FOOD FLAVOUR AS INFLUENCE FACTOR FOR BALANCED DIET FOR CHILDREN

JOVANA POPOVIĆ1, SLAVEN GRBIĆ2, MILOŠ MILOŠEVIĆ3, RADOVAN Ilić4, NATAŠA KILIBARDA5
1Dr med. spec. pedijatrije, Dom zdravlja Rakovica, Beograd; 2Dr sci. vet. med., Veterinarski zavod „Slaven“;
3Ass. dr, Univerzitet Singidunum, Beograd; 4Dr, Univerzitet Singidunum, Beograd
5Dr sci. vet. med., Univerzitet Singidunum, Beograd

Abstract: Anthropology of some health disorders and diseases, such as obesity, cardiovascular diseases, diabetes and malignant diseases, can be linked to unbalanced diet started from the earliest days of life. For that reasons, it is very important to adopt proper diet patterns from the earliest days of life. There are few factors influencing choice of food. Food flavour is one among them. Understanding mechanisms, which later make influence how to accept or reject some food in children, in intrauterine development phase, and after birth period, is of vital significance when we create healthy habits for children and adult diets.

Key words: Prevention, human health, children, food flavour, food choice.

INTRODUCTION
Increased food intake, considers as main cause for obesity. Excessive food intake in the early childhood, can result in obesity later in adulthood. It is confirmed that number of adipocytes in the body of adult human being, depends only on quantity of fat tissue previously deposited at the early stage of life (Beleslin, 2008). Anyway, in obesity children, number of adipocytes increase up to the three times comparing to the children with normal body weight, during puberty production of adipocytes additionally increases, while obesity of adults is mainly consequence of hypertrophy of already existing adipocytes.

It is possible to link cardiovascular diseases, diabetes, malignant diseases, such as colon carcinoma, breast carcinoma, kidneys and digestive tract, with unbalanced diet and obesity from the earliest life age.

For that reasons it is necessary to pay attention to diet for children and youth, and how they choose food. Aim of this paper is to analyse mechanism of developing of preferences for specific food, review consequences of choice they made, and to provide guidelines for prevention to improve public health status.

FACTORS THAT INFLUENCE CHOICE OF FOOD
Research actually shows tendency to specific type of food, more accurate flavour of food what can be congenital or acquired. It is concluded that tendency for sweet flavour, just like repulse toward bitter and sour flavour, exists from the child birth. However, particular tendencies or repulse against some type of food flavour, are consequences of experience from the earliest age in the life, and later develops additionaly as consequences of different attitudes, convictions and expectations (Павлићевић and all., 2014). We can not make influence on acquired tendency, in a way to create healthy habitats in children diet. However, acquired tendency to some food is something that parents can make influence in a way to create healthy habits in childrens, and in some point of view it is parent duty.

Key impulses for food consumption is hunger, but type of food we choose, is not defined exclusively by physiological or nutritive requirements. Some of the factors for food selection in our diet are:

- biological factors (hunger, appetite, flavour),
- economical factors (price, availability),
- physical factors (art of cooking, time for food preparation),
- social factors (culture, tradition, family, age, society),
• physiological factors (mood, stress),
• psychological influence.

Many factors influencing choice of food for consumption, shows process complexity, how to choose, and tendency to specific food (Anon, 2005).

**FOOD FLAVOUR**

Food flavour, as one of the most important factors, when we talk about how to make a choice for specific food. Term food flavour, means all the senzoric stimuli as the result of food consumption, like flavour, smell, appearance and consistency of a food (Павлићевић and all., 2014). Most prominent senzoric characteristic of the food is *flavour*. Term - english word flavour means and include tottality of food senzoric characteristics, defined from consumers as smell, flavour and texture of food. By definition, flavour is perception when it stimulates three anatomically remoted chemistry senses, gustatory sense, sense of smell and chemical-senzoric irritation and represents complex combination of olfactory, gustatory and trigeminal senses, which appears after food consumption (Beauchamp and Mennella, 2009).

