**Appendix Table 1. Oral bacteria found in the gut of patients with gut pathology, with references**

| Gut pathology | Oral bacterial species § detected in the gut | Sample types | References |
|---|---|---|---|
| Irritable Bowel Syndrome (IBS) | *Streptococcus* spp. | Stool | Fourie et al. 2016; Kassinen et al. 2007; Malinen et al. 2005; Pittayanon et al. 2019; Rajilic-Stojanovic et al. 2011; Rigsbee et al. 2012; Saulnier et al. 2011; Si et al. 2004; Su et al. 2018; Tana et al. 2010; Vich Vila et al. 2018; Wyatt et al. 1988 |
| | *Streptococcus thermophilus* | Stool | |
| | *Veillonella* spp. | Stool | |
| | *Haemophilus* spp. | Stool | |
| | *Prevotella* spp. | Stool | |
| | *Fusobacterium* spp. | Stool | |
| | *Dialister invisus* | Stool | |
| | Gammaproteobacteria (Class) | Stool | |
| | Enterobacteriaceae (family) | Stool | |
| Inflammatory Bowel Disease (IBD) | Veillonellaceae (family) | Tissue | Atarashi et al. 2017; Burrello et al. 2019; Darfeuille-Michaud et al. 2004; Gevers et al. 2014; Ismail et al. 2012; Lupp et al. 2007; Mahendran et al. 2011; Man et al. 2010; Mottawea et al. 2016; Mukhopadhya et al. 2011; Ohkusa et al. 2002; Ott et al. 2004; Pascal et al. 2017; Patwa et al. 2011; Pilarczyk-Zurek et al. 2013; Seksik et al. 2003; Sokol et al. 2017; Verma et al. 2010; Vich Vila et al. 2018; Willing et al. 2010 |
| | Pasteurellaceae (family) | Tissue | |
| | Neisseriaceae (family) | Tissue | |
| | Peptostreptococcaceae (family) | Tissue | |
| | *Atopobium parvulum* | Tissue | |
| | Fusobacteriaceae (family) | Stool, Tissue | |
| | *Fusobacterium varium* | Tissue | |
| | *Campylobacter* spp. | Tissue | |
| | *Campylobacter concisus* | Stool, Tissue | |
| | *Aggregatibacter segnis* | Stool | |
| | *Streptococcus* spp. | Stool, Tissue | |
| | *Streptococcus anginosus* | Stool | |
| | Gemellaceae (family) | Stool, Tissue | |
| | Enterobacteriaceae (family) | Stool, Tissue | |
| | *Escherichia coli* | Stool, Tissue | |
| Colorectal Cancer (CRC) | *Porphyromonas* spp. | Stool, Rectal swab | Ahn et al. 2013; Chen et al. 2012; Flemer et al. 2018; Guo and Li |
| | *Porphyromonas gingivalis* | Stool | |

| | | | |
|---|---|---|---|
| | *Porphyromonas uenonis* | Stool | 2014; Herlyn et al. 1982; Komiya et al. 2019; Olsen and Yilmaz 2019; Thomas et al. 2019; Wirbel et al. 2019; Yachida et al. 2019; Zumkeller et al. 2006 |
| | *Fusobacterium* spp. | Stool, tissue, rectal swab | |
| | *Fusobacterium nucleatum* | Stool, tissue | |
| | *Streptococcus* spp. | Stool | |
| | Peptostreptococcaceae (family) | Stool, Rectal swab | |
| | *Peptostreptococcus stomatis* | Stool | |
| | *Peptostreptococcus anaerobius* | Stool | |
| | *Prevotella* spp. | Stool | |
| | *Prevotella intermedia* | Stool | |
| | *Gemella morbillorum* | Stool, Rectal swab | |
| | *Solobacterium moorei* | Stool | |
| | *Atopobium parvulum* | Stool | |
| | *Actinomyces odontolyticus* | Stool | |
| | *Parvimonas micra* | Stool | |
| | *Escherichia coli* | Stool, Tissue | |
| | *Klebsiella* spp. | Stool | |
| | *Helicobacter pylori* | Tissue | |
| | *Mogibacterium* | Stool | |
| | *Dialister pneumosintes* | Tissue | |
| Celiac Disease | *Staphylococcus* spp. | Stool | Collado et al. 2008; Sanchez et al. 2013 |
| | *Staphylococcus epidermidis* | Tissue | |
| | Enterobacteriaceae (family) | Tissue | |
| | *Klebsiella oxytoca* | Tissue | |

The taxonomic rank is provided in parentheses only if the species information is not defined in the reference.
§ Oral bacteria are defined as following criteria; (i) bacteria identified as a constituent of the oral microbiome by the Human Oral Microbiome Database (Escapa IF *et al*. mSystems. 2018) and (ii) bacteria have higher abundance in the oral tissues than that in the gut samples in healthy individuals based on the NIH Human Microbiome Project (HMP1). In addition, some bacteria, which are previously reported as bacteria involved in oral pathology are also listed as possible oral bacteria, although they do not meet criterion (ii).

