

Inhibitory effect of *Lactobacillus helveticus* SBT2171 on the growth of colon carcinoma cells and the action mechanism

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Lactobacillus helveticus SBT2171 (LH2171: provided by Megmilk Snow Brand Co., Ltd.) is a lactic acid bacterium with high protease activity and used in starter cultures in the manufacturing of cheese. We have previously revealed that consumption of cheese using LH2171 alleviated symptoms of dextran sodium sulfate (DSS)-induced colitis in mice. In this study, we investigated the effect of LH2171 on the proliferation of MC38, a mouse colon carcinoma cell line and HT-29, a human colorectal adenocarcinoma cell line. LH2171 inhibited the proliferation of both MC38 cells and HT-29 cells. As a result of assay for the phosphorylation of cell growth regulators in MC38 cells, LH2171 inhibited the activation of JNK signaling pathway. In addition, LH2171 induced the expression of JNK-inactivating phosphatase, MKP1 at a transcriptional level and MKP1 siRNA attenuated the effect of LH2171 to inhibit cell proliferation. Furthermore, this regulation by LH2171 occurred by LH2171-induced TGF- β 1 autocrine manner. Subsequently, LH2171 released TGF- β 1 at a transcriptional level through the activation of extracellular signal-regulated kinase (ERK). These results indicate that the inhibitory effect of LH2171 on the proliferation of MC38 cells depends on the activation of ERK-TGF- β 1 axis and concomitant induction of MKP1 to inhibit JNK activity and cell proliferation.

Lean six sigma methodology in Saudi healthcare organizations: Drawing the topography of an unexplored territory

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Aim: The aim of this research is to identify the perceived benefits, the critical success factors and the expected challenges associated with implementing Lean Six Sigma methodology in healthcare taking Saudi Arabia as an example for developing countries.

Method: This research study is based on quantitative approach through a Structured Self-Administered Questionnaire (SAQ) disseminated to healthcare leaders and quality professionals working in different healthcare organizations in Saudi Arabia to collect empirical data to be statistically analyzed to reach valid and objective conclusions. The results have been compared to similar studies conducted in developed countries like USA and UK.

Findings: The study has concluded that Lean Six Sigma is still in its evolution stage in healthcare especially in developing countries identifying process improvement, waste reduction, lead/cycle time reduction and medical errors reduction as the main benefits while top management commitment, understanding Lean Six Sigma tools and techniques, effective communication and teamwork skills as the most crucial factors for success. Resistance to change and inability to sustain improvements are the most frequent and difficult challenges. Basic quality tools requiring no or simple statistical knowledge are more important and frequently used in healthcare unlike tools relying on advanced statistics. Conducting workshops with hands on training is essential as it is the most effective training method for Lean Six Sigma.

Conclusion: The paper focuses on exploring the topography of Lean Six Sigma implementation in Saudi healthcare organizations as an example of developing countries identifying the perceived benefits and expected challenges associated with it in addition the Critical Success Factors (CSFs) required for effective implementation. The paper is based on a newly designed Self-Administered Questionnaire (SAQ) which covers comprehensively the different areas of the research study. Literature review showed scarcity in the studies exploring this area in healthcare compared to other sectors and in developing countries compared to developed countries.

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