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Gastrointestinal microecology in sudden unexpected death of infants

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Literature on the cause of sudden unexpected death of infants is contradictory and does not show a uniform pathogenic mechanism. Therefore, the gastrointestinal microflora from 29 infants who had suddenly died at the age of 2 weeks to 22 months was investigated in 8 sections of the alimentary tract (stomach, upper and lower jejunum, upper and lower ileum, caecum, colon transversum, colon sigmoides). The following 14 germ groups were determined qualitatively and quantitatively (Haenel, 1960; Bendig, 1967): total aerobes and total anaerobes, bifidus, bacteroides, coli, Klebsiella-Enterobacter and Proteus groups, aerobic lactobacilli together with streptococci, staphylococci, aerobic spore-forming germs, yeasts, pseudomonads, Salmonella together with Shigella and lecithinase-positive clostridia.

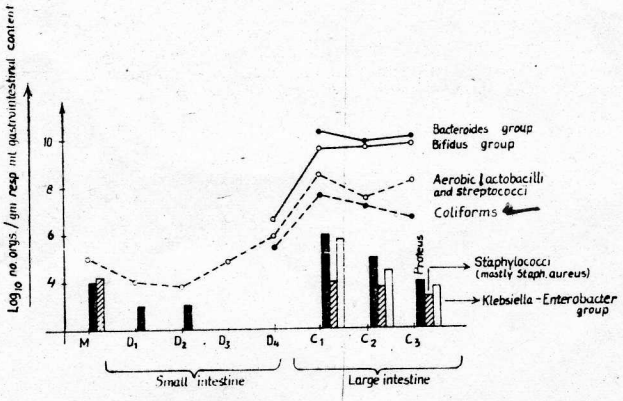
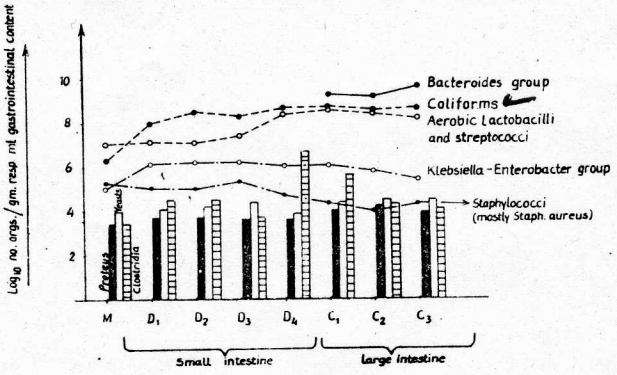


Fig. 1 (above). Gastrointestinal microecology of an infant with eubiotic relations. M = stomach; D_1 = upper jejunum; D_2 = lower jejunum; D_3 = upper ileum; D_4 = lower ileum; C_1 = caecum; C_2 = colon transverse; C_3 = colon sigmoides.

Fig. 2 (below). Gastrointestinal microecology of 21 infants with dysbiotic relations (average counts of micro-organisms). Symbols as in Figure 1.



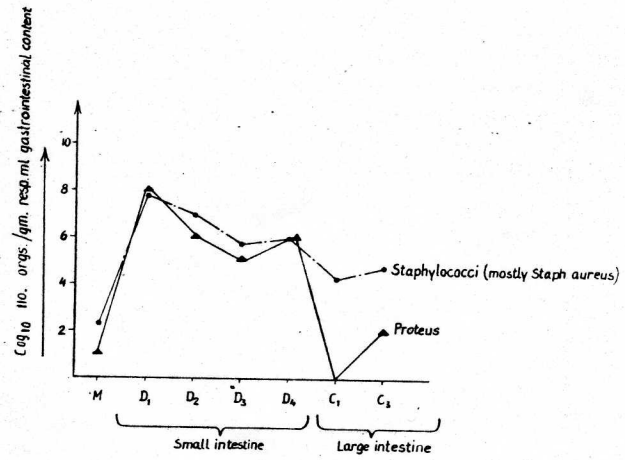


Fig. 3. Gastrointestinal microecology of an infant showing dysbiosis with high counts of *Staph. aureus* and Proteus. Symbols as in Figure 1.

At the dissection the anatomical substratum of toxic dyspepsia, referring to an enteric infection, was observed in 24 of the 29 infants.* Before dissection the dead bodies had been stored 6–24 hours, the bacterial cultivation followed dissection after approximately 8 hours. In spite of the long period between death of the infants and preparation of material, microecological results allowed conclusions with respect to the relations of microflora during lifetime, following the criteria of normal and abnormal intestinal microecology, respectively (Cregan and Hayward, 1953; Dixon, 1960; Haenel, 1965; Bornside *et al.*, 1966; Drasar *et al.*, 1969). Only in 3 infants did there exist normal, eubiotic relations: none or only small counts of micro-organisms in the stomach and small intestine contents, predominance of obligate anaerobes ($> 90\%$) in the large intestine with approximately equal parts of the bacteroides-group (obligate, gram-negative anaerobes) and bifidus group (obligate, gram-positive anaerobes, mostly *L. bifidus* after Bergey), less than 5% of aerobes and very small parts ($< 0.01\%$) of Proteus, staphylococci and of the Klebsiella-Enterobacter group (Fig. 1).

In 21 cases a disturbed, dysbiotic microbial flora was found throughout the intestinal tract: high counts of fecal germs in stomach and small intestine, absence or low counts of bifidus group in the large intestine, approximately equal high counts of bacteroides group and aerobic bacteria, mainly coliforms, streptococci or aerobic lactobacilli (Fig. 2). In conjunction with these criteria, the incidence of facultative pathogenic bacteria – partly in high counts – as well as coli serotypes, described to be pathogenic for infants, was relatively fre-

* We wish to thank Dr. Möbius, Institute of Pathology, Schwerin, for the experimental material.

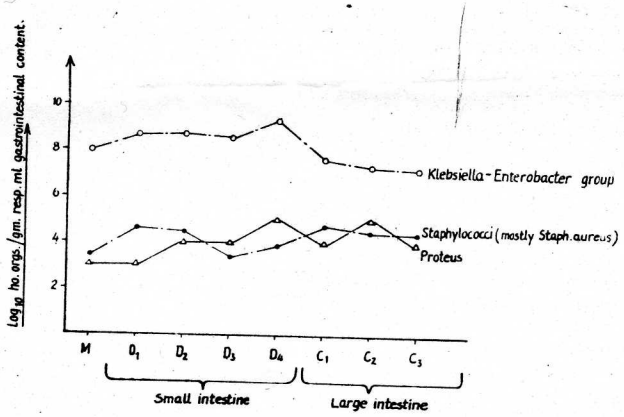


Fig. 4. Gastrointestinal microecology of an infant showing dysbiosis with high counts of Klebsiella-Enterobacter group. Symbols as in Figure 1.