

# LcS Insight: A study day report

## Current insights into the gut microbiota and its influence on health

**Yakult**  
HCP Study Day 2014

### References

1. Marchesi JR *et al* (2011) Towards the human colorectal cancer microbiome. *PLOS ONE* **6**(5): e20447.
2. Li JV *et al* (2011) Experimental bariatric surgery in rats generates a cytotoxic environment in the gut contents. *Frontiers Microbiol* **2**: Article 183.
3. Watanebe M *et al* (2012) Bile acid binding resin improves metabolic control through the induction of energy expenditure. *PLOS ONE* **7**(8): e38286.
4. Sjöholm K *et al* (2013) Evaluation of current eligibility criteria for bariatric surgery. *Diabetes Care* **36**:1335-1340.
5. Carroll IM, Maharshak N (2013) Enteric bacterial proteases in inflammatory bowel disease – pathophysiology and clinical implications. *World J Gastroenterol* **19**(43):7531-7543.
6. Qin X (2014) May bacterial or pancreatic proteases play a critical role in inflammatory bowel disease? *World J Gastroenterol* **20**(35):12709-12710.
7. Cani PD *et al* (2007) Metabolic endotoxaemia initiates obesity and insulin resistance. *Diabetes* **56**:1761-1772.
8. Bijkerk CJ *et al* (2003) Irritable bowel syndrome in primary care: the patients' and doctors' views on symptoms, etiology and management. *Can J Gastroenterol* **17**(6):363-368.
9. Manning AP *et al* (1978) Towards positive diagnosis of the irritable bowel. *Br Med J* **2**:653-654.
10. <http://www.romecriteria.org/criteria/>
11. <http://www.hscic.gov.uk/qof>
12. Rome Foundation // Rome III Questionnaires [www.romecriteria.org/questionnaires/](http://www.romecriteria.org/questionnaires/)
13. NICE (2013) Faecal calprotectin diagnostic tests for inflammatory diseases of the bowel. Nice Diagnostic Guidance DG13. <https://www.nice.org.uk/guidance/dg11>
14. Griffiths C *et al* (2007) How effective are expert patient (lay led) education programmes for chronic disease? *BMJ* **334**(7606):1254-6.
15. Everitt H *et al* (2013) Management of irritable bowel syndrome in primary care: the results of an exploratory randomised controlled trial of mebeverine, methylcellulose, placebo and a self-management website. *BMC Gastroenterol* **13**:68.
16. Robinson A *et al* (2006) A randomised controlled trial of self-help interventions in patients with a primary care diagnosis of irritable bowel syndrome. *Gut* **55**(5):643-648.
17. Deechakawan W *et al* (2014) Anxiety, depression, and catecholamine levels after self-management intervention in irritable bowel syndrome. *Gastroenterol Nurs* **37**(1):24-32.
18. Ljótsson B *et al* (2011) Internet-delivered exposure-based treatment vs. stress management for irritable bowel syndrome: a randomized trial. *Am J Gastroenterol* **106**(8):1481-91.
19. Jarrett ME *et al* (2009) Comprehensive self-management for irritable bowel syndrome: randomized trial of in-person vs. combined in-person and telephone sessions. *Am J Gastroenterol* **104**(12):3004-14.
20. NICE guidelines (2008) Irritable bowel syndrome in adults: Diagnosis and management of irritable bowel syndrome in primary care (<http://www.nice.org.uk/Guidance/CG61>)
21. McKenzie YA *et al* (2012) British Dietetic Association evidence-based guidelines for the dietary management of irritable bowel syndrome in adults. *J Human Nutr Diet* **25**(3):260-74
22. Parkes GC *et al* (2012) Distinct microbial populations exist in the mucosa-associated microbiota of sub-groups of irritable bowel syndrome. *Neurogastroenterol Motil* **24**(1):31-9.

23. Tana C *et al* (2010) Altered profiles of intestinal microbiota and organic acids may be the origin of symptoms in irritable bowel syndrome. *Neurogastroenterol Motil* 22(5):512-9.
24. Kassinen A *et al* (2007) The fecal microbiota of irritable bowel syndrome patients differs significantly from that of healthy subjects. *Gastroenterol* 133(1):24-33.
