Evaluation of Blood Lead and Cadmium Status in Sheep Grazing On Street Garbage in Assuit Governorate

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Abstract

The goal of the present study is to evaluate blood lead and cadmium status in sheep grazing on street garbage. A total number of 30 ewes (2 – 3 years old) were subjected to study. Animals were classified into two groups, the first group (No.= 20) included animals grazed on street garbage in Egypt, the second group (No.= 10) were selected from sheep lived indoor at the Veterinary Teaching Hospital, Assiut University, Egypt. Blood lead concentration was 1.44 ± 0.16 (ppm) in the street garbage group and was 0.38 ± 0.17 (ppm) in the Indoor group. Blood cadmium concentration was 0.16 ± 0.02 (ppm) in the street Garbage group and was 0.008 ± 0.004 (ppm) in the Indoor group. Statistical comparison of the two groups revealed that street garbage group had a higher blood lead and cadmium concentrations than the indoor group. In conclusion, the increased blood lead and cadmium in sheep grazing on street garbage indicated the continuous exposure to the two elements and bear significant health hazard on the health condition of animals and on human health.

Key words: sheep, lead, cadmium, street, garbage

Introduction

Industrial and agricultural processes have resulted in the release of many toxic metals into the environment, although relatively high concentrations can also occur naturally. Cadmium, lead, arsenic, and mercury are the elements that have probably caused the most concern. This is because they are readily transferred through food chains and can pose a potential health risk to animals and humans. Lead is considered one of the major environmental pollutants and has been incriminated as a cause of accidental poisoning in domestic animals more than any other substance, particularly in cattle, sheep and horses. Cadmium is recognized as one of the most toxic elements to man and animals. This metal is naturally present in the environment, including sea and fresh water, soils, sediment and air. It is used in many industrial processes and it is a contaminant in some fertilizers, especially in partially acidulated phosphate fertilizers and in urban sewage sludge to fertilize pastures or crops. This widespread distribution and the industrial fallout have resulted in all food being exposed to and containing cadmium. Sheep naturally grazing on street garbage are exposed to wide variety of health hazard materials, that originate from the exposure to environmental pollutants.
and from eating garbage that contains hidden toxicants, the evaluation of blood lead and cadmium status in sheep naturally grazing on street garbage is the aim of the present study.

Materials and Methods

Animals: A total number of 30 ewes (2–3 years old) were subjected to study. Animals were classified into two groups, the first group (n = 20) included animals naturally grazed on street garbage in Assiut City, Assiut Governorate, Egypt. The second group (No.=10) were selected from sheep live indoor at the Veterinary Teaching Hospital, Assiut University, Egypt.

Samples: Blood samples (5 ml) were collected from the jugular vein in vacutainer tubes containing heparin, and kept in deep freeze (-20 ºC) for chemical analysis.

Digestion of samples: Blood samples were digested according to Zilva (1973), briefly, to each 1 ml whole blood sample, 2 ml of digestion mixture (equal volume of concentrated nitric acid and 72% perchloric acid) was added in a 50 ml Teflon beaker and left to react over 24 hours at room temperature. The mixture was then heated on a hot plate at 100ºC until the sample become colorless. The samples were then diluted with bidistilled water up to 20 ml.

Analytical methods: Lead and cadmium concentrations were determined in digested whole blood using Atomic Absorption Spectrophotometry (Atomic absorption 906, GBC, Australia). Certified standard solutions of the elements were used for the preparation of the elements working standard solutions.

Statistical analysis: Statistical analysis was conducted using SPSS 16.0 for windows (SPSS, Chicago, USA) and were carried out using one way ANOVA. Data were expressed as Mean ± SD.

Results

Blood lead concentration was 1.44 ± 0.16 (ppm) in the street Garbage group and was 0.38 ± 0.17 (ppm) in the Indoor group.

Blood cadmium concentration was 0.16 ± 0.02 (ppm) in the street Garbage group and was 0.008 ± 0.004 (ppm) in the Indoor group.

Statistical comparison of the two groups revealed that street garbage group had a higher blood lead and cadmium concentrations than the indoor group. Results are summarized in table 1.

Table 1. Blood lead and cadmium concentrations in sheep

<table>
<thead>
<tr>
<th></th>
<th>Street garbage group (No.=20)</th>
<th>Indoor group (No.=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead (ppm)</td>
<td>1.44 ± 0.16**</td>
<td>0.38 ± 0.17</td>
</tr>
<tr>
<td>Cadmium (ppm)</td>
<td>0.16 ± 0.02**</td>
<td>0.008 ± 0.004</td>
</tr>
</tbody>
</table>

** significant at p<0.01
Discussion

Increasing biological interest in minerals has led to the search for reliable methods to quantify body levels of trace elements and toxic metals. A number of studies have reviewed specific aspects of lead toxicity in man and animals. Various specimens, such as blood may be used to assess element status in man and animals. In some areas of Assiut City (Assiut, Egypt), sheep are grazing on street garbage, which may carry health hazard. Significant increase in blood lead concentration (p<0.01) was observed in sheep grazing on street garbage (1.44 ± 0.16 ppm) when compared with the indoor group (0.38 ± 0.17 ppm). Sheep grazing in the street are daily exposed to lead, which originates from various industrial operations and automobile exhausts. After combustion, the tetraethyl lead contained in petrol settles as lead oxide or chloride on the vegetation by roadsides. Blood lead observed in the current study is higher than the permissible limit in the blood of ruminant. Radostits et al. reported that whole blood lead level in normal ruminants is usually below 0.05 – 0.25 ppm.

Blood cadmium concentration was significantly higher in street grazing group (0.16 ± 0.02 ppm) than the indoor group (0.008 ± 0.004 ppm). The higher level of cadmium in the grazing group may be attributed to eating of incinerated solid wastes during grazing on garbage, or may be due to the intake of foods contaminated with cadmium from manmade sources. In conclusion, the increased blood lead and cadmium in sheep grazing on street garbage indicated the continuous exposure to the two elements, which may affect the reproduction and production of the animals and bear significant health hazard to human.

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