CASE 6

Short case number: 3_16_6
Category: Children and Young People
Discipline: Paediatrics_Medicine
Setting: General Practice
Topic: Infant feeding, nutrition and dentition. [SDC]

Case

Previously well 7 month old Henry Walzak presents with his mother Josephine. She is concerned that Henry has become fussy taking the breast. He seems irritable and not sleeping well. She is not sure whether she should increase his solids or change him to formula.

She informs you that one of the mothers at her playgroup said that Henry is probably teething and that she should try teething rusks, but she has heard that these can cause cavities in developing teeth. She asks you what you think she should do.

Questions

1. Outline the key features of history and examination of Henry to determine his nutritional status.
2. Briefly outline the NHMRC dietary guidelines for children and adolescents.
3. Josephine thinks that she should switch Henry to formula. Compare the composition of breast milk to commonly used infant formula.
4. Irritability and fussiness are commonly attributed to teething. Summarise in a table the eruption times for primary and permanent teeth and outline the evidence for the use of teething devices and preparations in the 'management of teething'.
5. Josephine is concerned that teething rusks can cause dental caries, describe the common risk factors for dental caries and outline the prevention strategies that can be implemented.

Suggested reading:

1. McCallum, Z., & Bines, J. (2012) Nutrition. In South, M & Isaacs, D. (Eds) Practical Paediatrics (pp 61 - 74). Edinburgh, Churchill Livingston.
2. Kilpatrick, N., & Hallet, K. (2012) Teeth and oral cavity disorders. In South, M & Isaacs, D. (Eds) Practical Paediatrics (pp 799 - 810). Edinburgh, Churchill Livingston.
3. NHMRC Dietary Guidelines: https://www.nhmrc.gov.au/guidelines-publications/n55

ANSWERS

1. Outline the key features of history and examination of Henry to determine his nutritional status.

History

Ask what the child usually eats in a typical day, in all settings that the child is in - i.e. home, child care, outings. Children derive up to 30% of their energy from snacks, so it is important to include these in the assessment of all food and fluids consumed.
Qualitative methods include a dietary history and food frequency questionnaire. These do not allow for the precise calculation of energy or nutrient intakes but rather determine the pattern, style and types of foods eaten.
Quantitative methods calculate precise energy and nutrient intakes and include a 24-hour food record and a 3-day food record.
If the initial dietary assessment raises concerns, then referral should be made to a dietitian.

Physical examination

Physical examination gives a general impression of nutritional status, including signs of anaemia, jaundice, wasting, oedema, lethargy, muscle weakness and fat stores.
Examination may reveal evidence of specific micronutrient deficiency, including pallor, bruising or bleeding, skin, hair and gum abnormalities, and neurological or ophthalmological disorders. In adolescents, the stage of puberty should be documented.
Anthropometry refers to the measurement of physical dimensions and body composition.
Measurement of height/length and weight gives the most useful assessment of overall nutritional status, although normal growth can still occur in marginally malnourished children. Serial measurements of growth add valuable information about the impact and chronicity of nutritional compromise. The following routine measurements are used for the anthropometric component of a nutritional assessment:

- recumbent length before 2 years of age, or height after 2 years of age
- weight for age
- weight for length/height
- head circumference (used until 36 months of age)
- growth velocity
- skinfold thickness (triceps and other sites as indicated)
- midarm circumference

Growth charts for height or length, weight and head circumference are used to monitor growth at different chronological ages. Specific ethnocultural- and even syndrome (Down, Turner)-specific growth charts exist.
Patients requiring long-term monitoring of nutritional status should have serial measurements of mid arm circumference and triceps skinfold thickness to assess fat and muscle stores.

2. **Briefly outline the NHMRC dietary guidelines for children and adolescents**

Full guidelines summary:
https://nhmrc.gov.au/about-us/publications/australian-dietary-guidelines

Australian Dietary Guidelines – Providing the scientific evidence for healthier Australian diets (National Health and Medical Research Council 2013)

- Encourage and support exclusive breastfeeding until 6 months of age
- Children and adolescents need sufficient nutrition foods to grow and develop normally
- Growth should be checked regularly for young children
- Physical activity is important for all children and adolescents; 3 hours of accumulated physical activity per day for 3-5 year olds, 1 hr of moderate to vigorous activity per day from 5 to 18 years
- Enjoy a wide range of nutritious foods
- Limit intake of food and drinks containing salt
- Children and adolescents should be encouraged to:
  - Eat plenty of cereals (including breads, rice, pasta and noodles), preferably wholegrain
- Include lean meat, fish and poultry and/or alternatives
- Include reduced fat milks, yoghurts, cheese and/or alternatives for children over 2 years
- Reduced fat milks are not suitable for young children under 2 years, because of the high energy needs of young children, Milk and water are the recommended drinks for children
- Caffeine-containing energy drinks are not suitable for children Alcohol is not recommended for children
- And care should be taken to:
- Limit intake of energy dense food.
- Limit intake of sugar sweetened drinks and foods.
- Care for your child's food: prepare and store it safely.
- Restrictive diets should be avoided unless prescribed by a dietitian
- Adolescents may be vulnerable to disordered eating

