

## Influence of Transport Stress on the Adaptation Potential of Chickens

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In poultry farming, great emphasis is placed on the prevention of stresses, including technological ones, which are associated with the intensity of the cultivation and use of poultry in industrial enterprises. The parent flock of poultry farms in the country is being updated by the importation of an incubation egg or daily chickens from the producing country. This leads to transport stress in chickens. It was established that before stress in two linear (group I) and four linear chickens (group II) leukogram parameters corresponded to normal limits, which reflected the physiological level of the body's overall resistance, but in the bloodstream of the hens obtained at the poultry farm, the number of leukocytes, basophils, eosinophils, segmented pseudo-eosinophils was greater, and the number of lymphocytes and monocytes was less. The formation of a stress reaction was accompanied by shifts in the cellular composition of the blood, which were typical for the action of any stress factor. So, in group II chickens, immediately and 1 hour after the simulated stress, the total number of leukocytes increased by 13.35–20.14% ( $p < 0.05$ ). In group I, in the body of two linear hens, the stress reaction was sluggishly current and longer in time. Consequently, the signs of a stress reaction did not stop in the birds during the indicated period, that is, chickens imported from abroad had a low adaptive potential. Their shifts increased gradually and reached a maximum only 24 hours after the action of the stress factor. The revealed features of changes in the leukogram in chickens imported from Germany under the influence of stress are a consequence of their transportation at the age of 24.

**Keywords:** Chickens; Cross; Leukogram; Stress factors

### Introduction

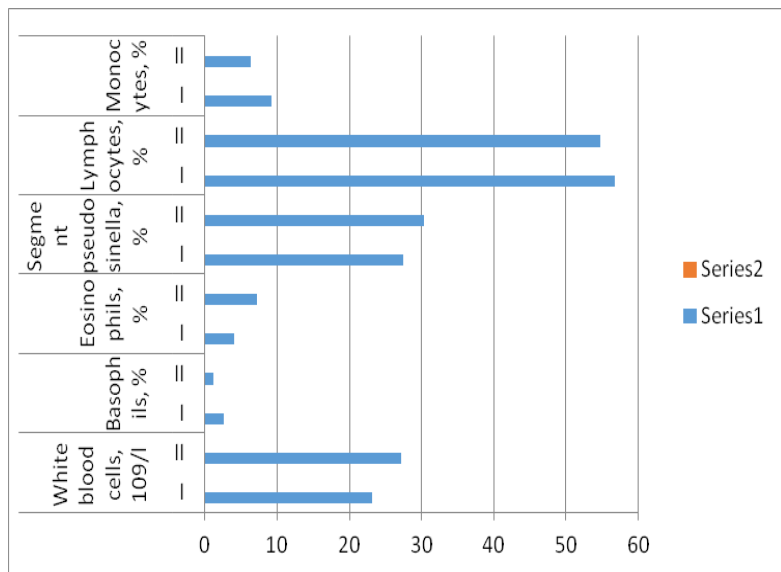
Poultry is often exposed to technological stresses in industrial production worldwide, which directly affects human nutrition (Belay & Teeter, 1993; Okuskhanova et al., 2019; Rozenboim et al., 2007; Soleimani & Zulkifli, 2010; Sharipova et al., 2017; Sydykova et al., 2019). Therefore, in poultry farming, great emphasis is placed on the prevention of stresses, including technological ones, which are associated with the intensity of poultry rearing and use (May & Lott, 1992; Sabban & Kvetnansky, 2001). In our country, large industrial poultry enterprises use hens of foreign crosses, which have high productivity with relatively low levels of preservation and stress resistance (Novikova & Lebedeva, 2018). The parent flock is updated by importing the hatching egg or day-old chicks from the producing country, which in turn increases the cost of production (Teke, 2019). In our opinion, the renewal of the parent herd by importing day-old chickens reduces the stress resistance of this category of bird. Blood leukocytes are most often used to diagnose stress and characterize adaptation processes (Cheng et al., 2016). The reason for this is that the morphological composition of the blood reflects the state of the organism of animals and birds, as it is interconnected with most homeostatic functions (Capitelli & Crosta, 2013; Faixová et al., 2010; Lee et al., 2003; Mohamed, 2009). Therefore, according to the dynamics of leukocyte cells, one can judge the degree of tension of each phase of the general adaptation syndrome ("urgent adaptation", "long-term adaptation") (Piotrowska et al., 2011). It is believed that the blood system and its cellular composition is one of the factors of the body's innate resistance to stress, as it is very fast changes in the context of the implementation of the stress response (Damaziak et al., 2017; Rani et al., 2011; Rath et al., 2009; Tóthová et al., 2019). In this regard, we studied the peculiarities of changes in the blood leukocyte composition of chickens imported to a poultry farm from Germany and obtained under conditions of a poultry farm during the development of a stress reaction.

