DANONE
International Prize for Alimentation

Award Lecture

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Dr Sophie NICKLAUS

(INRA-CSGA, France)

Nurturing health through the pleasure of eating

the right choices from the start

DANONE International Prize for Alimentation

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Children's healthy eating is about much more than just food itself. A whole host of other powerful influences is at work when it comes to driving children's food preferences. Determining the nature of these driving forces has been the focus of research for Dr Sophie Nicklaus, the 2018 winner of the new Danone International Prize for Alimentation (DIPA).

Dr Nicklaus has dedicated her entire career so far to studying children's eating behaviour, with the aim of understanding how feeding experiences in the first years of life can lead to the development of healthy eating in later life – and how suboptimal eating habits in school-aged children can be improved in ways other than simply providing nutritional information.

Specifically, her work has focused on expanding our knowledge of how young children learn to like new foods and how this knowledge can be used to encourage them to make healthy food choices for the best start in life.

Dr Nicklaus now aims to apply her research findings to everyday practice. This means working with healthcare professionals (HCPs) to develop the resources for helping parents set their children on the right path for healthy eating. It also means collaborating with schools and other meal-providers to find ways to empower children to make healthy food choices for themselves.

Dr Sophie NICKLAUS, winner of 2018 DIPA.
Research Director at INRA, Centre for Taste and Feeding Behaviour in Dijon, France.

A fresh look at food and eating habits

The driving forces that influence children's food choices include social, psychological and cultural factors, collectively known as Alimentation. Through her research, Dr Nicklaus has come to see Alimentation as fulfilling several functions:

- Meeting nutritional needs
- Providing pleasure
- Building social bonds with family and friends
- Defining individuals' identity by creating a sense of belonging, for example, to a social, religious or cultural group.

These functions of Alimentation are integrated into Dr Nicklaus's conclusions and advice she draws from her research.

Get it right from the start: early food preferences track into later life

It is already known that the nutritional environment during a baby's development in the uterus affects health status later in life (Barker et al 1989), but the strength of early influences on eating behavior has been revealed by Dr Nicklaus and her colleagues. They found a high consistency of individual food preferences being carried through childhood, teenage and early adulthood (Nicklaus et al, 2004, 2005).

That's why the way parents feed their infants from the start is so important in determining how healthily their children eat as they grow up, Dr Nicklaus says (Nicklaus & Remy 2013).

Dr Nicklaus advises:

- It's important to stress to parents that they shouldn't delay in starting their child on healthy foods, but should introduce them right from the start of the weaning process.

Harness the power of pleasure to achieve healthy eating

Instilling children with a sense of pleasure of eating is a crucial and fundamental way to encourage healthy eating in later life. Pleasure can be a valuable tool in encouraging healthy eating because it drives food choices.

Dr Nicklaus' research has shown that children learn to derive pleasure from food through their early eating experiences. If children learn to enjoy healthy food this way early on, it is more likely to become a habit that they take forward into later life (Nicklaus et al, 2004, 2005).
It's not just enjoying the taste of food that's important when it comes to associating food with pleasure. Dr Nicklaus sees three dimensions of pleasure associated with eating:

1. **Sensory pleasure:** Except for our innate liking of sweet foods, we learn sensory pleasure relating to food through our early eating experiences (Nicklaus 2016). From birth, babies can taste and smell foods – an experience that can take place through breast milk as the food eaten by the mother influences the flavour of her milk and thereby the baby's preference (Mennella 2001, Cooke & Fildes et al 2011, Schwartz et al 2017). As infants grow, they will learn to cope with a variety of textures. By the age of 2 years, and probably before, they are fully equipped to enjoy all aspects of their eating experience.
2. **Interpersonal pleasure:** As well as the food itself, the context of eating is important (Marty et al 2018). Sharing healthy mealtimes with parents, siblings and peers can help children to learn to take pleasure in healthy foods, because it offers an opportunity to learn by imitation. Children as young as 1 year old learn which foods are preferred in their culture by watching and imitating people around them (Shutts et al 2013, Crowys et al 2015). Seeing family enjoying healthy foods in a positive, sociable environment reinforces and drives children's own food choices in later life (Liberman et al 2016). Simply talking about the food being eaten – how good it tastes – has also been shown to be important for shaping a child's enjoyment of mealtimes (Wiggins 2016).
3. **Cognitive pleasure:** children's thinking about food may be influenced by cognitive processes (thoughts, ideas, images). Cognitive cues can add 'extra value' to foods – this is exploited in many advertisements of unhealthy foods. But adverts can also be used to cue healthy eating; and positive attitudes towards foods can be built during childhood. Hence children can enjoy healthy foods through their cognitive value, as well as their health value (Fernqvist et al 2014).