**Appendix Table 2. Possible mechanisms of oral bacteria in the gut pathogenesis, with references**

| Oral bacteria | Target cells | Effector | Pathways in host cells | | Pathological functions | References |
|---|---|---|---|---|---|---|
| | | | Receptor | Related signals | | |
| *Fusobacterium nucleatum* | *Epithelial cells* | Fap2 | Gal-GalNAc | - | Tumor binding and enrichment | Abed et al. 2016 |
| | *Epithelial cells* | - | - | *metalloproteinase collagenase* | Cellular migration and invasive properties | Uitto et al. 2005; Gursoy et al. 2008 |
| | *Epithelial cells* | FadA | Ecad | *Wnt/β-catenin* | Tumor cell proliferation | Rubinstein et al. 2013 |
| | *NK cells T cells* | Fap2 | TIGIT | - | Immune evasion | Gur et al. 2015 |
| | *Epithelial cells* | LPS | TLR4 | *miR-4802 miR-18a** | Chemoresistance (Autophagy activation) | Yu et al. 2017 |
| | *Epithelial cells* | LPS | TLR4 | *Myd88 miR-21* | Tumor cell proliferation | Yang et al. 2017 |
| | - | - | - | - | Recruitment of tumor-infiltrating immune cells (MDSC, TAM, regDC) | Kostic et al. 2013 |
| *Fusobacterium varium* | *Epithelial cells* | - | - | - | Adhesion and Invasion IL-8 and TNF-α production | Ohkusa et al. 2003; Ohkusa et al. 2009 |
| *Porphyromonas gingivalis* | *Epithelial cells* | - | - | *Jak1/Akt/Stat3 PI3K/Akt* | Cell survival (antiapoptotic) | Mao et al. 2007; Yilmaz et al. 2004 |
| | *Epithelial cells* | - | - | *cyclin D & E PI3K* | Cell proliferation | Kuboniwa et al. 2008; Pan et al. 2014 |
| | *Epithelial cells* | Gingipain | β-catenin destruction | *β-catenin* | Cell proliferation | Zhou et al. 2015 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | complex degradation | | | |
| | *Epithelial cells* | - | - | - | Immune evasion (B7-H1 and B7-DC upregulation) | Groeger et al. 2011 |
| | *Epithelial cells* | Gingipain | PAR | *NF-kB, ERK1/2, p38* | Tumor invasiveness (MMPs expression↑) | Ha et al. 2015; Inaba et al. 2015; Inaba et al. 2014 |
| | *Epithelial cells and others* | - | - | - | Epithelial disruption<br>Proinflammatory cytokine induction<br>Gut dysbiosis | Arimatsu et al. 2014; Nakajima et al. 2015 |
| | *Epithelial cells and others* | - | - | - | Epithelial disruption<br>Immune activation<br>Gut dysbiosis | Sato et al. 2017; Flak et al. 2019 |
| | *Neutrophils* | - | TLR1-TLR2 | *Myd88* | Impaired antimicrobial response<br>Impaired killing activity | Hajishengallis 2015 |
| | *Mø and DC* | Fimbrial proteins (FimA & Mfa1) | CR3 or DC-SIGN | MMP and C1q | Hijack and direct host immune cells (Distant tissue destruction) | Hajishengallis 2015 |
| *Klebsiella pneumoniae Klebsiella aerogenes (Klebsiella aeromobilis)* | *Epithelial cells* | - | *TLR* | *IL18*<br>*MyD88* | Th1 cell generation | Atarashi et al. 2017 |
| *Atopobium parvulum* | *Unknown* | $H_2S$ | | | Mitochondrial dysfunction in host with impaired $H_2S$ detoxification | Mottawea et al. 2016 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Campylobacter concisus* | *Epithelial cells* | | | | Epithelial disruption | Nielsen et al. 2011 |
| *Staphylococcus aureus* | *Epithelial cells*<br>*T cells* | enterotoxins | - | - | Epithelial disruption<br>Immune activation | Edwards et al. 2012 |

