IMPACT OF MATERNAL DIET ON BREAST MILK FLAVOR RELATING TO INFANT FOOD PREFERENCE

By: Kylie Peterson

Food the mother consumes affects the flavor of her breast milk, which in turn impacts food preference and acceptance in the weaned child. The primary objective of this review is to provide a collection of studies analyzing the effects of breast milk flavor change on a child’s food preference and acceptance. Journal articles were collected using EBSCO database search engine. Results from the studies suggest that maternal diet does affect the flavor of milk. Infants are more accepting of flavors that they are familiar with due to previous exposure from breastfeeding. The results of these studies demonstrate that when a child is exposed to a variety of unfamiliar flavors through breast milk they will be more accepting of those foods in childhood. This could have a profound impact on increasing fruit and vegetable consumption in individuals which in turn has the potential to lower risks for obesity, cancer, diabetes, and other chronic diseases.
INTRODUCTION

Breast milk is composed of the ideal amount of carbohydrate, protein, and fat that is easily digestible and is unique to the needs of the infant. Additionally, breast milk contains antibodies from the mother that helps boost the infant’s immune system. While breast milk provides infants with numerous benefits, one benefit that was recently discovered is that breast milk increases an infant’s preference and acceptance of a wider variety of food.

An infant’s first exposure to food comes from the amniotic fluid in which the infant is submersed in while in utero; second, from the mother’s breast milk; and third, from solid foods. There has been research showing that the sensory quality of a mother’s breast milk changes with the mother’s food consumption. This sensory change was first identified in bovine and rodent specimen and is currently being researched in human beings.

The impact of the maternal diet and how it affects the infant’s later food preferences could prove to play a large role in improving the child’s future diet. If the child is exposed to a vast array of flavors, specifically foods high in nutrient density, like whole grains, fruits, and vegetables, it is hypothesized that they will consume more of these foods later in life. Also, the impact of a maternal diet that contains flavors associated with alcohol or smoking may increase the risk of those lifestyle habits in infants as well.

The primary objective of this review is to provide a collection of studies analyzing the effects of breast milk flavor change on a child’s food preference and acceptance. This collection of peer-reviewed journals emphasizes the impact of maternal diet on the acceptance of breast fed infants. If a mother’s diet is varied and includes a high amount of whole grains, fruits, vegetables, and lean meats while avoiding alcohol and smoking, this will in turn increase the likelihood of the same dietary patterns for the weaned infant. Habits such as these will continue on into childhood and later adulthood, thus improving overall health and quality of life.

METHODS

Journal articles were found using EBSCO databases. Databases included Alt-health Watch, Biomedical Reference Collection, Health Source, and Medline. The advanced search tool engine was used. Search terms included “breast milk”, “flavor”, “infant food preference”, and “Monell Chemical Sensory Center”. In reference to the latter search term, the Monell Chemical Sensory Center is a scientific institute for research on taste, smell and chemosensory. A vast amount of related research on the flavor of breast milk and the impact on infant nutrition was studied there and provided the majority of the journal articles used. The searches resulted in one to two pages of related journals. Journals were chosen on their relevance to the subject. Because the subject is a relatively new field of study, there was a small amount of relevant articles all of which were used.

A review of the early research done concerning the impact of diet on sensory qualities of breast milk will be discussed. Following, the collection of studies performed at the Monell Chemical Sensory Center will be analyzed, and the mechanisms for how the flavor of breast milk impacts the human infant’s preference and acceptance of food will be investigated. Other pertinent studies will be included as well.
RESULTS/DISCUSSION

Similarities between what the mother consumed and what the infant later preferred was first seen in animals. In the early 18\textsuperscript{th} century, it was common knowledge that a calf preferred the same feed that the mother consumed during lactation. Rat pups with garlic-water-consuming mothers consumed more garlic water than the pups with plain water-consuming mothers when weaned. This indicates that the rats had accepted the garlic flavor because of the familiarity when exposed to it during lactation as well as in weaned foods. Another study confirmed the change in milk flavor and its effect on the young. Two sets of rats were fed milk from a nurse rat that ate a particular feed. One group, after consuming the milk, was injected with a small amount of poison to create an aversion to that flavor of the milk. Upon weaning, the poisoned rats rejected the original feed and the control group of rats consumed a greater amount of that feed. The rats were able to recognize the feed flavor in the milk and later identify that flavor in the feed itself. From these studies, the hypothesis is supported that suggests the diet of the nursing mother affects the flavor of milk, and in effect, future food preference and acceptance in her offspring.

