

Prenatal flavour programming: a novel route to improve children's liking of bitter vegetables

The issue: Fruits and vegetables are the cornerstone of a healthy diet but getting children to 'eat their greens' is challenging due to their innate preference for sweet and salty foods. Repeated exposure to foods can modify taste preferences and there is evidence that flavour learning begins *in utero*. However proof of concept in humans is sparse and confined to a single strong flavour exposure such as garlic. Accordingly, we tested whether an intervention which increases the diversity of fruits and vegetables consumed by mothers in the 3rd trimester of pregnancy would positively influence the infants' acceptance of novel fruits and vegetables, particularly those with a bitter profile, at weaning.

The Womb to WEAN study: Seventy-nine pregnant women were recruited and ate soups/sauces with or without bitter vegetables for 24-days from ~30 weeks gestation in addition to their usual diet. Habitual diet and monthly milk-feeding status were assessed by questionnaires/24h diet recalls. Infant taste-tests were videoed by the mothers in their own homes at the outset of weaning. Potato puree was offered first until babies were competent at eating, then taste-tests were conducted using potato, apple, broccoli, and spinach purees. Four independent assessors observed the first ten spoons per test using a previously validated behaviour and facial expression coding system developed for feeding infants. This involved recording the baby's positive and negative behaviours before the test puree was tasted and the negative expressions once the food was tasted. Food acceptance behaviour and the amount eaten were also recorded, and all of this provided an independent assessment of the infants overall liking of the different test purees which was compared with the mother's assessment of her infant's liking.

Findings and conclusion: Mothers proved to be highly effective at conducting the taste tests in the home environment and there was strong agreement between the researcher's independent assessments of infant liking compared to that of the mothers¹. Few differences in the babies' response to the potato, apple or broccoli purees were observed but the response to the bitter spinach puree test was striking and highly significant. The babies liking of spinach was correlated with the level of bitter flavour exposure achieved via their mothers' diet in the womb. This proved to be case for mothers whose normal intake of bitter vegetables was already high, and for mothers who were receiving more bitter vegetables than normal while eating the intervention foods². Furthermore, these effects were independent of the babies *TAS2R38* (bitter tasting) genotype. *Thus, prenatal exposure to bitter flavours during late pregnancy via the maternal diet can positively influence infants' acceptance of bitter tasting vegetables at weaning, laying the foundations for healthy eating habits.*

Policy implications: Pregnancy is a teachable moment when mothers are motivated to make lifestyle changes to benefit their baby's health. By increasing and diversifying their own intake of bitter vegetables in late pregnancy mothers can programme their baby's taste preferences from the very earliest opportunity to promote liking of green vegetables. Parents are more likely to reoffer foods which are initially perceived as being liked by their infant, thus reinforcing acceptance and encouraging healthy eating habits which will track throughout the life-course.

Publications:

1. [Validation of taste-tests conducted by mother-infant dyads in the home environment to assess infant taste preferences | Proceedings of the Nutrition Society | Cambridge Core](#)
2. [An intervention to increase consumption of bitter vegetables in late pregnancy reduces infants' disliking of bitter vegetables at weaning | Proceedings of the Nutrition Society | Cambridge Core](#)

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