Dr Nicklaus says public health campaigns should promote the pleasure of eating healthy foods, and help guide parents to support their children's pleasure of healthy eating in a positive social context.

Dr Nicklaus advises:

- Remember that healthy foods can be enjoyable foods. Pleasure derived from eating a certain food can be learnt through experience, so children need to be provided with the opportunity to learn about those healthy foods.
- Parents should be role models for healthy eating. By showing their children they enjoy the foods, they're setting an example their children will tend to follow. Parents shouldn't expect a child to want food they don't eat themselves.
- Parents should always talk positively about healthy food – discuss how tasty it is, what its flavour is like, etc.
- Sharing meals together is very important to promote the pleasure of healthy eating. Making it a happy occasion when children and parents are chatting over a healthy meal creates an enjoyable atmosphere in which the children come to associate healthy foods with pleasure.

New views on complementary feeding (weaning)

Commonly known as weaning, complementary feeding [1], offers the most important window of opportunity for children to learn to accept new foods. For the baby, it's a blast of new sensations, opening the door to a whole new world filled with the delights of new tastes, flavours and textures.

Introduce food texture at the right time

With the emphasis on nutritional content of food, it's easy to forget that infants also need to learn how to deal with lumpy food. Many parents struggle with introducing new textures into their baby's diet (Nicklaus et al 2015) – but it's worth persevering. Previous research has shown that infants aged 8 months who are given more texture (more, harder and larger pieces) become better at chewing their food than children given less texture, at least, straight after the intervention (da Costa et al 2017).

Few guidelines exist on when is the best time to introduce lumpy foods, and parents tend to be nervous about the risk of choking. As a result, most children are about 12 months old before they are moved from pureed foods to pieces of food. However, Dr Nicklaus and her colleagues in France have shown that children will accept textures at an earlier age then when they are usually introduced (Demonteil et al 2018). The evidence suggests that parents should be advised to introduce their children to lumpy foods earlier than most currently do, Dr Nicklaus concludes.

Dr Nicklaus advises:

- Most infants are ready to start taking food in soft pieces, rather than smooth or pureed, by about 8 months of age – by this time most children can sit up by themselves or stand alone without support.
- It's important to let the child look at the new food and touch it before putting it in their mouth, so they can discover for themselves the food's characteristics such as the lumpy texture.
- Parents shouldn't rush – they should give their child enough time to process each mouthful before giving the next one.
- It's no good trying to persuade children to try new textures when they are hungry and irritable. At such times, it may be better to feed them a spoonful of puree to calm their hunger – then they will be more ready and willing to discover new food experiences in a relaxed way.

Don't give up at the first hurdle: repeated exposure encourages children to eat healthy foods

It's important that parents don't give up on a healthy food if their child turns their nose up at it at the first attempt. By repeatedly offering it, the chances are that eventually the child will come to accept and like the food (Cahon et al 2013).

For example, Dr Nicklaus and colleagues found that repeatedly exposing a child to a vegetable is an effective and simple way to increase the child's intake and liking for it, at least until 3 months after exposure. Their study also showed for the first time that it isn't necessary to add an ingredient the child likes or an energy-dense ingredient to help them learn to like a novel vegetable (Remy et al 2013, Caton et al 2014, Issanchou & Nicklaus 2015, Issanchou 2017).

It's worth trying a particular food up to 10 times before giving up (Anzman-Frasca et al 2017). However, if a child really hates a particular food, it is important to respect that – we all have some foods we just can't face!

Dr Nicklaus advises:

- Children learn about food by experience, and repeated exposure is a powerful tool in this process. However, it can take time. In the same way that parents may need to remind their chid to say 'please' and 'thank you' over and over again, they should also be prepared to offer a food repeatedly to their child; sooner or later, the child will learn to like that food.
- Parents should avoid getting over-anxious about persuading their child to eat everything offered. Weaning is about making the transition from a milk-based diet to the parents' diet. If, for example, the parents eat carrots every day, it is important that the child learns to like carrots; if parents eat artichokes only occasionally, then it is less important for the child to like them. Insisting too much can simply put the child off that food.
- A good target for 'likes' is at least 6 types of vegetables and 6 types of fruit.

