Dietary Curcumin significantly improves obesity-associated inflammation and diabetes in mouse models of diabesity

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Obesity is closely associated with development of several chronic diseases, including myocardial infarction, stroke, type 2 diabetes mellitus and cancer. It is also associated with substantially decreased health-related quality of life and increased medical expenditures.

A large body of evidence is available suggesting that a large component of obesity-associated pathophysiology may stem from a low-grade pro-inflammatory state. Newer approaches have to be developed to deal with large burden imposed by obesity on the welfare of society, to reduce its occurrence as well as reverse its detrimental physiological alterations.

Therefore, therapeutic management of diabetes and related complications with compounds that attenuate the inflammatory response would be helpful. Curcumin has been known to inhibit activation of the TLR-4 and NF-κB pro-inflammatory signaling pathways, which are implicated in the pathogenesis of type 2 diabetes as well.

Objective:

To investigate whether Curcumin could attenuate the pro-inflammatory, endocrine and metabolic consequences of obesity in genetically obese Lep $^{ob/ob}$ mice.

Study Design:

- Male C57BL/6J *ob/ob* mice (8-10 weeks) were randomized to receive a standardized diet meal of 4% fat by weight containing either a 3% by weight admixture of Curcumin or no additive
- The wild-type C57BL/6J mice (3-5 weeks) were randomized to receive either a standardized 4% fat by weight diet or high-fat diet containing 35% fat by weight
- At the age of 20 weeks, wild-type mice were further randomized with regard to the addition to their predesignated diet of a 3% by weight admixture of Curcumin or no additive
- Body composition analysis, glucose and insulin tolerance tests, immunohistochemistry, hormone and NF-κB activity assays were done

Results and Discussion:

- Wild-type C57BL/6J mice showed gradual development of obesity and moderate diabetes when fed with high-fat diets, whereas *ob/ob* showed spontaneous knockout mutation of the leptin gene resulting in hyperphagia, decreased metabolic rate, severe obesity and moderate diabetes
- A significant decrease in random-fed glucose levels in both diet-induced obesity (DIO) and *ob/ob* mice was observed after less than 2 weeks of Curcumin treatment
- Insulin tolerance test revealed improved insulin sensitivity in the *ob/ob* mice when treated with Curcumin
- Curcumin treatment showed a significant decrease in body fat in both DIO and *ob/ob* mice and more lean mass in the *ob/ob* mice

- Immunohistochemistry demonstrated that Curcumin treatment significantly decreased adipose, hepatic and systemic inflammation

Conclusion:

Curcumin was effective in reversing many of the inflammatory and metabolic derangements associated with obesity and improved glycemic control in mouse models of type 2 diabetes. Thus, warranting further investigation as a novel adjunctive therapy for type 2 diabetes in humans.