25. Whorwell PJ *et al* (2006) Efficacy of an encapsulated probiotic *Bifidobacterium infantis* 35624 in women with irritable bowel syndrome. *Am J Gastroenterol* 101(7):1581-90.
26. Halmos EP *et al* (2014) A diet low in FODMAPs reduces symptoms of irritable bowel syndrome. *Gastroenterol* 146(1):67-75.
27. Staudacher HM *et al* (2012) Fermentable carbohydrate restriction reduces luminal bifidobacteria and gastrointestinal symptoms in patients with irritable bowel syndrome. *J Nutr* 142(8):1516-1518.
28. Ford AC *et al* (2014) American College of Gastroenterology monograph on the management of irritable bowel syndrome and chronic idiopathic constipation. *Am J Gastroenterol* 109 Suppl 1:S2-26.
29. ESPCG publication (2013) **Practical Reference Guide – Consensus Guidelines on Probiotics.** <http://espcg.eu/publications/>
30. Hungin AP *et al* (2013) Systematic review: probiotics in the management of lower gastrointestinal symptoms in clinical practice – an evidence-based international guide. *Aliment Pharmacol Ther* 38:864-886.
31. Spiller R *et al* (2007) Guidelines on the irritable bowel syndrome: mechanisms and practical management. *Gut* 56:1770–1798.
32. Map of Medicine (2010) Irritable Bowel Syndrome. [www.mapofmedicine.com](http://www.mapofmedicine.com)
33. [www.crohnsandcolitis.org.uk/information-and-support/information-about-ibd/what-is-IBD](http://www.crohnsandcolitis.org.uk/information-and-support/information-about-ibd/what-is-IBD)
34. Silverberg MS *et al* (2005) Toward an integrated clinical, molecular and serological classification of inflammatory bowel disease: report of a working party of the 2005 Montreal World Congress of Gastroenterology. *Can J Gastroenterol* 19(Suppl A):5-36.
35. Jostins L *et al* (2012) Host-microbe interactions have shaped the genetic architecture of inflammatory bowel disease. *Nature* 491:119-124.
36. Lees CW *et al* (2011) New IBD genetics: common pathways with other diseases. *Gut* 60:1739-1753.
37. Manichanh C *et al* (2006) Reduced diversity of faecal microbiota in Crohn's disease revealed by a metagenomic approach. *Gut* 55:205-211.
38. Frank DN *et al* (2007) Molecular-phylogenetic characterization of microbial community imbalances in human inflammatory bowel diseases. *Proc Nat Acad Sci* 104(34):13780-13785.
39. Peterson DA *et al* (2008) Metagenomic approaches for defining the pathogenesis of inflammatory bowel diseases. *Cell Host Microbe* 3(6):417-427.
40. Sokol H *et al* (2006) Specificities of the fecal microbiota in inflammatory bowel disease. *Inflamm Bowel Dis* 12(2):106-111.
41. Sokol H *et al* (2008) *Faecalibacterium prausnitzii* is an anti-inflammatory commensal bacterium identified by gut microbiota analysis of Crohn disease patients. *Proc Nat Acad Sci USA* 105(43):16731-16736.
42. Hansen R *et al* (2012) Microbiota of *de-novo* pediatric IBD: Increased *Faecalibacterium prausnitzii* and reduced bacterial diversity in Crohn's but not in ulcerative colitis. *Am J Gastroenterol* 107:1913-1922.
43. Ott SJ *et al* (2008) Dynamics of the mucosa-associated flora in ulcerative colitis patients during remission and clinical relapse. *J Clin Microbiol* 46(10):3510-3513.
44. McLaughlin SD *et al* (2013) Exclusive elemental diet impacts on the gastrointestinal microbiota and improves symptoms in patients with chronic pouchitis. *J Crohns Colitis* 7(6):460-6.
45. Tozer PJ *et al* (2014) What role do bacteria play in persisting fistula formation in idiopathic and Crohn's anal fistula? *Colorectal Dis* [Epub ahead of print]
46. Morgan XC *et al* (2012) Dysfunction of the intestinal microbiome in inflammatory bowel disease and treatment. *Genome Biol* 13:R79.
