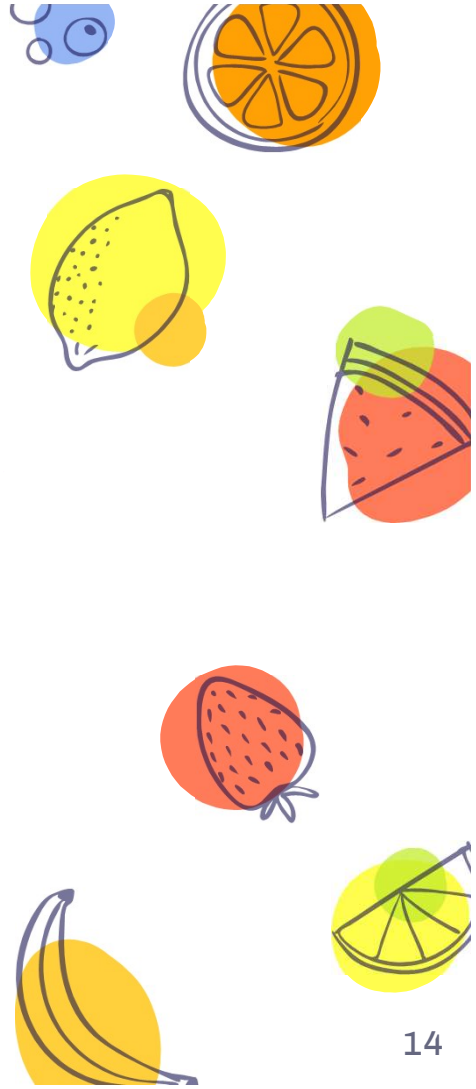
- Raw garlic, onion, leek
- Asparagus
- Banana
- Dragon fruit, palm flesh, palm embryo, jackfruit flesh, jackfruit seed, and okra pod



(Wichienchot et al., 2015)

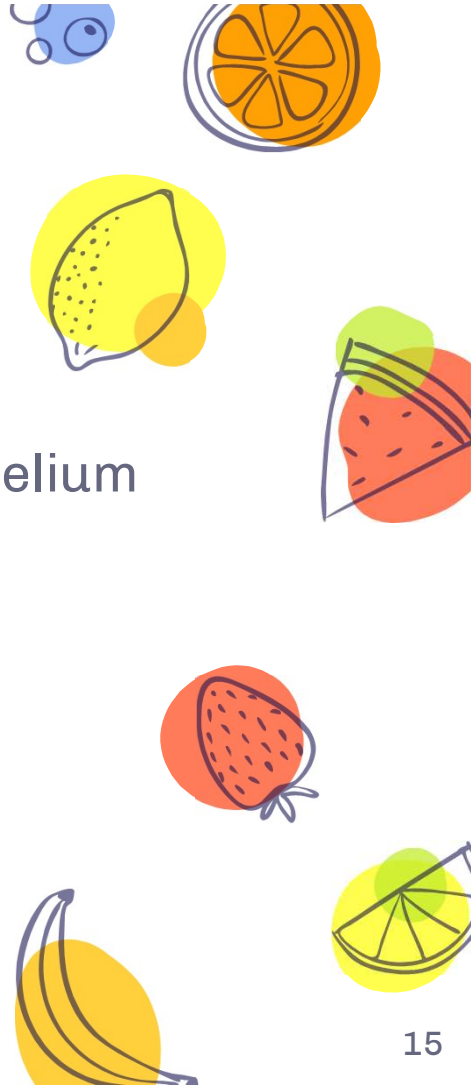
Health impacts

- Gastrointestinal tract
- Immune response
- Psychological health
- Female reproductive system health
- Metabolism, Lipid profile and CVD risk



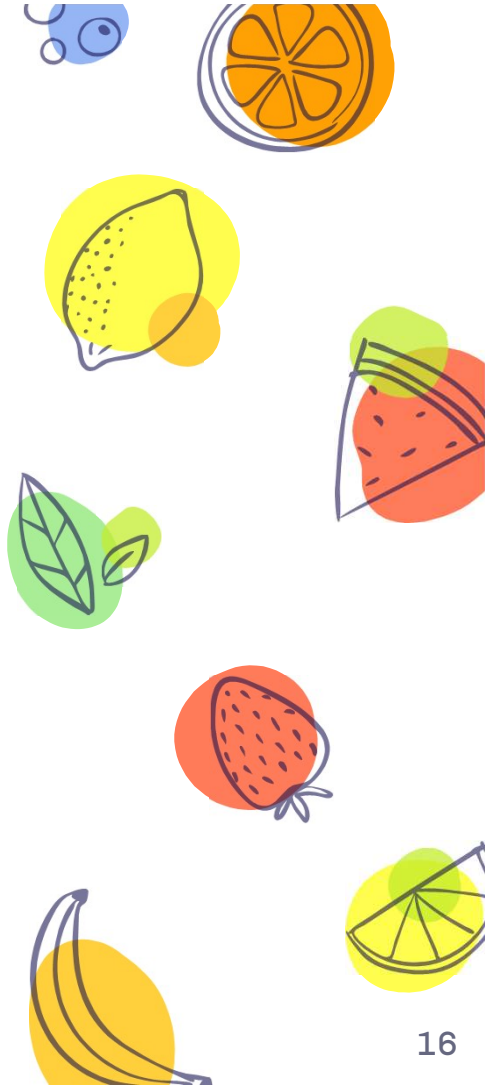
GI: Mechanism of action

- Inhibit the development of pathogenic bacteria
- Compete with pathogens for adhesion to the epithelium
- Inhibit bacterial toxin production
- Modulate host immune system



