PostScript

LETTER

If you have a burning desire to respond to a paper published in the *JECH*, why not make use of our "rapid response" option?

Log on to our website (www.jech.com), find the paper that interests you, and send your response via email by clicking on the "eletters" option in the box at the top right hand corner.

Providing it isn't libellous or obscene, it will be posted within seven days. You can retrieve it by clicking on "read eletters" on our homepage.

The editors will decide as before whether to also publish it in a future paper issue.

Change in sex ratio at birth in Sardasht (north west of Iran) after chemical bombardment

About 18 years ago (on 27 July 1987), Saddam's regime ordered a chemical weapons attack on a Kurdish small city, Sardasht (west Azarbaijan province, north west of Iran). It is estimated that more than a third of city's population were exposed to the toxic chemical. The annual number of live births by sex for the period 1362–82 Hejirae-Shamshi (HS) (Iranian calendar; equal to 20 March 1983 to 19 March 2004) was obtained from the annual publications of the Statistic Centre of Iran. The sex ratio at birth (SRB) was expressed as the male proportion. The odds ratio (OR) was calculated. An OR>1.0 shows an increase and an OR<1.0 shows a decrease in SRB in Sardasht (exposed population) in comparison with the

other parts of west Azarbaijan province (unexposed population) as control group.

As table 1 shows the SRB in the reference population was low (0.499) and there was no difference between the study populations before the chemical attack (from 1983–7). The SRB increased after the Iran/Iraq war compared with that of during war. There was no difference between the studied populations after war. This is in agreement with the report showing that the SRB decreased during the war (September 1980 to July 1988) and increased to reach about 0.515 after war.¹ Supposing that intercourses occurred on 27 July 1987 or after that, pregnancy term would be April 1988 and after that (= 1367 HS). Interestingly, a prominent increase in SRB in Sardasht (0.516) was seen in 1367 HS in comparison with unexposed population (0.499) (OR = 1.07, 95%CI = 1.01 to 1.14). Because both populations experienced same tensions during the study period, except for chemical attack, the observed difference might be attributed to the effect of mustard gas bombardment. The offspring SRB in men² and rats³ exposed to mustard gas increased. These reports are consistent with the finding in this work.

It has been hypothesised that SRB is partially controlled by the parental hormone levels around conception (James' hypothesis).⁴ Exposure to mustard gas results in very low levels of total and free testosterone and high level of FSH and LH in the first five weeks and that normalisation by the 12th week after injury in a cohort of men with battlefield exposure to mustard gas.⁵ Hormone studies showed an increased plasma FSH level and normal levels of LH and testosterone in patients years after exposure.⁶ If the James' hypothesis is correct, this change should be translated into the SRB decline in Sardasht. These data, however, are not consistent with the James' hypothesis, at

least when men are exposed to mustard gas. There are no published data concerning the effect(s) of mustard gas on sex hormones in females of either human or animals. It might be speculated that hormonal levels in exposed females changed. In that case, the James' suggestion may be correct.

It should be mentioned that the number of births in each year is limited in Sardasht. Therefore, it cannot be excluded that the observed increase of SRB is determined by chance. On March 1988, Halabja (a Kurdish city in north east of Iraq) was bombarded by Saddam's regime with chemical bombs. A possible change of SRB in Halabja should be investigated to test the reliability of the finding in this report.

Correspondence to: Dr Mostafa Saadat, Department of Biology, College of Sciences, Shiraz University, Shiraz 71454, Iran; saadat@susc.ac.ir

doi: 10.1136/jech.2005.040964

Funding: this study was supported by Shiraz University

References

- 1 Ansari-Lari M, Saadat M. Changing sex ratio in Iran, 1976–2000. *J Epidemiol Community Health* 2002;56:622–3.
- 2 Pour-Jafari H. Secondary sex ratios in progenies of Iranian chemical victims. *Vet Hum Toxicol* 1994;36:475–6.
- 3 Sasser LB, Cushing JA, Dacre JC. Two-generation reproduction study of sulfur mustard in rats. *Reprod Toxicol* 1996;10:311–19.
- 4 James WH. Further evidence that mammalian sex ratios at birth are partially controlled by parental hormone levels around the time of conception. *Hum Reprod* 2004;19:1250–6.
- 5 Azizi F, Keshavarz A, Roshanzamir F, et al. Reproductive function in men exposure to chemical warfare with sulphur mustard. *Med War* 2001;11:34–44.
- 6 Safarinejad MR. Testicular effect of mustard gas. *Urology* 2001;58:90–4.

Table 1 Sex ratio at birth in exposed and unexposed populations

Year	Sardasht			West Azarbaijan			OR	95% CI	p Value
	Males	Females	SRB	Males	Females	SRB			
1362–4 (1983–6)	8186	8055	0.504	132227	132978	0.499	1.02	0.99 to 1.06	0.180
1365 (1986–7)	2100	2031	0.508	43349	44056	0.496	1.05	0.99 to 1.12	0.124
1366 (1987–8)	2067	2096	0.497	37713	37726	0.499	0.99	0.93 to 1.05	0.681
1367 (1988–9)	2191	2055	0.516	40161	40338	0.499	1.07	1.01 to 1.14	0.031
1368 (1989–90)	2353	2286	0.507	38528	36800	0.511	0.98	0.93 to 1.04	0.585
1369 (1990–1)	2166	2060	0.513	37015	35087	0.513	1.00	0.94 to 1.06	0.929
1370–5 (1991–7)	9796	9072	0.519	198265	187670	0.514	1.02	0.99 to 1.05	0.145
1376–81 (1997–2003)	7098	6583	0.519	158460	151365	0.511	1.03	1.00 to 1.07	0.093

SRB, sex ratio at birth.