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Survey of arsenic concentration in the sheep's blood, wool and liver at Kurdistan provinces, Iran

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Basic information on arsenical poisoning in cattle and small ruminants are meager (Tapan Kumar *et al.* 2014). Arsenic exposure affects all body systems viz. cardiovascular, nervous, hepatobiliary, gastrointestinal, renal, dermatologic and respiratory system (Gulin 2016). This arsenic accumulation tendency in the body of animals is a threatening problem for livestock and human (Chimoy *et al.* 2016). The dominant basis of arsenic poisoning is from groundwater that naturally contains high concentration of arsenic (Verma *et al.* 2016). About 21 countries around the world are facing groundwater arsenic contamination, but in aquifers of Asian countries the most drastic occurrences were found (Al-forkan *et al.* 2016). This study aimed to examine and measure the presence of arsenic in blood and sheep's tissues of Ghrveh area, city of Kurdistan provinces of Iran, which can be samples of ecosystem and environment population of the area.

This study was done in 3 villages of Kurdistan, Iran, which researchers identified as risky areas with severe pollution in terms of arsenic presence in geological studies in the past. The blood and wool samples were randomly taken from 55 sheep, including both sexes in the age groups less than 1 year, 1–3 years, and above 3 years from 3 villages. In addition to these samples, liver of 10 sheep were also chosen from the slaughterhouse of the area for study. Arsenic concentrations of the blood, wool, and liver were measured according to atomic absorption instruction (Chinmoy *et al*. 2016). Initially data were entered in Microsoft Excel and then imported to GraphPad prism version 3.0 where descriptive statistics (mean, standard deviation of the mean) of the blood, wool and liver analytical variables were determined. The SPSS (version 14) statistical tool was used for one-way analysis of variance (ANOVA) computation to compare the groups and $P \leq 0.05$ was considered significant.

In this research, levels of arsenic concentration in blood and wool of sheep at Ghorveh area were studied (Table 1). Lopez Alonso *et al.* (2000) specified the maximum level arsenic in the blood of animals as 2.92 ppb, our results indicated significant differences of arsenic concentration in sheep's blood under study compared with normal levels ($P \leq 0.05$). The studies done on drinking water and underground water of Kurdistan province and Ghorveh area (Iran) showed high arsenic contamination, it can be said that one of the main reasons for this high level is using groundwater which is contaminated with arsenic in different ways. Using grasses and pastures irrigated with this water and exposing to gases released from springs and mineral can be other possible causes. Taheri *et al.* (2016) also reported that high groundwater arsenic level induced high body arsenic loads for inhabitant and animals in northeastern Iran. Similar findings were reported by others (Verma *et al.* 2016, Gulin 2016, Fakir *et al.* 2016).

Table 1. The amount of arsenic (ppb) and number of samples with maximum, minimum and mean± SD

Sample	Num.	Min.	Max.	Mean ±SD
Blood	54	6.059	16.935	10.024 ± 7.105
Wool	54	2.653	32.09	13.699 ± 10.205
Liver	10	2.191	10.801	7.684 ± 3.755

Based on the studies done by Lopez Alonso *et al.* (2000) in which maximum level of arsenic in the wool was specified as 100 ppb, there is no significant difference of arsenic concentration in sheep's wool under study compared with normal levels ($P \geq 0.05$). In the study done on arsenic concentration in sheep and some blood parameters on Tekab's sheep around gold mines, the level of arsenic concentration in all sheep's wool under study was higher than the normal range (Rezazadeh *et al.* 2014). Chinomy *et al.* (2016) also reported that arsenic concentration in wool in exposed Garole sheep in India, showed significant increase.

Generally, the hair contains metabolic dead substances, which are around the hair, between the hair, and in the active substances which are in the hair root. Active root hair cells are able to concentrate or accumulate different elements; this accumulation depends on the type and concentration of elements in the environment, nutrition, exposure duration,

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Table 2. The amount of arsenic in blood and wool in age groups (ppb)

Age group	Num.	Min. Blood	Max.	Mean± SD	Min. Wool	Max.	Mean± SD
≤1years	15	6.855	13.854	10.855± 2.07	5.09	30.455	17.340± 8.35[a]
1-3years	25	3.458	16.655	10.211± 5.32	2.07	25.371	12.509± 9.04[a]
≥3years	15	3.568	16.659	11.288± 5.3	2.653	32.09	17.44± 10.25[a]

[a]There is no significant difference (P≥0.05) in the level of arsenic in age groups.