47. Thomas LV *et al* (2014) Exploring the influence of the gut microbiota and probiotics on health: a symposium report. *Br J Nutr* 112 (Suppl):S1-S18.
48. Mimura T, Rizzello F, Helwig U *et al* (2004) Once daily high dose probiotic therapy (VSL#3) for maintaining remission in recurrent or refractory pouchitis. *Gut* 53:108-114.
49. Kruis W *et al* (2004) Maintaining remission of ulcerative colitis with probiotic *Escherichia coli* Nissle 1917 is as effective as with standard mesalazine. *Gut* 53(11):1617-23.
50. Sood A *et al* (2009) The probiotic preparation, VSL#3 induces remission in patients with mild-to-moderately active ulcerative colitis *Clin Gastroenterol Hepatol* 7(11):1202-9.

51. Benjamin JL *et al* (2011) Randomised, double-blind, placebo-controlled trial of fructo-oligosaccharides in active Crohn's disease. *Gut* **60**(7):923-9.
52. Brandt LJ *et al* (2012) Long-term follow-up of colonoscopic fecal microbiota transplant for recurrent *Clostridium difficile* infection. *Am J Gastroenterol* **107**:1079–87.
53. Zipursky JS *et al* (2012) Patient attitudes towards the use of fecal microbiota transplantation in the treatment of recurrent *Clostridium difficile* infection. *Clin Infect Dis* **55**:1652-8.
54. Chang JY *et al* (2008) Decreased diversity of the fecal microbiome in recurrent *Clostridium difficile*-associated diarrhea. *J Infect Dis* **197**(3):435-8.
55. Sofi AA *et al* (2013) Relationship of symptom duration and fecal bacteriotherapy in *Clostridium difficile* infection-pooled data analysis and a systematic review. *Scand J Gastroenterol* **48**(3):266-73.
56. Brandt LJ *et al* (2012) Long-term follow-up of colonoscopic fecal microbiota transplant for recurrent *Clostridium difficile* infection. *Am J Gastroenterol* **107**:1079-87.
57. Grehan MJ *et al* (2010) Durable alteration of the colonic microbiota by the administration of donor fecal flora. *J Clin Gastroenterol* **44**:551-61.
58. Khoruts A *et al* (2010) Changes in the composition of the human fecal microbiome after bacteriotherapy for recurrent *Clostridium difficile*-associated diarrhea. *J Clin Gastroenterol* **44**:354-60.
59. van Nood E *et al* (2013) Duodenal infusion of donor feces for recurrent *Clostridium difficile*. *New Engl J Med* **368**:407-415.
60. Anderson JL *et al* (2012) Systematic review: faecal microbiota transplantation in the management of inflammatory bowel disease. *Aliment Pharmacol Ther* **36**:503-516.
61. Kump PK *et al* (2013) Alteration of intestinal dysbiosis by fecal microbiota transplantation does not induce remission in patients with chronic active ulcerative colitis. *Inflamm Bowel Dis* **19**:2155-65.
62. Bakken JS *et al* (2011) Treating *Clostridium difficile* infection with fecal microbiota transplantation. *Clin Gastroenterol Hepatol* **9**:1044-1049.
63. Bakken JS *et al* (2011) Treating *Clostridium difficile* infection with fecal microbiota transplantation. *Clin Gastroenterol Hepatol* **9**:1044-1049.
64. Hamilton MJ *et al* (2012) Standardized frozen preparation for transplantation of fecal microbiota for recurrent *Clostridium difficile* infection. *Am J Gastroenterol* **107**:761–7.
65. Davies SC (2012) Annual Report of the Chief Medical Officer, Volume One, 2011, On the State of the Public's Health. London: Department of Health.
66. Chalasani N *et al*, (2012) The diagnosis and management of non-alcoholic fatty liver disease: Practice guideline by the American Association for the Study of Liver Diseases, American College of Gastroenterology, and the American Gastroenterological Association. *Hepatology* **55**(6):2005-23.