## Materials and Methods

The object of the study was 40-day-old chickens (♀) of the cross-country Loman-white. Poultry was selected into groups according to the principle of analogues, taking into account the origin, live weight, gender and clinical condition. Group I, two-line cross chickens brought to the poultry farm from Germany by the company Loman Tierzucht (subjected to prolonged transport stress, including air travel, car transportation, followed by transplantation to the house). Group II - four-line chickens Cross-country Loman-white obtained in a poultry farm. To determine the morphological parameters, blood smears were made immediately after taking the material, then stained according to the Romanovsky-Giemsa method. White blood cell counts were performed in the Goryaev's cell.

## Results and Discussion

It was established that before stress in two-line (group I) and four-line chickens (group II), the parameters of the leukogram corresponded to normal limits, which reflected the physiological level of the body's overall resistance. However, in the bloodstream of chickens obtained at the poultry farm, the number of leukocytes was  $27.10 \pm 0.93 \cdot 10^9 / l$ , basophils, eosinophils, segmented pseudo-eosinophils, lymphocytes and monocytes, respectively,  $1.20 \pm 0.37$ ;  $7.20 \pm 0.37$ ;  $30.40 \pm 0.93$ ;  $54.80 \pm 0.97$  and  $6.40 \pm 0.68\%$ . In the blood of two-line birds imported to the poultry farm from Germany, the number of leukocytes was  $23.10 \pm 1.02 \cdot 10^9 / l$ , eosinophils  $4.00 \pm 0.71\%$ , segmented pseudo-eosinophils  $27.40 \pm 0.97\%$ , lymphocytes  $56.80 \pm 1.07\%$  and monocytes  $9.20 \pm 0.38\%$  (Figure 1).