(1) Weaning or complementary feeding is usually defined as the progressive introduction of any foods other than milk (i.e. breast milk or infant formulas) (Harris & Mason 2017).

Be adventurous – give them as much variety as possible

Babies are more likely to accept new foods if they've sampled lots of tastes, flavours and textures, Dr Nicklaus and her colleagues have confirmed (Mennella et al 2008, Issanchou & Nicklaus 2015, Nicklaus 2016). So a daily variety of healthy foods such as vegetables right from the start is the perfect way to get them to love their greens – and even try new vegetables they've not come across before (Nicklaus 2011, Lange et al 2013, Remy et al 2013, Nicklaus 2016).

Even better, having a lot of variety in each meal is even more powerful at encouraging them to eat their greens (Mennella et al 2008).

Dr Nicklaus advises:

- The more foods children try, the more foods they'll like. As for learning to like healthy foods, learning to adapt to variety should start right from the beginning of the weaning process, with parents offering many different tastes, flavours, and textures. This helps their child to realise that pleasure can be experienced from a myriad of foods.

Let (most) children decide how much they eat

Over-eating can have its origins very early in life – from as young as 6 months, Dr Nicklaus has discovered (Nicklaus & Remy 2013). That's because, as well as learning what to eat, children must also learn how much they need to eat (Nicklaus 2016).

Given our basic biology, babies should be able to eat as much food as they need and stop when they've had enough. However, appetite regulation varies widely between individuals (Llewellyn et al 2010). These differences are largely governed by genetics, but appetite regulation is also learned from experience with foods that vary in energy density. Dr Nicklaus and her team have found this is especially so after the start of weaning (complementary feeding) (Nicklaus 2016), when infants learn about which foods make them feel full, and begin to adapt their energy intakes accordingly (Remy et al 2013). This self-regulation has been demonstrated in infants from as young as 6 months (Fox et al 2006) – but in some this control is not as strong as in others.

By the age of 3 years, some children already struggle with appetite regulation – for example, they may eat when they're not hungry (Remy et al 2015).

This can happen if the parents don't pick up on signs that their child has had enough to eat. Parents should pay attention to their child's hunger and satiation signals during meals. Repeatedly over-feeding a child can over-rule the natural process that governs satiety so the child doesn't know when to stop eating. This can begin very early on – even before weaning.

Dr Nicklaus advises:

- Parents are responsible for providing healthy food to their children but children are responsible for deciding how much they eat. It's easy to forget that children have a smaller stomach than adults and parents tend to overestimate the amount their child can eat. Parents should pay attention to their child while eating and look out for signs of food refusal that indicate when the child has had enough.
- Parents should expect variation in their child's eating from one meal to the next. Children's appetite varies from day to day and according to the energy density of the food, energy they've expended, the time since last eating, and other factors.
- If parents are concerned that their child is always eating too little and is under-weight (as shown by their growth curves), they should see their doctor.

Guidelines on weaning (complementary feeding) need to be tailored to meet cultural differences

As early feeding is about nutrition, pleasure, socialisation and identity, it may vary across cultures, reflecting local practices, beliefs, and food availability. For example, British parents tend to put emphasis on health and nutrient quality, while French parents value the development of the palate (Caton et al 2011, Schwartz et al 2013).
Guidelines therefore need to consider cultural differences. However, they can also take into account examples from a variety of cultures to show that all babies around the world can learn to eat the healthy foods within the framework of their culture.

Dr Nicklaus advises:

- Alimentation is partly about learning cultural aspects of feeding, helping a child develop a sense of belonging and 'identity'. Hence during the weaning process when children are transitioning from a milk-based diet to their parents' diet, they will be learning different things according to their parents' culture – for example, whether they eat with cutlery or chopsticks, or with their hands, etc. It is important that parents and HCPs respect these cultural differences in eating and so nurture children's sense of identity with those around them.

Encourage older children to think of healthy foods as happy foods

Children can distinguish between healthy and unhealthy foods and make appropriate informed choices, for example, if asked to choose foods appropriate for a nutrition class at school or for a party (Monnery-Patris et al 2015, Marty et al 2017). However, like adults, children naturally choose the foods they like, regardless of whether they're healthy foods. The difference is that children are more flexible than adults; there is still time to intervene so that they develop positive attitudes towards healthy foods.