67. Schuppan D & Afdhal NH (2008) Liver cirrhosis. *The Lancet* **371**(9615):838-851.
68. Jalan R *et al* (2006) Natural history of acute decompensation of cirrhosis: The basis of the definition, prognosis and pathophysiology of acute on chronic liver failure. *Hepatology* **44** (Suppl 1):371A-372A.
69. Bala S *et al* (2014) Acute binge drinking increases serum endotoxin and bacterial DNA levels in healthy individuals. *PLOS ONE* **9**(5):e96864.
70. Rosselli M *et al* (2013) Beyond scoring: a modern interpretation of disease progression in chronic liver disease. *Gut* **62**(9):1234-1241.
71. Jalan R *et al* (2012) Acute-on chronic liver failure. *J Hepatol* **57**:1336–1348.
72. Bajaj JS, Hylemon PB, Younossi Z (2012) The intestinal microbiota and liver disease. *Am J Gastroenterol Suppl* **1**:9-14.
73. Bajaj JS *et al* (2014) Altered profile of human gut microbiome is associated with cirrhosis and its complications. *J Hepatol* **60**(5): 940-947.
74. Tritto G *et al* (2011) Evidence of neutrophil functional defect despite inflammation in stable cirrhosis. *J Hepatol* **55**(3): 574-581.
75. Stadlbauer V *et al* (2008) Effect of probiotic treatment on deranged neutrophil function and cytokine responses in patients with compensated alcoholic cirrhosis. *J Hepatol* **48**: 945-951
76. Rincon D *et al* (2014) Oral probiotic VSL#3 attenuates the circulatory disturbances of patients with cirrhosis and ascites. *Liver International* **34**(10): 1504-12.
77. Dhiman RK *et al* (2014) Probiotic VSL#3 reduces liver disease severity and hospitalization in patients with cirrhosis: A randomized, controlled trial. *Gastroenterol* Epub ahead of print Aug 26.
78. Sha N *et al* (2012) Prevention of acute kidney injury in a rodent model of cirrhosis following selective gut decontamination is associated with renal TLR4 expression. *J Hepatol* **56**(5):1047-1053.

79. Boyd SD *et al* (2013) Human lymphocyte repertoires in ageing. *Curr Opin Immunol* **25**(4):511-5.
80. You J *et al* (2013) Ageing impairs the T cell response to dendritic cells. *Immunobiol* **218**(8):1077-84.
81. Biagi E *et al* (2013) Ageing and gut microbes: Perspectives for health maintenance and longevity. *Pharmacol Res* **69**(1):11-20.
82. Tiihonen K *et al* (2010) Human intestinal microbiota and healthy ageing. *Ageing Res Rev* **9**(2):107-116.
83. Ogra PL (2010) Ageing and its possible impact on mucosal immune responses. *Ageing Res Rev* **9**(2):101-106.
84. Pang IK, Iwasaki A (2012) Control of antiviral immunity by pattern recognition and the microbiome. *Immunol Rev* **245**(1):209-2026.
85. Hao Q *et al* (2011) Probiotics for preventing acute upper respiratory tract infections. *Cochrane Database Syst Rev* **7**(9):CD006895.
86. Gill HS *et al* (2001) Enhancement of immunity in the elderly by dietary supplementation with the probiotic *Bifidobacterium lactis* HN019. *Am J Clin Nutr* **74**:833-839.
87. Dong H *et al* (2010) Selective effects of *Lactobacillus casei* Shirota on T cell activation, natural killer cell activity and cytokine production. *Clin Exp Immunol* **161**(2):378-88.
88. Dong H *et al* (2013) Immunomodulatory effects of a probiotic drink containing *Lactobacillus casei* Shirota in healthy older volunteers. *Eur J Nutr* **52**(8):1853-1863.
89. Dong H *et al* (2012) Comparative effects of six probiotic strains on immune function *in vitro*. *Br J Nutr* **108**(3):459-470.
90. Shida K *et al* (2011) Flexible cytokine production by macrophages and T cells in response to probiotic bacteria. *Gut Microbes* **2**(2):109-114.
91. You J, Yaqoob P (2012) Evidence of immunomodulatory effects of a novel probiotic, *Bifidobacterium longum* bv. *infantis* CCUG 52486. *Fems Immunol Med Microbiol* **66**(3): 353-362.
