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*Original Contribution*

# CHANGES IN LEUKOCYTE PROFILE OF HORSES AFTER INTOXICATION WITH JIMSON WEED (DATURA STRAMONIUM)

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**ABSTRACT**

Studies, using intoxicating fresh silag containing about 50% Jimson weed, were carried out on 34 horses. Leukocyte profiles of these horses were done in a space of 7 days. Subsequently, a relationship between the intoxication produced by the Jimson weed and the leukocyte profile was established. The studied profile included leukocytosis, neutrophilia with regenerative shift and lymphocytopenia.

**Key words:** *intoxication, Jimson Weed (Datura stramonium), horses*

## INTRODUCTION

Jimson Weed (*Datura stramonium*) is an annual plant from the *Solanaceae* family It is widely distributed in the southern parts of Asia, Europe and North America (1, 2). In Bulgaria, it is most commonly found in maize and sunflower fields as a result of ineffective use of herbicides and inadequate mechanical soil cultivation. More rarely, it could be seen in uncultivated lands, meadows, pastures, alfalfa, cereals as wheat, barley etc. (3, 4).

The toxic effect of Jimson weed is determined by the alkaloids it contains (hyoscyamine, hyoscine, d,l-hyoscyamine, l-hyoscine), sitosterol and proteins. They possess strong anticholinergic properties (5-10).

The wide distribution, the strong toxicity and the potential for occurrence in foodstuffs are responsible for the numerous incidents in humans (11-15). The incidents with Jimson weed intoxication in animals are considerably less numerous – cattle (16), swine (8, 17-19), dogs (20, 21), sheep and goats (22) and birds (3, 23). In horses, poisoning has occurred mainly after ingestion of Jimson weed seeds (2, 4, 24 - 27).

In the literature, the possibility of intoxication after ingestion of silage containing Jimson weed has been outlined (7, 16), but there are no reports about cases in horses that have consumed seeds, fruits, stems, leaves, through maize, harvested for silaging.

This motivated our study on the changes in the leukocyte profile in horses after Jimson weed intoxication with regard to the rapid and correct diagnosis and prognosis and consequently, effective treatment of this intoxication.

## MATERIALS AND METHODS

In October 1999, three stallions have been referred to the Clinical of Internal Diseases and Clinical Toxicology to the Faculty of Veterinary Medicine, Stara Zagora. The history revealed that 18 hours before, 34 horses, owned by the Horse station of the Faculty of Agriculture of Trakia University, were fed *ad libitum* with fresh maize with a high content (approximately 50%) of Jimson weed. All animals that ingested the forage manifested signs of intoxication in various degrees, the animals referred to the clinic being the most affected with clinical symptoms.

The examination *in situ* showed that the horses were aged 3 to 14 years, with a live body weight of 400–600 kg, from various breeds (Trakehner, Hanoverian, Danube, East-Bulgarian, Arabian etc.) and type. Both genders were present: 18 mares, 12 stallions and 4 geldings.

Depending on the degree of clinical

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symptoms, the animals were divided into 3 groups:

- Group one (n=18) – horses with typical clinical symptoms: 9 stallions, 1 gelding, 8 mares; 3 of them pregnant.
- Group two (n=16) – horses with atypical symptoms: 3 stallions, 3 geldings, 2 pregnant mares, and 8 lactating dams (the suckling foals were not included in the group).
- Group three (n=18) – horses (owned by the Mounted police), housed in the same premises under similar conditions, but fed another forage, serving as controls.

Blood for analysis was sampled from v. jugularis for determination of total leukocyte counts (on an automated haemoanalyser Serono+System 150, USA) and differential leukocyte counts (according to Pappenheim).

All results were statistically processed using the ANOVA test (Statistica software). The significance of differences was evaluated *vs* the control group for each time interval. The results were determined as significant at $p<0.05$.