1. Probiotics for treating acute infectious diarrhea

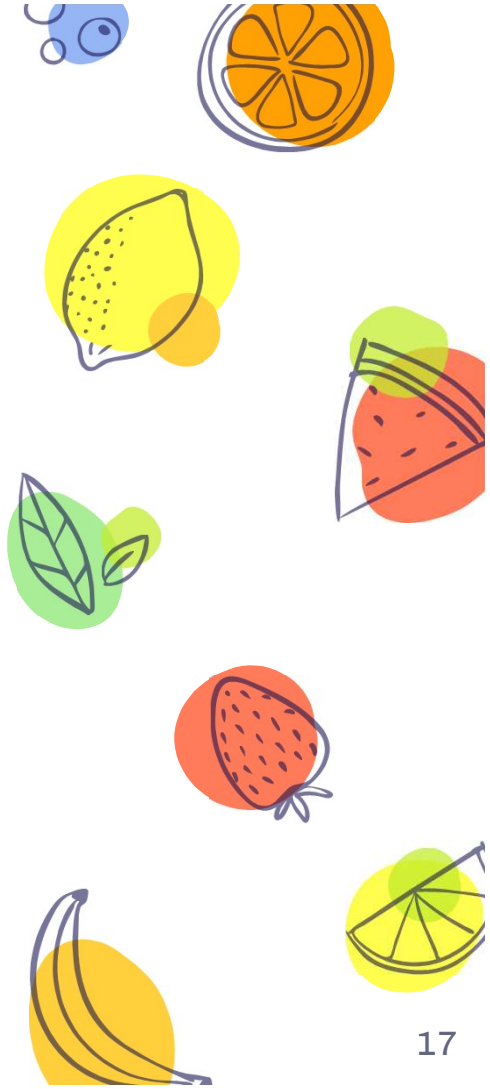
- 63 trials, 8014 people (mainly infants and children)
- ↓ duration of diarrhea by 25 hours
- ↓ reduced stool frequency
- ↓ risk of diarrhea lasting >4days by 59%
- 1 fewer diarrheal stool on day 2
- More research is needed to identify which probiotics should be used for which groups of people



Cochrane.org, 2010

2. The use of probiotics to prevent Clostridium difficile diarrhea associated with antibiotic use

- 31 RCTs, 8672 participants
- ↓ risk of developing CDAD by 60%
- Participants at high risk of developing CDAD (> 5%), the potential benefit is more pronounced with a 70% risk reduction
- short-term use of probiotics appears to be safe and effective when used along with antibiotics in patients who are not immunocompromised or severely debilitated.

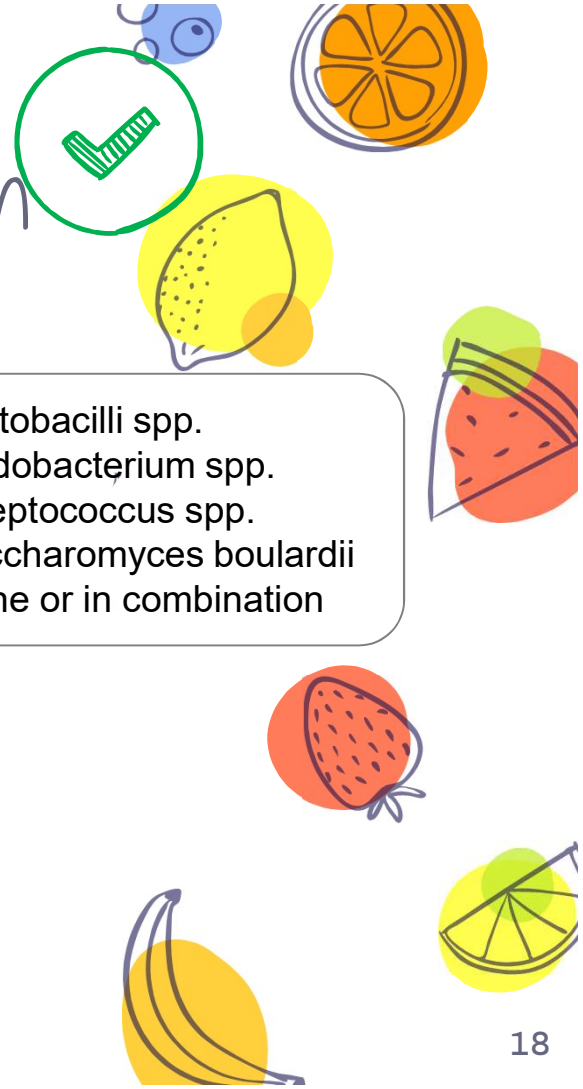


Cochrane.org, 2017

3. Probiotics for the prevention of antibiotic-associated diarrhea in children

- 33 studies, 6352 children
- Probiotics with antibiotics to prevent AAD
- 5 days to 12 weeks
- ↓ Incidence of AAD 8% (259/3232) vs 19% (598/3120) in the control group, NNT=9
- higher dose probiotics (≥ 5 billion CFUs per day) reduce the incidence of AAD 8% (162/2029) vs 23% (462/2009)
- generally well tolerated, and minor side effects

