

Abstract

Replacing Part of Maltodextrin with Galactose in Early Life Diet Results in an Improved Body Composition and Energy Metabolism in a Mouse Model [†]

Maryam Rakhshandehroo ^{1,*}, Peixin Sun ² , Melissa Bekkenkamp-Grovenstein ², Lidewij Schipper ¹ and Evert M. Van Schothorst ² 

¹ Danone Nutricia Research, 3584 CT Utrecht, The Netherlands; lidewij.schipper@danone.com

² Human and Animal Physiology, Wageningen University, 6708 WD Wageningen, The Netherlands; peixin.sun@wur.nl (P.S.); evert.vanschothorst@wur.nl (E.M.V.S.)

* Correspondence: maryam.rakhshandehroo@danone.com

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Abstract: Background: Lactose, a disaccharide of glucose and galactose, is the primary carbohydrate found in milk. Recently, there has been an increased demand for low lactose/lactose-free infant formulas. Maltodextrin (MDX) is a popular, alternative carbohydrate source in these formulas, yet the (long-term) health effects of consuming maltodextrin in early life are unclear. Previously, consuming galactose (partly replacing glucose) in a postweaning diet was shown to improve metabolic health in mice. Objective: To investigate the effects of partly replacing MDX with galactose in post-weaning diets on body composition and energy metabolism. Methods: Weaned, individually housed female C57BL/6JRcHsd mice received isocaloric diets (in a dough ball format) with different carbohydrate profiles for three weeks (postnatal day (PN)21–PN42). GLUGAL (lactose mimic, n = 13) contained 15.7 en% glucose, 15.7 en% galactose and 14.9 en% MDX, and GAL (n = 12) contained 15.7 en% galactose, no glucose and 30.6 en% MDX. MDX (n = 13) contained 38.4 en% MDX and 7.9 en% glucose. Energy metabolism was assessed via indirect calorimetry from PN40–PN42. At PN42, all mice were challenged with a 40 en% high-fat diet (HFD) until PN105. Body composition was measured weekly using Echo-MRI. At PN105, fasted (4 h) mice were sacrificed for serum and tissue analysis. Results: At PN42, mice in both galactose-fed groups (GLUGAL and GAL) had a significantly lower body weight, fat mass and relative fat mass compared with the MDX group ($p < 0.0001$). The respiratory exchange ratio was significantly lower in both galactose-fed groups compared with the MDX group ($p < 0.05$), suggesting lower carbohydrate oxidation and thus higher relative fat oxidation levels. In parallel, both galactose-fed groups showed lower energy expenditure ($p < 0.05$). Discussion: The GAL mice were similar to the GLUGAL (lactose mimic) mice in terms of body weight, composition and energy metabolism, while being significantly different from the MDX group at PN42. These findings suggest an improvement of body composition and energy metabolism when replacing MDX with galactose. This study is the first to compare the effects of replacing part of MDX with galactose in early life and reinforces the impact of the type of carbohydrates on metabolic outcomes.



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