ing hyperpolarisation produced by such an effect would then act as a stimulus, augmenting Cl^- secretion by increasing the driving force for Cl^- exit through already active apical Cl^- channels. If this Cl^- channel is defective in jejunal enterocytes from cystic fibrosis patients then an alternative explanation for the calcium ionophore effect can also be based on activation of K^+ channels. This activation would in itself be reflected in a transient increase in short circuit current, produced by basolateral K^+ exit, until a new steady state of intracellular K^+ is attained. Another possibility is that the hyperpolarisation ensuing from K^+ channel activation could act to increase Na^+ absorption by increasing the driving force for an apical electrogenic Na^+ entry mechanism.

The fact that Necturus small intestine enterocytes possess a channel with comparable properties to those reported to be defective in cystic fibrosis airway epithelium suggests that defective regulation of this channel in mammalian enterocytes could explain the results of Taylor *et al.* This possibility needs to be examined in future work carried out at the molecular level.

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Reply

SIR,—Sepúlveda *et al* suggest that the ability of the Ca^{2+} ionophore A23187 to increase the short circuit current (SCC) across jejunal biopsies from children with cystic fibrosis (CF) may not represent a response of luminal Cl^- channels to a rise in intra-cellular Ca^{2+} . This is based on patch clamp studies of Necturus enterocytes where luminal Cl^- channels fail to respond to changes in cytosolic Ca^{2+} concentration.¹ Their view that human Cl^- channels behave in the same way is supported by a single patch clamp study of the apical membranes of airway epithelial cells from CF patients where similar Ca^{2+} -independent Cl^- channels have been demonstrated.² Another study however, using the same tissue has identified Cl^- channels that can be activated by increased cytosolic Ca^{2+} both in the cell attached recording mode (by applying A23187) and in excised cell-free membrane patches.³ Thus there is as yet no consensus on the properties of the Cl^- channels that are activated when secretion is stimulated.

Sepúlveda and colleagues attribute the increase in SCC observed with A23187 in jejunal biopsies to a hyperpolarisation of the basolateral membrane resulting from the activation of Ca^{2+} -dependent K^+ channels, as in the airway epithelium patch clamp studies have indicated that these channels operate normally in CF.² When the transepithelial SCC of the airway is measured however, no increase is observed in response to secretagogue challenge, nor is a hyperpolarisation of the basolateral membrane detected.⁴ In the normal small intestine, secretagogues such as acetylcholine and prostaglandin E_2 increase basolateral K^+ conductance,⁵ but these agents fail to elicit a SCC response from CF jejunal biopsies.⁶ Such observations suggest that K^+ channel activation alone does not lead to an increase in transepithelial electrical activity and so cannot explain the response of CF jejunal tissue to A23187.

Additional evidence for our suggestion that the mechanism for raising intracellular Ca^{2+} might be impaired in CF comes from experiments with BaCl_2 . This agent, in spite of acting as a K^+ channel blocker, elicits a net fluid secretion and an associated rise in SCC in the normal intestine,^{7,8} an effect that can be attributed to its ability to release Ca^{2+} from intracellular stores. BaCl_2 also increases the SCC genera-

Figure Responses of jejunal biopsies from control (○) and CF (●) children to 5 mM BaCl₂. The SCC for each tissue is shown before the addition of BaCl₂ and at the peak of the response. The mean (1 SE of the mean) was 12.5 (3.6) (6) $\mu\text{A}/\text{cm}^2$ for control biopsies and 10.5 (3.1) (4) $\mu\text{A}/\text{cm}^2$ for CF biopsies ($p > 0.05$).

ted by jejunal biopsies from CF children (Figure), an effect that was not significantly different from the response obtained in biopsies from a control group.

It therefore appears that the increased SCC across CF jejunum induced by A23187 is unlikely to result from the opening of basolateral K⁺ channels alone, but could represent a Cl⁻ secretory response brought about by the elevation of intracellular Ca²⁺. Patch clamp analysis of the luminal membranes of enterocytes affected by CF would provide a more definitive answer to this problem.

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News

International Bilirubin Workshop

This workshop will be held in Trieste, Italy, 6–8 April, 1989. For inquiries and registration forms contact either of the Directors: Claudio Tiribelli, MD, Istituto Patologia Medica, University of Trieste, 34100 Trieste, Italy. Tel: (40)-776-4525, Fax: (40)-910-690; or J Donald Ostrow, MD, V.A. Lakeside Medical Center, 333 East Huron Street, Chicago, IL 60611, USA. Tel: (312)-943-6600, Ext 358, Fax: (312)-908-0365.

31st International Congress of Physiological Sciences

Will be held in Helsinki, Finland, on 7–14 July, 1989. Information from The Congress Secretariat, PO Box 722, SF-00101 Helsinki, Finland. (Telefax: 358–0–611 188).

Correction

24 h Intragastric acidity and plasma gastrin concentration . . . Lanzon-Miller *et al.* October 1988 issue pp 1364–9. The fourth column in Figures 3 and 4 should be correctly labelled ranitidine 300 mg.