Gustatory sense: gustatory sense makes taste receptors located on the tongue (upper surface of the tongue and the epiglottis. We have taste receptors on taste buds (gustatory calyculi), 10000 of them in oral cavity. gustatory calyculi is made of 50 – 100 sense cells. The sensation of taste includes five established basic tastes: sweetness, sourness, saltiness, bitterness, and umami. However, humans can distinguish infinitely much tastes, where additionaly helps olfactory sense (Guyton, 1980). de Araujo and all., 2003).

Olfactory sense: substances with smell characteristics, release molecules reacting with olfactory receptors locates in upper part of nasal cavity (Ецмунд and all., 2007). Olfactory region (olfactory mucose) makes about 5-10 millions olfactory cells (Guyton, 1980). Olfactory system is organized in such manner, that it is capable to recognize wide spectar of smells, difference among them, but still, in human beings, up to 2 third of receptors out of function, comparing to other mammals (f. ex. dogs, rodents) (Shepherd, 2007).

Chemical-senzoric irritation: Irritation that appears after chemical stimuli of receptors and free nerv endings of trigemnal nerve and nervus Vagus, in oral cavity, and nose, may lead to sense of pain, warm, coldness, refresheness, itch, pricking and tackling. By all that mean, we talk about irritate sensations, and it can be unexceptably when we talk about senzoric characteristics of the food (Mela and Mattes, 1988).

Biological factors: When it comes to biological factors, closely related to food senzoric characteristics, and make influence to specific type of taste, it is mentioned congenital mechanism how humans resolve the hunger, in a way to taste more different tastes. (Rolls, 2000). This mechanism for meeting satiety, most probably had it own adaptive role in human evolution, ensuring that consumption of food with different taste (flavour) ensure enough quantities of essential nutrieniens (Павлићевић and all., 2014). This congenital predestination, in some way has impact to tendency for specific food esspecialy when it comes to children, however, it is known that biggest influence for food acceptance and tendency for some food aquired/learned, as a result of experience, and in that way can be chenge (Menella and all., 2004).

Psychological influence: Diet and behaviour linked to collection, preparation and food consumption are deeply linked with psyche and individual development, also human society evolution. Reduction this relation to physical, chemical or physiological characteristics and influences would be mistake. This can be easily spotted from the nature itself of interaction of psychological and physiological apparatus while feeding. Informations from chemical senses next to the described influence na flavour sensation is linked with sexual and predator behaviour, not just with humans but other species to (Stevens, 2001), and it is more or less linked with emotions from informations gained by eye or ear (Koster, 2003). It is possible to notice evolutionary role of the senses, but also learnig mechanism, where positive and negative experience with food developes acceptably patterns in consumption.
TENDENCY AND REPULSE TO FOOD FLAVOURS

To what degree, one organism will develop tendency to some flavour, depends on congenital factors, and then to environmental factors after birth (diet, experience) (Павлићевића and all, 2014).

Congenital tendency: Tendency to sweetnes is congenital, but it is changing during growing up, and can be modified with experience. Following evolution of human species, humans are born with natural tendency for sweetnes, and from evolutionary point of view represents advantage, considering that taste for sweetnes, actually reflects food rich in sugars (high energy value), what is necessary for life functions and survival in early stage of life (Blissett and Fogel, 2013.). Altough children during early childhood express higher tendency to sweetnes comparing to adults, that tendency is decreasing at puberty period, as a result of gustatory papilla decreasing on the tong, during the time (Blissett and Fogel, 2013).

Mother milk itself, the best source of nutrients in first few months of the life of the child, is moderately sweet. Breastfeeding, beside numerous other biological functions develops emotional bond between mother and baby, makes decisive influence to emotional development in first ages of life. Since newborn child informations about its own environment, gather in the first line through mouth, Freud (Sigmund Freud), postulates oral phase psycho-sexual development, and same opinion are numerous other psychoanalysts such as Melanie Klein and Herbert Sullivan, who are noticing influence of breastfeeding and child relation to breast for personality development as a possible rooth of psychopathological processes (further readings Freud, 1991; Plon, & Rudinesko, 2002). It is possible to notice role of taste for swetenes in combination with tactile sense as important mechanismus of emotional development. Sense for sweet in this process has role to reinforcing, respectively indulging not just biological needs but emotional needs.

