

Work environment and health risks in plastic industry



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Introduction

Some work environments can greatly affect human health. The industry-based cross sectional studies on non-asthmatic eosinophilic bronchitis and obstructive airway disease demonstrate that work-related pathogenic factors may be responsible for 5%–30% of workers contracting this disorder depending on the industry (Becklake et al., 1999; Blanc and Toren, 1999; Kogevinas et al., 1999; Arif et al., 2002; ...). Pollutants cause inflammation, which is associated with chronic airways inflammation and structural remodeling which may contribute to the clinical symptoms of Chronic Obstruction Pulmonary Disease (COPD) (De Boer, 2002; Chovan, 2003). Phthalate diesters have been used commercially in a large variety of industrial and consumer applications, especially in plastic industry as plasticizers in polymers, primarily in Polyvinyl-Chloride. These plasticizers have been shown to elute at a constant rate from plastic products to the environment (Latini, 2005). The work environment can greatly affect human health, especially where the human organism is also exposed to negative effects in their living environments.

Materials and methods

A cross-sectional study was conducted in an environmentally exposed group (n = 15; average age 44.8 ± 11.34) from the manufacture of plastic material in Nitra. Personal questionnaire contain information about life style, including cigarette consumption (p/y) and objective assessment of health condition.

Anthropometry and somatometry

Anthropometric measurements were realized by standardized anthropological methods and included weight, height, body mass index (BMI), body circumference (waist, hip), waist to hip ratio (WHR), visceral fat, fat mass index (FMI) and fat-free mass index (FFMI).

Spirometry

Spirometry was performed at room temperature by Spirolab II and Winspiro PRO software (spirometry tests: Forced Vital Capacity, Slow Vital Capacity and Maximum Voluntary Ventilation). The European Respiratory Society predicted values (ERS) were used to calculate “normal” spirometry values. The best test result was determined following the ERS and ATS standards (American Thoracic Society), and FEV₁, FVC and PEF parameter reproducibility was also calculated.

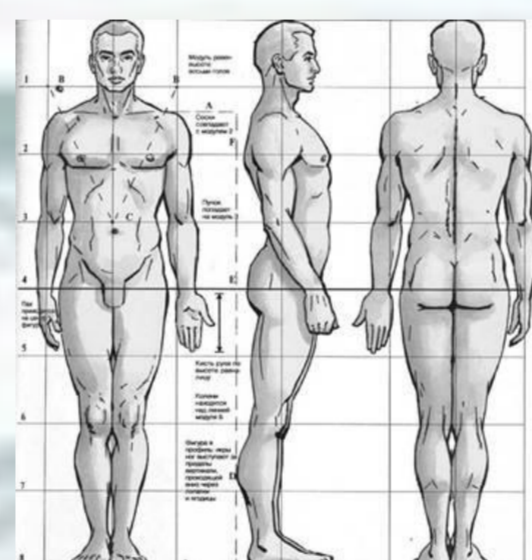
Proband's participation in this study was entirely voluntary and informed consent was required.

Results

In a cohort were detected COPD symptoms in 13.3 % of probands (n = 2, average p/y = 12.5). Overweight, based on BMI ≥ 25, was detected in 53.3 % of subject (n = 8; 62.5% of female; 37.5 of male). The women registered a high WHR value of 0.87 ± 0.07, whereas men had moderate to values at 0.96 ± 0.04.

Visceral fat level (10.67 ± 2.08 for man; 7.45 ± 3.05 for women) reached low risk; FMI value was high (6.3 ± 0.9 for men; 10.82 ± 5.0 for women). Meanwhile the FMI for the women was higher their FFMI was in the normal reference values, with 16.35 ± 1.41. FFMI in men was in the high reference value 19.88 ± 0.65.

The results show on negative effects of work environment with higher exposition of environmental burdens on the state of human health.



Parameter	♂ (n=3)	♀ (n=12)	(n=15)
Age	51.67±10.12	43.04±11.36	44.8±11.34
WHR	0.96±0.04	0.87±0.07	0.89±0.08
Visceral fat level	10.67±2.08	7.45±3.05	8.14±3.11
FMI	6.3±0.9	10.82±5.0	9.91±4.82
FFMI	19.88±0.65	16.35±1.41	17.06±1.94
BMI	26.27±1.36	27.44±6.27	27.21±5.6
FVC	4.02±0.34	3.17±0.4	3.86±0.59
% PV FVC	116.78±8.03	116.78±21.17	116.78±19.01
FEV ₁	3.66±0.10	2.85±0.45	3.02±0.52
%PV FEV ₁	113.3±13.42	106.74±23.56	108.05±21.67
FEV ₁ /FVC	78.7±3.62	78.17±7.72	78.21±6.98
%PV FEV ₁ /FVC	100.61±6.77	97.17±9.67	97.86±9.06
VC	4.43±0.19	3.52±0.5	3.7±0.59
%PV VC	106.28±5.51	113.07±23.58	111.71±21.19
p/y	1.67±2.89	2.42±4.98	2.27±4.56

Conclusion

We hypothesize that occupational exposure in the manufacture of plastics materials in specific type of work environment could affect selected parameter. Because of the potential human toxicities of phthalates, internal dose measurements of phthalates are necessary for exposure and risk assessment. To determine possible involvement of phthalates on human health, a 2x2 mL urine sample was collected from each subject and stored at -75 °C, which are currently being investigated by HPLC MS/MS.