VENTILATORY RESPONSES TO HYPOXIA IN DIABETIC RATS

J. Antosiewicz, A. Dymecka, A. Rękawek, and M. Pokorski
Department of Respiratory Research, Medical Research Center, Polish Academy of Sciences, Warsaw, Poland

The carotid bodies have unique physiological characteristics that are consistent with their role in offsetting changes in arterial blood glucose. However, carotid body chemosensory function in diabetes is little known. The aim of this study was to determine the influence of diabetes on the chemical regulation of breathing. We addressed the issue by comparing the hypoxic ventilatory responses (HVR) in 7 conscious Wistar rats with streptozocin-induced diabetes (80 mg/kg, i.p.) and 7 normal (control) rats. The mean glycemia amounted to 510.2 ±32.6 SE) mg% in diabetic rats 4 weeks after streptozocin administration as opposed to 126.7 ±12.5 mg% in controls. The HVR to 14% and 11% O_2 in N_2 were taken with the use of whole body plethysmography in the poikilokcapnic condition. Ventilatory changes were expressed as a percentage of the baseline prehypoxic level, taken as 100%. The results show that resting minute ventilation (VE) was similar in both groups (331 ±32 ml/min in diabetics *vs.* 316 ±79 ml/min in controls). The HVR also was typically biphasic, stimulatory/inhibitory, in both groups. We found, however, a substantial decrease of the hypoxic ventilatory profile in the diabetic rats. The decrease was particularly apparent in the stimulatory phase of the stronger 11% hypoxia. At that level of hypoxia, the peak VE barely reached 120 ±8% of baseline in diabetic compared with the 160 ±7% increase in the control rats ($P<0.02$), which resulted in a substantial decline in hypoxic ventilatory gain. The reduction of HVR was due mostly to a reduction in the frequency component. In conclusion, malfunction of carotid body-generated hyperventilation becomes apparent under the strain of severe hypoxia. An understanding of the hypoxic ventilatory handicap evoked by diabetes requires an alternative study design that would allow an insight into the ultrastructural carotid body changes.