Further research is needed to identify the best ways of priming healthy eating choices during this critical time, enabling children to act on their knowledge but at no cost to pleasure. They need to learn that healthy foods can be tasty, enjoyable foods.
Dr Nicklaus and her colleagues have found that one key way of promoting healthy foods to children is through their symbolic value – linking them with happy occasions, such as birthday parties where children expect to be treated with foods that look and taste good (Marty et al 2018).

Often parents make the mistake of trying to encourage their children to eat a particular food because it is good for them. Usually this means they are trying to get them to eat something they don't like – a counter-productive step that results in children coming to think of healthy foods as having a nasty taste. Ultimately this can lead to them rejecting foods that are labelled as healthy (Wardle & Huon 2000).

Dr Nicklaus advises:

- In order for children to choose a healthy food, it must look good, taste good and should also be thought of as a treat.
- Parents can promote healthy foods as enjoyable foods by talking about how tasty and attractive a food is and discussing interesting food facts such as the origins of a food or how it was grown. They can explain why they have chosen to eat a particular food themselves: for example, "I like this apple because it is juicy and crisp, and because it came from grandpa's orchard".
- Including healthy foods at family celebrations such as birthday parties can help children come to think of them as a treat.
- Involving children in food preparation and cooking can help them to become familiarised with and accept healthy foods.
- Parents should avoid telling children to eat a food because it's good for them, as this can be a signal that the food tastes bad.
- Keeping healthy foods available in the home and within reach means children can help themselves to an easy, healthy snack such as a banana rather than a biscuit.

Next steps – bridging the gap between research and society

Dr Nicklaus plans to take the research findings from the laboratory into the real world. She aims to empower parents and children towards healthy eating in the first 10 years of life, by providing evidence-based guidance for parents on healthy feeding during a child's first 3 years and for children to make the healthiest food choices in every circumstance.
She also plans to pilot an intervention for healthy eating in school canteens in her local town of Dijon and to disseminate a framework for applying this approach to other cities and cultures.

Developing these alimentation strategies to encourage healthy eating requires a multidisciplinary approach from statisticians, sociologists, and economists, to psychologists, paediatricians and nutrition scientists. Dr Nicklaus has brought together a variety of experts to make significant progress towards the promotion of healthy foods.

10 tips for building kids' love of healthy eating

1. Get it right from the start – offer your child healthy foods as soon as you start the weaning process.

2. Make it enjoyable – eating together and chatting with family and friends over a meal will help your child associate healthy eating with happy times.

3. Be a role model – show you enjoy healthy foods by eating them yourself and talking about how tasty they are; the chances are your child will follow your example.

4. Let them explore: don't be afraid to start moving from purees to pieces of food at around 8 months. Let them check out the food if they want to, by touching it and discovering the lumpy texture before they put it in their mouth.

5. Don't quit at the first hurdle: if a child rejects a new food, try it again another time – the chances are your child will eventually come to like it. It's worth trying a new food up to 10 times before giving up.

6. Be adventurous: the more foods children try, the more they'll end up liking. Try them on lots of different tastes, flavours and textures. A good target for 'likes' is at least 6 types of vegetables and 6 types of fruit.

7. Put them in charge of how much: keep a lookout for when your child starts showing signs of feeling full. Continuing to feed children when they're not hungry can lead to habitual over-eating and set them on the path to becoming overweight.

8. Celebrate: for older children, promote the association between healthy eating and pleasure by providing healthy foods at birthday parties and other happy occasions.

9. Get them involved: Encourage older children to help with food preparation and cooking, and discuss interesting facts about the food such as where it comes from.

10. Keep healthy foods to hand: keep them within easy reach, have them available every day, and make them the natural option – or better still, the only option.

And finally… relax.

You may not succeed with every food you offer. Be prepared to accept that your child may have an aversion to some foods – we all have foods we just can't face!

REFERENCES:

Get it right from the start: early food preferences track into later life

Barker DJ, Osmond C, Golding J, et al. Growth in utero, blood pressure in childhood and adult life, and mortality from cardiovascular disease. BMJ 1989;298:564–7.

