Abstract. A number of 20 work horses, clinically healthy (group no.1, control group) and 9 work horses with purpura hemorrhagica (group no.2) were investigated paraclinically using the parameters of the minimum balance of homeostasis. In both groups we determined the prothrombine time (PT), partial activated thromboplastine time (APTT) and fibrinogen. Using the average value of PT in group no.1 and group no.2 we calculated the INR value (International Normalized Ratio). The values of PT, APTT and INR were increased in horses from the 2nd group (PT = 56,43 ±86,48s; APTT = 95,53 ±14,81s; INR = 5,03) compared to the average values of the same parameters in the horses from group no.1 (PT = 11,19 ±1,76s; APTT = 58,17 ±11,72s; INR = 1,10). Plasmatic fibrinogen was of 183 ±49,46 mg/dl in the horses of the 1st group and 136 ±57,57 mg/dl in the horses of the 2nd group.

INTRODUCTION

Hemostasis is the ensemble of physiological phenomena which ensures the stability of blood fluid-coagulant balance within the circulator system, impeding the apparition of intravascular coagulopathy. In the same time, in cases of vascular wall lesions, the limitation of hemorrhage is possible with spontaneous hemostasis, as a consequence of the coordinative action of thrombocytes and coagulation factors, inclusively the tissue factor.

In purpura hemorrhagica, a common complication of strangles, the presence of specific Streptococcus equi antigens in the blood stream together with specific antibodies (IgA), is a common and well known physiopathological phenomena. In some instances, the IgA-M-like proteins circulating immune complexes are retained within the organism (hyperproduction of IgA or hepatic disorder in their elimination?) and induces an allergic hypersensitivity reaction, injuring the capillary endothelium [1, 10]. The leucocitoclastic vasculitis lesions determine abnormal permeability in the cappilaries inducing edema and accentuated vascular fragility with consecutive hemorrhagical syndrome [1, 5, 6]. The bacterial toxins (especially those of Streptococcus) may induce endothelial lesions with the mentioned consequences and direct impact upon the blood vessels.

The same effects are encountered in endotoxemia associated to the colic syndrome in horses [3, 4, 8, 9].

This paper aims to establish wether the hemorrhagic syndrome in purpura hemorrhagica is exclusively due to the so called blood vessel fragility or if there are implied anomalies in blood coagulation, too.
MATERIAL AND METHOD

The studies were performed at the Medical Pathology Clinic of the Faculty of Veterinary Medicine Cluj-Napoca and at the Zonal Sanitary Veterinary. Circumscription from Aghires, Cluj county, in the period October 2004 - May 2006.

The biologic material consisted of the control group, namely group no. 1, which contained a total number of 20 work horses with ages between 3 and 17 years, 8 being males and 12 females. The selected horses were clinically healthy, in good and very good condition, with negative serologic analysis for Equine Infectious Anemia (E.I.A.).

Group no.2 was represented by 9 horses with clinical symptoms of purpura hemorrhagica (PH), also with negative serologic analysis for E.I.A.. Two of them were hospitalized and treated at the Medical Pathology Clinic, the rest of the horses being treated at the owner’s residence. The clinical examination was performed according to the routine procedures using the major semiological methods. Blood samples were taken from these patients, in special tubes (vacutainers) with sodium-citrate 3%, for APTT, PT and fibrinogen graduation. The sample collection was performed in minimum conditions of stress, because in the horses agitation can determine the increase of thrombocyte number and various coagulation factors (FV, FVIII, FvW, fibrinogen).

From both groups we determined the prothrombine time (PT or Quick time), the partially activated prothrombine time (APTT) and the fibrinogen with the KC-1A semi-automatic coagulometer using a commercially available kit for human medicine.

RESULTS AND DISCUSSIONS

We considered it important to establish specific reference values for APTT, PT and fibrinogen, because in the bibliography we found high differences of reference values for these parameters. This consideration protruded itself regarding the fact that these measurements were made with human kits. Kits designed for horses are not commercially available. The obtained results were submitted to statistical approximation, calculating the arithmetic mean and the standard deviation. In table no.1 we presented the specific reference values obtained in the horses from the control group and the ill ones, compared with values mentioned by other authors [8].

<table>
<thead>
<tr>
<th>APTT (seconds)</th>
<th>PT (seconds)</th>
<th>FIBRINOGEN (mg/dl)</th>
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<tbody>
<tr>
<td>58.17±11.72</td>
<td>11.19±1.76</td>
<td>183.25±49.4685</td>
</tr>
<tr>
<td>95.53±14.81*</td>
<td>56.43±86.48*</td>
<td>136.50±57.57*</td>
</tr>
<tr>
<td>37 – 54**</td>
<td>&lt; 7 – 9**</td>
<td>200 – 400**</td>
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Table no. 1. Average values of APTT, PT and fibrinogen in group no. 1 and PH* group.

