Technique

Collection of samples of intestinal juices in infants and children with a new device avoiding contamination¹

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In recent years the intestinal microflora has been widely investigated in man, in illness as well as in health, with the aim of finding an aetiological explanation for some protracted infective diarrhoeas with negative stool cultures. Three types of technique are commonly used: direct needling at operation (Creagan and Hayward, 1953), peroral intubation, or aspiration of intestinal fluids using tubes, either

left open or protected by various devices. None of the devices used to avoid contamination proved satisfactory (Shiner, Waters, and Gray, 1963). The variety of methods may account for the contradictory results. Few studies relating to children have been published (Barbero, Runge, Fischer, Crawford, Torres, and György, 1952; Anderson and Langford, 1958; Bishop and Anderson, 1960; Lifschitz, Coello-Ramirez, and Gutiérrez-Topete, 1970) and most of them investigate the duodenum and proximal jejunum but as none protect the tubes, the results are open to doubt.

We wish to describe a new technique which allows simultaneous and uncontaminated sampling of intestinal aspirates at several levels of the gastro-intestinal tract. The new device is designed by joining three or four single-lumen radioopaque tubes of different lengths and of 1.5 mm external diameter (Portex radioopaque PVC tubing 800/023/100). The distal ends of the tubes are hermetically sealed by inserting an inner cap of the same material; a rubber balloon containing 0.5 ml mercury is attached to the cap of the longest tube (fig. 1).

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Fig. 1 A view of the multiple-lumen tube. An inner cap is attached to each distal end. The longest tube is loaded with a rubber balloon.

After sterilization, the multiple-lumen tube is passed through the nose of the fasting child and allowed to progress by peristalsis as far as the required level of the intestine (the ligament of Treitz in approximately 20 minutes and the ileum in less than four hours in the younger children). The position of the tubes is controlled fluoroscopically. The injection of 2 ml air through the proximal ends results

Fig. 2 In vitro experiments to test the impermeability of the tube.

- A *Klebsiella pneumoniae* in the nutrient broth.
- B The contents of the tube remain sterile.
- C The nutrient broth remains sterile.
- D *Klebsiella pneumoniae* still present in the tube.
- E Bacterial growth is not inhibited by the tube.
- F No growth even when a germicidal solution has been used.

in ejecting the distal caps and opening the distal ends of the tubes.

The device was tested *in vitro* and proved to be impermeable (fig. 2, A to D): a closed distal end of one tube, containing sterile saline, was placed in a pure culture of *Klebsiella pneumoniae* in nutrient broth and incubated for 48 hours at 37°C. Thereafter, Petri plates were inoculated either with the nutrient broth (fig. 2A) or with the contents of the tube (fig. 2B): a fair growth on the former, and no growth was noticed in the latter. A pure culture of *Klebsiella* was injected in the distal end of a tube which was closed afterwards, and incubated in a sterile nutrient broth for 48 hours at 37°C. The Petri plate inoculated with the broth remained sterile (fig. 2C) whereas the one inoculated with the contents of the tube showed moderate growth of *Klebsiella* (fig. 2D). No bactericidal effect of the tubes was observed (fig. 2E) even when a germicidal solution (HAC) was used before the tube was sterilized (fig. 2F). This new device proves to be impermeable *in vitro*, allows simultaneous collection of intestinal juices, and avoids contamination of the samples by microflora present at upper levels of the gastrointestinal or respiratory tracts through which the tubes have passed.

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