**Abstract**

**Aim:**

The aim of the study is to investigate the effect of $CO_2$ on neurovascular coupling in response to epileptiform activity after trancallosal electric stimulation in rats.

**Methods:**

Adult albino rats (250-350g, n=6) were anaesthetized with isoflurane and epidural silver EEG electrodes were implanted and fixed into the skull over sensorimotor cortices. To measure regional cerebral blood flow (rCBF) during epileptic activity a self-made metal holder for Laser Doppler Flowmeter (LDF) probe was fixed to thinned skull with dental acrylic. To measure arterial blood pressure (BP) and arterial blood gasses a plastic catheter was implanted into the common carotid artery. After postsurgical recovery animals were placed in a recording chamber. After 20 minutes of background recording effect of $CO_2$ on basal BP an rCBF was tested by inflating a mixture of 10%$CO_2$, 20%$O_2$ and 70%$N_2$ for 30seconds. To assess changes in neurovascular coupling a rat model for myoclonic seizures was used. Biphasic constant current suprathreshold stimulus (8Hz, 15s) was applied under normal or elevated $CO_2$ atmosphere.

**Results:**

Elevated $CO_2$ led to a significant increase of both regional cerebral blood flow and blood pressure. In addition, inhalation of 10%$CO_2$ during electrical stimulation of senzorimotor cortex (8Hz, 15s) caused significant increase in regional cerabral blood flow. Surprisingly, basal blood pressure did not increase after 10%$CO_2$ exposure during electrical stimulation of senzorimotor cortex. Transcallosal electrical stimulation produced cortical epileptic

afterdischarges which were paralleled by facial and fore limb clonic seizures. Elevated $CO_2$ reduced or completely blocked the stimulation-evoked epileptiform afterdischarges.

**Conclusions:**

Our data suggest that application of $CO_2$ may be effective in the acute treatment of epileptic seizures. The effect of $CO_2$ might be explained by both decreased excitability due to tissue acidosis and elevated rCBF levels.

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