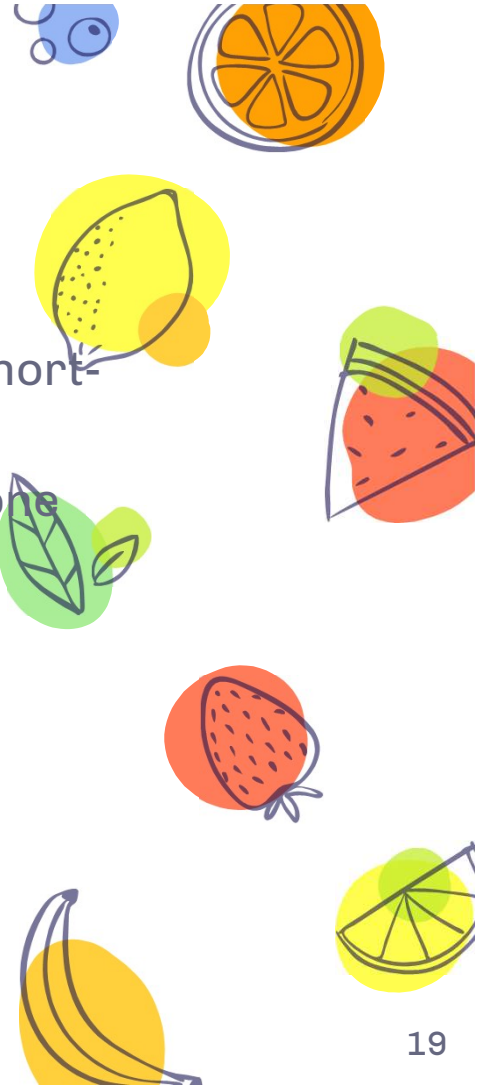
Lactobacilli spp.
Bifidobacterium spp.
Streptococcus spp.
Saccharomyces boulardii
alone or in combination



Cochrane.org, 2019

Proposed mechanisms

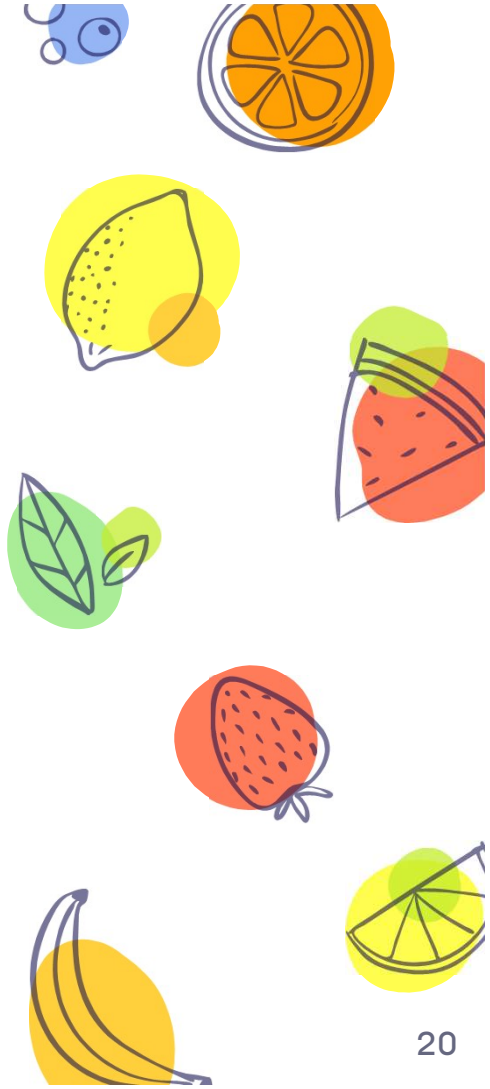
- Regulate the action of hepatic lipogenic enzymes > ↑ short-chain fatty acids (SCFAs), such as propionic acid.
- Production of SCFAs as a result of fermentation > histone acetylation > ↑ the availability of numerous genes for transcription factors.
- The modulation of mucin production.



SCFAs, namely: acetic acid, butyric acid, and propionic acid, which are subsequently used by the host as a source of energy

