

LcS Topic: Cancer

Lactobacillus casei Shirota (LcS) is the unique probiotic strain in Yakult

For further information visit our website: www.yakult.co.uk/hcp
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1. Colorectal cancer
2. Bladder cancer
3. Breast cancer
4. Cervical cancer
5. Biliary and liver cancer
6. Lung cancer
7. Uterine cancer
8. Reduction of harmful substances
9. Immune function (relevant to cancer)

1. Colorectal cancer

Immune modulatory mechanisms of Yakult in prevention of colitis-associated colorectal cancer.

Pang Z, Shaopeng Y (2013) *Journal of Gastroenterology & Hepatology* **28** (Suppl 3): 852.

[Abstract]

Effect of *Lactobacillus casei* on *Streptococcus bovis* in faecal flora.

Kawano A, Ishikawa H, Akedo I *et al* (2010) *BMJ Case Reports* doi: 10.1136/bcr.06.2009.2019; pii: bcr06.2009.2019

[Free paper] [PubMed]

Randomized trial of dietary fiber and *Lactobacillus casei* administration for prevention of colorectal tumours.

Ishikawa H, Akedo I, Otani T, Suzuki T, Nakamura T *et al* (2005) *International Journal of Cancer* **116**: 762-767.

[Reprint available on request] [PubMed]

The effect of an oral administration of *Lactobacillus casei* strain Shirota on azoxymethane-induced colonic aberrant crypt foci and colon cancer in the rat.

Yamazaki K, Tsunoda A, Shibusawa M, Tsunoda Y, Kusano M *et al* (2000) *Oncology Report* **7(5)**: 977-982.

[PubMed]

The enhancing effect of oral *Lactobacillus casei* on the immunologic activity of colon cancer patients.

Sawamura A, Yamaguchi Y, Toge T, Nagata N, Ikeda H *et al* (1994) *Biotherapy* **8(12)**: 1567-1572.

2. Bladder cancer

***Lactobacillus casei* strain Shirota and prevention of recurrence of bladder cancer.**

Naito S (2008) *International Journal of Probiotics and Prebiotics* **3(3)**: 163-164.

[Journal available on request]

Prevention of recurrence with Epirubicin and *Lactobacillus casei* after transurethral resection of bladder cancer.

Naito S, Koga H, Yamaguchi A, Fujimoto N, Hasui Y *et al* (2008) *Journal of Urology* **179**: 485-490.
[PubMed]

The probiotic approach: An alternative treatment option in urology.

Hoesl CE & Altwein JE (2005) *European Urology* **47**: 288-296.
[PubMed]

Habitual intake of lactic acid bacteria and risk reduction of bladder cancer.

Ohashi Y, Nakai S, Tsukamoto T, Masumori N, Akaza H *et al* (2002) *Urologia Internationalis* **68**: 273-280.
[PubMed]

Antitumor effects of the intravesical instillation of heat killed cells of the *Lactobacillus casei* strain Shirota on the murine orthotopic bladder tumor MBT-2.

Takahashi T, Kushiro A, Nomoto K, Uchida K, Morotomi M *et al* (2001) *Journal of Urology* **166**: 2506-2511.
[PubMed]

Preventive effect of a *Lactobacillus casei* preparation on the recurrence of superficial bladder cancer in a double blind trial.

Aso Y, Akaza H, Kotake T, Tsukamoto T, Imai K *et al* (1995) *European Urology* **27**: 104–109.
[PubMed]

Influence of *Lactobacillus casei* on rat bladder carcinogenesis.

Tomita K, Akaza H, Nomoto K, Yokokura T, Matsushima H *et al* (1994) *Japanese Journal of Urology* **85(4)**: 655-663. [English abstract]
[PubMed]

Prophylactic effect of a *Lactobacillus casei* preparation on the recurrence of superficial bladder cancer.

Aso Y, Akaza H, Tomoishi J, Fujita K, Saito I *et al* (1992) *Urologia Internationalis* **49(3)**: 125-129.
[PubMed]

Antitumour activity of *Lactobacillus casei* (LC 9018) against experimental bladder tumour (MBT-2).