**Appendix Table 3. Potential factors associated with gut colonization of oral bacteria, with references (Corresponding to Fig.1)**

| Oral bacterial dissemination into bloodstream after dental activities | | |
|---|---|---|
| Factors | Oral bacteria detected in the "blood" | References |
| General activity<br>(e.g., chewing, brushing) | *Streptococcus* spp.<br>*Streptococcus mitis*<br>*Streptococcus anginosus*<br>*Streptococcus intermedius*<br>*Streptococcus sanguinis*<br>*Staphylococcus epidermidis*<br>*Staphylococcus warneri*<br>*Stenotrophomonas maltophilia*<br>*Propionibacterium acnes*<br>*Acinetobacter Iwoffii*<br>*Acinetobacter calcoaceticus*<br>*Actinobacillus actinomycetemcomitans*<br>*Peptostreptococcus micros*<br>*Veillonella parvula*<br>*Actinomyces naeslundii* | Bhanji et al. 2002; Forner et al. 2006; Hartzell et al. 2005; Kinane et al. 2005; Lockhart et al. 2008; Lucas and Roberts 2000; Sconyers et al. 1973 |
| Periodontal procedures<br>(e.g., probing, root planing, extraction) | *Streptococcus* spp.<br>*Streptococcus sanguinis*<br>*Streptococcus mutans*<br>*Streptococcus oralis*<br>*Streptococcus milleri*<br>*Streptococcus anginosus*<br>*Streptococcus constellatus*<br>*Streptococcus cristatus*<br>*Streptococcus gordonii*<br>*Streptococcus intermedius*<br>*Streptococcus mitis* | Aitken et al. 1995; Allison et al. 1993; Assaf et al. 2007; Bender et al. 2003; Cherry et al. 2007; Daly et al. 1997; Daly et al. 2001; Debelian et al. 1995; Diz Dios et al. 2006; Erverdi et al. 2001; Erverdi et al. 2000; Flood et al. 1990; Hall et al. 1996; Hunter et al. 1989; Khairat 1966; Lafaurie et al. 2007; Lamey et al. 1985; Lockhart et al. 2004; Lockhart et al. 2008; Lucas et al. 2007; Lucas et al. 2002; Macfarlane et al. 1984; Rahn et al. 1995; Rajasuo et al. 2004; Roberts et al. 2006; Roberts et al. 1998; Rosa et al. 2005; |

| | | |
|---|---|---|
| | *Streptococcus salivarius*<br>*Actinomyces spp.*<br>*Actinomyces meyeri*<br>*Actinomyces odontolyticus*<br>*Actinomyces naeslundii*<br>*Staphylococcus* spp.<br>*Staphylococcus epidermidis*<br>*Staphylococcus warneri*<br>*Staphylococcus aureus*<br>*Neisseria* spp.<br>*Neisseria elongata*<br>*Neisseria flavescens*<br>*Neisseria mucosa*<br>*Neisseria sicca*<br>*Neisseria pharyngis*<br>*Capnocytophaga* sp.<br>*Eikenella corrodens*<br>*Fusobacterium nucleatum*<br>*Fusobacterium fusiforme*<br>*Granulicatella adiacens*<br>*Haemophilus aphrophilus*<br>*Lactobacillus rhamnosus*<br>*Lactobacillus casei*<br>*Lactobacillus salivarius*<br>*Porphyromonas gingivalis*<br>*Prevotella* spp.<br>*Prevotella denticola*<br>*Prevotella melaninogenica*<br>*Prevotella oralis*<br>*Propionibacterium acnes*<br>*Veillonella parvula* | Savarrio et al. 2005; Sweet et al. 1978; Tomas et al. 2007a; Tomas et al. 2007b; Waki et al. 1990; Yamalik et al. 1992 |

| | | |
|---|---|---|
| | *Enterobacter aerogenes*<br>*Eubacterium lentes*<br>*Capnocytophaga* spp.<br>*Micromonas micros* | |
| Oral diseases<br>(e.g., gingivitis, periodontitis) | *Staphylococcus epidermidis*<br>*Streptococcus mitis*<br>*Streptococcus oralis*<br>*Streptococcus acidominimus* | Raber-Durlacher et al. 2013 |
| **Impaired gastric barrier function** | | |
| Factors | Oral bacteria detected in the "gut" | References |
| Gastric hypochlorhydria<br>(e.g., proton pump inhibitor, surgery) | *Streptococcus* spp.<br>*Veillonella* spp.<br>*Haemophilus* spp.<br>*Megasphaera* spp.<br>*Actinomyces* spp.<br>*Granulicatella* spp.<br>*Enterobacteriaceae* spp.<br>*Escherichia coli*<br>*Klebsiella pneumoniae*<br>*Veillonella* spp.<br>*Veillonella parvula*<br>*Veillonella dispar*<br>*Pseudomonas* spp. | Castaner et al. 2018; Graessler et al. 2013; Jackson et al. 2016; Paganelli et al. 2019; Takagi et al. 2018; Tremaroli et al. 2015 |
| **Disruption of gut colonization resistance** | | |
| Factors | Oral bacteria detected in the "gut" | References |
| Antibiotics<br>(e.g., vancomycin) | *Klebsiella pneumoniae*<br>*Escherichia coli*<br>*Veillonella* spp.<br>*Streptococcus mitis*<br>*Lactobacillus salivarius* | Reijnders et al. 2016 |
| | *Fusobacterium nucleatum* | |

