- Meeting, Greece. *The use of the Bioecogram in behavioural paediatrics*, Greece, 2004.
- 14 Blair M, Tamhne R. The Bioecogram: a novel assessment tool for the enhancement of family pediatric practice and child centred care. USA Pediatric Academic Societies Annual Scientific Meeting, San Francisco, 2004.
 - 15 Barlow J, Coren E, Stewart Brown S. Meta-analysis of the effectiveness of parenting programmes improving maternal psychosocial health. *Br J Gen Pract* 2002;**52**:223–33.
 - 16 Elkan R, Blair M, Robinson J. Evidence-based practice and health visiting: the need for theoretical underpinnings for evaluation. *J Adv Nurs* 2000;**31**:1316–23.
 - 17 Murdoch Eaton D, Cottrell D. Maximising the effectiveness of undergraduate teaching in the clinical setting. *Arch Dis Child*. 1998;**79**: 365–7 and ward round teaching).
 - 18 Heidenreich C, Lye P, Simpson D, et al. The search for effective and efficient ambulatory teaching methods through the literature. *Pediatrics* 2000;**105**:231–7.
 - 19 Lindsey Lane J, Gottlieb R. In course formative assessment structured clinical observations a method to teach clinical skills with limited time and resources. *Pediatrics* 2000;**105**:973–77.
 - 20 Blair M, Walker D. Development and use of a weighted checklist for assessing clinical skills in medical undergraduates studying paediatrics and child health. *Ambul Child Health* 1998;**4**:407–13.
 - 21 Kohler L. Child public health. A new basis for child health workers. *Eur J Public Health* 1998;**8**:253–5.
 - 22 McCain MN, Mustard F. Early years study: Reversing the Real Brain Drain, 1999. www.edu.gov.on.ca/eng/document/reports/reports.html (accessed 20 December 2006).
 - 23 Waterston T, Alperstein G, Stewart Brown S. Social capital: a key factor in child health inequalities. *Arch Dis Child* 2004;**89**:456–9.
 - 24 Rigby M, Kohler L, Blair M, et al. Child health indicators for Europe: a priority for a caring society. *Eur J Public Health* 2003;**13**(Suppl):38–46.
 - 25 Kohler L. Health indicators for Swedish Children. Save the children Sweden, 2006.
 - 26 Spencer NJ. Consultant paediatric outreach clinics—a practical step in integration. *Arch Dis Child* 1993;**68**:496–500.
 - 27 Bowling A, Stramer K, Dickinson E, et al. Evaluation of specialists' outreach clinics in general practice in England: process and acceptability to patients, specialists, and general practitioners. *J Epidemiol Community Health* 1997;**51**:52–61.
 - 28 Kendrick D, Marsh P, Fielding K, et al. Preventing injuries in children: cluster randomised controlled trial in primary care. *BMJ* 1999;**318**:980–3.
 - 29 Lyons RA, Lo SV, Heaven M, et al. Injury surveillance in children—usefulness of a central database of accident and emergency attendances. *Injury Prev* 1995;**1**:173–6.
 - 30 Roberts H, Curtis K, Liabo K, et al. Putting public health evidence into practice: increasing the prevalence of working smoke alarms in disadvantaged inner city housing. *J Epidemiol Community Health* 2004;**58**:280–5.

IMAGES IN PAEDIATRICS.....

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Green teeth

When primary teeth erupted in an 11-month-old male infant with congenital cytomegalovirus infection they were green and had hypoplastic enamel (fig 1). He had been icteric from birth, with a serum bilirubin concentration of 156 $\mu\text{mol/l}$ (72% conjugated) 1 h after delivery. At the age of 9 days, bilirubin concentrations peaked at 497 $\mu\text{mol/l}$ (95% conjugated), remaining >100 $\mu\text{mol/l}$ until he was 6 months old. Serum bilirubin normalised at 13 months of age. When permanent teeth erupted at the age of 6 years, some molars had green pigmentation.

Green teeth are a rare finding in children with neonatal hyperbilirubinaemia due to blood group incompatibility, sepsis-induced cholestasis or biliary atresia.¹ Through direct analysis, the green pigment was shown to be bilirubin,² which seems to be incorporated into enamel and dentin during matrix formation.³ Although it was initially thought that bilirubin levels should exceed 500 $\mu\text{mol/l}$ to induce green staining,⁴ subsequently patients were reported who had had peak bilirubin levels <200 $\mu\text{mol/l}$.¹ As the duration of hyperbilirubinaemia varies widely between patients with green teeth, and many patients with a longer or more intense hyperbilirubinaemia do not have any teeth discolouration, it seems that other factors may determine which patients develop green dental staining

Figure 1 Infant with congenital cytomegalovirus infection showing green teeth and hypoplastic enamel. (A) Primary teeth at 18 months and (B) permanent teeth at 8 years. Informed consent was obtained for publication of this figure.

and which patients do not. This might be related to the density of the matrix, or to individual disturbances in the absorption of calcium, phosphate and fat-soluble vitamins in these patients with cholestasis.⁵

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References

- 1 Guimarães LP, Silva TA. Green teeth associated with cholestasis caused by sepsis: a case report and review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003;**95**:446–51.
- 2 Watanabe K, Shibata T, Kurosawa T, et al. Bilirubin pigmentation of human teeth caused by hyperbilirubinemia. *J Oral Pathol Med* 1999;**28**:128–30.
- 3 Zaia AA, Graner E, de Almeida OP, et al. Oral changes associated with biliary atresia and liver transplantation. *J Clin Pediatr Dent* 1993;**18**:39–42.
- 4 Miller J. The effect of bilirubin on tooth development in the rat. *Arch Oral Biol* 1960;**2**:143–50.
- 5 O'Connor MJ. Mechanical biliary obstruction. A review of the multisystemic consequences of obstructive jaundice and their impact on perioperative morbidity and mortality. *Am Surg* 1985;**51**:245–51.