Asano M, Karasawa E, Takayama T (1986) *Journal of Urology* **136**:719-721.
[PubMed]

3. Breast cancer

Probiotic beverage with soy isoflavone consumption for breast cancer prevention: a case control study.

Toi M, Hirota S, Tomotaki A, *et al* (2013) *Current Nutrition & Food Science* **9(4)**:194-200.
[Free paper] [PubMed]

***Lactobacillus casei* Shirota enhances the preventive effect of soymilk in chemically induced breast cancer.**

Kaga C, Takagi A, Kano M *et al* (2013) *Cancer Science* Aug 28. **104**:1508-1514.
[PubMed]

4. Cervical cancer

Probiotics enhance the clearance of human papillomavirus-related lesions: a prospective controlled pilot study.

Verhoeven V, Renard N, Makar A *et al* (2012) *European Journal of Cancer Prevention* **22(1)**:46-51.
[Abstract]

5. Biliary and liver cancer

Anticarcinogenic effect of probiotic fermented milk and chlorophyllin on aflatoxin-B₁-induced liver carcinogenesis in rats.

Kumar M, Verma V, Nagpal R *et al* (2011) *British Journal of Nutrition* Aug 5 [Epub ahead of print]
[PubMed]

Perioperative synbiotic treatment to prevent infectious complications in patients after elective living donor liver transplantation. A prospective randomised study

Eguchi S, Takatsuki M, Hidaka M *et al* (2010). *The American Journal of Surgery* 201(4):498-502
[PubMed]

Perioperative synbiotic treatment to prevent postoperative infectious complications in biliary cancer surgery: A randomized controlled trial.

Sugawara G, Nagino M, Nishio H *et al* (2006). *Annals of Surgery* **244(5)**:706-714.
[Free paper] [PubMed]

Synbiotics reduce postoperative infectious complications: a randomized controlled trial in biliary cancer patients undergoing hepatectomy.

Kanazawa H, Nagino M, Kamiya S, Komatsu S, Mayumi T *et al* (2005) *Langenbeck's archives of surgery* **390(2)**: 104-113.
[PubMed]

6. Lung cancer

Control of the carcinomatous pleural effusion with LC9018 and quality of life in lung cancer patients.

Masuno T, Kishimoto S, Ogura T, Honma T, Niitani H *et al* (1994) *Biotherapy* **8(6)**: 847-856.

A comparative trial of LC9018 plus doxorubicin and doxorubicin alone for the treatment of malignant pleural effusion secondary to lung cancer.

Masuno T, Kishimoto S, Ogura T, Honma T, Niitani H *et al* (1991) *Cancer* **68(7)**: 1495-1500.
[PubMed]

The efficacy of LC9018 in patients with malignant pleural effusion of primary lung cancer.

Masuno T, Kishimoto S, Ogura T, Fukuoka M, Matsui K *et al* (1989) *Biotherapy* **3(6)**: 1598-1606.

7. Uterine cancer

Effect of LC9018 combined with radiation therapy on carcinoma of the uterine cervix. A phase III, multicenter, randomized, controlled study.

Okawa T, Niibe H, Arai T, Sekiba K, Noda K *et al* (1993) *Cancer* **72(6)**: 1949-1954.

[PubMed]

Phase II randomized clinical trial of LC9018 concurrently used with radiation in the treatment of carcinoma of the uterine cervix: Its effect on tumor reduction and histology.

Okawa T, Kira M, Arai T, Iida K, Dokiya T *et al* (1989) *Cancer* **64**: 1769-1776.

[PubMed]

Reduction of harmful substances (e.g. carcinogens, etc)

***In vitro* study of the potential protective role of *Lactobacillus* strains by acrylamide binding.**

Serrano-Nino CJ, Cavazos-Garduno A, Gonzalez-Cordova AF *et al* (2014) *Journal of Food Safety* **34**:62-68.

[Free paper]

Impact of the synbiotic combination of *Lactobacillus casei* Shirota and oligofructose-enriched inulin on the fecal volatile metabolite profile in healthy subjects.