*Reference values [8].
But, the simple graduation in seconds of PT is inconclusive for the interpretation of the results. It has to be taken in consideration compared to the PT value of a control plasma (commercially available) or NCCP (normal coagulation control plasma), representing a mixture or pool of plasmas from healthy animals.

This is the reason why is preferable the uniform graduation of PT with the referred INR parameter (International Normalized Ratio), as in the following expression:

\[
\text{INR} = \frac{\text{PT ill patient}}{\text{PT control patient}};
\]

According to this expression we calculated INR both in control and PH horses (table no. 2).

<table>
<thead>
<tr>
<th>INR average value in healthy horses</th>
<th>1,106</th>
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<tr>
<td>INR average value in PH horses</td>
<td>5,038</td>
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Table no. 2. INR average values in the two groups of horses.

The obtained APTT values (in seconds) in the healthy horses were between 40,6 (minimum value) and 84,6 (maximum value), with an average value of 58,17 (±11,72), situated over the maximum (54 sec.) as showed by Morris [8]. The results obtained in the PH horses vary between 77 (minimum value) and 118,5 (maximum value) with an average of 95,53 (±14,81).

Concerning the healthy horses, our results for PT were between 10,5 seconds (minimum value) and 15,5 seconds (maximum value), with an average of 11,19 seconds (±1,76). This average value exceeds the maximum value (9 seconds) determined by Morris [8]. Concerning the PH horses, the obtained values were of 13,2 seconds (minimum value) and 267,45 seconds (maximum value) with an average of 56,43 seconds (±86,48), superior to our reference values. This considerable high value of the standard deviation is explained by the different gravity of the disease in the horses from group no. 2. Nevertheless, there is a major difference between the PT average value from the healthy horses and the value determined in the PH horses.

The INR values act almost the same as the PT ones, with evident differences between the two groups.

The obtained results regarding fibrinogen in the control horses is between 120 mg/dl (minimum value) and 276 mg/dl (maximum value) with an average of 183 ±49,46 mg/dl. But, the fibrinogen values determined in the PH horses were between 40 mg/dl (minimum value) and188 mg/dl (maximum value) with an average of 136 ±57,57 mg/dl. The average values of plasmatic fibrinogen in the two groups (control and PH) are inferior to those (200 – 400 mg/dl) mentioned in the bibliography [8].

The major modification of the measured parameters (increase of APTT, PT, decrease of fibrinogen) in the PH horses, suggests their absolute involvement in the pathogenesis of the hemorrhagic syndrome of this disease. PH is a condition which develops secondary to some infectious diseases (ex. strangle) or as a consequence to chronic supurative processes. These conditions are associated with a massive synthesis of endotoxins, proteic substances capable of inducing antibody production. The accumulation of the endotoxins in the blood and their interlink with antibodies may induce an allergic hypersensitivity syndrome with elaboration of vasoactive and inflammation mediators responsible for the edemas and subcutaneous and intestinal hemorrhages [1, 10]. The consequence of toxemia and hypersensitivity may be the \textit{systemic inflammatory response syndrome} (SIRS) which degenerates into endotoxic shock.
Even in the absence of the endotoxic shock, the endotoxins (for ex. the streptococic endotoxin) emphasizes fibrinolysis and induces balance disorders of the anticoagulant and coagulant factors. In this view, strong arguments are, the delaying of the coagulation time and the decrease of plasmatic fibrinogen in PH horses [2, 7].

Another systemic consequence of endotoxiemia is the induction of hepatic lesions [5, 7]. The delaying of the coagulation time in the PH horses may be the expression of a deficient synthesis of the coagulation factors. Because the deficit of some coagulation factors induce the delaying of APTT (XII, XI, X, IX, VIII, V, II, I) and/or of PT (X, VII, V, II, I), there is necessary to perform additional investigations in order to elucidate which factors are in few quantities.

CONCLUSIONS

- The average value of APTT in the healthy horses was of 58,17 s ±11,72, and in the PH horses of 95,53 s ±14,81.
- The average value of PT in the heathy horses was of 11,19 s ±1,76, and in particulary cases of PH was recorded an average value of 56,43 s ±86,48.
- The average fibrinogen blood concentration in the healthy horses was of 183 mg/dl ±49,46, meanwhile in the PH horses of 136 mg/dl ±57,57.

The clinical aspects of hemorrhagic syndrome in the PH horses were associated to the increased levels of PT and APTT and decreased plasmatic fibrinogen.

BIBLIOGRAPHY