J Pediatr (Rio J). 2015;91(3):306–312

Jornal de Pediatria
www.jped.com.br

ORIGINAL ARTICLE

Effects of soy beverage and soy-based formula on growth, weight, and fecal moisture: experimental study in rats☆,☆☆

Maisa de Lima Correia Silva[a,b], **Patrícia da Graça Leite Speridião**[a,b], **Renata Marciano**[a,b], **Olga Maria S. Amâncio**[c,d], **Tânia Beninga de Morais**[a,e], **Mauro Batista de Morais**[b,f,*]

[a] *Postgraduate Program in Nutrition, Escola Paulista de Medicina (EPM), Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil*
[b] *Division of Pediatric Gastroenterology, Department of Pediatrics, Escola Paulista de Medicina (EPM), Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil*
[c] *Postgraduate Teaching Committee in Pediatrics and Sciences Applied to Pediatrics, Escola Paulista de Medicina (EPM), Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil*
[d] *Division of Nutrology, Department of Pediatrics, Laboratory of Research in Pediatrics, Escola Paulista de Medicina (EPM), Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil*
[e] *Laboratory of Food Science and Food Microbiology, Escola Paulista de Medicina (EPM), Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil*
[f] *Department of Pediatrics, School of Medicine, Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil*

Received 28 April 2014; accepted 4 September 2014
Available online 22 January 2015

KEYWORDS
Soy milk;
Infant formula;
Soy proteins;
Milk proteins;
Experimental design

Abstract
Objective: To compare body growth, weight, and fecal moisture in recently weaned rats fed exclusively on infant soy formula and soy-based beverage.
Methods: Three similar groups were formed (n = 10/group) consisting of weanling Wistar rats, maintained in metabolic cages. One group was fed soy protein-based beverage, another with soy-based infant formula, and another with cow's milk infant formula (control group). Water and diet were offered *ad libitum*. Body weight and length were measured. Stool was collected for three consecutive days.

☆ Please cite this article as: Silva MdL, Speridião PdG, Marciano R, Amâncio OM, de Morais TB, de Morais MB. Effects of soy beverage and soy-based formula on growth, weight, and fecal moisture: experimental study in rats. J Pediatr (Rio J). 2015;91:306–12.
☆☆ Study conducted at Research Laboratory of the Department of Pediatrics, Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil.

* Corresponding author.
E-mails: mbmorais@osite.com.br, maisalcs@yahoo.com.br (M.B. de Morais).

http://dx.doi.org/10.1016/j.jped.2014.09.003

Results: Weight and length were lower (p = 0.001; p = 0.001) in the groups receiving soy protein-based beverage (73.16 ± 5.74 g; 23.94 ± 1.04 cm) and soy-based formula (71.11 ± 5.84 g; 24.74 ± 0.60 cm) in relation to the group receiving cow's milk formula (84.88 ± 9.75 g; 26.01 ± 0.91 cm). Fresh fecal weight was greater (p < 0.001) in the soy-based beverage (3.44 ± 0.48 g) than in the soy-based formula (0.79 ± 0.20 g) and cow's milk-based formula (0.42 ± 0.17 g). Fecal moisture was higher (p < 0.001) in the group receiving soy protein-based beverage (47.28 ± 9.02%) and soy-based formula (37.21 ± 13.20%) than in the group receiving cow's milk formula (22.71 ± 10.86%).
Conclusion: The growth of rats fed soy protein-based beverage and soy-based formula was lower than those fed cow's milk-based formula. The soy protein-based beverage resulted in significant increase in fecal weight and moisture.

PALAVRAS-CHAVE
Leite de soja;
Fórmulas infantis;
Proteínas de soja;
Proteínas do leite;
Desenho experimental

Efeitos de bebida e de fórmula de soja no crescimento, peso e umidade fecal: estudo experimental em ratos

Resumo
Objetivo: Comparar o crescimento corporal, o peso e a umidade das fezes de ratos recém-desmamados alimentados exclusivamente com fórmula infantil de soja e com bebida de extrato de soja.
Métodos: Constituíram-se três grupos similares (n = 10/grupo) de ratos machos Wistar recém-desmamados, mantidos em gaiolas metabólicas. Um grupo foi alimentado com bebida de extrato de soja, outro com fórmula infantil de soja e o outro com fórmula infantil de leite de vaca (grupo controle). Água e dieta foram oferecidas ad libitum. Foram mensurados o peso e o comprimento corporal. Fezes foram coletadas durante 3 dias consecutivos.
Resultados: Peso e comprimento foram menores (p = 0,001; p = 0,001) nos grupos com bebida de extrato de soja (73,16 ± 5,74 g; 23,94 ± 1,04 cm) e fórmula infantil de soja (71,11 ± 5,84 g; 24,74 ± 0,60 cm) em relação ao grupo de fórmula infantil de leite de vaca (84,88 ± 9,75 g; 26,01 ± 0,91 cm). O peso fresco fecal foi maior (p < 0,001) na bebida de extrato de soja (3,44 ± 0,48 g) do que com as fórmulas infantis de soja (0,79 ± 0,20 g) e de leite de vaca (0,42 ± 0,17 g). A umidade fecal foi maior (p < 0,001) na bebida de extrato de soja (47,28 ± 9,02%) e fórmula infantil de soja (37,21 ± 13,20%) do que na fórmula infantil de leite de vaca (22,71 ± 10,86%).
Conclusão: O crescimento de ratos alimentados com bebida de soja e fórmula infantil de soja foi menor do que os alimentados com fórmula com proteína do leite de vaca. A bebida à base de extrato de soja proporcionou aumento expressivo do peso e da umidade fecal.

Introduction

Soy formulas are currently indicated for the treatment of infants in the second semester of life with suspected IgE-mediated allergy to cow's milk.[1,2] However, some studies on pharmacoeconomics evaluating the impact of food allergy on the health systems of many countries[3–6] demonstrated that soy formulas are also used, in practice, in patients with non-IgE-mediated allergy to cow's milk. Although inadequate, from the nutritional viewpoint, to feed infants, a study performed in Brazil[7] showed that a significant number of health professionals considered that soy-based beverages could be used in the alternative diet of infants allergic to cow's milk.

Soy-based formulas have been used in infant nutrition either due to their relatively low cost or their acceptance by infants.[8] Despite the very limited indications, they are used by a large number of infants around the world,[9,10] representing one of the most often-used alternatives to substitute cow's milk-based infant formula, frequently introduced at a very early age or in the neonatal period. The composition of soy proteins is very complex, and differs from cow's milk proteins used in infant formula.[11]

The market also offers other soy-based beverages. These products should not be called formula, but rather soy-based beverages, as although some are fortified, they do not meet the legal standards for child nutrition related to protein quality or levels of minerals and their proportions.[12]

Initially, their consumption in the West was restricted mainly to people with lactose intolerance as a substitute for cow's milk, in addition to vegetarians and those with food restrictions.[13,14] Currently, this product is very well accepted and widely consumed, indicating that consumers have been receptive and have incorporated it into their eating habits.[15]