De Preter V, Ghebretinsae AH, Abrahantes JC *et al* (2011) *Molecular Nutrition & Food Research* **55**:714-722

Key role of teichoic acids on aflatoxin B1 binding by probiotic bacteria.

Hernandez-Mendoza A, Guzman-de-Peña D, Garcia HS (2009) *Journal of Applied Microbiology* **107(2)**:395-403.

[PubMed]

p-Cresol inhibits IL-12 production by murine macrophages stimulated with bacterial immunostimulant.

Kawakami K, Makino I, Kato I, Uchida K, Onoue M (2009) *Immunopharmacology and Immunotoxicology* **31(2)**: 304-309.

[PubMed]

Effect of dietary intervention with different pre- and probiotics on intestinal bacterial enzyme activities.

De Preter V, Raemen H, Cloetens L, Houben E *et al* (2008) *European Journal of Clinical Nutrition* **62**: 225-231

[PubMed]

Effect of probiotics, *Bifidobacterium breve* and *Lactobacillus casei*, on Bisphenol A exposure in rats.

Oishi K, Sato T, Yokoi W, Yoshida Y, Ito M, Sawada H (2008) *Bioscience Biotechnology & Biochemistry* **72(6)**: 1409-1415.

[Free article]

Effects of *Lactobacillus casei* Shirota, *Bifidobacterium breve* and oligofructose-enriched inulin on the colonic nitrogen-protein metabolism in healthy humans.

De Preter V, Vanhoutte T, Huys G, Swings J, De Vuyst L *et al* (2007) *American Journal of Physiology, Gastrointestinal & Liver Physiology* **292**: 358-368.

[PubMed]

The effects of a synbiotic fermented milk beverage containing *Lactobacillus casei* strain Shirota and transgalactosylated oligosaccharides on defecation frequency, intestinal microflora, organic acid concentrations, and putrefactive metabolites of sub-optimal health state volunteers: a randomized placebo-controlled cross-over study.

Shioiri T, Yahagi K, Nakayama S, Asahara T, Yuki N *et al* (2006) *Bioscience & Microflora* **25(4)**:137-146.

The *in vivo* use of the stable isotope-labelled biomarkers lactose-[15N] ureide and [2H4] tyrosine to assess the effects of pro- and prebiotics on the intestinal flora of healthy human volunteers.

De Preter V, Geboes K, Verbrugghe K, De Vuyst L, Vanhoutte T *et al* (2004) *British Journal of Nutrition* **92**: 439-446

[PubMed]

The effect of consumption of milk fermented by *Lactobacillus casei* strain Shirota on the intestinal microflora and immune parameters in humans.

Spanhaak S, Havenaar R, Schaafsma G (1998) *European Journal of Clinical Nutrition* **52**: 899-907.

[PubMed]

Suppressing effect of *Lactobacillus casei* administration on the urinary mutagenicity arising from ingestion of fried ground beef in the human.

Hayatsu H & Hayatsu T (1993) *Cancer Letters* **73**: 173-179.

[PubMed]

Immune function (relevant to cancer)

Daily *Lactobacillus casei* Shirota intake increases natural killer cell activity in smokers.

Reale M, Boscolo P, Bellante V *et al* (2011) *British Journal of Nutrition* doi:10.1017/S0007114511005630

[PubMed]

A component of polysaccharide peptidoglycan complex on *Lactobacillus* induced an improvement of murine model of inflammatory bowel disease and colitis-associated cancer.

Matsumoto S, Hara T, Nagaoka M, Mike A, Mitsuyama K *et al* (2009) *Immunology* **128 (suppl 1)**: e170-e180.

[Free paper] [PubMed]

Relationship between the *in vitro* response of dendritic cells to *Lactobacillus* and prevention of tumorigenesis in the mouse.

Takagi A, Ikemura H, Matsuzaki T, Sato M, Nomoto K *et al* (2008) *Journal of Gastroenterology* **43**: 661-669.

[PubMed]

Effects of a fermented milk drink containing *Lactobacillus casei* strain Shirota on the human NK-cell activity.

Takeda K & Okumura K (2007) *Journal of Nutrition* **137 (Suppl)**: 791S-793S.

[Free article]

Modulation of natural killer cell activity by supplementation of fermented milk containing *Lactobacillus casei* in smokers.

