CIRCADIAN BIORHYTHM OF HEART BEAT FREQUENCY IN BROILER CHICKS

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SUMMARY

Due to the structural vicinity and of the synaptic connections of the pineal gland with diencephalon formations, the involvement of the latter in the modulation of the diurnal and nocturnal variations of the organism is possible. In birds, the involvement of the pineal gland in the correlation of the circadian variations of the circadian rhythm was shown by many authors (Binkley, S. et al., 2000, Cain, J. et al., 1999). We monitored for 12 days the early display of this relation surveying day-old broiler chicks. The experiment used 4 groups: groups 1 and 2 with continuous light regimen but with different light intensity (200 lux and 2 lux), groups 3 and 4 with 12 hours of light and 12 hours of darkness and light intensity of 200 lux and 2 lux. The telemetric (Polar Monitor HRNV) monitoring of the heartbeat showed a variation related to the light intensity, with the light to darkness ratio and with the moment of feed removal. In all 4 groups, between days 3 and 7 the average values of the heartbeat increased with the chick age expressed in days of exposure to light. After that day heartbeat frequency remained constant. In groups 1 and 2 there were no significant differences of the heartbeat related to the light intensity and no circadian rhythm of the heartbeat was observed. In groups 3 and 4 irrespective of the light intensity, heartbeat frequency was higher during the periods of light and lower during the periods of darkness. This shows the synchronisation of the heartbeat frequency with photoperiods of 12 hours light and 12 hours darkness. The daily cycle of the periods of darkness determined the onset of the circadian biorhythm of the heartbeat frequency. The average daily values of the heartbeat frequency recorded between days 4 and 12 were 9.3% higher in group 4 (2 lux light intensity) than in group 3 (200 lux light intensity) during the period of light and 26% during the period of darkness. Heartbeat frequency increase is more important during the period of darkness than during the period of light and for a light intensity of just 2 lux. This shows the activation of the secretory function of the pineal gland during the period of darkness and during the periods of poor illumination due to the intensification of noradrenaline release in the sympathetic terminations that innerve the epiphysis. The noradrenaline release stimulated the activity of N-acetyltransferase that transforms N-acetylserotonin into melatonin and also increases the heartbeat frequency.

BIBLIOGRAPHY

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