**Figure 1.** Background leukogram.

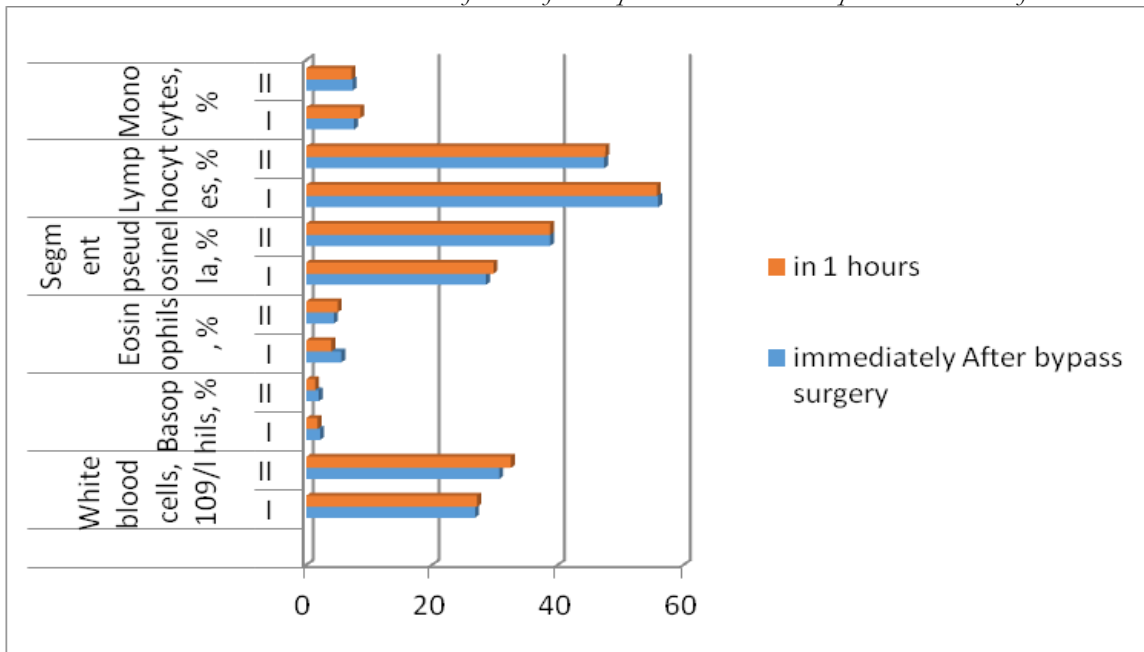
In chickens imported from abroad, compared with chickens obtained at a poultry farm, the overall resistance of the organism was due to the predominance of lymphocytes and monocytes in the leukogram, that is, cells involved in the functioning of specific immunity factors. On the contrary, in the leukogram of four-linear hens, in comparison with two-linear, eosinophils and segmented pseudo-eosinophils dominated, which determine the level of nonspecific resistance of the body. Consequently, the number of lines in the bird genotype influenced the composition of cells in the leukogram and the total number of leukocytes.

The reaction of the chickens to the vibrational effect was manifested in the form of the development of a stress reaction corresponding to the stage of urgent adaptation in the general adaptation syndrome. The formation of a stress reaction was accompanied by shifts in the cellular composition of the blood, which were typical for the action of any stress factor. So, chickens of group II immediately and 1 hour after the simulated stress (Figure 2), the total number of leukocytes increased by 13.35-20.14% ( $p < 0.05$ ). In the leukogram, a decrease in the number of eosinophils and lymphocytes, respectively, by 30.55-38.88% ( $p < 0.001$ ) by 13.14-13.58% ( $p < 0.001$ ) was noted, compared to the background, against the background of an increase in the percentage the shares of basophils (16.66-66.66%), monocytes (12.50-15.60%) and segmented pseudo-eosinophils (27.63%). Moreover, the maximum changes were observed 1 hour after the action of the stress factor.