| | | |
|---|---|---|
| Dietary components (e.g., high fat, artificial sweetener) | *Aggregatibacter aphrophilus*<br>*Streptococcus* spp.<br>*Staphylococcus* spp.<br>*Peptostreptococcaceae* spp. | Bian et al. 2017; David et al. 2014; Mehta et al. 2017; Palma et al. 2012 |
| Environmental factors (e.g., smoking, aging) | *Porphyromonadaceae*<br>*Neisseria* spp.<br>*Streptococcus* spp.<br>*Veillonella dispar*<br>*Prevotella intermedia*<br>*Prevotella tannerae*<br>*Corynebacterium* spp.<br>*Mogibacterium* spp.<br>*Peptococcaceae* spp.<br>*Pseudoramibacter_Eubacterium*<br>*Bulleidia* spp.<br>*Campylobacter* spp.<br>*TM7* spp.<br>*Megasphaera* spp. | Iwauchi et al. 2019; Lee et al. 2018; Odamaki et al. 2016; Shanahan et al. 2018 |
| Host genetics (e.g., HLA, SNP) | *Staphylococcus* spp.<br>*Klebsiella* spp.<br>*Streptococcus sanguinis*<br>*Streptococcus thermophilus*<br>*Streptococcus australis*<br>*Veillonella* spp.<br>*Veillonella atypica* | Kolde et al. 2018; Palma et al. 2012; Russell et al. 2019 |
| Gut Diseases (e.g., IBD, CRC) | Please see an appendix table 1 | |

**REFERENCES, APPENDIX TABLE**


Abed J, Emgard JE, Zamir G, Faroja M, Almogy G, Grenov A, Sol A, Naor R, Pikarsky E, Atlan KA et al. 2016. Fap2 mediates fusobacterium nucleatum colorectal adenocarcinoma enrichment by binding to tumor-expressed gal-galnac. Cell Host Microbe. 20(2):215-225.

Ahn J, Sinha R, Pei Z, Dominianni C, Wu J, Shi J, Goedert JJ, Hayes RB, Yang L. 2013. Human gut microbiome and risk for colorectal cancer. J Natl Cancer Inst. 105(24):1907-1911.

Arimatsu K, Yamada H, Miyazawa H, Minagawa T, Nakajima M, Ryder MI, Gotoh K, Motooka D, Nakamura S, Iida T et al. 2014. Oral pathobiont induces systemic inflammation and metabolic changes associated with alteration of gut microbiota. Sci Rep. 4:4828.

Atarashi K, Suda W, Luo C, Kawaguchi T, Motoo I, Narushima S, Kiguchi Y, Yasuma K, Watanabe E, Tanoue T et al. 2017. Ectopic colonization of oral bacteria in the intestine drives th1 cell induction and inflammation. Science. 358(6361):359-365.

Burrello C, Pellegrino G, Giuffre MR, Lovati G, Magagna I, Bertocchi A, Cribiu FM, Boggio F, Botti F, Trombetta E et al. 2019. Mucosa-associated microbiota drives pathogenic functions in ibd-derived intestinal inkt cells. Life Sci Alliance. 2(1).

Chen W, Liu F, Ling Z, Tong X, Xiang C. 2012. Human intestinal lumen and mucosa-associated microbiota in patients with colorectal cancer. PLoS One. 7(6):e39743.

Collado MC, Donat E, Ribes-Koninckx C, Calabuig M, Sanz Y. 2008. Imbalances in faecal and duodenal bifidobacterium species composition in active and non-active coeliac disease. BMC Microbiol. 8:232.

Darfeuille-Michaud A, Boudeau J, Bulois P, Neut C, Glasser AL, Barnich N, Bringer MA, Swidsinski A, Beaugerie L, Colombel JF. 2004. High prevalence of adherent-invasive escherichia coli associated with ileal mucosa in crohn's disease. Gastroenterology. 127(2):412-421.

