Objectives: Peripheral artery disease (PAD) is a major health problem; however, no satisfactory intervention is available for its treatment. This study was undertaken to investigate the effects as well as mechanisms of the CO$_2$-enriched water bath (CEWB) treatment on blood flow in the ischemic hind limb.

Experimental Model: For inducing PAD, the femoral artery was occluded for 5 weeks in rats. The animals were treated with or without CEWB at 37°C for 4 weeks (20 min daily; 5 days per week) starting one week after the artery occlusion. CEWB was prepared by using Carbothera (Mitsubishi Rayon Engineering Tokyo). The blood flow was measured by Pulse Wave Doppler Ultrasound technique before and after the ligation as well as at the end of 4 weeks treatment. The angiogenesis (formation of new blood vessels) in the skeletal muscle was studied by histological examination.

Results: The peak, mean or minimal blood flow was not detected in the untreated ischemic hind limb animals due to arterial ligation. However, the values for blood flow were about 50% of the control values upon treatment with CEWB; 67% of the ligated animals showed positive blood flow by CO$_2$ treatment. Morphological examination of the treated ischemic skeletal muscle revealed a 3-fold increase in small artery count. Although plasma triglycerides were decreased and plasma NO concentration was increased in the ischemic animals, CEWB treatment produced no effects on these parameters. No mortality or changes in body wt, heart rate and plasma glucose, cholesterol or high density lipoproteins were seen in the control and experimental animals.

Conclusion: This study demonstrates the beneficial effect of CEWB treatment on blood flow in hind limb PAD. Furthermore, it is suggested that this beneficial action of CO$_2$ therapy may be due to the formation of new blood vessels in the ischemic skeletal muscle.

Keywords: CO$_2$ water bath, Peripheral artery disease, Hind limb blood flow, Angiogenesis, Blood lipids