92. Albers R *et al* (2013) Monitoring immune modulation by nutrition in the general population: identifying and substantiating effects on human health. *Br J Nutr* **110** Suppl 2:S1-30.
93. Ritchie ML, Romanuk TN (2012) A meta-analysis of probiotic efficacy for gastrointestinal diseases. *PLOS One* **7**(4):e34938.
94. <http://eldermet.ucc.ie/>
95. Claesson MJ *et al* (2012) Gut microbiota composition correlates with diet and health in the elderly. *Nature* **488**:178-184.
96. O'Sullivan O *et al.* (2013) Alterations in intestinal microbiota of elderly Irish subjects post-antibiotic therapy. *J Antimicrob Chemother* **68**(1):214-221.
97. <http://www.nu-age.eu/home>
98. Katz PP *et al* (2013) Measures of adult general functional status. The Barthel Index, Katz Index of Activities of Daily Living, Health Assessment Questionnaire (HAQ), MACTAR Patient Preference Disability Questionnaire, and Modified Health Assessment Questionnaire (MHAQ). *Arthritis & Rheumatism (Arthritis Care & Research)* **49** (5S): S15–S27.
99. Molloy DW, Standish TM (1997) Mental status and neuropsychological assessment. A guide to the Standardized Mini-Mental State Examination. *Int Psychogeriatrics* **9** (Suppl 1): 87-94
100. Corr SC *et al* (2007) Bacteriocin production as a mechanism for the anti-infective activity of *Lactobacillus salivarius* UCC118. *PNAS* **18**:7617–7621.
101. Riboulet-Bisson E *et al* (2012) Effect of *Lactobacillus salivarius* bacteriocin Abp118 on the mouse and pig intestinal microbiota. *PLOS One* **7**(2):e31113.
102. Distrutti E *et al* (2014) Modulation of intestinal microbiota by the probiotic VSL#3 resets brain gene expression and ameliorates the age-related deficit in LTP. *PLOS One* **9**(9):e106503.
103. Costabile A *et al* (2012) Impact of polydextrose on the faecal microbiota: a double-blind, crossover, placebo-controlled feeding study in healthy human subjects. *Br J Nutr* **108**(3):471-481.
104. Petrof EO *et al* (2013) Stool substitute transplant therapy for the eradication of *Clostridium difficile* infection: 'RePOOPulating' the gut. *Microbiome* **1**: 3.
105. <http://www.apparelyzed.com/spinal-cord-injury-centre-infographic.html>
106. Myers J *et al* (2007) Cardiovascular disease in spinal cord injury: an overview of prevalence, risk, evaluation, and management. *Am J Phys Med Rehabil* **86**(2):142-52.
107. <http://www.apparelyzed.com/paralysis.html>
108. Wong S *et al* (2012) The prevalence of malnutrition in spinal cord injuries patients: a UK multicentre study. *Br J Nutr* **108**(5):918-923.
109. Wong S *et al* (2012) Meal provision in a UK National Spinal Injury Centre: a qualitative audit of service users and stakeholders. *Spinal Cord* **50**(10):772-777.

110. Wong S *et al* (2012) Validation of the spinal nutrition screening tool (SNST) in patients with spinal cord injuries (SCI): result from a multicentre study. *Eur J Clin Nutr* **66**(3):382-387.
111. Wong S *et al* (2012) Is nutritional risk associated with adverse clinical outcomes such as length of stay and mortality in a spinal cord injured patients admitted to a spinal centre? *Gut* **61**(Suppl 2): A89.
112. Wong S *et al* (2013) Morbid obesity after spinal injury: an ailment not to be treated? *Eur J Clin Nutr* **67**(9):998-999.
113. Wong S *et al* (2014) High prevalence of vitamin D deficiency in patients with spinal cord injury: a 1 year longitudinal study. *Proc Nutr Soc* **73**(OCE1): E14.
114. Wong S *et al* (2014) A *Lactobacillus casei* Shirota probiotic drink reduces antibiotic-associated diarrhoea in patients with spinal cord injuries: a randomised controlled trial. *Br J Nutr* **111**(4):672-678.