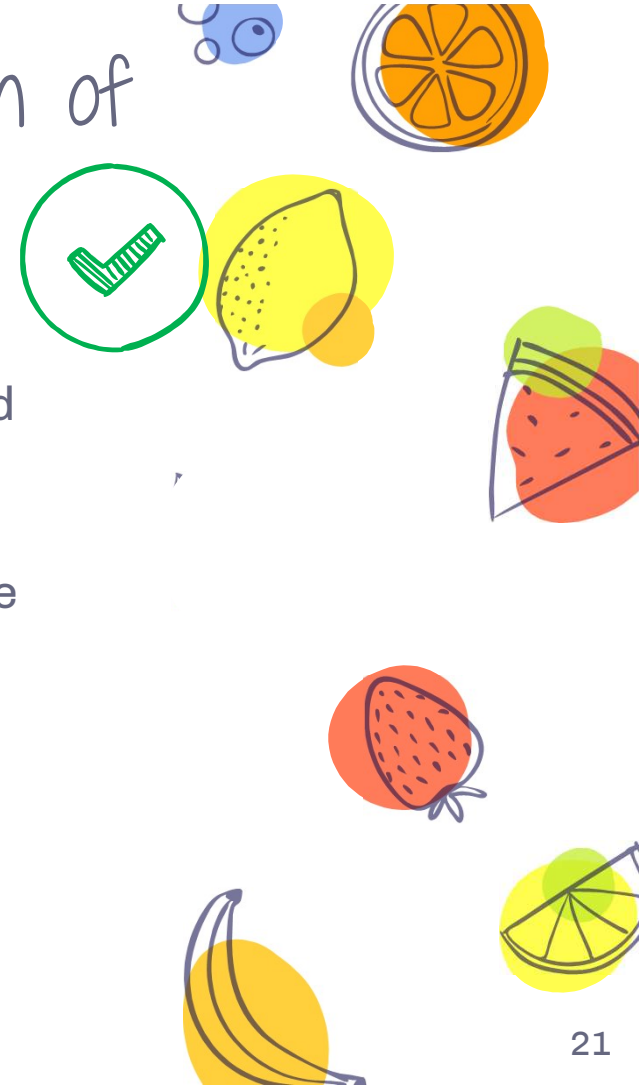
Proposed mechanisms

- ↑ lymphocytes and/or leukocytes in gut-associated lymphoid tissues (GALTs) and in peripheral blood.
- ↑ secretion of IgA by GALTs may stimulate the phagocytic function of intra-inflammatory macrophages



1. Prebiotics in infants for prevention of allergic disease and food allergy

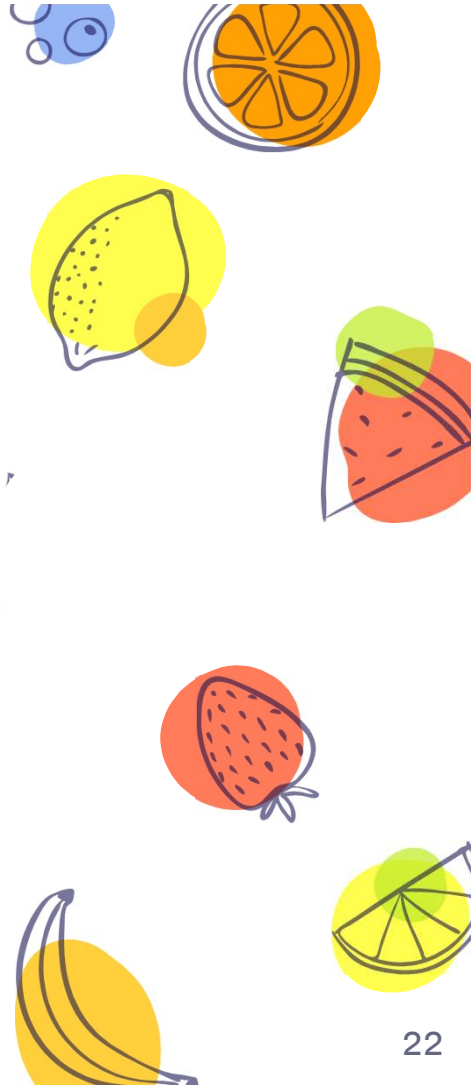
- Reactions to foods and allergies (including asthma, eczema and hay fever) are common and may be increasing.
- Prebiotic supplement added to infant feeds may prevent eczema in infants up to two years of age
- Further research is needed to confirm the findings before routine use of prebiotics can be recommended for prevention of allergy



Cochrane.org, 2013

2. Probiotics for treating eczema

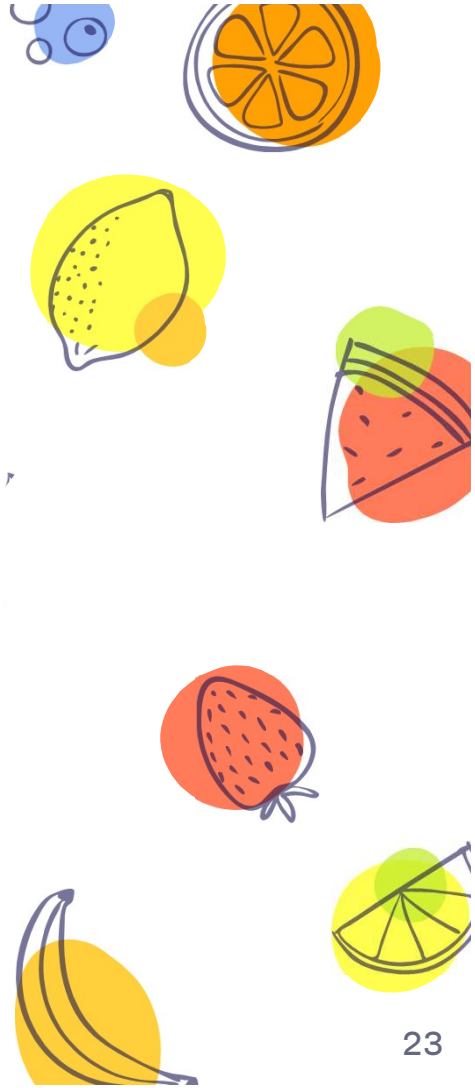
- People with eczema have different bacteria in their gut compared to people without eczema, and sometimes they have inflammation in their gut
- 39 RCTs with 2599 participants
- All gender and ages (mostly children)
- Eczema ranging from mild to severe
- Probiotics make little or no difference in reducing eczema symptoms
- May slightly reduce the severity of eczema scored although it is uncertain if such a change is meaningful for patients.



