

ON THE QUESTION OF CHANGES IN THE ACID-BASE BALANCE AND THE REDOX PROCESSES IN PERITONITIS ASSOCIATED WITH BLOOD LOSS

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The purpose of this work was to trace the changes in the acid-base balance and the blood catalase indices in peritonitis associated with blood loss. The presence of this type of data affords the opportunity of explaining the pathogenesis of these two pathological processes.

The work was carried out on 35 rabbits. The entire experimental stock was divided into three series. In the first series (10 rabbits) we studied the indices associated with peritonitis. In the second series (20 rabbits) we studied the same indices in association with peritonitis plus the loss of 15% of the blood volume. The third series (5 rabbits) served as the control to the blood loss factor. The animals were maintained for three days under identical regimes and diets, and their temperature, leukocyte count,

hemoglobin in percent, erythrocyte count, blood catalase and alkaline reserve were all determined prior to the beginning of the experiment. After the investigations were performed in the rabbits of the first and second series the operative field was prepared and a laparotomy executed under local anaesthesia (10-15 ml of 0.5% novocaine subcutaneously). A perforation was made in the stomach, using a rod 0.3 cm in diameter that was first heated "red hot." With this, the contents of the stomach poured out into the peritoneal cavity. One billion microbial bodies from a one-day-old culture of a virulent strain of *Staphylococcus aureus*, seeded from the purulent exudate of patients, were introduced into the lumen of the stomach via the perforation. The same microbial emulsion, intro-

The Change in a Number of Blood Indices (in Average Numbers) Observed in Rabbits with Peritonitis, Peritonitis in Association with a Blood Loss of 15%, and a Blood Loss without Peritonitis

| Series | Experimental conditions | Body temperature | Leukocytosis | Hemoglobin (in Sahli units) | Erythrocytes | Catalase index | Alkaline reserve (in vol % CO ₂) |
|--------|------------------------------------|------------------|--------------------|-----------------------------|---------------------------|-----------------|--|
| First | Original state | 38,2° | 9 470 | 74 | 4 090 000 | 11,66 | 34,3 |
| | Peritonitis | 39,4° (+1,2°) | 24 650 (+15,18) | 72 (-2) | 3 695 000 (-395 000) | 9,86 (-1,80) | 30,0 (-4,3) |
| Second | Original state | 38,8° | 9 850 | 73 | 4 598 000 | 10,84 | 30,0 |
| | Peritonitis and a 15% blood loss | 39,6° (+0,8°) | 17 360 (+7,51) | 52 (-21) | 2 910 000 (-1 688 000) | 7,66 (-3,18) | 19,4 (-10,6) |
| Third | Original state | 39,4° | 9 060 | 76 | 4 414 000 | 10,48 | 41,7 |
| | 15% blood loss without peritonitis | 39,2° (-0,2°) | 7 630 (-1,43) | 71 (-5) | 3 916 000 (-498 000) | 8,74 (-1,74) | 35,8 (-5,9) |

duced subcutaneously into a rabbit, caused necrosis and pustular inflammation of the cellular tissue, and, when injected intravenously, death. The wound in the peritoneal cavity was sutured tightly. In addition, in the animals of the second and third series the needle of a syringe was inserted into the cavity of the heart and blood was withdrawn up to an amount representing 15% of the total blood volume. The original amount of blood in this case was taken to be $\frac{1}{13}$ th of the animal's weight. The results of the blood loss were evaluated by the changes in the quantity of hemoglobin and the number of erythrocytes in the blood. The temperature and blood leukocytosis served as indices of the development of the inflammation. Catalase was determined by the method of Bakh and Zubkovaya; alkaline reserve was measured by the method of van Slyke. The animals, prepared in this manner, were again subjected to the determinations after 24 hours. The results obtained from these studies are presented in the table.

EXPERIMENTAL RESULTS

As can be seen from the table, the peritonitis caused by this method was accompanied by an elevation in the temperature and the leukocyte count, a lowering of the erythrocyte count, the blood catalase index and the blood alkaline reserve. In the case of peritonitis in association with a loss of 15% of the total blood volume the elevation in the temperature and the leukocyte count was less marked, while the remaining indices (erythrocyte count, percent hemoglobin, blood catalase index and alkaline reserve) underwent more appreciable changes. In the animals of the third series, which were subjected to only the blood loss, the temperature even fell slightly; the

rest of the indices changed even less significantly than in the second series. Inflammation and blood loss by themselves caused a lowering of the blood catalase. The combination of inflammation (peritonitis) with blood loss was accompanied by a lowering of the blood catalase that was almost twice as strong as that caused by either peritonitis or blood loss alone. We noted similar changes in connection with the blood alkaline reserve.

On the basis of the data we obtained it may be concluded that peritonitis in association with blood loss and blood loss alone diminish the body temperature the leukocyte count, the percent hemoglobin, and the erythrocyte count.

Lower values are observed for the catalase index and the alkaline reserve in rabbits with peritonitis plus blood loss.

The reactivity of the animals with peritonitis complicated by blood loss differs from the reactivity of animals in which the blood loss did not take place.

SUMMARY

The loss of 15% of the blood volume accompanying infectious peritonitis weakened the leukocytic and the temperature reaction in rabbits and decreased the phagocytic activity of leukocytes. In rabbits with blood loss and peritonitis there were less leukocytes in the peritoneal exudate than in those without any such loss; there was a rise of the acidity and protein level in the exudate. Arterial pressure dropped (both spontaneously and after intravenous administration of the exudate) — more so in peritonitis complicated by blood loss than in an uncomplicated one.