Nicklaus S, Boggio V, Chabanet C, Issanchou S. A prospective study of food preferences in childhood. Food Qual Pref 2004;15:805–18.

Nicklaus S, Boggio V, Chabanet C, Issanchou S: A prospective study of food variety seeking in childhood, adolescence and early adult life. Appetite 2005;44:289-97.

Nicklaus S, Remy E. Early Origins of overeating: Tracking between early food habits and later eating patterns. Curr Obes Rep 2013;2:179–84.

Harness the power of pleasure to achieve healthy eating

Nicklaus S, Boggio V, Chabanet C, Issanchou S. A prospective study of food preferences in childhood. Food Qual Pref 2004;15:805–18.

Nicklaus S, Boggio V, Chabanet C, Issanchou S: A prospective study of food variety seeking in childhood, adolescence and early adult life. Appetite 2005;44:289-97.

Nicklaus S. The role of food experiences during early childhood in food pleasure learning. Appetite 2016;104:3-9.

Schwartz C, Chabanet C, Szleper E, et al. Infant acceptance of primary tastes and fat emulsion: developmental changes and links with maternal and infant characteristics. Chem Senses 2017;42:593-603.

Mennella JA, Jagnow CP, Beauchamp GK. Prenatal and postnatal flavor learning by human infants. Pediatrics 2001;107(6):E88.

Cooke L, Fildes A. The impact of flavour exposure in utero and during milk feeding on food acceptance at weaning and beyond. Appetite 2011;57(3):808-11.

Marty L, Chambaron S, Nicklaus S, Monnery-Patris S. Learned pleasure from eating: An opportunity to promote healthy eating in children? Appetite 2018;120:265-74.

Shutts K, Kinzler KD, DeJesus JM. Understanding infants' and children's social learning about foods: previous research and new prospects. Dev Psychol 2013;49:419-25.

Liberman Z, Woodward AL, Sullivan KR, Kinzler KD. Early emerging system for reasoning about the social nature of food. Proc Natl Acad Sci U S A 2016;113(34):9480–5.

Cruwys T, Bevelander KE, Hermans RCJ. Social modelling of eating: a review of when and why social influence affects food intake and choice. Appetite 2015;86:3-18.

Wiggins S. Producing infant food preferences during weaning: the role of language and gesture in parent-child interaction. Appetite 2016;101(224).

Fernqvist F, Ekelund L. Credence and the effect on consumer liking of food - a review. Food Quality and Preference 2014;32(PC),340-53.

Introduce food texture at the right time

Nicklaus S, Demonteil L, Tournier C. Modifying the texture of foods for infants and young children, In Modifying Food Texture, edited by Jianshe Chen and Andrew Rosenthal, Woodhead Publishing 2015;187-222.

da Costa SP, Remijn L, Weenen H, et al. Exposure to texture of foods for 8-month-old infants: Does the size of the pieces matter? J Texture Stud 2017;Dec;48(6):534-540.

Demonteil L, Tournier C, Marduel A, et al. Longitudinal study on acceptance of food textures between 6 and 18 months. Food Quality and Preference, in press.

Don't give up at the first hurdle: repeated exposure encourages children to eat healthy foods

Caton SJ, Ahern SM, Remy E, et al. Repetition counts: Repeated exposure increases intake of a novel vegetable in UK pre-school children compared to flavour-flavour and flavour-nutrient learning. Br J Nutr 2013;109(11):2089-97.

Issanchou S. Determining factors and critical periods in the formation of eating habits: results from the Habeat Project. Ann Nutr Metab 2017;70:251–56.

Issanchou S, Nicklaus S. Sensitive periods and factors in the early formation of food preferences. In M-L Frelut (Ed.), The Free Obesity eBook 2015 ECOG's eBook on Child and Adolescent Obesity.

Caton SJ, Blundell P, Ahern S, et al. Learning to eat vegetables in early life: the role of timing, age and individual eating traits. Plos One 2014;9(5),e97609.

Remy E, Issanchou S, Chabanet C, Nicklaus S. Repeated exposure of infants at complementary feeding to a vegetable puree increases acceptance as effectively as flavor-flavor learning and more effectively than flavor-nutrient learning. J Nutr 2013;143:1194-200.

Anzman-Frasca S, Ventura AK, Ehrenberg S, Myers KP. Promoting healthy food preferences from the start: a narrative review of food preference learning from the prenatal period through early childhood. Obes Rev 2017;Dec 20. [Epub ahead of print] Review. PubMed PMID: 29266778.