Cochrane.org, 2018

3. Probiotics to prevent upper respiratory tract infections

- 12 RCTs, 3720 participants
- ↓ the number of participants experiencing episodes of acute URTI by about 47%
- ↓ duration of an episode of acute URTI by 1.89 days.
- slightly reduce antibiotic use and school absence.
- Side effects were minor

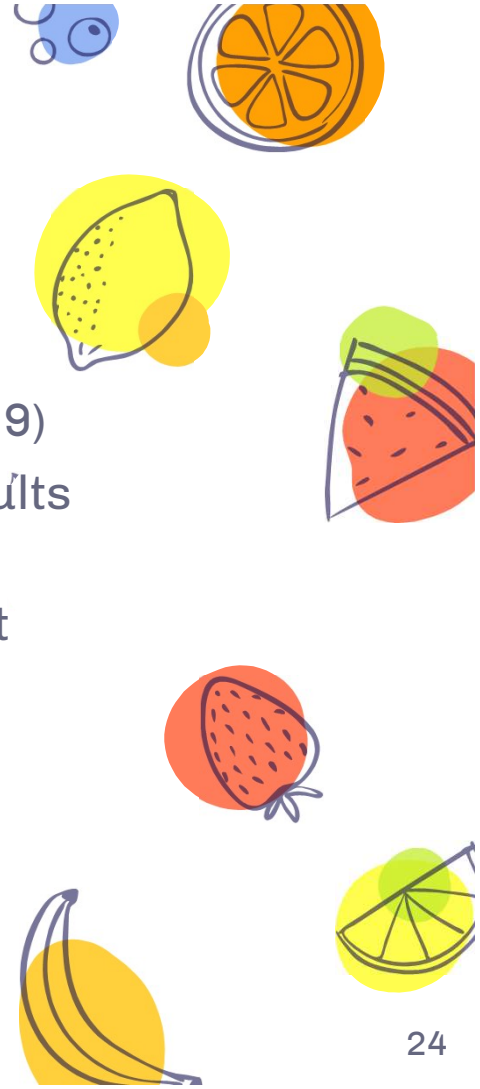


Cochrane.org, 2015

Female reproductive system health

Inconclusive/ insufficient evidence

- Probiotics for the treatment of bacterial vaginosis (2009)
- Probiotics for preventing urinary tract infections in adults and children (2015)
- Probiotics for vulvovaginal candidiasis in non-pregnant women

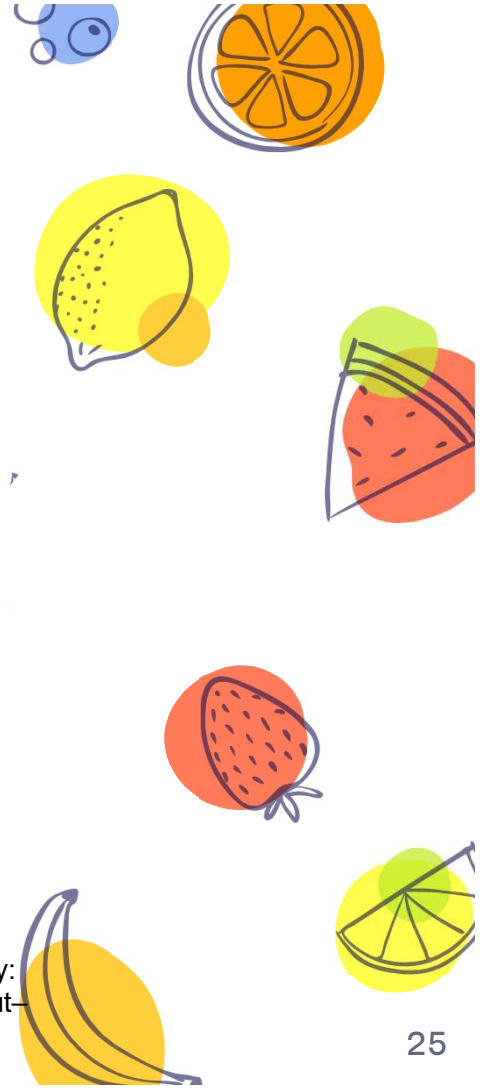


Cochrane.org, 2019

Psychological health

The gut and gut microbiota work together to perform the tasks of digestion, immune and endocrine functions, and neurotransmission

1. Pain perception
2. Cognitive functions, including learning capacity and memory
3. Mood and emotion
4. Temperament and character
5. Stress management
6. Dietary behavior
7. Social interaction



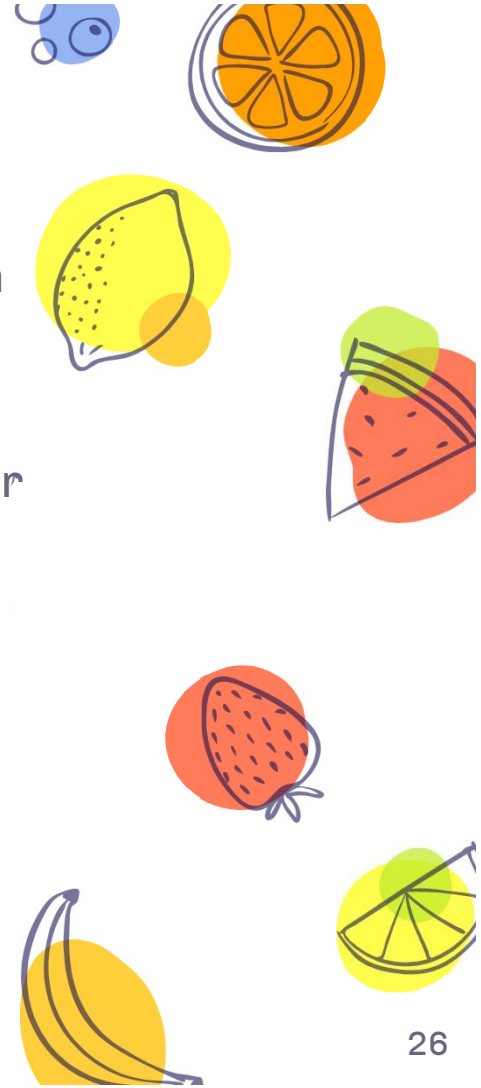
Liang, S., Wu, X. & Jin, F. Gut-Brain Psychology: Rethinking Psychology From the Microbiota–Gut–Brain Axis. Front Integr Neurosci 12, (2018).

