Influence of mode of delivery on gut microbiota composition in seven year old children

S Salminen, G R Gibson, A L McCartney and E Isolauri

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Notes
serial pH and BiliTeck monitoring, with appropriate therapeutic modification to achieve predetermined end points. Patients who are candidates for laparoscopic fundoplication should have additional PPI therapy, as required, to achieve the same end points. Outcomes should be measured by standard endoscopic assessment and also by examination of a panel of molecular and cellular markers that is important in the pathogenesis of Barrett's adenocarcinoma.

A I Sarela, C S Verbeke, C Pring, P J Guilou
University of Leeds School of Medicine, Leeds, UK

Correspondence to: Mr A Sarela, B 37, Clarendon Wing, Department of Surgery, The General Infirmary at Leeds, Leeds LS1 6LE, UK; a.sarela@leeds.ac.uk

References

Improving hepatitis C services across the UK: response to a walk-in HCV testing service

The Department of Health (DH) estimates that approximately 0.4% of the UK population are chronically infected with hepatitis C virus (HCV) (that is, 200,000 people). As few as 10% of these individuals, who are at risk of end stage liver disease, are thought to be aware of their infection. Clearly, it is required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs (pegylated interferons required to identify and treat these patients with current drugs

Nineteen people attended and two were infected. One of these patients had been lost to follow up due to non-attendance at a local liver clinic.24

Open access confidential hepatitis C testing clinics may play an important role in encouraging people to come forward for HCV testing and may facilitate public education about this important treatable infection. However, these clinics are labour intensive and, in our experience, unlikely to provide a cost effective solution to the identification of people with this treatable, sometimes fatal, infection.

R F C’Souza, M J Glynn, E Alstead, G R Foster
Hepatobiliary Group, Barts and The London, Queen Mary’s School of Medicine and Dentistry, London, UK

Correspondence to: Professor G R Foster, Hepatobiliary Group, Department of Gastroenterology, DDRC, Turner St, London E1 2AD, UK; g.r.foster@qmul.ac.uk

Conflict of interest: Dr Foster acts as a consultant to companies who sell drugs for the treatment of viral hepatitis and has received research funding from such companies. He has received fees from companies who market antiviral therapeutics.

Influence of mode of delivery on gut microbiota composition in seven year old children

Intestinal microbiota development begins immediately following birth.2 The composition of the infant's evolving microbiota is initially defined by the mother, the source of the newborn's first microbial inoculum. Colonising bacteria rapidly adapt to breast milk and epithelial mucins as sources of nutrients.

The prevalence of caesarean section delivery in Western countries is increasing. Caesarean born babies are deprived of contact with the maternal/vaginal microbiota and the first exposure is characterised by a lack of strict anaerobes and the presence of facultative anaerobes such as Clostridium species.3 Caesarean born infants have a more slowly diversifying microbiota, with differences reported from normally born infants, even after six months of age. Arierances in early microbiota acquisition can affect immunophysiological development with a heightened disease risk.2 This study assessed microbiota composition in seven year old children and compared the respective effects of normal delivery and caesarean section.

In all, 60 seven year old children were randomly selected from Southwestern Finland, representing caesarean and vaginal deliveries.2 The children were invited to attend a clinical examination, including skin prick testing and determination of serum total and antigen specific IgE antibodies. Perinatal data were derived from hospital medical records. Questionnaires were completed by the parents to verify a history of allergic symptoms.

Faecal samples were produced at clinical examination and frozen at −70°C for microbiota assessment. Faecal microbiota profiles were determined using the culture independent fluorescent in situ hybridisation method. Probes specific for bifidobacteria, lactobacilli/enterococci, bacteroides, clostridia, and total bacterial numbers were applied.4 Written informed consent was obtained from parents and the study was approved by the ethics committee of the university.

Of the study population, 31 children had been delivered by caesarean section and 29 by vaginal delivery. At seven years of age, significantly higher numbers of clostridia were found in children delivered vaginally compared with caesarean born children (p = 0.0055) (table 1). No differences were observed in other faecal bacteria or total numbers of bacteria (table 1).

Children with asthma diagnosed by a physician (n = 6) had lower numbers of clostridia in their faecal specimens while healthy children (n = 54) had higher clostridial numbers.

Early colonisation guides subsequent microbiota development which may later impact on health, to the extent of predisposing some infants towards specific diseases. Bifidobacteria are considered useful for health promotion. Reported effects are related to the individual “balance” of the gut microbiota and prevention of aberrances within the gastrointestinal tract. Clostridia are generally considered harmful toxin producing species causing diarrhoea and food poisoning.2

Our results show that bifidobacterial levels in the faeces of cohort children were comparable at seven years of age, independent of the mode of delivery at birth, while numbers of clostridia were significantly higher in normally born children seven years after birth. Differences in neonatal gut microbiota in particular the balance between bifidobacterium species and Clostridium species, have been reported to precede heightened production of antigen specific IgE antibodies, a hallmark of the atopic responder type.2 Such differences may be related to external environmental

### Table 1: Numbers of faecal bacteria (log 10 number of bacteria/g faeces) and total serum IgE concentration, and number of children with asthma or atopic dermatitis among seven year old children with a history of normal birth or caesarean section

<table>
<thead>
<tr>
<th>Parameter (concn of specific microbe or total IgE)</th>
<th>Normally delivered</th>
<th>Caesarean born</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total bacteria</td>
<td>11.56 (11.46–11.7)</td>
<td>11.59 (11.5–11.68)</td>
<td>0.61</td>
</tr>
<tr>
<td>Lactobacilli/enterococci</td>
<td>9.07 (8.85–9.3)</td>
<td>9.05 (8.86–9.2)</td>
<td>0.85</td>
</tr>
<tr>
<td>Bifidobacteria</td>
<td>10.32 (10.13–10.5)</td>
<td>10.29 (9.99–10.59)</td>
<td>0.87</td>
</tr>
<tr>
<td>Clostridia</td>
<td>9.29 (9.06–9.51)</td>
<td>8.83 (8.6–9.06)</td>
<td>0.0055</td>
</tr>
<tr>
<td>Total IgE</td>
<td>79 (16–255)</td>
<td>65 (25–160)</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Values are median (interquartile range).

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We read with interest the case described by Sonwalkar et al. We confirmed the diagnosis of CD, which was made earlier in this report. The patient received a liver transplant from a living related donor for chronic liver disease. A 24-year-old female received a liver transplant from a donor with known history of CD. The recipient tested negative for any of the three common CD associated NOD2/CARD15 variants (R702W, G908R, 1007fsinsC) but unfortunately we were unable to screen the liver donor for these polymorphisms. Our case, similar to that described by Sonwalkar et al, raises the intriguing possibility that CD susceptibility may have been transferred to the recipient with liver transplantation as well. Collins et al have reported complete and stable replacement of recipient haematopoiesis and B lymphopoiesis with donor derived cells approximately six weeks following orthotopic liver transplantation for haemochromatosis. T lineage reconstitution also occurred and derived almost exclusively from expansion of mature memory/effector T cells from the transplanted liver. One possibility is that the expanded immune cells have become tolerant to the graft but not to the intestinal luminal antigens leading to the development of CD. Whether liver donor selection should exclude those with a known diagnosis of CD is unclear and is still premature to answer.