



P roject Safety

University of Ottawa IGEM 2009

Researcher Safety

The iGEM uOttawa research laboratory is biosafety level 1 laboratory as defined by the Centers for Disease Control and Prevention¹. *Lactobacillus plantarum* and *Acetobacter xylinum* are both risk group 1 microorganisms: agents that are not associated with disease in healthy adult humans¹. The genetically modified *L. plantarum* carrying the cellulose synthase gene also poses no risk to the researchers since it does not in any way affect its pathogenicity or antibiotic resistance. All members of the laboratory have undergone autoclave safety training, WHMIS (Workplace Hazardous Materials Information System) training and sterile technique training to ensure their safety in the laboratory.

Public Safety

The public safety concern that could arise is the ingestion of the genetically modified *Lactobacillus plantarum* as a probiotic. The wild-type *L. plantarum* has been shown to modulate the intestinal flora as well as increase faecal short-chain fatty acid content². *L. plantarum* has been thoroughly tested in-vivo in mice and it is known to attach in the ileum, cecum and colon and may persist in the organism for at least 7 days after injection^{3,4}. Since *L. plantarum* is currently used as a probiotic there are no public safety concerns associated with the use of the strain itself. However, the integration of *L. plantarum* into the natural human gut flora needs to be thoroughly investigated in order to determine if it displaces other vital microorganisms in the gut. This will be tested on biofilms as well as in-vivo in mice. The activity of the cellulose synthase itself could also cause potential risks. If the synthase is overly active, it could potentially process too much glucose causing low glucose levels in individuals. Also, if incorrectly marketed the product could become dangerous if over-ingested or seen as a weight-loss solution. These issues will be fully addressed once the activity of the cellulose synthase in *L. plantarum* is fully characterized.

Environmental Safety

A possible environmental safety concern could surface upon the inclusion of cellulose-synthase carrying *L. plantarum* in yogurts. The environmental release of the genetically modified organism could initiate its spread and potential displacement of the non-modified *L. plantarum* in the environment. Since the expression has not yet been characterized, it is uncertain if the expression of the cellulose synthase could potentially alter the *L. plantarum* lactic acid producing function as well as other aspects of its metabolism. We plan to address this issue by fully characterizing the expression of the cellulose synthase, as well as carrying out biofilm testing in order to observe the integration of the modified *L. plantarum* in a natural environment.

References:

1 - *Biosafety in Microbiological and Biomedical Laboratories*, Centers for Disease Control and Prevention, ed. 5, Washington, 2007.

<http://www.cdc.gov/od/ohs/biosfty/bmlb5/BMBL_5th_Edition.pdf>

- 2 – Saarela, M., Mogensen, G., Fonden R., Matto, J., Mattila-Sandholm, T. 2000. Probiotic bacteria: safety, functional and technological properties, *Journal of Biotechnology*, v. 84, p. 197 – 215.
- 3 – Ramiah, K., ten Doeschate, K., Smith, R., Dicks, L.M.T. 2009. Safety Assessment of *Lactobacillus plantarum* 423 and *Enterococcus mundtii* ST4SA Determined in Trials with Wistar Rats, *Probiotics and Antimicrobial Proteins*, v. 1, p. 15 – 23.
- 4 – Duangjitcharoen, Y., Kantachote, D., Ongsakul, M., Poosaran, N., Chaiyasut, C. 2009. Potential use of probiotic *Lactobacillus plantarum* SS2 isolated from a fermented plant beverage: safety assessment and persistence in the murine gastrointestinal tract, *World Journal of Microbiology and Biotechnology*, v. 25, p. 315 – 321.