Edwards LA, O'Neill C, Furman MA, Hicks S, Torrente F, Perez-Machado M, Wellington EM, Phillips AD, Murch SH. 2012. Enterotoxin-producing staphylococci cause intestinal inflammation by a combination of direct epithelial cytopathy and superantigen-mediated t-cell activation. Inflamm Bowel Dis. 18(4):624-640.

Flak MB, Colas RA, Munoz-Atienza E, Curtis MA, Dalli J, Pitzalis C. 2019. Inflammatory arthritis disrupts gut resolution mechanisms, promoting barrier breakdown by porphyromonas gingivalis. JCI Insight. 4(13).

Flemer B, Warren RD, Barrett MP, Cisek K, Das A, Jeffery IB, Hurley E, O'Riordain M, Shanahan F, O'Toole PW. 2018. The oral microbiota in colorectal cancer is distinctive and predictive. Gut. 67(8):1454-1463.

Fourie NH, Wang D, Abey SK, Sherwin LB, Joseph PV, Rahim-Williams B, Ferguson EG, Henderson WA. 2016. The microbiome of the oral mucosa in irritable bowel syndrome. Gut Microbes. 7(4):286-301.

Gevers D, Kugathasan S, Denson LA, Vazquez-Baeza Y, Van Treuren W, Ren B, Schwager E, Knights D, Song SJ, Yassour M et al. 2014. The treatment-naive microbiome in new-onset crohn's disease. Cell Host Microbe. 15(3):382-392.

Groeger S, Domann E, Gonzales JR, Chakraborty T, Meyle J. 2011. B7-h1 and b7-dc receptors of oral squamous carcinoma cells are upregulated by porphyromonas gingivalis. Immunobiology. 216(12):1302-1310.

Guo Y, Li HY. 2014. Association between helicobacter pylori infection and colorectal neoplasm risk: A meta-analysis based on east asian population. J Cancer Res Ther. 10 Suppl:263-266.

Gur C, Ibrahim Y, Isaacson B, Yamin R, Abed J, Gamliel M, Enk J, Bar-On Y, Stanietsky-Kaynan N, Coppenhagen-Glazer S et al. 2015. Binding of the fap2 protein of fusobacterium nucleatum to human inhibitory receptor tigit protects tumors from immune cell attack. Immunity. 42(2):344-355.

Gursoy UK, Kononen E, Uitto VJ. 2008. Stimulation of epithelial cell matrix metalloproteinase (mmp-2, -9, -13) and interleukin-8 secretion by fusobacteria. Oral Microbiol Immunol. 23(5):432-434.

Ha NH, Woo BH, Kim DJ, Ha ES, Choi JI, Kim SJ, Park BS, Lee JH, Park HR. 2015. Prolonged and repetitive exposure to porphyromonas gingivalis increases aggressiveness of oral cancer cells by promoting acquisition of cancer stem cell properties. Tumour Biol. 36(12):9947-9960.

Hajishengallis G. 2015. Periodontitis: From microbial immune subversion to systemic inflammation. Nat Rev Immunol. 15(1):30-44.

Herlyn M, Sears HF, Steplewski Z, Koprowski H. 1982. Monoclonal antibody detection of a circulating tumor-associated antigen. I. Presence of antigen in sera of patients with colorectal, gastric, and pancreatic carcinoma. J Clin Immunol. 2(2):135-140.

Inaba H, Amano A, Lamont RJ, Murakami Y. 2015. Involvement of protease-activated receptor 4 in over-expression of matrix metalloproteinase 9 induced by porphyromonas gingivalis. Med Microbiol Immunol. 204(5):605-612.

Inaba H, Sugita H, Kuboniwa M, Iwai S, Hamada M, Noda T, Morisaki I, Lamont RJ, Amano A. 2014. Porphyromonas gingivalis promotes invasion of oral squamous cell carcinoma through induction of prommp9 and its activation. Cell Microbiol. 16(1):131-145.

Ismail Y, Mahendran V, Octavia S, Day AS, Riordan SM, Grimm MC, Lan R, Lemberg D, Tran TA, Zhang L. 2012. Investigation of the enteric pathogenic potential of oral campylobacter concisus strains isolated from patients with inflammatory bowel disease. PLoS One. 7(5):e38217.

Kassinen A, Krogius-Kurikka L, Makivuokko H, Rinttila T, Paulin L, Corander J, Malinen E, Apajalahti J, Palva A. 2007. The fecal microbiota of irritable bowel syndrome patients differs significantly from that of healthy subjects. Gastroenterology. 133(1):24-33.