Be adventurous - give them as much variety as possible

Issanchou S, Nicklaus S. Sensitive periods and factors in the early formation of food preferences. In M.-L Frelut (Ed) 2015; The Free Obesity eBook: ECOG's eBook on Child and Adolescent Obesity.

Nicklaus S. Complementary Feeding Strategies to Facilitate Acceptance of Fruits and Vegetables: A Narrative Review of the Literature. Int J Environmental Research and Public Health 2016;13:1160.

Mennella JA, Nicklaus S, Jagolino AL, Yourshaw LM. Variety is the spice of life: Strategies for promoting fruit and vegetable acceptance during infancy. Physiology & Behavior 2008;94(1):29-38.

Remy E, Issanchou S, Chabanet C, Nicklaus S. Repeated exposure at complementary feeding to a vegetable purée increases acceptance as effectively as flavor-flavor learning and more effectively than flavor-nutrient learning. J Nutr 2013;143(7):1194-200.

Nicklaus S. Children's acceptance of new foods at weaning. Role of practices of weaning and of food sensory properties. Appetite 2011;57:812-15.

Lange C, Visalli M, Jacob S, et al Maternal feeding practices during the first year and their impact on infants' acceptance of complementary food. Food Qual Pref 2013;29:89-98.

Let (most) children decide how much they eat

Nicklaus S, Remy E. Early origins of overeating: tracking between early food habits and later eating patterns. Curr Obes Rep 2013;2:179–84.

Nicklaus S: Complementary feeding strategies to facilitate acceptance of fruits and vegetables: a narrative review of the literature. Int J Environmental Research and Public Health 2016;13:1160.

Llewellyn CH, van Jaarsveld CH, Johnson L, et al. Nature and nurture in infant appetite: analysis of the Gemini twin birth cohort. Am J Clin Nutr 2010;91:1172-1179.

Remy E, Issanchou S, Chabanet C, Nicklaus S. Repeated exposure at complementary feeding to a vegetable purée increases acceptance as effectively as flavor-flavor learning and more effectively than flavor-nutrient learning. J Nutr 2013;143(7):1194-200.

Fox MK, Devaney B, Reidy K, et al. Relationship between portion size and energy intake among infants and toddlers: evidence of self-regulation. J Am Diet Assoc 2006;106:S77-S83.

Remy E, Issanchou S, Chabanet C, et al. Impact of adiposity, age, sex and maternal feeding practices on eating in the absence of hunger and caloric compensation in preschool children. Int J Obesity 2015;39,925–930.

Guidelines on weaning (complementary feeding) need to be tailored to meet cultural differences

Schwartz C, Scholtens P, Lalanne A, et al. Development of healthy eating habits early in life: review of recent evidence and selected guidelines. Appetite 2011;57(3):796-807.

Caton SJ, Ahern SM, Hetherington MM. Vegetables by stealth: An exploratory study investigating the introduction of vegetables in the weaning period. Appetite 2011;57,816–825.

Encourage older children to think of healthy foods as happy foods

Marty L, Miguet M, Bournez M, et al: Do hedonic-versus nutrition-based attitudes toward food predict food choices? a cross-sectional study of 6-to 11-year-olds. Int J Behav Nutr Phys Act 2017;14

Monnery-Patris S, Marty L, Bayer F, et al. Explicit and implicit tasks for assessing hedonic-versus nutrition-based attitudes towards food in French children. Appetite 2016;96,580-587.

Marty L, Nicklaus S, Miguet M et al. When do healthiness and liking drive children's food choices? The influence of social context and weight status. Appetite 2018;125:466-473.

Wardle J, Huon G: An experimental investigation of the influence of health information on children's taste preferences. Health Educ Res 2000;15:39-44.

DANONE International Prize for Alimentation

Dr Sophie Nicklaus

Winner of the first Danone International Prize for Alimentation, is Research Director at the French National Institute for Agricultural Research, based at the Centre for Taste and Feeding Behaviour in Dijon. This is her story.

A taste of childhood

Once upon a time, a young Sophie Nicklaus' passion for biology led her to study sciences and set her on the path that would ultimately lead her to becoming the winner of the Danone International Prize for Alimentation (DIPA), the global award that recognises outstanding, innovative and collaborative approaches to improving food-related health and to develop effective healthy eating strategies.

