

Acute exposure to disinfection by-products in swimming pools and short-term changes in respiratory biomarkers

Cristina M Villanueva^{1,2,3}, Laia Font-Ribera^{1,2}, Federico P Gómez⁴, Esther Barreiro², Jan-Paul Zock^{1,2,3}, Mark J Nieuwenhuijsen^{1,2,3}, Dick Heederik⁵, Ricard Marcos⁶, Joan O Grimalt⁷, Manolis Kogevinas^{1,2,3,8}

- (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain
- (2) Municipal Institute of Medical Research (IMIM-Hospital del Mar), Barcelona, Spain
- (3) CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain
- (4) Hospital Clínic, Barcelona, Spain
- (5) Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, Netherlands
- (6) Mutagenesis Research Group, Universitat Autònoma de Barcelona, Spain
- (7) Institute of Environmental Assessment and Water Research, CSIC, Barcelona, Spain
- (8) Department of Social Medicine, Medical School, University of Crete

Synopsis

Exposure to disinfection by-products in swimming pools has been associated with respiratory symptoms suggestive of asthma and/or altered levels of lung proteins (1-3). Evidence is inconclusive and mechanisms are not well understood.

We measured biomarkers of lung inflammation (exhaled nitric oxide - FE_{NO} -), oxidative stress (8-isoprostane in exhaled breath condensate), lung permeability and immunological response (surfactant protein -SP-D- in serum), lung damage (Clara cell protein -CC16- in serum) and lung function in 48 non-smoking non-asthmatic volunteers before and after swimming during 40 minutes in a chlorinated pool. Lifestyle data was collected through questionnaires. We took daily water and air samples to measure trihalomethanes (THM) and chloramines. THM in exhaled air was measured before and immediately after the exposure.

Study subjects were exposed with an average increase of THM in exhaled air of 800%. Geometric mean CC16 levels before and after swimming were respectively 5.11 and 5.54 μ g/l, average increase 8%, N=48, paired Wilcoxon test p-value=0.03. This increase was more pronounced in individuals who had swum 1000 meters or more (13% increase, p-value 0.004, N=24). Levels of SP-D, FE_{NO} , 8-isoprostane, and lung function did not change after swimming.

In summary, results point towards an acute respiratory epithelial injury through CC16 not observed on other biomarkers.

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