

European Investigators Identify Potential Cause of Asthma in Swimmers

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By Cameron Johnston

BERLIN, GERMANY -- September 28, 2001 -- European investigators at two different centres have identified what might be the trigger that causes asthma in swimmers more than many other athletes.

During the Olympic Games held in Australia, last year, it was reported that more than one-quarter of the American swim team suffered from some degree of asthma. In separate presentations at the European Respiratory Society meeting, held this week in Berlin, Dr. K. Thickett, of the Occupational Lung Diseases Unit at the Birmingham Heartlands Hospital, Birmingham, England, said it is not only the exposure to the chlorine that is the culprit causing asthma in swimmers. More important, she said, is the chemical reaction that occurs when chlorine comes into contact with sweat and urine, and releases derivatives such as aldehydes, halogenated hydrocarbons, and chloramines.

As part of Dr. Thickett's study, three employees of a local public swimming pool who complained of asthma-like symptoms were subjected to chloramine challenge tests in which, in the lab setting, they were exposed to roughly the same amounts of chloramine as they would be exposed at work (i.e., around the swimming pool, close to the surface of the water). Measurements of nitrogen trichloride were taken 15 points around the pool, 1 meter above the surface of the water.

When exposed to equivalent amounts of the chemical in the lab, the three subjects all experienced significant reductions in forced expiratory volume in one second (FEV1), and high measurements on their Occupational Asthma Expert System (OASYS) scores, a measurement of asthma and allergy severity. "Our results show, indeed, that nitrogen trichloride is a cause of occupational asthma in swimming pool workers like lifeguards and swim instructors." "We used to think that chloramines caused only eye and throat irritation, and while other studies have hinted that there might be a connection between chloramines and respiratory irritation, this is the first to demonstrate a causal effect on the basis of a bronchial challenge test."

In Dr. Thickett's study, each of the subjects either stopped taking inhaled corticosteroids altogether, or their asthma symptoms resolved significantly once they were placed in other occupations away from the swimming pools.

Meanwhile, investigators in Belgium and Australia presented research showing that exposure to such chloramines greatly increases permeability of the lung epithelium. In the study presented by Dr. Simone Carbonnelle, of the industrial toxicology and occupational medicine unit at the Catholic University of Louvain, in Brussels, 226 otherwise healthy school children, mean age 10, were followed to determine how much time they spent around swimming pools, and the condition of their lung epithelium.

As with the British study, chloramines in the air around the surface of the pool were measured. In addition, three specific proteins were measured in the children: SF-A and SF-B (surfactant A and B) and Clara cell protein 16 (CC16). Surfactant A and B are lipid-protein structures which enhance the bio-physical activity of lungs, lessening surface tension in the lung epithelium and preventing the collapse of the alveoli at the end of expiration. Anything that impairs the function of these surfactants will clearly impair lung function as well, because it makes the epithelium more permeable.

The children in Dr. Carbonnelle's study were exposed to air around the school swimming pool for a mean of 1.8 hours per week. It was then observed that there was a significant variance in the levels of SF-A and SF-B as well as CC16 that were directly proportional to the amount of time the children spent around the pool. For SF-B, the variance was 11.6 percent, which according to Dr. Carbonnelle, would be the equivalent of what she would expect to see in a heavy smoker.

The variation in lung surfactants persisted whether the children lived in a rural area or in the city, and whether they were from upper income, or less well-off families, she added. "These findings suggest that the increasing exposure to chlorine-based disinfectants used in swimming pools and their by-products might be an unsuspected risk factor in the rising incidence of childhood asthma and allergic diseases," she said.

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