After gaining her diploma in agricultural science, Sophie soon developed her fascination with food and the influences that shape our food preferences. So she embarked on her career in studying children's eating behaviour and how it might be modified to steer children onto the right path to healthy eating throughout life.

Sophie's PhD thesis at the National Institute for Agricultural Research (INRA) in Dijon [(1)] was her first taste of studying the development of food preference in children. She conducted a cohort study in collaboration with a nursery school paediatrician in Dijon who was following the food habits of the children in the school. *"He gave me free access to all his data – and told me I'd need a wheelbarrow to carry all of it!"* Sophie recalls. *"Being able to follow up certain individuals from childhood up to age 22 made it possible to understand how food preferences established in early childhood affect food behaviours through to early adulthood".* Sophie developed methods to assess the sensory qualities (taste and smell) of foods in order to understand their relationship with preferences and food choices. This expertise became the foundation for her future research projects.

Dr Sophie NICKLAUS, winner of 2018 DIPA.
Research Director at INRA, Centre for Taste and Feeding Behaviour in Dijon, France.

From developing the senses in infancy…

During Sophie's post-doctoral studies in the USA [2], she investigated early sensory experiences in infants. *"Infants have the ability to taste and smell foods, for example through their mother's milk. Experiencing a variety of flavours in this way can increase the appreciation for new foods when babies are weaned. We also observed that when babies eat a wide range of foods from when they are weaned, this has a positive effect on the appreciation of new foods",* Sophie says.

Developing eating behaviour early in life

In 2006, Sophie returned to INRA Dijon as a research scientist at the Centre for Taste and Feeding Behaviour (CSGA) [3], continuing her work through the French National Research Agency's OPALINE project [4], which she led. This observational study examined the taste and food preferences of children from the third trimester of pregnancy to the age of two years. The study's findings were then developed into models. She continued her research through the European Union's HabEat project, which studied the factors and critical periods contributing to the formation of food habits in children under six years old. *"Our approach was experimental. We developed hypotheses before we had data, then tested them by asking parents to change their usual food practices".*

Sophie is currently coordinating the French National Research Agency's PUNCH project, where she works with experts in sociology, experimental economics, consumer sciences, marketing and cognitive psychology. The wide-ranging project looks at several issues, from the quantitative control of food intake (as perceived by parents) to ways to promote healthy food choices in schoolchildren. *"The aim here is to go beyond well-worn public health messages and think instead about how to promote the pleasure of eating healthy foods. This is done by finding the appropriate balance between sensory qualities and energy density, developing positive social perceptions of food consumption and increasing the representation of healthy foods",* explains Sophie. *"This is in line with Claude Lévi-Strauss belief that foods are chosen not because they are 'good to eat' but because they are 'good to think'".*

… to making healthy food choices in later life

Sophie considers herself lucky. *"My research focus is something that people really care about. The findings can be translated into concrete action. Recommendations and partnerships with industrial food producers can improve the quality of the foods they produce. Working with dietary health professionals, such as paediatricians and dieticians, can influence behaviours".*

Shaping early eating habits

Sophie's work is used to inform public health policy. She sees winning the Danone International Prize for Alimentation as an opportunity for her to share her vision. *"Food serves four functions — nutrition, pleasure, identity, social ties — that must be taken into account. We often focus on nutrition above all else, while public health goals could be achieved more easily by addressing the four functions in a balanced way".*
Sophie hopes the Prize will enable her to take her work out of the laboratory and share the knowledge with the wider public, and with the parents of young and school-aged children in particular. *"The message is really important: how to feed children from a very young age and teach them about food so that these future consumers will be able to make the best, most informed choices".* She is passionate about these issues. *"I think it is important to address the needs of less privileged groups so that inequalities in health do not worsen".*

Taking pleasure in healthy eating

As Sophie reminds us, *"It's never too late to learn to eat healthily".* And knowing that, we may all live happily — and healthily — ever after.

