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Concurrent prebiotic supplement reverses hyperinsulinemia induced by early-life pulsed antibiotic in rats

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Background: Early life exposure to antibiotics increases risk of obesity. Prebiotics improve metabolic health and reduce fat mass. Our aim was to examine if early postnatal prebiotic supplementation when co-administered with antibiotic can reduce obesity risk in metabolically challenged offspring.

Methods: 10 week old female Sprague-Dawley rats (n=20) were mated and their pups were cross-fostered when 19 days old. Dams with their litters were randomized to: 1)control [C], 2)antibiotic [A] (azithromycin; dose 10mg/kg/day), 3)prebiotic [P] (10% oligofructose (OFS) oral suspension/diet), 4)antibiotic+prebiotic [A+P] and 5)lean conrol [LC]. The first pulse of antibiotics/prebiotics was administered before weaning from d19-21 of life through a feeding dropper. Animals were weaned onto a high fat high sugar diet (HFS), with prebiotic groups (P and AP) containing 10% OFS in their diet. Prebiotic groups remained on the diet until the last pulse of antibiotics. The second and third pulse of antibiotic were given d29-31 and d38-40, respectively. Body weight was assessed weekly, fecal samples were collected repeatedly and tissues and blood were collected at sacrifice (wk7 and wk10). Insulin tolerance test (ITT) was performed wk9 of life.

Results: Males and females given antibiotics(A) had higher body weight than any other group; in females (A) higher fasting glucose, insulin and leptin was detected after the third pulse of antibiotics (wk7) when compared to P and AP group and ITT revealed insulin resistance compared to other groups. Similarly, males were insulin resistant compared to P and AP groups, with higher fasting insulin levels. Calculation of homeostatic model assessment of insulin resistance (HOMA-IR) confirmed insulin resistance in males and females. Longitudinal microbiota and hypothalamic/hepatic gene expression analysis is ongoing.

Conclusion: Therapeutic doses of antibiotic administered to rats mirrored the concentration commonly used for human children for an acute infection. Antibiotics increased body weights, impaired insulin production and insulin sensitivity, but the effects were reversed with prebiotic co-administration.

Biography

Klancic T has completed her BSc in Scotland, she pursued her MSc in Nutrition and Biomedicine in Germany. In 2015 she joined Dr. Reimer's laboratory in Calgary, where she is currently completing her PhD in Nutrition, Metabolism and Genetics. Her goal is to become an expert in the application of nutrition and metabolism to obesity, and conduct research on novel methods of improving maternal and child metabolic health.

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