3. **Josephine thinks that she should switch Henry to formula, compare the composition of breast milk to commonly used infant formula.**

Table 30-3. Breast milk and artificial formulas composition table

	Energy kJ (kcal)/100 ml	Protein source	Fat source	Carbohydrate source	Indication	Concerns
Breast milk	289 (69)	Protein source is whole protein	Short-, medium- and long-chain fats	Lactose	The preferred infant feed	HIV infection in mother
Breast milk fortified with FM85 (5%) and Polyjoule (4.2%)	432 (103)	Protein source is whole protein	Short-, medium- and long-chain fats	Lactose	Pre-term infant	
Preterm formula, e.g. S26 LBW LCPs	340 (81)	Whey : casein 60 : 40	Coconut, oleic, palm, soy. LCPs, MCT12.5%	Lactose	Pre-term infant	Does not contain immunoglobulins, and other non-specific protective and growth and factors
Term formula - cow's-milk based, e.g. S26, Nan1	273 (65)	Whey : casein 60 : 40	Oleo, coconut, soy, oleic, palm, canola, corn	Lactose	If breast milk not available	Does not contain immunoglobulins, and other non-specific protective and growth factors

Table 30-3. Breast milk and artificial formulas composition table

	Energy kJ (kcal)/100 ml	Protein source	Fat source	Carbohydrate source	Indication	Concerns
Lactose-modified formulas, e.g. De-Lact	286 (69)	Casein dominant	Vegetable oil	Maltodextrin, glucose, galactose	Low-lactose or lactose-free formulas are the feeds of choice for formula-fed infants with true lactose intolerance	In older children with lactose intolerance, enzymatic drops containing lactase may be used with cow's milk
Soy formula, e.g. Infasoy	274 (65)	Soy isolate	Oleo, coconut, soy, oleic	Corn syrup solids, sucrose	Soy formulas should be used in galactosaemic infants and for infants of vegetarian families reluctant to use cow's milk	Does not contain immunoglobulins, and other non-specific protective and growth factors. The presence of phytates in soy formulas may inhibit absorption of minerals, particularly calcium. Soy formulas have a higher aluminium content than other formulas. This places preterm infants or infants with poor renal function at risk of toxicity, especially renal osteodystrophy

4. **Irritability and fussiness are commonly attributed to teething. Summarise in a table the eruption times for primary and permanent teeth and outline the evidence for the use of teething devices and preparations in the 'management of teething'.**

Table 220-1. A summary of the eruption times for primary and permanent teeth

Primary dentition (months after birth)							
Central incisors		Lateral incisors		Canines	First molars		Second molars
6-12		9-16		16-23	13-19		23-33
Permanent dentition (years of age)							
Central incisors	Lateral incisors	Canines	First premolars	Second premolars	First molars	Second molars	Third molars
6-8	6.5-8.5	9-13	9.5-11.5	10-13	5.5-7.0	11-13	17+

Teething

Teething is a normal process by which an infant begins to cut their first teeth (primary dentition). A variety of symptoms can accompany teething, including sensitive and painful gums, mouth ulceration, drooling, feeding difficulties, lack of sleep, fevers, diarrhoea and crying. The scientific evidence that any of these symptoms are directly related to tooth eruption is controversial. Nevertheless, they are commonly reported and can cause significant distress to the child and anxious parent. Similarly there is no evidence base to support any particular management strategy. The use of chilled teething rings, hard, sugar-free rusk biscuits and finger pressure appears to help. Over-the-counter teething preparations are of limited use. Not only do many contain choline salicylate and significant amounts of ethanol and are contra-indicated in very young infants but also repeated use can cause ulceration of the gums. Some lidocaine (lignocaine)-based gels are thought to be slightly more effective and may be mildly antiseptic. Mild elevations in temperature can be managed with systemic oral medication but temperatures of 38°C and higher or other serious symptoms (e.g. convulsions) should not be ascribed to teething
and should be assessed independently.