Komiya Y, Shimomura Y, Higurashi T, Sugi Y, Arimoto J, Umezawa S, Uchiyama S, Matsumoto M, Nakajima A. 2019. Patients with colorectal cancer have identical strains of fusobacterium nucleatum in their colorectal cancer and oral cavity. Gut. 68(7):1335-1337.

Kostic AD, Chun E, Robertson L, Glickman JN, Gallini CA, Michaud M, Clancy TE, Chung DC, Lochhead P, Hold GL et al. 2013. Fusobacterium nucleatum potentiates intestinal tumorigenesis and modulates the tumor-immune microenvironment. Cell Host Microbe. 14(2):207-215.

Kuboniwa M, Hasegawa Y, Mao S, Shizukuishi S, Amano A, Lamont RJ, Yilmaz O. 2008. P. Gingivalis accelerates gingival epithelial cell progression through the cell cycle. Microbes Infect. 10(2):122-128.

Lupp C, Robertson ML, Wickham ME, Sekirov I, Champion OL, Gaynor EC, Finlay BB. 2007. Host-mediated inflammation disrupts the intestinal microbiota and promotes the overgrowth of enterobacteriaceae. Cell Host Microbe. 2(2):119-129.

Mahendran V, Riordan SM, Grimm MC, Tran TA, Major J, Kaakoush NO, Mitchell H, Zhang L. 2011. Prevalence of campylobacter species in adult crohn's disease and the preferential colonization sites of campylobacter species in the human intestine. PLoS One. 6(9):e25417.

Malinen E, Rinttila T, Kajander K, Matto J, Kassinen A, Krogius L, Saarela M, Korpela R, Palva A. 2005. Analysis of the fecal microbiota of irritable bowel syndrome patients and healthy controls with real-time pcr. Am J Gastroenterol. 100(2):373-382.

Man SM, Zhang L, Day AS, Leach ST, Lemberg DA, Mitchell H. 2010. Campylobacter concisus and other campylobacter species in children with newly diagnosed crohn's disease. Inflamm Bowel Dis. 16(6):1008-1016.

Mao S, Park Y, Hasegawa Y, Tribble GD, James CE, Handfield M, Stavropoulos MF, Yilmaz O, Lamont RJ. 2007. Intrinsic apoptotic pathways of gingival epithelial cells modulated by porphyromonas gingivalis. Cell Microbiol. 9(8):1997-2007.

Mottawea W, Chiang CK, Muhlbauer M, Starr AE, Butcher J, Abujamel T, Deeke SA, Brandel A, Zhou H, Shokralla S et al. 2016. Altered intestinal microbiota-host mitochondria crosstalk in new onset crohn's disease. Nat Commun. 7:13419.

Mukhopadhya I, Thomson JM, Hansen R, Berry SH, El-Omar EM, Hold GL. 2011. Detection of campylobacter concisus and other campylobacter species in colonic biopsies from adults with ulcerative colitis. PLoS One. 6(6):e21490.

Nakajima M, Arimatsu K, Kato T, Matsuda Y, Minagawa T, Takahashi N, Ohno H, Yamazaki K. 2015. Oral administration of p. Gingivalis induces dysbiosis of gut microbiota and impaired barrier function leading to dissemination of enterobacteria to the liver. PLoS One. 10(7):e0134234.

Nielsen HL, Nielsen H, Ejlertsen T, Engberg J, Gunzel D, Zeitz M, Hering NA, Fromm M, Schulzke JD, Bucker R. 2011. Oral and fecal campylobacter concisus strains perturb barrier function by apoptosis induction in ht-29/b6 intestinal epithelial cells. PLoS One. 6(8):e23858.

Ohkusa T, Okayasu I, Ogihara T, Morita K, Ogawa M, Sato N. 2003. Induction of experimental ulcerative colitis by fusobacterium varium isolated from colonic mucosa of patients with ulcerative colitis. Gut. 52(1):79-83.

Ohkusa T, Sato N, Ogihara T, Morita K, Ogawa M, Okayasu I. 2002. Fusobacterium varium localized in the colonic mucosa of patients with ulcerative colitis stimulates species-specific antibody. J Gastroenterol Hepatol. 17(8):849-853.

Ohkusa T, Yoshida T, Sato N, Watanabe S, Tajiri H, Okayasu I. 2009. Commensal bacteria can enter colonic epithelial cells and induce proinflammatory cytokine secretion: A possible pathogenic mechanism of ulcerative colitis. J Med Microbiol. 58(Pt 5):535-545.