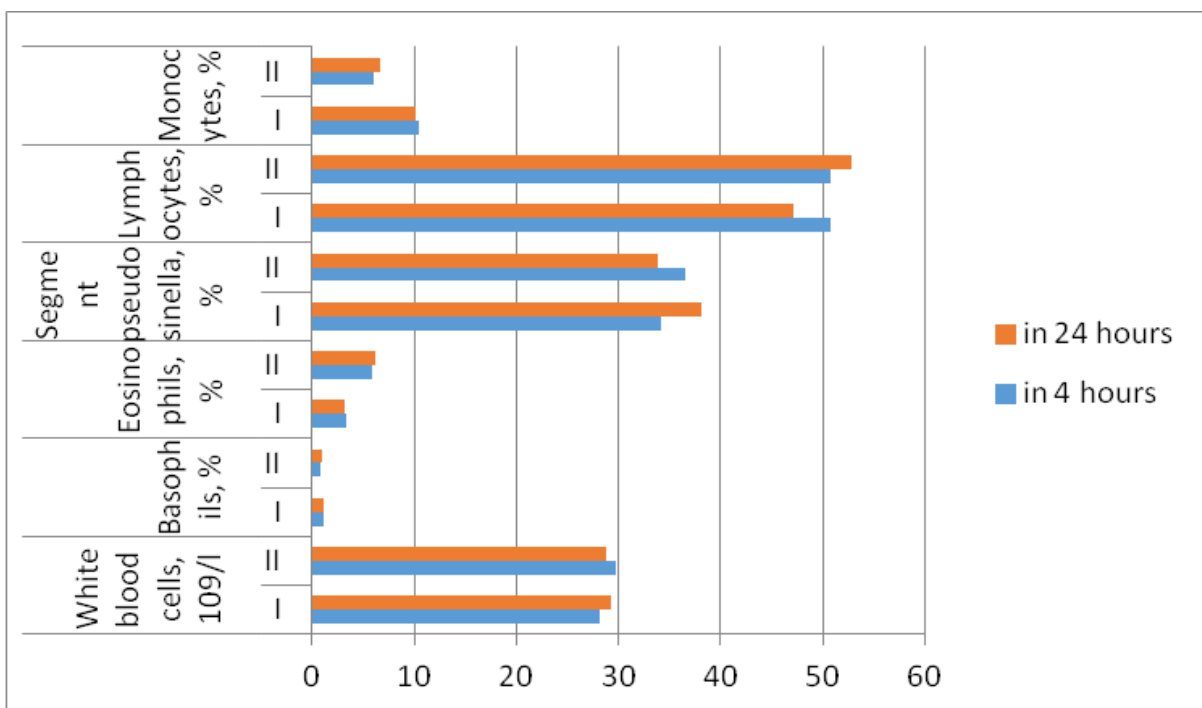
However, just 4 hours after the vibrational effect, the direction of changes in leukocyte cells became opposite: the total number of leukocytes, basophils, segmented pseudo-eosinophils and monocytes decreased against the background of an increase in eosinophils and lymphocytes (Figure 3).

In group I, the blood composition of chickens against the background of simulated stress had changes of the same type as those that were established by us in hens (♀ ABSD) in the first hour of post-vibration exposure (Figure 2). At the same time, the shifts increased gradually and reached a maximum only 24 hours after the action of the stress factor (Figure 3).

In group I, in the body of two-linear hens, the stress reaction was sluggishly current and longer in time. Therefore, in birds in the indicated period the signs of the stress reaction did not stop, and this suggests that the chickens imported from abroad had low adaptive potential, and their body was not able to quickly mobilize plastic and energy reserves, which delayed the formation of adaptation.



**Figure 2.** Leukogram immediately and an hour after vibration.



**Figure 3.** Leukogram after 4 and 24 hours after scutellaria.

**Discussion**

The results of our studies showed that experimental production stress of rearrangement and transportation initiated in the body two- and four-linear development of a stress reaction, which was characterized by standard changes in the leukocyte composition of the blood, detected by the action of any stress factor. However, in birds obtained at the poultry farm, the phase of "urgent adaptation" was characterized by high tension, which testified to the high adaptive potential of chickens of their own reproduction. Our data on the nature of cell changes in bird leukogram after vibration exposure are consistent with the results of Bueno, J.P.R., Nascimento, M.R.B.M., Martins, J.M.S. and others. However, the authors registered them at a later date of research. In the body of chickens imported from Germany, a less active and therefore longer stress reaction was observed, the signs of which increased gradually and reached a maximum 24 hours after exposure to the stress factor. Our results are consistent with the data of Gueguinou, N. Huin-Schohn, S., Ouzren-Zarhloul, N. and others; Hosseini-Vashan, S.J., Golian, A., Yaghobfar, A., who also noted the development of stress reactions in chickens under vibration exposure with a vibration frequency of 140 and 160 per minute.

**Conclusion**

The revealed features of changes in the leukogram in chickens imported from Germany under the influence of stress are a consequence of their transportation at the age of 24. Therefore, individuals had low adaptive capabilities of the body.

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