Soya Milk and Allergy:
Indications and Contraindications

Angela Tewari, *MBBS, BSc*
Rosan Meyer, *BSc Dietetics, Post Grad Diploma Dietetics, M Nutrition*
Department of Paediatric Allergy and Immunology,
St. Mary''s Hospital at Imperial College, London, United Kingdom
Helen Fisher, *RN (Child), BSc Hons*
George du Toit, *MB BCh, DCH, MMed, FCP(SA), Dip Allergy (SA), FRCPCH Evelina Children's Hospital, Guy's & St Thomas's NHS Foundation Trust, King's College, London, United Kingdom*

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ABSTRACT

Cow's milk protein allergy (CMPA) is a common food allergy in early childhood with a prevalence of 2-7.5%. CMPA typically develops in early infancy, presenting at the time of weaning and is characterised by symptoms involving the skin (angioedema, urticaria), gastro-intestinal tract (diarrhoea and colic), respiratory tract (wheezing, dyspnoea and cough) and failure to thrive.

Parents and health care workers are faced by a wide selection of formulas when choosing a breast milk alternative for an infant with CMPA. Soy-based formulas are well established in the UK and currently fed to approximately 1% of non-breast-fed infants aged 4-10 weeks, rising to approximately 2% of infants aged 10-14 weeks. Reasons for using a soy formula as an alternative to a cow's milk-based formula include: CMPA, lactose intolerance, following a vegan diet, religious or health beliefs that advocate the avoidance of cow's milk in the diet. Soy formula is also appropriate for infants diagnosed with galactosaemia and galactokinase deficiency.

Recent concerns have arisen in respect of the correct indications and possible side-effects of soy formulas. This article summarises appropriate indications for the use of soy milk in CMPA infants in the UK and aims to encourage regulations from the Department of Health in South Africa. It also serves to expand on the potential dangers and drawbacks of soy formula.

INTRODUCTION

Currently the UK Department of Health advises that: 'Soy infant formulas should only be used on the advice of health professionals. Those parents who have been advised by their doctor or health care professional to feed their baby with soy-based infant formula can continue to do so.' In 2003 the Committee on Toxicity in Food, Consumer Products and the Environment (COT)[1] produced a report reviewing the scientific evidence on soy infant formulas. This is summarised in an article[2] and information paper.[3] COT considered the science in this area to be complex and the presence of phyto-oestrogens in soy-based formulas to pose a potential risk to reproductive health in infants. This was also noted by the Scientific Advisory Committee on Nutrition (SACN)[4] who felt there was no substantive medical need or health benefit arising from the use of soy-based infant formulas. The current general consensus is that formulas based on cows' milk protein hydrolysates are more appropriate than soy infant formulas.[4] Such advice has both nutritional implications for certain infants, e.g. infants with cow's milk protein allergy (CMPA), and infants of vegan parents, and financial implications. Recommendations have been made to review the current advice on the use of soy-based infant formulas.

INDICATIONS FOR SOY MILK AS AN INFANT FORMULA

Soy milk and food allergy

For infants with CMPA, an alternative formula needs to be selected from either partially or extensively hydrolysed formulas or elemental/amino acid formulas. Feeding infants at high risk of developing atopic disease a documented hypoallergenic formula combined with avoidance of solid foods during the first 4-6 months reduces the cumulative incidence of CMPA and atopic dermatitis as compared with a standard cow's-milk-based formula[5] and is strongly recommended. This is especially true of an elemental formula.

Although the scientific evidence is weighted in favour of these milk products, many CMPA children find them unpalatable. Both hydrolysates and elemental formulas are significantly more expensive.

A recent Cochrane review[6] assessed a series of studies comparing prolonged early infant feeding with a soy and cow's milk formula with breast-feeding. One group found that at 12 and 18 months of age, the incidence of atopic eczema was significantly lower and similar in the breast-fed and whey hydrolysate groups, compared with soy formula groups. Another group showed that among infants at high risk of developing atopic disease, exclusive breast-feeding or whey hydrolysate formula from weaning to 9

Continued on p36 ➥

Soya Milk and Allergy:
Indications and Contraindications

➥ *Continued from p34*

months of age was associated with alower incidence of allergic disorders compared with groups fed soy formulas. Although there was no evidence of benefit of a soy formula in prevention of allergy, no study indicated an increase in allergy prevalence.

It is well recognised that a proportion of infants who have CMPA are also allergic to soy protein.[7] In young children with CMPA, soy-protein allergy has been recorded in between 17% and 47%. However it remains unclear as to whether this occurs as a co-allergy in otherwise food-allergic infants, or as a consequence of cross-sensitisation. The British Dietetic Association Paediatric Group[8] recommends that use of a soy-based infant formula as first-line treatment should be discouraged during the first 6 months of life in infants with atopy or cow's milk allergy/ intolerance as they are most likely to become sensitised to soy protein during this period. SACN[4] noted that soy-based infant formulas were the only vegan infant formula option available if babies were not exclusively breastfed, so there is a market for soy formulas in atopic vegan infants especially after the first 6 months of age.

Other work[9] analysing the relationship between intake of soy products and isoflavones and the prevalence of allergic rhinitis found a significant inverse relationship - a higher soy consumption led to a lower prevalence of allergic rhinitis. This suggests controversy in the application of soy products in the prevention of allergy.