Olsen I, Yilmaz O. 2019. Possible role of porphyromonas gingivalis in orodigestive cancers. J Oral Microbiol. 11(1):1563410.

Ott SJ, Musfeldt M, Wenderoth DF, Hampe J, Brant O, Folsch UR, Timmis KN, Schreiber S. 2004. Reduction in diversity of the colonic mucosa associated bacterial microflora in patients with active inflammatory bowel disease. Gut. 53(5):685-693.

Palma GD, Capilla A, Nova E, Castillejo G, Varea V, Pozo T, Garrote JA, Polanco I, Lopez A, Ribes-Koninckx C et al. 2012. Influence of milk-feeding type and genetic risk of developing coeliac disease on intestinal microbiota of infants: The proficel study. PLoS One. 7(2):e30791.

Pan C, Xu X, Tan L, Lin L, Pan Y. 2014. The effects of porphyromonas gingivalis on the cell cycle progression of human gingival epithelial cells. Oral Dis. 20(1):100-108.

Pascal V, Pozuelo M, Borruel N, Casellas F, Campos D, Santiago A, Martinez X, Varela E, Sarrabayrouse G, Machiels K et al. 2017. A microbial signature for crohn's disease. Gut.

66(5):813-822.

Patwa LG, Fan TJ, Tchaptchet S, Liu Y, Lussier YA, Sartor RB, Hansen JJ. 2011. Chronic intestinal inflammation induces stress-response genes in commensal escherichia coli. Gastroenterology. 141(5):1842-1851 e1841-1810.

Pilarczyk-Zurek M, Chmielarczyk A, Gosiewski T, Tomusiak A, Adamski P, Zwolinska-Wcislo M, Mach T, Heczko PB, Strus M. 2013. Possible role of escherichia coli in propagation and perpetuation of chronic inflammation in ulcerative colitis. BMC Gastroenterol. 13:61.

Pittayanon R, Lau JT, Yuan Y, Leontiadis GI, Tse F, Surette M, Moayyedi P. 2019. Gut microbiota in patients with irritable bowel syndrome-a systematic review. Gastroenterology. 157(1):97-108.

Rajilic-Stojanovic M, Biagi E, Heilig HG, Kajander K, Kekkonen RA, Tims S, de Vos WM. 2011. Global and deep molecular analysis of microbiota signatures in fecal samples from patients with irritable bowel syndrome. Gastroenterology. 141(5):1792-1801.

Rigsbee L, Agans R, Shankar V, Kenche H, Khamis HJ, Michail S, Paliy O. 2012. Quantitative profiling of gut microbiota of children with diarrhea-predominant irritable bowel syndrome. Am J Gastroenterol. 107(11):1740-1751.

Rubinstein MR, Wang X, Liu W, Hao Y, Cai G, Han YW. 2013. Fusobacterium nucleatum promotes colorectal carcinogenesis by modulating e-cadherin/beta-catenin signaling via its fada adhesin. Cell Host Microbe. 14(2):195-206.

Sanchez E, Donat E, Ribes-Koninckx C, Fernandez-Murga ML, Sanz Y. 2013. Duodenal-mucosal bacteria associated with celiac disease in children. Appl Environ Microbiol. 79(18):5472-5479.

Sato K, Takahashi N, Kato T, Matsuda Y, Yokoji M, Yamada M, Nakajima T, Kondo N, Endo N, Yamamoto R et al. 2017. Aggravation of collagen-induced arthritis by orally administered porphyromonas gingivalis through modulation of the gut microbiota and gut immune system. Sci Rep. 7(1):6955.

Saulnier DM, Riehle K, Mistretta TA, Diaz MA, Mandal D, Raza S, Weidler EM, Qin X, Coarfa C, Milosavljevic A et al. 2011. Gastrointestinal microbiome signatures of pediatric patients with irritable bowel syndrome. Gastroenterology. 141(5):1782-1791.

Seksik P, Rigottier-Gois L, Gramet G, Sutren M, Pochart P, Marteau P, Jian R, Dore J. 2003. Alterations of the dominant faecal bacterial groups in patients with crohn's disease of the colon. Gut. 52(2):237-242.

Si JM, Yu YC, Fan YJ, Chen SJ. 2004. Intestinal microecology and quality of life in irritable bowel syndrome patients. World J Gastroenterol. 10(12):1802-1805.

Sokol H, Leducq V, Aschard H, Pham HP, Jegou S, Landman C, Cohen D, Liguori G, Bourrier A, Nion-Larmurier I et al. 2017. Fungal microbiota dysbiosis in ibd. Gut. 66(6):1039-1048.

