European Respiratory Society
Annual Congress 2013

Abstract Number: 7045

Publication Number: P4973

Abstract Group: 4.1. Clinical respiratory physiology, exercise and functional imaging

Keyword 1: Sport **Keyword 2:** Lung injury **Keyword 3:** Environment

Title: Comparison of airway damage after swimming and indoor cycling in swimmers

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Body: Background : The respective roles of exercise ventilation and chlorine byproducts inhalation on the development of airway disorders observed in competitive swimmers remain to be determined. Aim : To compare the effect of an exercise performed in a chlorinated swimming pool and on an bicycle at a same heart rate on pulmonary epithelium in swimmers. Methods : Changes of pneumoproteins (surfactant-associated protein D (SP-D) and Clara cell protein (CC16)) were measured in the serum of 17 swimmers (19±3 years) before and 10 min after two identical training sessions: swimming (S) and cycling (C) sessions. Both sessions were performed at the same heart rate (166±7 b.min-1), at the same hour of the afternoon, and separated by at least one day. The total duration of each training was 41±1min, constituted of 6 to 8 repetitions of exercise periods (mean duration: 316±19sec) separated by one minute rest. A spirometry was performed before and 5 min after each session. During S, trichloramines varied from 0.2 to 0.5 ppm in the water and from 0.4 to 1.2 mg.m-3 in the air. Results : No swimmers had a bronchoconstriction after S or C. No significant difference in serum CC16, SP-D, CC16/SP-D was observed at rest before S and C. The SP-D and CC16 were significantly increased in blood after S ($p<0.0001$) and C ($p<0.05$), but the ratio CC16/SP-D was significantly increased after S only ($p=0.002$). The variation was greatest after S than after C, for CC16 (mean relative increase after S: 105% vs C: 80%, $p=0.002$) and SP-D (mean relative increase: 28% after S and 12% after C, $p=0.01$). Conclusion : Our study suggests that exercise induces airway damage, probably increased by chlorine by-products inhalation.