Effects of Portabella mushrooms on collagen-induced arthritis, inflammatory cytokines, and body composition in dilute brown non-agouti (DBA1) mice

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Short running title: Portabella and collagen-induced arthritis

Abstract:
Background:
Exotic mushrooms have long been used in Asia for treatment and/or prevention of chronic diseases due to their immunomodulatory properties. However, the health benefits of portabella mushrooms (PM) (brown Agaricus bisporous), on collagen-induced arthritis (CIA) and associated complications, (i.e. loss of lean mass, increased fat mass and inflammatory cytokines), have not been previously investigated.

Methods:
We investigated CIA pathogenesis, body composition and plasma levels of IL-6, TNF-α and sICAM1 in DBA1 female mice fed either the AIN76 diet or the same diet fortified with 5% lyophilized PM (n=19-20/group). Ten mice/group were immunized with 100 µg bovine collagen type II on day 42 of the protocol, followed by 50 µg lipopolysaccharides on day 62, and euthanized on day 73-74. Cytokines were measured by ELISA.

Results:
Compared to baseline diet, PM had: no protective effect from CIA since all collagen-immunized mice developed severe edema, bone erosion, and mononuclear cell infiltration in paws. In mice with and those without CIA, feeding a PM-fortified diet resulted in higher percent of body fat than feeding the baseline diet (p<0.05). After CIA induction, PM provided the following
beneficial effects: (a) a smaller reduction in lean mass and absolute thymus weight; (b) a higher fat mass loss; and (c) lower plasma TNF-α levels (p <0.05). PM-fortification did not alter plasma IL-6 and sICAM1 regardless of CIA status; but it increased in vitro IL-6 secretion by mitogen-treated spleen cells.

**Conclusion:**
Our data suggest that PM may reduce plasma TNF-α, attenuate lean mass loss and thymus atrophy associated with arthritis, and protect spleen cell function assessed by IL-6 secretion. However, PM-fortification did not attenuate overall CIA pathogenesis which may be due to lack of effect on plasma IL-6. Decreased TNF-α without alterations in IL-6 may reduce the risk of other conditions associated with chronic inflammation such as cardiovascular disease.

**Key words:** portabella mushrooms, inflammatory cytokines, collagen-induced arthritis, body composition, TNF-α, IL-6, thymus, DBA1 mice.