Su T, Liu R, Lee A, Long Y, Du L, Lai S, Chen X, Wang L, Si J, Owyang C et al. 2018. Altered intestinal microbiota with increased abundance of prevotella is associated with high risk of diarrhea-predominant irritable bowel syndrome. Gastroenterol Res Pract. 2018:6961783.

Tana C, Umesaki Y, Imaoka A, Handa T, Kanazawa M, Fukudo S. 2010. Altered profiles of intestinal microbiota and organic acids may be the origin of symptoms in irritable bowel syndrome. Neurogastroenterol Motil. 22(5):512-519, e114-515.

Thomas AM, Manghi P, Asnicar F, Pasolli E, Armanini F, Zolfo M, Beghini F, Manara S, Karcher N, Pozzi C et al. 2019. Metagenomic analysis of colorectal cancer datasets identifies cross-cohort microbial diagnostic signatures and a link with choline degradation. Nat Med. 25(4):667-678.

Uitto VJ, Baillie D, Wu Q, Gendron R, Grenier D, Putnins EE, Kanervo A, Firth JD. 2005. Fusobacterium nucleatum increases collagenase 3 production and migration of epithelial cells. Infect Immun. 73(2):1171-1179.

Verma R, Verma AK, Ahuja V, Paul J. 2010. Real-time analysis of mucosal flora in patients with inflammatory bowel disease in india. J Clin Microbiol. 48(11):4279-4282.

Vich Vila A, Imhann F, Collij V, Jankipersadsing SA, Gurry T, Mujagic Z, Kurilshikov A, Bonder MJ, Jiang X, Tigchelaar EF et al. 2018. Gut microbiota composition and functional changes in inflammatory bowel disease and irritable bowel syndrome. Sci Transl Med. 10(472).

Willing BP, Dicksved J, Halfvarson J, Andersson AF, Lucio M, Zheng Z, Jarnerot G, Tysk C, Jansson JK, Engstrand L. 2010. A pyrosequencing study in twins shows that gastrointestinal microbial profiles vary with inflammatory bowel disease phenotypes. Gastroenterology. 139(6):1844-1854 e1841.

Wirbel J, Pyl PT, Kartal E, Zych K, Kashani A, Milanese A, Fleck JS, Voigt AY, Palleja A, Ponnudurai R et al. 2019. Meta-analysis of fecal metagenomes reveals global microbial signatures that are specific for colorectal cancer. Nat Med. 25(4):679-689.

Wyatt GM, Bayliss CE, Lakey AF, Bradley HK, Hunter JO, Jones VA. 1988. The faecal flora of two patients with food-related irritable bowel syndrome during challenge with symptom-provoking foods. J Med Microbiol. 26(4):295-299.

Yachida S, Mizutani S, Shiroma H, Shiba S, Nakajima T, Sakamoto T, Watanabe H, Masuda K, Nishimoto Y, Kubo M et al. 2019. Metagenomic and metabolomic analyses reveal distinct stage-specific phenotypes of the gut microbiota in colorectal cancer. Nat Med. 25(6):968-976.

Yang Y, Weng W, Peng J, Hong L, Yang L, Toiyama Y, Gao R, Liu M, Yin M, Pan C et al. 2017. Fusobacterium nucleatum increases proliferation of colorectal cancer cells and tumor development in mice by activating toll-like receptor 4 signaling to nuclear factor-kappab, and up-regulating expression of microrna-21. Gastroenterology. 152(4):851-866 e824.

Yilmaz O, Jungas T, Verbeke P, Ojcius DM. 2004. Activation of the phosphatidylinositol 3-kinase/akt pathway contributes to survival of primary epithelial cells infected with the periodontal pathogen porphyromonas gingivalis. Infect Immun. 72(7):3743-3751.

Yu T, Guo F, Yu Y, Sun T, Ma D, Han J, Qian Y, Kryczek I, Sun D, Nagarsheth N et al. 2017. Fusobacterium nucleatum promotes chemoresistance to colorectal cancer by modulating autophagy. Cell. 170(3):548-563 e516.

Zhou Y, Sztukowska M, Wang Q, Inaba H, Potempa J, Scott DA, Wang H, Lamont RJ. 2015. Noncanonical activation of beta-catenin by porphyromonas gingivalis. Infect Immun. 83(8):3195-3203.

Zumkeller N, Brenner H, Zwahlen M, Rothenbacher D. 2006. Helicobacter pylori infection and colorectal cancer risk: A meta-analysis. Helicobacter. 11(2):75-80.