Psychological health

- Probiotics were associated with a significant reduction in depression (1)
- ↓ depression scale score
- Healthy population, major depressive disorder (MDD) or aged <60
- No effect on people aged over 65

Inconclusive/ insufficient evidence

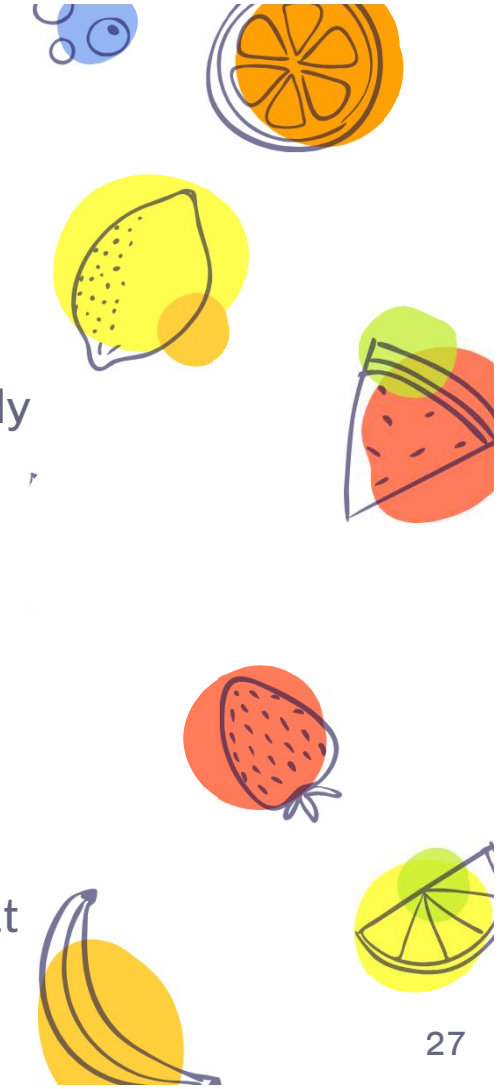
- Probiotics did not significantly reduce symptoms of anxiety in humans (2)



1.Huang, R., Wang, K. & Hu, J. Effect of Probiotics on Depression: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Nutrients 8, (2016).
2.Reis, D. J., Ilardi, S. S. & Punt, S. E. W. The anxiolytic effect of probiotics: A systematic review and meta-analysis of the clinical and preclinical literature. PLOS ONE 13, e0199041 (2018).

Obesity

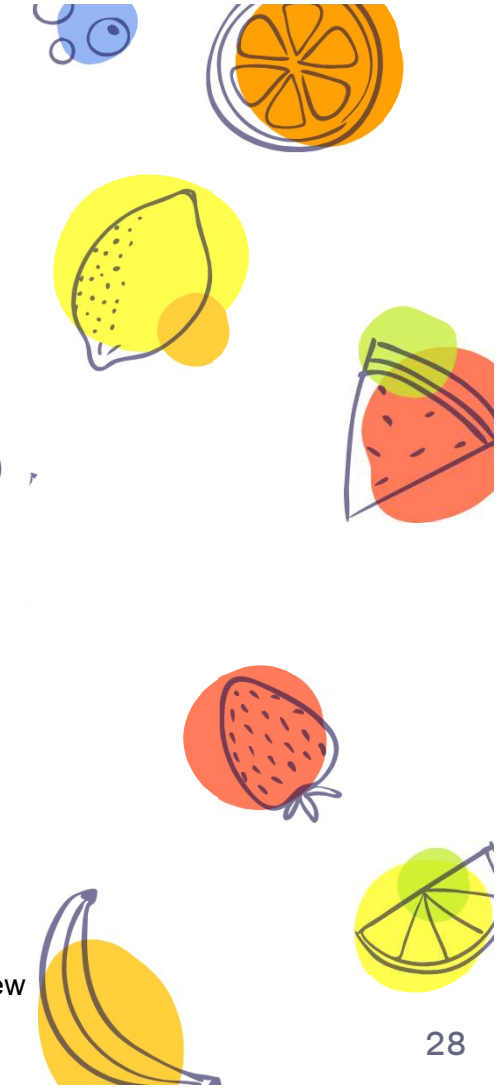
- Probiotic use was associated with reduction of BMI, weight and fat mass.
- Prebiotics demonstrated a significant reduction in body weight
- Synbiotics did not show an effect
- Prebiotics/Probiotics/Synbiotics vs placebo
  - −0.28 BMI
  - −0.64 kg body weight
  - −0.60 kg fat mass
- Only studies with >12 weeks showed a significant reduction in BMI and body weight and <12 week for fat mass



1.Kunnackal John, G. et al. Dietary Alteration of the Gut Microbiome and Its Impact on Weight and Fat Mass: A Systematic Review and Meta-Analysis. Genes (Basel) 9, (2018).