115. Besselink MG *et al* (2008) Probiotic prophylaxis in predicted severe acute pancreatitis: a randomised, double-blind, placebo-controlled trial. *Lancet* **371**(9613):651-659.
116. Salminen MK *et al* (2002) *Lactobacillus* bacteremia during a rapid increase in probiotic use of *Lactobacillus rhamnosus* GG in Finland. *Clin Infect Dis* **35**:1155-1160.
117. AlFaleh K, Anabrees J (2014) Probiotics for prevention of necrotizing enterocolitis in preterm infants. *Cochrane Database Syst Rev* 4:CD005496.
118. Hempel S *et al* (2012) Probiotics for the prevention and treatment of antibiotic-associated diarrhea: a systematic review and meta-analysis. *JAMA* **307**(18):1959-1969.
119. Johnston BC *et al* (2012) Probiotics for the prevention of *Clostridium difficile*-associated diarrhea: a systematic review and meta-analysis. *Ann Intern Med* **157**(12):878-888.
120. Pisouni E *et al* (2009) Does the use of probiotics/synbiotics prevent postoperative infections in patients undergoing abdominal surgery? A meta-analysis of randomized controlled trials. *Eur J Clin Pharmacol* **65**(6):561-570.
121. Morrow LE *et al* (2010) Probiotic prophylaxis of ventilator-associated pneumonia : a blinded, randomized, controlled trial. *Am J Respir Crit Care Med* **182**(8):1058-1064.
122. Bleichner G *et al* (1997) *Saccharomyces boulardii* prevents diarrhea in critically ill tube-fed patients. A multicentre, randomized, double-blind placebo-controlled trial. *Intensive Care Med* **23**(5):517-523.
123. Whelan K, Myers CE (2010) Safety of probiotics in patients receiving nutritional support: a systematic review of case reports, randomized controlled trials, and nonrandomized trials. *Am J Clin Nutr* **91**:687-703.
124. Fasoli S *et al* (2003) Bacterial composition of commercial probiotic products as evaluated by PCR-DGGE analysis. *Int J Food Microbiol* **82**(1):59-70.
125. Cassone M *et al* (2003) Outbreak of *Saccharomyces cerevisiae* subtype *boulardii* fungemia in patients neighboring those treated with a probiotic preparation of the organism. *J Clin Microbiol* **41**(11):5340.
126. Boyle RJ *et al* (2006) Probiotic use in clinical practice: what are the risks? *Am J Clin Nutr* **83**:1256-1264.
127. Hennequin C *et al* (2000) Possible role of catheters in *Saccharomyces boulardii* fungemia. *Eur J Clin Microbiol Infect Dis* **19**(1):16-20.
128. Marshall JC *et al* (1993) The gastrointestinal tract: the undrained abscess of multiple organ failure. *Ann Surg* **218**:111-119.
129. Gatt M *et al* (2007) Review article: bacterial translocation in the critically ill – evidence and methods of prevention. *Aliment Pharmacol Ther* **25**:741-757.
130. Marteau P, Shanahan F (2003) Basic aspects and pharmacology of probiotics: an overview of pharmacokinetics, mechanisms of action and side-effects. *Best Pract Res Clin Gastroenterol* **17**(5):725-740.
131. Besselink MG *et al* (2009) Intestinal barrier dysfunction in a randomized trial of a specific probiotic composition in acute pancreatitis. *Ann Surg* **250**:712-719.
132. Hempel S *et al* (2011) Safety of probiotics to reduce risk and prevent or treat disease. *Evidence Report/Technology Assessment* Number 200.
133. Van Dalen EC *et al* (2012) Low bacterial diet versus control diet to prevent infection in cancer patients treated with chemotherapy causing episodes of neutropenia. *Cochrane Database Syst Rev* **9**:CD006247.
134. Carr SE, Halliday V (2014) Investigating the use of the neutropenic diet: a survey of UK dietitians. *J Hum Nutr Diet* Aug 28. doi: 10.1111/jhn.12266. [Epub ahead of print]
135. Redman MG *et al* (2014) The efficacy and safety of probiotics in people with cancer: a systematic review. *Ann Oncol* **25**(10):1919-1929.