Table 3. The level of arsenic in blood and wool in male and female (ppb)

Sex	Num.	Min. Blood	Max.	Mean± SD	Min. Wool	Max.	Mean± SD
Male	21	6.059	14.741	10.105± 2.01	6.662	32.09	15.488± 7.25[a]
Female	24	3.458	16.935	10.566± 7.25[a]	2.07	30.445	13.497± 9.45[a]

[a]There is no significant difference (P≥0.05) in the level of arsenic in both sexes.

weather conditions, individual characteristics and breed. Therefore, while the results of the present study about arsenic concentration in sheep's wool are similar to the results of other studies, but it differs from some other studies. So to overcome this ambiguity, studying, and sampling should be done as made in the study at both the infected and control areas to obtain a reference value for sheep's wool of the area under study. Perhaps owing to the significant difference and noticeable increase of arsenic concentration in the blood of all animals in the present study, values obtained in their wool are proximately toxic or abnormal also. According to levels of toxic arsenic in liver in the forms of acute, sub acute and chronic poisoning (Radostits *et al.* 2014) which can be 3–15 ppb, it can at least be confirmed the absence of toxic amounts in livers under study. But it is important to bear in mind that the value of 3–15 ppb, reported by Radostits *et al.* (2014), indicated the risk of arsenic poisoning in animals. It can never represent the authorized or non-authorized concentration of arsenic in the liver as a substance in the human food chain. The results showed no significant difference between age and concentration of arsenic in blood and wool. Similarly, no significant difference was found between concentration of arsenic and sex. Similar findings were reported by Rezazadeh *et al.* (2014) (Tables 2, 3).

In conclusion, our results especially on the levels of arsenic concentration in the blood of animals under study, public health risk followed by direct or indirect use of arsenic in many different ways such as drinking water, eating vegetables, feeding on domestic animals and their products is quite serious danger, which its consequences show itself proportional to the exposure to toxins duration, poison's concentration and its chemical nature, in the clinical forms of poisoning, types of cancers, diabetic diseases, neurological disorders, etc. More comprehensive studies with a wider range and by studying more parameters are recommended.

SUMMARY

The aim of this study is to determine level of arsenic in sheep's blood, wool and liver in Ghorveh area, city of Kurdistan provinces in Iran. The samples of blood and wool of 55 sheep, including both sexes in different age groups (≤1, 1–3 and ≥3 years) were collected, sampling of liver also carried out from the slaughterhouse of the mentioned area. The mean concentration of arsenic in the blood, wool and liver of sheep were 10.024±7.105, 13.699±10.205 and 7.684±3.75 ppb, respectively, which blood concentration shown significant difference statistically in comparison to the normal value (P≤0.05) whereas wool and liver do not show significant difference statistically (P≥0.05). There is no significant correlation between arsenic concentration with age and sex (P≥0.05). Arsenic concentration revealed the high level of arsenic in the environment and food in Kurdistan, which can be a serious threat to public health and other creatures.

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REFERENCES

Alforkan M, Islam S, Akter R, Shameen A and Khaleda L. 2016. A sub-chronic exposure study of arsenic on hematological parameters, liver enzyme activities, histological studies and accumulation pattern of arsenic in organs of Wistar albino rats. *Journal of Cytology and Histology* **5**: 1–7.

Chimoy M, Samar S, Suman B, Pabiyra H B and Bakul K D. 2016. Experimental assessment of arsenic toxicity in garole sheep in India. *Emerging Contaminants* **4**: 1–7.

Fakir Y, Safayet K, Priyanka C, Ab-Hasant M, Sumaira H and Mahfuzar R. 2016. A review of groundwater arsenic contamination in Bangladesh: The millennium development Goal Era and beyond. *International Journal of Environmental Research and Public Health* **13**: 2–18.

Gulin G K. 2016. Review arsenic cytotoxicity. *Journal of Otology* **3**: 1–5.

Lopez Alonso M, Benedito J L, Miranda M, Castil C, Hernandez J and Shore R F. 2000. Arsenic, cadmium, lead, copper and zink in cattle from Galicia, NW Spain. *Sciences Total Environmental* **10** (2–3): 237–46.

Radostits O M, Gay C C, Hinchcliff K W and Constable P D. 2014. *Veterinary Medicine.* 11th ed. Saundrs London; pp. 1808–11.

Rezazadeh F, Jafari R, Sheikhzadeh F and Paktinat S. 2014. A study on wool arsenic concentration and some blood parameters in sheep flocks grazing around tailing dams of gold mines in Takab, Iran. *Research Opinion Animal Veterinary Sciences* **4** (5): 233–36.

Taheri M, Mehrzad J, Fshari R, Dadsetan A and Hami S H. 2016. High soil and groundwater arsenic levels induce high body arsenic loads, health risk and potential anemia for inhabitants of Northeastern Iran. *Environmental Geochemistry and Health* **28** (2): 469–82.

Tapan K, Veena M, Harjit K, Neelam K and Dipak B. 2014. Effect of vitamine E supplementation on production performances in arsenic exposed goats. *India Journal of Animal Sciences* **84** (6): 660–63.

Verma C, Rohit B, Vinay P and Ashawat M. 2016. Arsenic induced diseases in human being, their diagnosis and treatment. *Journal of Chemical and Pharmaceutical Research* **8** (1): 13–22.