## RESULTS

The total leukocyte counts (**Figure 1**) in group I was significantly increased between the 1st and the 3rd day of intoxication. The peak values were observed by the 2nd day – 18.11±1.21 G/l *vs* the control group 9.16±0.88 G/l ($p<0.001$). In group II, changes were present only on the first day 14.62±1.54 G/l compared to respective control values of 8.55±0.92 G/l ($p<0.01$).

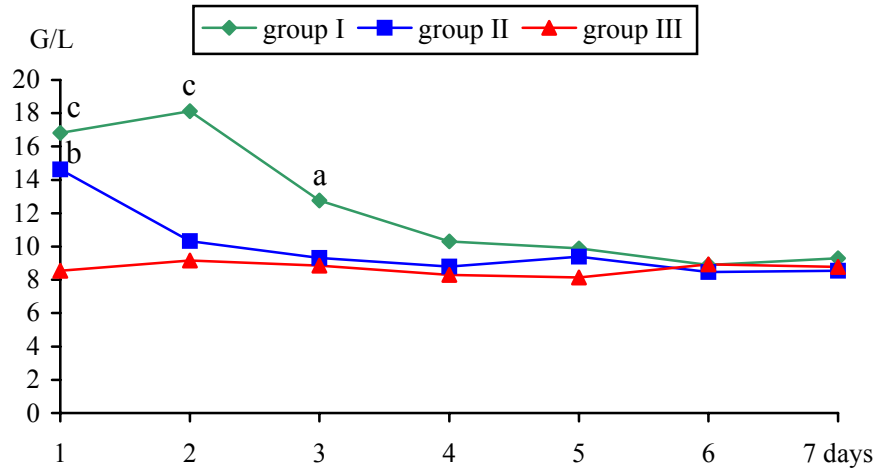


***Figure 1.*** *Changes in total white blood cell counts in horses after intoxication with Jimson weed (Datura stramonium)*

The changes in the differential leukocyte counts (**Table 1**) consisted in the absence (aneosinophilia) or reduction (eosinopenia) of eosinophils. In **group I** the changes lasted between days 1 and 4 whereas in **group II**, between days 1 and 3.

The percentage of metamyelocytes in **group I** was the highest by day 2 – 3.2±0.3% compared to controls – 0% ($p<0.001$). In **group II**, the highest values were observed by day 1 – 1.8±0.3%, *vs* 0% in controls for the same time interval ($p<0.001$).

Band neutrophils were increased in all intoxicated horses 1 to 6 days after the incident. The peak values in **group I** were by day 2 – 12.8±1.3% (vs 0.8±0.1% in controls) ($p<0.001$), unlike **group II** when the highest percentage was that by day 1 – 4.8±0.6% (1.2±0.3% in controls) ($p<0.001$).

Segmented neutrophils were increased only in **group I** between days 1 and 4, the highest levels being by day 1 – 38.5±6.7%, significant *vs* the respective control (48.5±3.4%) ($p<0.01$).

A considerable reduction in lymphocytes was also present. In the first group the changes lasted between days 1 and 4 whereas in the second one – by day 1. The lowest percentages were detected on the first day of the intoxication: 5.8±0.5% ($p<0.001$) in **group I** and 33.8±2.8% ($p<0.05$) in **group II**, compared to control values – 46.1±3.7%.

## DISCUSSION

The data about the changes in the total leukocyte counts and the percentages of leukocyte classes in equine blood after intoxication with Jimson weed revealed increased total leukocytes, metamyelocytes, band and segmented neutrophils, reduced lymphocytes and absence or decreased eosinophil percentages. The observed changes

are due to Jimson weed alkaloids (3, 5, 7, 12, 18, 22, 25). After their occurrence in the gastrointestinal tract, they directly irritate the mucosa and cause an inflammation (2, 4, 10, 12, 15, 20, 24, 27). On the other side of it, because of their anticholinergic effect, they produce paralysis of organs innervated by the parasympathetic nerves and, consequently, paralytic ileus occurs resulting in retention of gastrointestinal content, and secondary inflammation that correlates with observed prolonged (4-5 days) changes in the leukocyte profile (4, 5, 9, 10, 11, 12, 13, 16, 21).

