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Concentration of Alpha Fetoprotein and Beta-Human Chorionic Gonadotropin Tumor Markers in Sulfur Mustard-Exposed Veterans

Mohammad Rafiee¹, Yunes Panahi²,
 Mohammad Yousef Alikhani³,
 Hassan Rafieemehr¹, Alireza Saadat²,
 Mohammad Abbasi⁴

¹Department of Medical Laboratory Sciences, School of Paramedicine, Hamadan University of Medical Sciences, Hamadan, Iran

²Chemical Injuries Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

³Microbiology Department and Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

⁴Department of Internal Medicine, Hamadan University of Medical Sciences, Hamadan, Iran



Correspondence to
 Mohammad Yousef
 Alikhani, PhD, Microbiol-
 ogy Department and
 Research Center for
 Molecular Medicine,
 Hamadan University
 of Medical Sciences,
 Shahid Fahmideh Street,
 Hamadan, Iran
 Tell: +98-81-3838-0755,
 E-mail: alikhani43@
 yahoo.com
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The most recent prominent use of sulfur mustard (SM) occurred during the Iraq-Iran war with more than 100 000 victims left behind suffering various complications for years.¹ Exposure to SM causes serious problems most importantly ophthalmic, respiratory and skin diseases.² It also increases the incidence of various malignancies.³ Different mechanisms such as alkylation of macromolecules like DNA, induction of excessive DNA repair, oxidative stress, and disrupted cell signaling have been proposed as the underlying causes of the observed signs and symptoms after SM exposure.⁴ A study of the long-term effects of exposure to SM gas on workers in SM manufacturing factories show that the risk of cancer and mortality due to SM exposure is almost five times higher among these workers.⁵ The International Agency for Research on Cancer (IARC) classifies SM as a carcinogen and a risk factor for lung cancer.⁵

Alpha fetoprotein (AFP) and beta-human chorionic gonadotropin (β -hCG) are two important tumor markers for the diagnosis and monitoring various malignancies. We conducted this study to determine

the concentrations of AFP and β -hCG in SM-exposed veterans.

One-hundred and fifty people exposed to SM during the Iraq-Iran war and 150 non-exposed healthy sex-matched subjects as the comparison group, were studied. None of the participants was smoker, had a history of radiotherapy or chemotherapy, or were afflicted by cancer. The tumor markers were measured by ELISA (Monobind ELISA kit, USA).

The mean age of SM-exposed veterans and the comparison group was 49.1 (SD 3.8) and 47.7 (SD 5.5) years, respectively. The elapsed time from the exposure in the victims was 30 years on average. Based on spirometry data, the exposure intensity was mild in 66%, moderate in 27%, and severe in 7% of SM-exposed group. The median AFP level was 5.29 (IQR 3.78) ng/mL in SM-exposed group and 3.65 (IQR 3.00) ng/mL in the comparison group ($p < 0.01$). The corresponding values for β -hCG levels were 0.42 (IQR 0.43) and 0.32 (IQR 0.22) mIU/mL, respectively ($p = 0.794$). No correlation was observed between age and tumor marker levels and between the concentrations of the two tumor markers

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studied.

Exposure to SM generates reactive oxygen species (ROS) with consequent oxidative damage to cell structures.⁶ Liver is very susceptible to such oxidative stress and this might explain the significant rise of AFP in the SM-exposed people. It could be noted that a long period is required for SM to exert its carcinogenic effects through its impact on DNA, proteins, and production of oxidants. Nishimoto, *et al*, showed an increased risk of cancer-related death in SM factory employees after 35–50 years of exposure.⁷ We examined the exposed group after an average of 30 years. A close follow up of these SM-exposed people seems mandatory for early diagnosis of any possible malignancies.

Conflicts of Interest: None declared.

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