Taste acceptance in PKU: do bitter tasting L-amino acid supplements influence this?

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The primary treatment for children with Phenylketonuria (PKU) is a low phenylalanine (phe) diet supplemented with phe-free L-amino acids. Children diagnosed by newborn screening are exposed to the bitter flavours of L-amino acid supplements usually within the first 2 weeks of life. Adherence with these supplements throughout infancy and childhood is essential for maintenance of good metabolic control. It is unknown if this early exposure to bitter flavours results in taste imprinting that subsequently leads to a preference and improved acceptance of other bitter foods during the weaning years and childhood. Certainly, studies in children exposed to bitter-tasting protein hydrolysate formula from an early age, show a stronger preference for bitter, sour and savoury tasting foods than do children raised on standard cow’s milk formula or breast milk [Menella et al, 2002, 2006, 2009, 2011; Beauchamp et al, 2009, 2011]. There is also evidence that these early experiences can influence food preferences in early childhood [Menella et al, 2002, 2006; Beauchamp et al, 2009, 2011].

We conducted a prospective, controlled, observational study to compare the taste preferences of 35 children aged 4-13 years with PKU with age and gender matched healthy control children.

Children were asked to taste 10 blinded puree foods (cauliflower, carrot, broccoli, sweet potato, apple, strawberry, banana, custard, lemon and coffee) in random order and to rate them using a 7-point pictorial hedonic scale (super yummy to super yucky) [Chen et al, 1996], and then to rank them in preferential order (1 = most liked, 10 = least liked). Parents of the children completed a questionnaire designed to measure the variety seeking tendencies of the children with respect to food [Pliner et al, 1992] and a food frequency questionnaire to measure how many times per week 60 commonly eaten foods were consumed.

The results demonstrated that both groups of children had a strong preference for sweet foods with the most popular foods for both groups being custard, banana, strawberry and apple (although not in the same order). However, when all vegetables were grouped together, children with PKU did rate
them higher than control children and controls rated fruits higher than children with PKU. Overall, PKU children did not appear to prefer bitter or sour tasting foods any more than control children. However, parents reported that children with PKU were significantly more food neophobic than control children. Specifically, they were more wary of new foods, more reluctant to try anything new and were very particular about the foods they would eat.

Whilst children with PKU are able to eat most fruits and vegetables without restriction, they did not consume any more of these foods than control children. Both groups ate an average of 3 serves of fruit and 3 serves of vegetables per day. However, children with PKU consumed twice as many high-energy foods such as sweets (6 serves/week vs 3 serves/week) and crisps (4/week vs 2/week) and three times as much sweetened drinks (9/week vs 3/week) compared with control children.

So despite the early exposure to bitter-tasting L-amino acids in infancy, children with PKU did not appear to prefer bitter or sour foods any more than control children. Although there was some evidence that they preferred savoury foods (in the form of vegetables) more so than controls, they also consumed significantly more sweets and sweetened drinks than control children – demonstrating a distinct preference for sweet foods.

Children with PKU generally categorised most foods higher than did control children, suggesting that they were less fussy about food despite their higher levels of neophobia. It is possible that the differences in food choice between PKU and control children are due more to food neophobia and a reluctance to try new foods rather than to particular preferences associated with taste. The restrictive
nature of the PKU diet and parental anxiety at mealtimes may result in disordered eating patterns that contribute significantly to neophobia [MacDonald et al, 1994, 1997].

There appears to be little evidence for taste imprinting in children with PKU beyond the age of 4 years. It may be that with the decrease in energy intake from L-amino acids with age and the subsequent increase in energy intake from other foods (particularly sweet foods) after weaning, taste preferences may normalise. Certainly, L-amino acid supplements used from the age of 3 years are commonly flavoured and sweetened to mask the bitter taste and this may also neutralise the effect of early taste imprinting.

References:


Mennella JA, Beauchamp GK. Flavour experiences during formula feeding are related to preferences during childhood. Early Hum Dev. 2002;68:71-82.