(1) Flavour, Vision and Consumer Behaviour (FLAVIC) Joint Research Unit (INRA-ENESAD-University of Burgundy), INRA Dijon Burgundy Franche-Comté
(2) Monell Chemical Senses Center, under J. Mennella, Philadelphia, USA
(3) Centre for Taste and Feeding Behaviour (CSGA) Joint Research Unit (AgroSup Dijon-CNRS-INRA-University of Burgundy–Franche-Comté), INRA Dijon Bourgogne Franche-Comté
(4) OPALINE: Observatory on the Food Preferences of Infants and Children

Sophie Nicklaus, Mini CV

- 46 years old, 1 child
- **Since 2006:** research scientist, later research director at the Centre for Taste and Feeding Behaviour (CSGA) Joint Research Unit (AgroSup Dijon-CNRS-INRA-University of Burgundy–Franche-Comté), INRA Dijon Bourgogne Franche-Comté. Leads the team studying factors shaping eating behaviour over a person's life and their link to health.
- **2013:** accreditation to supervise research in food sciences from the University of Burgundy, Dijon.
- **2004–2005:** Post-doctoral studies, Monell Chemical Senses Center, Philadelphia, USA.
- **2004:** Ph.D. in food sciences from the University of Burgundy, Dijon. 'Longitudinal Study of Food Preferences and Variety from Early Childhood through to Adulthood'.
- **1998–2006:** sensorial analysis research engineer, Flavour, Vision and Consumer Behaviour (FLAVIC) Joint Research Unit (INRA-ENESAD-University of Burgundy), INRA Dijon Burgundy Franche-Comté.
- **1995:** Agricultural engineering degree, National Agricultural Institute Paris-Grignon, Paris, specialisation: food quality and food regulation.
- **Author** of 85 scientific journal articles, 14 book chapters, and a Quæ publication; elected member of the ALIMH Division Scientific Board; editor at the Appetite journal.

Find out more

How does taste develop in children?
http://www.dijon.inra.fr/en/All-the-news/Opaline

How children acquire food preferences
http://www.didit.inra.fr/en/Results/pratiques-alimentaires/how-children-acquire-food-preferences

Yes, you can make your children eat vegetables!
http://presse.inra.fr/en/Press-releases/HabEat-you-can-make-your-children-eat-vegetables

DANONE International Prize for Alimentation

Danone International Prize for Alimentation rewards mid-career scientists for outstanding research

This year sees the first Danone International Prize for Alimentation (DIPA), awarded in recognition of outstanding research leading to strategies promoting sustainable healthy eating habits. It represents a far-reaching initiative by the Danone Institute International and the French research organisation Fondation pour la Recherche Médicale.

The 100,000 Euro prize will be awarded every two years and is open to talented mid-career researchers who lead a collaborative approach to Alimentation – the umbrella term for all factors influencing people's food choices, eating habits and food-related health.

The DIPA replaces the long-standing Danone International Prize for Nutrition which traditionally rewarded eminent leaders in the field for their lifetime achievements in nutrition-related research.

The move to reward instead emerging leaders in the research community reflects the need for innovative approaches that connect the multiple disciplines affecting alimentation, including economic, social, psychological and cultural factors.

Unravelling the relationships between these alimentation factors and how they impact on public health requires researchers to build bridges between all these disciplines.

The DIPA aims to:

- advance understanding of Alimentation through cutting edge research
- encourage and inspire pioneering approaches that integrate nutrition research into lifestyle, cultural and socio-economic aspects
- boost collaboration between the different disciplines affecting nutrition, from anthropology to economics
- support talented and highly motivated mid-career researchers whose work contributes to scientific excellence in the field of Alimentation.

For details please visit http://www.danoneinstitute.org/nutrition-science-support/dipa

DANONE INSTITUTE INTERNATIONAL *Nutrition for Health*

* The Danone Institute International (DII) is a not-for-profit organisation aiming to promote human health through developing and disseminating knowledge about the links between food and health, and to highlight the importance of nutrition in health. The DII comprises a network of 14 Danone Institutes around the world and involves over 200 experts in this field of science.

Visit www.danoneinstitute.org/ for more information.

FONDATION RECHERCHE MÉDICALE

* The French "Fondation pour la Recherche Médicale" aims to contribute to the development of pioneering and innovative French medical research, leading to medical advances for all. It is an independent organisation that operates through the generosity of its donors.

Find out more at www.frm.org/

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DANONE INSTITUTE INTERNATIONAL
Nutrition for Health

FONDATION RECHERCHE MÉDICALE

CONTACTS

INRA Press office: presse@inra.fr – T. +33 (0)1 42 75 91 86

Danone Institute International: press.dipa@gmail.com