CONTRAINDICATIONS TO THE USE OF SOY MILK

Cow's milk intolerance

Up to 60% of infants with cow's-milk-protein-induced enterocolitis will be sensitive to soy protein.[10] It is theorized that the intestinal mucosa damaged by cow's milk protein is also sensitised to the soy antigen. This process is non-IgE-mediated and most children can resume soy protein consumption safely after 5 years of age. Soy-based formulas are therefore not indicated in the management of documented cow's-milk-proteininduced enteropathy or enterocolitis. Extensively hydrolysed formulas are more appropriate alternatives in these infants, and for the few patients who remain symptomatic, an elemental formula is the optimal option.

Soya milk should be avoided in premature infants or infants with renal compromise due to a high aluminium and phosphate load.[10] A suitable neonatal formula should be used and in the case of cow's milk intolerance, a dietician should be consulted.

Soya contains phyto-oestrogens

Phyto-oestrogens belong to a large group of compounds known as flavonoids. There are three classes of flavonoids: coumestans, lignans and isoflavones.[1] The isoflavones found in abundance in soy possess the most potent oestrogenic activity. They are thought tointeract with oestrogen receptors and modulate endogenous oestrogen concentrations. In 1997[11] a group found blood levels of phyto-oestrogens to be 13 000-22 000 times higher in babies fed soy formula between birth and 4 months than babies who were not. This corresponded to 6-11 times more phytooestrogens on a body-weight basis than the amount that has hormonal effects in adults. The British Dietetic Association Paediatric Group[8] state that, as milk is the sole source of nutrition during the first 6 months of life, an infant fed soy milk would consume approximately 4 mg isoflavones/kg body weight/day. During this developmental stage, this could result in permanent hormonal changes. After 6 months the risk is reduced, as the dose of phyto-oestrogens per kg body weight is likely to be lower once the infant is taking solids. Also, the infant's potentially vulnerable organ systems are likely to have matured by this age, further reducing the risk of long-term damage.

Two studies contributed to the concerns of the longterm effects of using soy formula in infancy. The first[12] examined infant exposure to soy formula and reproductive health in young adulthood. Although some women who had been fed soy formula reported a slightly longer duration of menstrual bleeding (0.37 days) and greater discomfort during menstruation, generally findings were reassuring about the safety of infant soy formulas. The other study[11] examined the effects of soy infant formulas and isoflavone content on the testis and blood testosterone levels. Although soy-fed infants had lower mean testosterone levels, data showed no consistent relationship between soy formula intake and hormone levels. The long-term effects are now under investigation. New research[13] shows that although isoflavones bind to oestrogen receptors, the biological effects of isoflavones differ markedly from oestrogen. These health effects cannot be based solely on oestrogen actions or attributed to phytooestrogens.

SOY AND PEANUT ALLERGY

Immune modulation of peanut allergy with soy formula

Allergen-specific immunotherapy (IT) is an effective therapeutic modality to prevent further anaphylactic episodes in patients with insect sting hypersensitivity and is being investigated for peanut allergy. Seed storage proteins in soybeans share considerable amino acid homology with peanut allergens. A recent murine study[14] observed the effect of soybean specific IT as a potential treatment option for peanut allergy. Specific doses of crude soybean and peanut were used to desensitise peanut-allergic mice over 4 weeks and the peanut specific antibody levels and cytokine profiles were observed. Antibody levels of peanut specific IgG1 in the soy IT group were found to be less than those in the peanut IT group and significantly lower than the placebo desensitised group, indicating that both peanut and soy efficiently interrupted the significant increase in specific IgG1

Continued on p38 ➥

Soya Milk and Allergy:
Indications and Contraindications

➥ *Continued from p36*

concentration that occurred during an allergic response, significantly more with soybean desensitisation. Theoretically soy IT may provide a new mode of immunomodulation for peanut allergy patients but more extensive work is needed.

Induction of peanut allergy through use of soy formula

Interesting work has associated peanut allergy with intake of soy milk or soy formula.[15] Data from this study found that of 10 children who had peanut allergy, 9 had consumed soy products prior to attacks. However, the quantities of soy milk and formulas that were consumed before allergy is not known, nor is it known whether the children had their first attacks before use of soy products. Such data are difficult to interpret as those infants who are most at risk of developing peanut allergy may preferentially have received soy formula, i.e. reverse causality. However there is a low prevalence of clinical reactivity to soy in infants with peanut allergy as only 1% of the total number of children who had consumed soy milk had peanut allergy. Although these results suggest sensitisation, no causal link between soy and peanut allergy has been prospectively demonstrated. Another group[16] felt that the use of a soy formula during the first 2 years did not increase the risk of development of peanut specific IgE antibodies or of clinical peanut allergy.

ADDITIONAL THEORETICAL CONCERNS

There is ongoing debate about the effects of soy products on cancer, coronary heart disease, osteoporosis, cognitive function, menopausal symptoms, and renal and thyroid function. Data remains inconsistent.[13]

CONCLUSION

Soy-protein-based formulas offer an affordable and accessible vegan breast milk alternative and should be incorporated into UK and South African diets. Our review of clinical data indicates that soy milk formulas provide a safe and effective breast milk alternative for the majority of term infants after 6 months of age.

They should be used with caution in individuals with CMPA or a family history of atopy, and omitted from the diet until 5 years of age in children with non-IgE-associated syndromes such as enterocolitis, proctocolitis, malabsorption syndrome or oesophagitis.

Although they are not suitable for premature infants, soy milk formulas are lactose-free and appropriate for use in infants with galactosaemia and hereditary lactase deficiency.

Declaration of conflict of interest
The authors have no conflict of interest.

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