Because of its high calorie values not followed with appropriate nutritive value, we can consider sweet food as one of the basic cuse for excessive intake of energy leading to obesity (Stanišić, 2019). From this reason one should take into account about control in providing children sweet food, and total percentage in total consumed food. It is recommended not to give to children food containing simple sugars. Since it is almost impossible carry into effect this recommendation in our social environment, it is important that parents controls children for this food in first age of life. It can help in later stage of life regarding sweet food intake, when children start to choose some food by itself, this measure will prevent occurrence of circular caries, offten happens to children consuming simple sugars. Carring into effect these recommendations will be subject of analysis soon.

As opposed to congenital tendency to sweet, humans are born with congenital repulse to beeter taste. Reason for congenital repulse against bitter taste, is linked to human evolution. Bitter taste, most often shows on presence of ingredients possibly toxic for humans: plants developed its own system, how to protect itself, by presence of bitter materies in plant body, while herbivores developed different type of senzoric systems to avoide potential toxic effect (Beauchamp and Mennella, 2009).

Vegetables containing low quantities of sugars, is not attractive without sweet flavour, and taste itself does not indicating high levels of energy. Beside that, vegetables composition, bitter as it is because of alcaloides containing most offently indicates presence of potential chemical hazards. That’s why it is the fact that vegetables such as carrot, corn, bean and potato, most often well accepted and widely consumpt in adults and children (Blissett and Fogel, 2013). Because of all mentioned, pediatricians are recommending, for children diet, first to introduce grains, then vegetables and at the end fruits, so we can avoide that child after consumption more tastefull food start to reject food less tastefull, but neccesary in diet.

When it comes to taste of saltines, it is well knowed that tendency to this taste, develops in the first few months of life. Infants up to 4 months of life prefere moderate concentartions of salt water, and when it comes in second year their preference to salt food is even bigger than in adults. Scientific studies in this area, tendency to saltiness, and later alterations based on new experiences, makes a lot of possibilities for
future work, also having in mind the fact, that higher salt intake in regular diet, one links to high blood pressure (Beauchamp and Mennella, 2009). Pediatricians do not recommend adding salt in infant formula, children as well, respectively advising to avoid salt. Even the fact that adding salt improve taste of the food, because of possible damage of kidneys and negative influence to developing organs and function.

Prenatal influences: Tendency to food flavours, that we detect with olfactory sense, in general refers to learning process and aquires very early in life, during intrauterine phase. Fetus develops inside of amnionic sack, very dinamic system. Senzoric characteristics inside of amnionic sack are changing, depending on mother diet, apropos food flavours are transmitting to amnionic fluid (Schaal and cap., 2000). That experience (learning) of flavours during intrauterine life, are linked to children tendency to specific flavour, what is expressing, very fast after birth and in period of stopping breastfeeding (Menella and assoc., 2001). However, it is paradox nowadays that almost every infant formula on the market have added glucose. This is how just for marketing and reasons for profit offers to children product with better flavour, but with all side effects previously mentioned.

Afterbirth influences: Experiences regarding new flavours, continues after birth, during breastfeeding, or feeding with adapted infant formulas. Mother milk, with ingredients representing flavours from mother diet, same as at intrauterine stage, influence accepting, tendency to specific flavours. (Menella and all., 2001). Coming from the fact that mother during breastfeeding , does not change significantly diet comparing period of pregnancy, it can be said that mother milk actually represents „bridge“ between food flavours experience in intrauterine stage and later from solid food (Beauchamp and Mennella, 2009). In connection with this, previously mentioned, breastfeeding, allows children, to have experience of many different flavours from food, and that is not the case when we feed children with uniform milk (infant) formula, uniformed in quality and flavour (Павлићевић and all, 2014). Big senzoric experience in children, who were breastfeeding, explains the fact, that those children, less finicky and much more „open“ and ready to taste the new flavours, making this as first step and condition for developing healthy habbits when feeding (Sullivan and Birch, 1994).

Even we consider mother milk as first choice for feeding infants, in situation when mother luck of milk, we can add adapted milk (infant) formula to prevent malnutrition, apropos providing proper growing and development. It is the same situation when mother is not able for breastfeeding. However, often in this situations happens that infant reject to consume infant formula or vomit after meal. One of the most often reasons for this is that infant don’t accept the flavour of that adapted infant formula. In this situation, it is recommended to use infant formula from other manufacturer, because there is difference in flavour. Change as it is, most often increase appetite and speed up growing, and reasons for this lays in flavour more acceptable from infant. It would be mistake to conclude that flavour is the only factor for this, but it is important to recognize how important it is.

