Reprinted from THE JOURNAL OF ALLERGY AND CLINICAL IMMUNOLOGY, St. Louis
Vol. 86, No. 2, P. 274, August, 1990 (Printed in the U. S. A.)

Role of calcium in airway reactivity and asthma

To the Editor:

The recent article, "Sensitization alters contractile responses and calcium influx in human airway smooth muscle," (J ALLERGY CLIN IMMUNOL 1989;440-7) by Black et al.[1] has further contributed to the hypothesis that some alteration in the regulation of airway smooth muscle calcium may contribute another mechanism to bronchial hyperresponsiveness.

The possible role of an abnormality in smooth muscle calcium homeostasis in the pathogenesis of airway reactivity was first reported by Weiss and Viswanath in 1979.[2] We have extended our initial observation of an acquired alteration in calcium metabolism after in vitro anaphylaxis to implicate a role of toxic oxygen products in this process. Both enhanced myorelaxation in a $(Ca^{++})_E$-free medium and a leukotriene (LTD_4)-induced synergism to histamine contractures (under physiologic 2.5 mmol/L and 0 mmol/L extracellular calcium conditions) were significantly inhibited by superoxide dismutase in guinea pig trachealis.[3, 4] Both LTD_4 and superoxide anion (O_2^-) have been demonstrated to be generated during experimental airway anaphylaxis.[5] Moreover, in children with asthma, leukocyte release of histamine was demonstrated to be significantly correlated with O_2^- generation.[6]

It is of interest that the studies of Black et al.[1] and other investigators[7] reveal a somewhat different phenomenon, that is, an enhanced myocontractility to agonist histamine and an involvement of the calcium voltage-dependent channel to depolarizing KCl after passive sensitization without requiring active immunogenic anaphylaxis. Given the experimental protocol of Black et al.,[1] it would have been of some interest to retest the cited agonists in their system after specific *Dermatophagoides farinae* challenge.

Collectively, the current observations suggest a possible direct role for a smooth muscle calcium alteration contributing to airway hyperresponsiveness, as occurs in asthma. A major element of smooth muscle tension development is an increase in intracellular calcium after a variety of chemical, electrical, or mechanical stimuli. However, a multiplicity of calcium mobilizing pathways can be involved in regulatory processes that influence smooth muscle tension and reactivity. Additional studies are clearly indicated to clarify the role of calcium in human airway reactivity; studies by Black et al.[1] have further contributed to an exciting area of interest.

Earle B. Weiss, MD
Senior Research Scientist (Pulmonary)
Department of Anesthesia
Research Laboratories
75 Francis St.
Boston, MA 02115

REFERENCES

1. Black JL, Marthan R, Armour CL, Johnson PRA. Sensitization alters contractile responses and calcium influx in human airway smooth muscle. J ALLERGY CLIN IMMUNOL 1989;84:440-7.
2. Weiss EB, Viswanath S. Calcium hypersensitivity in airway smooth muscle: isometric tension responses following anaphylaxis. Respiration 1979;38:266-72.
3. Weiss EB. Toxic oxygen products alter calcium homeostasis in an asthma model. J ALLERGY CLIN IMMUNOL 1985;75:692-7.
4. Weiss EB, Bellino JR. Leukotriene-associated toxic oxygen metabolites induce airway reactivity. Chest 1986;89:709-16.
5. Weiss EB, Bellino JR. Superoxide anion generation during airway anaphylaxis. Int Arch Allergy Appl Immunol 1986;80: 211-3.
6. Neyens HJ, Raatgreep RE, Degenhart HJ, Duiverman EJ, Kerrebijn KF. Altered leukocyte response in relation to the basic abnormality in children with asthma and bronchial hyperresponsiveness. Am Rev Respir Dis 1984;130:744-7.
7. Souhrada M, Souhrada JF. Immunologically induced alterations of airway smooth muscle cell membrane. Science 1984;225: 723-5.