Lipid profile and CVD risk

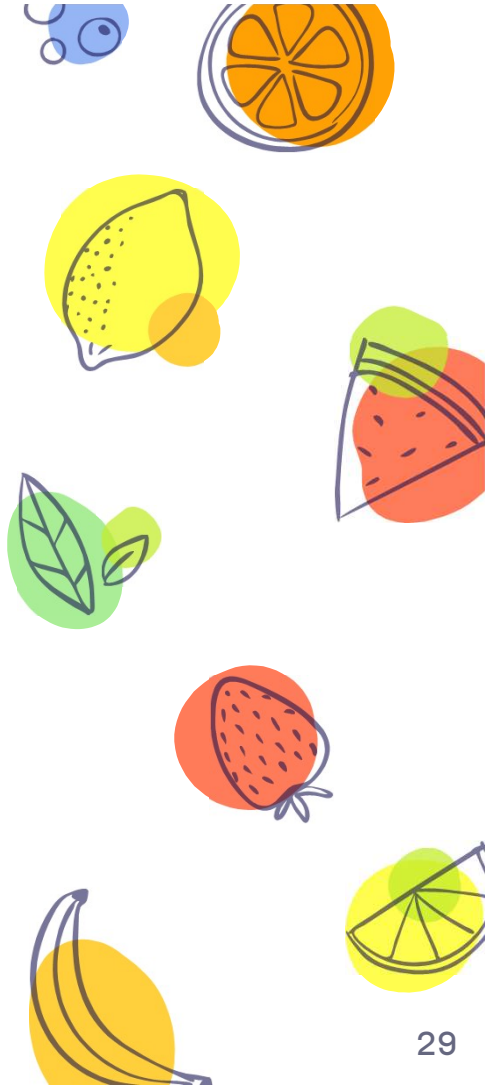
- High risk of CAD is associated with dyslipidemia, especially LDL level
- 15 studies, 13 studies used Lactobacillus spp. and the other 2 studies used synbiotics (Lactobacillus + inulin)
- Daily dose varied from 107 to 1011 CFU
- Duration varied from 3 to 24 weeks
- ↓ TG by 10 mg/dl (0.26 mmol/l)
- ↓ LDL by 8.9 mg/dl (0.23 mmol/l)
- HDL was unchanged



Wu, Y., Zhang, Q., Ren, Y. & Ruan, Z. Effect of probiotic Lactobacillus on lipid profile: A systematic review and meta-analysis of randomized, controlled trials. PLOS ONE 12, e0178868 (2017).

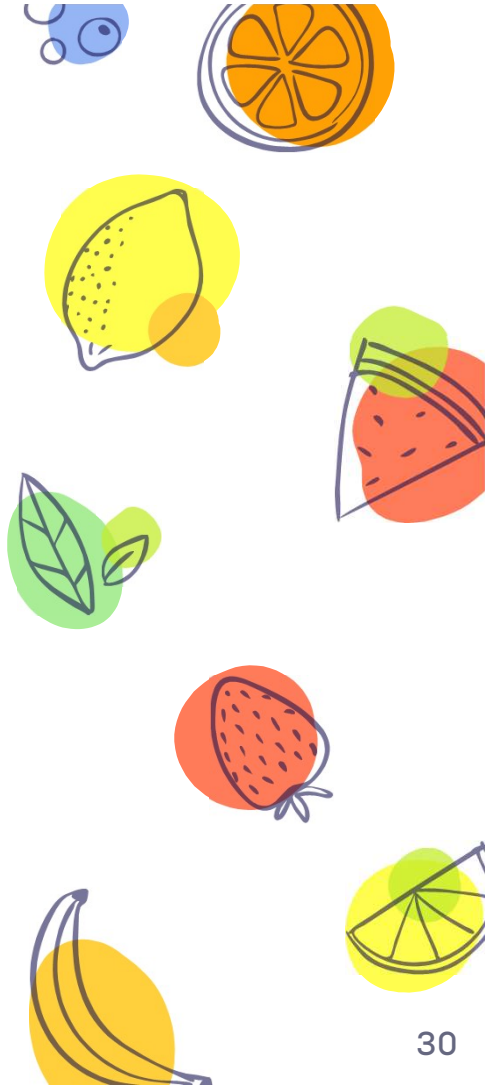
Lipid profile: proposed mechanism

- Decrease in HMG-CoA reductase in liver
- A significant conversion of cholesterol into bile acids.
- Deconjugation of bile acids > ↑ elimination in the faeces > ↓ serum cholesterol
- Cholesterol may be removed by probiotics by incorporation into the cellular membranes during growth (*in vitro* study)



Conclusion

- Variety of probiotic and prebiotics
- Combination
- Specific indication for selected populations
- Dosing
- Seemed promising
- Need more evidence



