

# Comments on the Respiratory Exposure to Toxic Gases and Metal Fumes Produced by Welding Processes and Pulmonary Function Tests

Hamed Jalilian

*Dear Editor,*

I read with interest the article recently published in *The IJOEM* on respiratory exposure to toxic gases and metal fumes produced by welding processes by Mehrifar, *et al.*<sup>1</sup> This paper has reported respiratory symptoms among welders and supported by field measurements of welding gases and fumes. However, there are certain issues that need to be addressed.

This study has conducted on a small population of welders. Under such circumstances, controlling all confounding variables is necessary to minimize bias. Nevertheless, several confounders were not controlled. For example, alcohol consumption, a variable with well-documented effects on the respiratory system has not been controlled at all.<sup>2</sup> Additionally, although the authors excluded smokers, it was not clear whether the study participants were past/second smokers or not. Moreover, although the authors report no significant difference ( $p_{\text{age}} = 0.13$ ,  $p_{\text{weight}} = 0.20$ ) between demographic characteristics of cases and controls, the age and weight have clear direct effects on respiratory functions,<sup>3-5</sup> and should be controlled

by statistical methods.

The most important weakness of this study, however, was the way gases and fumes were measured. At first, the authors state that the concentration of magnesium has been measured (page 43, Metal Fumes and Gases section) but no comments on this issue could be found throughout the manuscript, neither in the Results nor in the Discussion. The second point is about air sampling zone, where the elements and gases were captured. The authors expressed that the air samples were collected from the “respiratory tract.” However, for obvious reasons, such a measurement is neither possible nor ethical to do so. Probably, this is just a misspelling and it has to be corrected to the “berating zone.” The third point, and the most important one, is that the authors do not declare how many samples and for how long were collected from welders. Generally, air-sampling time has a direct relationship to the minimum and maximum required air volume, but there is no statement about none of these important points.<sup>6</sup> Recently, the Occupational Safety and Health Administration (OSHA) has published a guideline for air sampling, indicating in-site air moni-

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Department of Occupational Health Engineering, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran



Correspondence to  
Hamed Jalilian, PhD,  
Department of Occupational Health Engineering, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran  
E-mail: jalilianh@hotmail.com  
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toring strategies, and any occupational air sampling must use one of the approaches mentioned therein.<sup>7</sup> On the other hand, recording the sampling times is important for the calculation of time-weighted average exposure of workers—the most important index for comparison of results with the threshold limit values (TLV). The authors have not calculated this index, have not compared the mean value to TLV, and incorrectly concluded that the welders' exposures were beyond the TLV. This big mistake has affected the whole document, their results and discussion.

Finally, the concentration of fumes or gases has not been measured in the control group. This is necessary as the authors claim that the control group has had no exposure to these pollutants and that the expected outcomes have been caused by the exposure.

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## Authors' Reply

**Dear Editor,**

The shipbuilding industry in Iran is not a common industry and there are just a few welders working in this sector in each work shift. Therefore, access to all industry welders is practically not possible and we had to stick to the number of welders studied. Furthermore, the number of welders studied in most reports is in the same range.<sup>1-4</sup>

Drinking alcoholic drinks in Iran is illegal and thus, consumers are very unlikely to report it. In this study, in a briefing held for workers to clarify stages of the study, we noted that those consuming alcoholic beverage should not participate in this study. This is an unfortunate fact that most of the participants of studies conducted in Iran refuse to report alcohol consumption, if any, for legal and cultural reasons.

We excluded smokers from the study. The main factor is in fact, lack of smoking, not the duration of smoking.

We did not mean to investigate the relationship between age, weight, and respiratory function. That is why we do not mention such a relationship in the article. In addition to weight and age, other items such as exercise and physical fitness also affect the person's respiratory function. In field and human studies, there are many confusing factors including psychological and personality factors that may affect the outcomes. Controlling of all these factors is obviously impossible.

We measured the total fume and six

metals, ie, chromium, manganese, zinc, copper, iron, and aluminum. In the final version, during the translation process, zinc was mistakenly mentioned as magnesium. In all Tables related to fumes, it is “zinc,” which is correct.

Air samples were taken from the respiratory zone of the welders, a region between 15 and 23 cm in front of individuals' shoulders (according to OSHA) using a cellulose ester filter. In the article the “respiratory tract” mentioned in the Abstract and Materials and Method should have been read as “respiratory zone.” This was a translation mistake.

Since this study was the exposure of welders during the work shifts, we therefore calculated the time-weighted average (TWA) of welders' exposure during the shift using the following equation:

$$TWA_{mg/m^3} = \frac{\sum_{i=1}^8 C_i T_i}{8}$$

Where, TWA is the weighted averaging time during the shift (mg/m<sup>3</sup> or ppm), C<sub>i</sub> is the concentration of the measured material at a certain time T<sub>i</sub>.

The welders spent some time for having breakfast and lunch, and doing prayers and activities other than welding tasks (eg, collecting and delivering parts). The welders work on welding from 8:00 to 10:00, from 10:45 to 12:30, and from 14:00 to 16:00. At each interval, concentrations and sampling time were calculated, and according to the above formula, the time weighted average of welders during the eight-hour shift was calculated. The reported numbers in the Table is TWA, which are compared to the threshold limit value (TLV). The above-mentioned procedures have not been included in the article because of the limited number of words in the body of the article in accordance to the journal standard. As in most studies, they refrain from

mentioning the details of these steps.

Regarding the lack of sampling gas and fume in the workplace air of the control group, it should be said that

The control group included administrative staff whose office building was far away from the welders' workplaces. The controls place had a good ventilation system. Therefore, there was no need of air sampling for the measurement of gas and fumes. In this study, the prevalence of respiratory and spirometric symptoms in the control group was also determined. The results showed normal pulmonary status. In many studies, concentrations of fume are not measured for the control group.<sup>6-9</sup>

Younes Mehrifar<sup>1</sup>, Zahra Zamanian<sup>2</sup>, Hamideh Pirami<sup>3</sup>

<sup>1</sup>Student Research Committee, School of Health Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

<sup>2</sup>Department of Occupational Health, School of Public Health, Shiraz University of Medical Sciences, Shiraz, Iran.

<sup>3</sup>Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran.

E-mail: hamide\_pirami@yahoo.com

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