

2<sup>nd</sup> International Conference and Exhibition on

# MARINE DRUGS AND NATURAL PRODUCTS

June 15-17, 2017 London, UK



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### Synbiotic effects of $\beta$ -glucans from cauliflower mushroom and *L. fermentum* on menopausal symptoms and gut microbiome in estrogen-deficient rats

Since gut microbiota influences obesity and bone mineral density, probiotics, prebiotics and synbiotics may attenuate menopausal symptoms by modulating gut microbiota in estrogen-deficient animals. We investigated whether the long-term consumption of *L. fermentum* (probiotics) and cauliflower mushroom (prebiotics) would prevent and/or delay the progression of post-menopausal symptoms in estrogen-deficient Ovariectomized (OVX) rats with diet-induced obesity and explored their mechanisms of action. OVX rats were fed with high fat diets containing 1% dextrin (control), 1% lyophilized cauliflower mushroom plus 0.1% casein (CFM), 0.1% *L. fermentum* plus 1% dextrin (LFE), 1% CFM plus 0.1% LFE (CFLF), or 30  $\mu$ g/kg body weight 17 $\beta$ -estradiol plus 1% dextrin (positive-control). CFM mainly contained  $\beta$ -glucans (about 95.8%). OVX exhibited impaired energy, glucose and lipid metabolisms and changed gut microbiome, and 17 $\beta$ -estradiol treatment prevented the impairment. Only CFLF lowered tail skin temperature without increasing serum 17 $\beta$ -estradiol and uterine index. CFLF and positive-control groups increased daily energy expenditure and fat oxidation. Dyslipidemia induced by OVX was improved by CFM and CFLF and CFLF prevented the dyslipidemia as much as in the positive-control group. Serum glucose levels and insulin levels were lower in CFLF as much as in the positive-control group. HOMA-IR was rather lower in CFLF than in the positive-control. Hepatic insulin signaling (pAkt $\rightarrow$ GSK-3 $\beta$ ) was also potentiated in the ascending order of the control, LFE, CFM, CFLF, and positive-control. AMPK phosphorylation showed similar patterns of hepatic insulin signaling but LFE increased it more than CFM. OVX increased the ratio of Firmicutes and Bacteroidetes and decreased the ratio of Actinobacteria plus Proteobacteria in the large intestines. The changes were prevented by CFLF as similar to the positive-control group. In conclusion, OVX changes gut microbiota and the changes were associated with menopausal symptoms and synbiotics of CFM and LFE prevented the gut microbiota and menopausal symptoms in estrogen-deficient animals.

#### Biography

James Daily has his expertise in Medicinal Plants and Natural Products from different sources. James Completed his PhD at the University of Tennessee. Currently he is working as a CEO at Daily Manufacturing Inc. USA. He has published number of papers in reputed journals and has been serving as an associate editor of J Medicinal Food

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