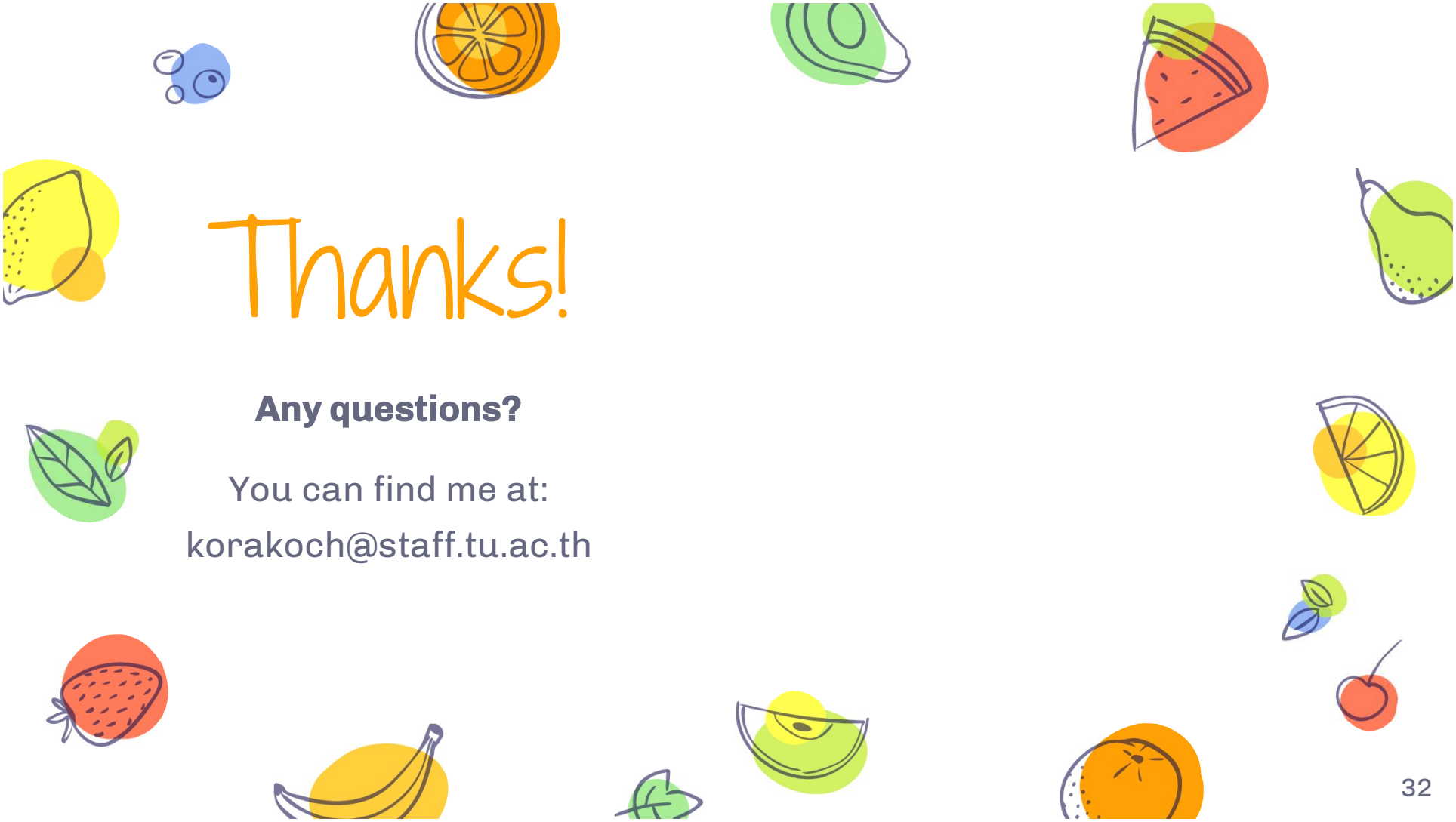
BBC เมนู

NEWS | ไทย

หน้าแรก | ประเทศไทย | ต่างประเทศ | วิทยาศาสตร์ | สุขภาพ | วิดีโอ | ยอดนิยม

ผลวิจัยใหม่ชี้โพรไบโอติกส์ตามท้องตลาดไร้ประโยชน์ต่อสุขภาพ

7 กันยายน 2018 แชร์



Thanks!

Any questions?

You can find me at:
korakoch@staff.tu.ac.th

References

1. 1.Markowiak, P. & Śliżewska, K. Effects of Probiotics, Prebiotics, and Synbiotics on Human Health. Nutrients 9, (2017).
2. 1.Wichienchot, S., Youravong, W., Prueksasri, S. & Ngampanya, B. Recent researches on prebiotics for gut health in Thailand. Functional Foods in Health and Disease 5, 381-394–394 (2015).
3. Liang, S., Wu, X. & Jin, F. Gut-Brain Psychology: Rethinking Psychology From the Microbiota–Gut–Brain Axis. Front Integr Neurosci 12, (2018).
4. .Huang, R., Wang, K. & Hu, J. Effect of Probiotics on Depression: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Nutrients 8, (2016).
5. Reis, D. J., Ilardi, S. S. & Punt, S. E. W. The anxiolytic effect of probiotics: A systematic review and meta-analysis of the clinical and preclinical literature. PLOS ONE 13, e0199041 (2018).
6. Kunnackal John, G. et al. Dietary Alteration of the Gut Microbiome and Its Impact on Weight and Fat Mass: A Systematic Review and Meta-Analysis. Genes (Basel) 9, (2018).
7. Wu, Y., Zhang, Q., Ren, Y. & Ruan, Z. Effect of probiotic Lactobacillus on lipid profile: A systematic review and meta-analysis of randomized, controlled trials. PLOS ONE 12, e0178868 (2017).