5. **Josephine is concerned that teething rusks can cause dental caries describe the common risk factors for dental caries and outline the prevention strategies that can be implemented.**

Table 220-2. The common risk factors for dental caries

Risk factor	Influence
Fluoride exposure	Exposure to fluoridated water source and the regular use of fluoridated toothpaste are two key factors that reduce caries risk
Sugar exposure	Infant feeding habits are very important with frequency of exposure being most relevant. High risk associated with prolonged on-demand night-time feeds
Family oral health history	Poor parental oral health places child at risk of decay as cariogenic bacteria can be transmitted to infants from their primary care giver (usually the mother)
Social and family practices	Poor, indigenous, ethnic and migrant groups have higher levels of dental disease
Medical history	Medically compromised children are more at risk of dental decay the impact of which, on their general health, can be considerable. They are also less likely to receive appropriate treatment
Saliva flow	Children with reduced salivary flow are at significant risk of developing caries as the acids in the oral cavity cannot be diluted, buffered and cleared effectively. Examples of such children are those on certain medications (e.g. anti-depressants, anticholinergics), exposed to radiotherapy or with certain conditions, e.g. Prader Willi and Velocardiofacial Syndrome.

Table 220-3. A summary of caries preventive strategies

Fluoride	A smear of toothpaste should be applied regularly to an infant's teeth within 6 months of their eruption
	For most individuals a junior toothpaste (400 ppm fluoride) will be adequate until about the age of 5-6. However, for children with additional risk factors, an adult toothpaste may be more appropriate
	Teeth should be brushed twice a day with nothing to eat or drink after the night-time brushing
	Parents should supervise toothbrushing until around 8 years of age
	The use of additional topical fluoride supplements (tablets or drops) can be of benefit to a few individuals but should be prescribed by an appropriate dental professional
Diet	Reduce the total amount and frequency of intake of sugary foods and drinks
	Avoid on-demand feeding through the night
	Limit sugary snacks to meal times, when salivary flow is optimal
	Avoid sugary snacks close to bedtime
	Increase water intake
Dental attendance	Parents should be encouraged to take their infant to a dental professional within 6 months of the eruption of their first teeth
	Regular monitoring by a dental professional should continue in to adulthood
Remineralizing products	Products containing calcium phosphopeptides, e.g. Tooth Mousse (GC Corporation, Itabashi-ku, Tokyo, Japan), are available through dental practitioners. These promote remineralization of early carious lesions

NOTES;

Dental caries (or decay) is an infectious disease caused by the presence of certain bacteria (predominantly mutans streptococci) in the oral cavity. The mutans streptococci (MS) metabolize sugars and starches to produced acids, which lower the pH of the oral cavity and promote loss of minerals from the tooth surface. Minerals in the oral cavity, including fluoride, are redeposited on the tooth surface once the neutral pH is restored (normally after about 20 minutes). This process is dynamic and as long as minerals are replaced the tooth surface remains sound and intact. If, however, the drop in pH is prolonged and/or frequent there will be a net loss of minerals, leading to a weakening and eventual breakdown (cavitation) of the tooth surface. The early sign of mineral loss is characterized by precavitated or 'white spot' lesions, usually around the necks of the teeth where the MS tend to accumulate in a biofilm (known as dental plaque) on the teeth. Early identification of these precavitated lesions is important as they signal the need for proactive preventive measures to encourage remineralization. Failure to change the oral environment to one that encourages remineralization will result in cavities. If this occurs, then restorations (fillings) are necessary.

Early childhood caries (ECC; historically also referred to as nursing bottle caries, baby bottle decay and many other terms) is a distinct form of dental caries affecting pre-school-age children. ECC is particularly virulent, causing massive destruction to the primary dentition in children as young as 18 months of age. At birth MS do not inhabit the oral cavity; however, the earlier colonization occurs the greater the risk of ECC. The most common source for transmission of MS has been shown to be the primary care giver, usually the mother.

Prevention of dental caries

Strategies to prevent dental caries should start as soon as the first primary teeth erupt (Table 22.3.3).

Fluoride

Fluoride is the single most effective way to protect teeth from decay. It acts in two ways; it can enhance the ability of teeth to resist demineralization caused by intraoral acids and it can also inhibit oral bacterial enzymes to reduce the conversion of sugars in to acids. However, the latter effect is relatively small in comparison to its biochemical modification of the structure of tooth enamel.

Fluoride can be delivered both systemically and topically. Fluoridation of the water supplies allows for both effects. Water ingested during development of the teeth allows fluoride to be incorporated into the developing dental enamel. However, it is as a topical agent that water has its most beneficial effect, as low-dose fluoride comes in to frequent contact with the teeth before being ingested. As such, water fluoridation is considered a very cost-effective public health intervention. However, many homes in rural and remote areas do not enjoy 'town water' and so miss out on the advantages of water fluoridation.