When introducing food without milk, in some cases children refuse to consume some food. In this situation it is wrong to insist on this food, no matter how important it is for healthy diet, but it is wise to sustaine from that food for a while. Food flavour not accepted from child is reason for this situation. After few days, when child make new experience with some new food flavour it is very probably that next attempt for introducing food in diet will be succesful.

Therefore, exposing children to food flavours begininning from intrauterine stage, then mother milk, and after that solid food makes influence how to form long lasting tendency to specific flavours, and make possible for children to develop patterns for accepting new food flavours when it comes to healthy diet.

CONSLUSION

Feeding infants and children has a significant role in overall development, both physical and personality
development. Habbits acquired in this period may have numerous consequences on health status, and later during whole life. Breastfeeding and proper introducing nonmilk food to infants represents fundament of future healthy habbits and food preference. Because of that, it is important to educate parents and support them when they are trying to introduce recommendations of pediatricians, despite of often local community ignorance and social pressures.

Food tastefulness represents fundamental base for accepting or rejecting food and one should be aware of this when it comes to create healthy habbits for children. Using sweet flavour as stimulus for different behaviours correction, might be useful as education (learning) tool, but it is wise to use it moderately or completely to avoid it, all because of possible negative consequences to health and growing up. It is the same situation, when we give candies as gift, as a way to create likes or sympathy and enforcing affective bonds with children or as tool to calm them down. It is wise, always keep it on mind long lasting consequences, not in proportion with short lasting benefit we can gain in this particular way.

REFERENCE
Anon (2005). The European Food Information Council (EUFIC). The Determinants of Food Choice. EUFIC Review 04/2005.
de Araujo, I.E., Kringelbach, M.L., Rolls, E.T., Hobden, P. (2003). Represetation of umami taste in the human brain, Journal of Neurophysiology, 90(1), 313-319.
Baltić, Ž.M., Andelković, R., Stevanović J., Karabasil, N., Kilibarda, N., Dimitrijević, M. (2009). Značaj čula mirisa u senzornoj analizi hrane, Tehnologija mesa, 48, 1-2, 131-137,
Beauchamp, K.G. and Mennella, J.A. (2009). Early Flavor Learning and Its Impact on Later Feeding Behavior. Journal of Pediatric Gastroenterology and Nutrition, 48:S25–S30,
Belesin, B. (2008). Specijalna patološka fiziologija. Beograd: Data status.
Blissett, J. and Fogel, A. (2013). Intrinsic and extrinsic influences on children’s acceptance of new foods Physiology & Behavior 121, 89–95
Drewnowski, A., Mennella, J.A., Johnson, S.L and Bellisle, F. (2012). Sweetness and Food Preference, The Journal of Nutrition, Supplement: Low-Calorie Sweeteners, Appetite and Weight Control—What the Science Tells Us, S1-S7
Freud, Sigmund. (1991a). On Sexuality: Three Essays on the Theory of Sexuality and Other Works. London: Penguin Books.
Guyton, A. (1980) .Temelji fiziologije čoveka. Jugoslovenska medicinska naklada, Zagreb,
Kalich, K.A., Bauer, D., McPartlin, D. “Early Sprouts” (2009). Establishing Healthy Food Choices for Young Children, Young Children, Vol. 68
Koster, E. P. (2003). The psychology of food choice: some often encountered fallacies. Food Quality and Preference, 14:359–373.
Mela, D.J., Mattes, R.D. (1988). The chemical senses and nutrition: Part 1. Nutrition Today 23 (Mart/April):4-9
Mennella, J.A., Griffin, C.E., Beauchamp, G.K.. Flavor programming during infancy, Pediatrics 113(4):840-845.
Mennella, J.A., Jagnow, C.P., Beauchamp, G.K. (2004). Prenatal and postnatal flavor learning by human infants. Pediatrics, 107(6):E88, (2001).

Received: May 24, 2019
Accepted: June 20, 2019