Like animals, human milk flavor also fluctuates. The sensory qualities of milk in human beings were first tested using the odor of garlic. Garlic was used because it has strong and easily identifiable characteristics. Mothers’ milk was analyzed by sensory specialists for the odor of garlic after consuming a capsule containing 1.5 grams of garlic. The garlic odor in milk was stated to peak after two hours. Changes in infant’s behavior while breastfeeding, including staying attached to the nipple longer and increasing number of sucks, identified that there was a change in the flavor in milk causing these behavior differences. Another study showed that when infants’ noses were exposed to a milk soaked pad they fed longer and more consistently, advocating that the more sensory exposure to a particular taste or odor increases infants acceptance.

The research done at the Monell Chemical Sensory Center furthered investigated and refined the hypothesis that maternal diet does cause a change of flavor in breast milk, which affects the infant’s food preference and acceptance. For all studies, the mother’s diet was changed during pregnancy and/or during lactation. A trial period followed where the infants were fed either formula or cereal containing the flavor the mother consumed. Preference and acceptance were measured by amount eaten, rate of eating, frequency of negative facial features, and mother’s judgment of infant’s pleasure using a hedonic scale. Necessary measures were taken to eliminate bias.

The first study performed at the Center hypothesized that the flavor in amniotic fluid or breast milk modifies the infant’s acceptance and enjoyment of similarly flavored food at weaning. The flavor studied was carrot juice. Three experimental groups included pregnant woman who consumed one of the following: (a) plain water for a specified time during their last trimester and plain water during the first two weeks of lactation, (b) carrot juice during pregnancy and plain water during lactation, or (c) plain water during pregnancy and carrot juice during lactation. Infants were fed a familiar brand of cereal mixed with carrot juice. Both infants who were born or breastfed from mothers consuming the carrot juice had a greater intake and fewer negative facial features than the infants whose mothers only consumed plain water. This proposes that the exposure to flavors during pregnancy and lactation increases an infant’s acceptance of the food at weaning. The results support the idea of the potential a mother’s diet has on the eating patterns of her offspring.
A similar study compared breastfed infants to formula fed infants. Infants that were recently introduced to solid foods were fed peaches and green beans. Breastfed infants had a higher acceptance and preference rate for both the peaches and the green beans as evidenced by their greater intake and fewer facial expressions than the formula-fed infants. Formula-fed infants are exposed to a constant flavor whereas breastfed infants are exposed to a wide variety of flavors depending on the mother’s diet. The results of this study strengthen the hypothesis that if infants are exposed to a wide range of unfamiliar flavors they are more likely to accept a variety of solid foods when weaned. This potentially will help to reduce the incidence of picky eating and potentially increase consumption of fruits, vegetables, and whole grains improving overall health.

A more controlled study looking at specific flavors took three groups of infants consuming breast milk, bovine milk-based formula, or hydrosylated formula. Hydrosylated formula is known for its predigested protein content, giving it a sour, bitter, and unpleasant taste. These infants were then fed cereal that had compounds added to it to create a sweet, salty, bitter, plain, sour, or savory flavor. Infants consuming hydrosylated formula had a greater preference and acceptance for the sour, bitter, and savory cereal than the other two groups proving that being exposed to a specific flavor, albeit unpleasant, increased acceptance. A similar study measured the acceptance of the bitter/sour flavors of cereals with infants who consumed a normal formula versus hydrosylated formula administered in different patterns over seven months. Results showed that there was a profound change in the sensory perception of infants at four months. Infants who were exposed to the hydrosylated formula during the first four months of life had a greater acceptance to the sour/bitter taste whereas infants exposed to hydrosylated formula after four months of life strongly rejected the formula. Results of this study later showed that children who were fed the hydrosylated formula had a higher preference for the sour/bitter taste common among vegetables. Both of these studies emphasize the concept that exposure to a flavor early in life increases acceptance to it later in life. Also, an increase exposure to bitter flavors in breast milk or formula has the potential to increase vegetable intake later in life potentially decreasing risks for chronic diseases.

The effects of alcohol on breast milk were also studied. Through an olfactory sensory panel, the presence of alcohol was identified for approximately two hours after consumption and the child’s eating patterns changed as well, suggesting there was a change in flavor. Smoking is also known to change the flavor of breast milk. This introduces the idea that if infants are pre-exposed to these, flavors they will be more likely participate in these behaviors later on in life.

In conclusion, all of the research suggests that maternal diet does affect the flavor of amniotic fluid as well as breast milk. Exposure to these flavors has a profound impact on the child and their acceptance and preference of solid foods. Mothers should be strongly encouraged to consume a wide variety of healthy, nutritious foods while pregnant. Breastfeeding should also be encouraged due to the fact that formula-fed infants are exposed to a constant flavor instead of the continuous changing flavor that breast milk provides. This in turn will expose the infant to many unfamiliar flavors and will enhance their preference and acceptance to nutritious foods later on in life and increase the willingness of a child to try new foods. Children who consume a higher amount of whole grains, fruits, and vegetables will decrease risk for diabetes, cancer, obesity, and numerous chronic diseases which will increase their overall well-being and quality of life.
REFERENCES