Morimoto K, Takeshita T, Nanno M, Tokudome S, Nakayama K (2005) *Preventive Medicine* **40**: 589-594.

Immunomodulatory and antitumour effects *in vivo* by the cytoplasmic fraction of *Lactobacillus casei* and *Bifidobacterium longum*.

Lee J-W, Shin J-G, Kim EH *et al* (2004) *Journal of Veterinary Science* **5(1)**:41-48.

[Free paper] [PubMed]

Lipoteichoic acid from *Lactobacillus* strains elicit strong tumour necrosis factor alpha-inducing activities in macrophages through Toll-like receptor 2.

Matsuguchi T, Takagi A, Matsuzaki T, Nagaoka M, Ishikawa K *et al* (2003) *Clinical Diagnostic Laboratory Immunology* **10(2)**: 259-266.

[PubMed]

Enhancement of natural killer cytotoxicity delayed murine carcinogenesis by a probiotic microorganism.

Takagi A, Matsuzaki T, Sato M, Nomoto K, Morotomi M *et al* (2001) *Carcinogenesis* **22(4)**: 599-605.

[Free article]

Modulating immune responses with probiotic bacteria.

Matsuzaki T & Chin J (2000) *Immunology & Cell Biology* **78(1)**: 67-73.

[Free article]

Natural cytotoxic activity of peripheral-blood lymphocytes and cancer incidence: an 11-year follow-up study of a general population.

Imai K, Matsuyama S, Miyake S, Suga K & Nakachi K (2000) *Lancet* **356**: 1795-1799

[PubMed] NB: This paper does not involve LcS, however it is of interest for this section

The role of tumor necrosis factor (TNF)-alpha in the antitumour effect of intrapleural injection of *Lactobacillus casei* Shirota in mice.

Yasutake N, Matsuzaki T, Kimura K, Hashimoto S, Yokokura T *et al* (1999) *Medical Microbiology & Immunology* **188**: 9-14.

[PubMed]

Augmentation of antimetastatic effect on Lewis lung carcinoma (3LL) in C57BL/6 mice by priming with *Lactobacillus casei*.

Matsuzaki T, Shimizu Y, Yokokura T (1990) *Medical Microbiology & Immunology* **179**: 161-168.

[PubMed]

Other mechanistic studies

Cytotoxicity of probiotics from Philippine commercial dairy products on cancer cells and the effect on expression of *cfos* and *cjun* early apoptotic-promoting genes and interleukin -1 β and tumor necrosis factor- α proinflammatory cytokine genes.

Shyu PT, Oyong GG, Cabrera EC (2014) *Biomed Research International* Article ID 491740, 9 pages.

[Free paper] [PubMed]

Reviews

Probiotics as efficient immunopotentiators: translational role in cancer prevention.

Shida K & Nomoto K (2013) *Indian J Med Res* **138**:808-814.

[Free paper] [PubMed]

Biological effects of probiotics: what impact does *Lactobacillus casei* Shirota have on us?

Nanno M, Kato I, Kobayashi T, Shida K (2011) *International Journal of Immunopathology & Pharmacology* **24(1)**:45-50.

[PubMed]

Probiotics and cancer – from *in vitro* to human studies

Rowland I (2008) *International Journal of Probiotics & Prebiotics* **3(3)**: 165-168.

[Journal available on request]

Improvement of the gut environment by probiotics: possible risk reduction of cancer development?

Verbeke K, De Preter V, Cloetens L (2008) *International Journal of Probiotics and Prebiotics* **3(3)**: 153-158.

[Journal available on request]

Role of probiotics, prebiotics and synbiotics in chemoprevention for colorectal cancer.

Fotiadis CI, Stoidis CN, Spyropoulos BG, Zografos ED (2008) *World Journal of Gastroenterology* **14**: 6453-6457.

[Free article]

Antitumour activity and action mechanisms of *Lactobacillus casei* through the regulation of immune responses.

Matsuzaki T, Takagi A, Ikemura H, Matsuguchi T, Yokokura T (2004) *BioFactors* **22**: 63-66.

[PubMed]