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Cutting edge: Chemoprevention of colorectal cancer by probiotics

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Polorectal cancer is the fourth most common cancer in men and the third most common cancer in women worldwide and is I therefore a major health problem underlining the need for effective chemo preventive strategies. Increasing evidence from experimental and human studies suggests that probiotics beneficially affect the host by selectively stimulating the growth of a limited number of resident colonic bacteria or modulate the host resistance against intestinal infections and provide protective effects against colon cancer development. There exists a potential role for foods that contain probiotics to change the colonic microbiota in a way that might prevent diseases such as colorectal cancer.Intervention of probiotics in colorectal carcinogenesis and on efficacy of its treatment with piroxicam (PXC) was studied in animal models. Probiotics significantly decreased the induction and progression of preneoplastic lesions such as aberrant crypt foci (ACF) and mucin depleted foci (MDF) compared to carcinogen treated group, and the probiotics improved its efficacy. The proliferating cell nuclear antigen (PCNA) index, a marker of carcinogenesis in GI tract, increased progressively in rats challenged with carcinogen. The treatment with probiotics or with PXC was equally effective in preventing the rise in PCNA index in carcinogen treated rats. Further, PXC and probiotics acted synergistically in preventing the rise in PCNA labelling index. The incidence of tumors in GI tract was 90% in rats induced with carcinogen, which it reduced to 65% in PXC treated group. The treatment with probiotics decreased tumor incidence to 60-65%. The synergistic effect of PXC and probiotics was evident from the fact that the tumor incidence reduced to 20-25% in rats treated with probiotic Dahi along with PXC. The tumor load in GI tract was also reduced from 227 mm³ in carcinogen treated rats to 78-79 mm³ in probiotics treated DMH induced rats and 71 mm³ in PXC treated carcinogen induced rats. In rats treated with combination of probiotics and PXC, the tumor load decreased to 4-9 mm³/animal. Feeding probiotics to carcinogen induced rats inhibited the progression of adenoma to carcinoma, and the significant inhibition was also observed by treatment with PXC. Glutathione-S-transferase (GST) carcinogen detoxifying activity in liver as well as in colorectal tissue decreased in carcinogen treated rats. The treatment with probiotics restored carcinogen induced decline in GST activity. The treatment with combination of probiotics and PXC resulted in augmentation of GST activity to the level even greater than that in normal rats. β-glucuronidase activity that converts procarcinogen to active carcinogens in GI tract increased in carcinogen treated rats. The treatment with probiotics or PXC decreased carcinogen induced activity β -glucuronidase in feces and the two probiotics were equally effective. The accumulation of lipid peroxidation products, thiobarbituric acid reactive substances (TBARS), in liver and colorectal tissues increased progressively with time in carcinogen treated rats. Feeding probiotics or piroxicam treatment attenuated carcinogen induced TBARS accumulation in liver and colorectal tissues; the effect of piroxicam and probiotics was synergistic. Feeding rats with probiotics increased expression of pro-apoptotic gene Bax and decreased expression of anti-apoptotic gene Bcl2, proto-oncogene c-myc and cell cycle check point gene cyclin D1, which correlated with decreased initiation and progression of carcinogenesis in GIT. In conclusion, probiotics attenuated the carcinogen induced colorectal carcinogenesis and improve the efficacy of cancer treatment with piroxicam.

Biography

Dheeraj Mohania, Ph.D. is Associate Scientist Consultant, in Department of Research, Sir Ganga Ram Hospital, Rajender Nagar, New Delhi, India (2010 onwards), visiting Assistant Professor in the Guru Gobind Singh Indraprastha University, New Delhi, India (2012), visiting Associate Professor in the Department of Biotechnology, kurukshetra University, kurukshetra, Haryana, India (2012), visiting Associate Professor in Division of Animal Biochemistry, Dairy Microbiology Division, Animal Biotechnology Centre, National Dairy Research Institute, Karnal, Haryana, India (2011). He has awarded with the Rajiv Gandhi National Fellowship awarded by the University Grant Commission (U.G.C.), India during the Doctorate's degree (2007)... He has been granted a travel fellowship by scientific committee of International Probiotic Conference (IPC) Slovakia, Europe 2008 and Asia Federation of Societies for Lactic Acid Bacteria (AFSLAB), Singapore Society for Microbiology & Biotechnology, Singapore, at the National University of Singapore (2009). For 3 years he had directed a research and development center in India at Sir Ganga Ram Hospital, New Delhi, India. He is the editor and board member of 2 PubMed-listed journals. He has co-edited a successful book on book entitled, "Microbes in the Service of Mankind: Tiny Bugs with Huge Impact", as a reference book and some book chapters on probiotics and vitamins. He has published 22 papers and presented 25 communications.

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