REGULATION OF AIRWAY CILIARY BEAT FREQUENCY BY POTASSIUM AND CALCIUM ION CHANNELS

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Different functions of our body are under the control of ion channels, which play an important role in maintaining effective mucociliary clearance. But mechanisms regulated the ciliary beating are not fully understood at present. Therefore the purpose of this experimental study was to determine and compare the roles of K_{ATP}, BK_{Ca}, and CRAC ion channels in the control of ciliary beat frequency (CBF) of healthy as well as ovalbumin-sensitized guinea pigs.

The study was performed on the cilia freshly isolated from the tracheas of animals using brushing technique. The ciliary beating was recorded by high speed camera attached to a microscope. To clarify the regulatory roles of ion channels in ciliary motion, agonists and antagonists of potassium and calcium ion channels related to the CBF have been used.

CBF was significantly increased by pinacidil (10^{-5} - 10^{-6} mol.l^{-1}), K_{ATP} channel agonist, but reduced after the blockade of CRAC ion channels by 3-fluoropyridine-4-carboxylic acid (10^{-5} - 10^{-7} mol.l^{-1}) in physiological conditions. Under allergic inflammatory conditions, the opposing effect of K_{ATP} ion channels on allergen-induced increase in CBF was confirmed, while only a moderate decrease in the CBF with CRAC ion blocker. BK_{Ca} ion channels failed in CBF regulation.

Our results support the changes in regulatory roles of K_{ATP} and CRAC ion channels related to ciliary movement under the allergic inflammatory conditions of the airways.

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