***Table 1.*** *Changes in Differential white counts in horses after intoxication with Jimson weed (Datura stramonium) (groups I and II) and controls (group III)*

| ***DWC*** | ***Group*** | ***Days after intoxication*** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
| *Eo (%)* | I | $0^{c}$ | $0^{c}$ | $0^{c}$ | $0.8\pm0.1^{c}$ | 3.2±0.4 | 4.1±0.3 | 5.2±0.2 |
| | II | $0^{c}$ | $0^{c}$ | $1.1\pm0.1^{c}$ | 3.7±0.4 | 4.1±0.3 | 3.7±0.3 | 4.2±0.5 |
| | III | 3.8±0.4 | 4.4±0.3 | 5.2±0.3 | 4.1±0.4 | 3.9±0.4 | 3.4±0.4 | 4.3±0.5 |
| *Mm (%)* | I | $2.4\pm0.2^{c}$ | $3.2\pm0.3^{c}$ | 0.5±0.5 | 0 | 0 | 0 | 0 |
| | II | $1.8\pm0.1^{c}$ | $0.6\pm0.5^{b}$ | $0.3\pm0.1^{b}$ | 0 | 0 | 0 | 0 |
| | III | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *St (%)* | I | $11.3\pm0.9^{c}$ | $12.8\pm1.3^{c}$ | $7.2\pm0.9^{c}$ | $5.8\pm0.7^{c}$ | $2.6\pm0.3^{c}$ | $1.5\pm0.2^{a}$ | 1.4±0.3 |
| | II | $4.8\pm0.6^{c}$ | $3.8\pm0.5^{c}$ | $2.3\pm0.5^{b}$ | $1.8\pm0.1^{c}$ | $2.2\pm0.1^{c}$ | $1.7\pm0.2^{a}$ | 1.9±0.4 |
| | III | 1.2±0.3 | 0.8±0.1 | 0.70±0.2 | 1.1±0.1 | 1.0±0 | 0.9±0.3 | 1.2±0.1 |
| *Sg (%)* | I | $78.3\pm6.7^{b}$ | $74.2\pm8.6^{a}$ | $70.7\pm4.8^{b}$ | $72.1\pm6.2^{b}$ | 62.7±5.5 | 49.1±6.3 | 50.7±4.3 |
| | II | 61.8±8.8 | 62.3±6.4 | 54.7±6.2 | 59.6±6.8 | 46.6±6.1 | 48.8±4.1 | 47.3±3.9 |
| | III | 48.5±3.4 | 51.1±5.3 | 46.9±5.8 | 49.3±3.9 | 50.5±5.2 | 47.6±3.8 | 48.9±3.3 |
| *Lym (%)* | I | $5.8\pm0.5^{c}$ | $11.1\pm1.0^{c}$ | $24.1\pm3.1^{c}$ | $23.8\pm3.1^{c}$ | 32.1±2.2 | 44.2±4.1 | 43.8±4.2 |
| | II | $33.8\pm2.8^{a}$ | 32.8±3.3 | 44.8±4.3 | 36.8±2.9 | 45.8±3.6 | 46.1±3.6 | 47.1±3.9 |
| | III | 46.1±3.7 | 44.3±4.5 | 47.6±3.8 | 45.5±5.2 | 46.7±3.9 | 46.2±3.7 | 45.3±3.1 |

$^{a}p<0.05$; $^{b}p<0.01$; $^{c}p<0.001$

## CONCLUSIONS

1. The intoxication with Jimson weed (*Datura stramonium*) in horses is accompanied by leukocytosis, aneosinophilia or eosinopenia, neutrophilia and regenerative shift and lymphocytopenia.
2. The duration and the extent of observed alterations are directly dependent on the consumed amount of Jimson weed and the stage of intoxication. The normalization of parameters after 4-5 days was indicative of the favourable issue of the intoxication.

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