



HOKKAIDO UNIVERSITY

Title	Effects of hydrogen peroxide on vascular tone in isolated rat mesenteric artery
Author(s)	OHTA, Mari
Citation	Japanese Journal of Veterinary Research, 49(1), 58-58
Issue Date	2001-05-31
Doc URL	https://hdl.handle.net/2115/2886
Type	departmental bulletin paper
File Information	KJ00002400348.pdf



Effects of hydrogen peroxide on vascular tone
in isolated rat mesenteric artery

Mari Ohta

*Laboratory of Pharmacology,
Department of Biomedical Science
School of Veterinary Medicine, Hokkaido University
Sapporo, 060-0818, Japan*

1. The effects of hydrogen peroxide (H_2O_2) on basal tone, 5 HT-and high K-induced contractions were investigated in ring preparations isolated from rat mesenteric artery. Changes in cytosolic Ca^{2+} concentration and cellular ATP contents in response to H_2O_2 were also examined.
2. H_2O_2 induced slow developing and sustained contractions in a concentration-dependent manner, regardless of the presence or absence of endothelium. The contractile response to H_2O_2 at higher (3 mM) but not at lower (1 mM) concentrations was reduced by the removal of endothelium.
3. H_2O_2 -induced contractions were not inhibited by nifedipine, the removal of extracellular Ca^{2+} and thapsigargin under extracellular Ca^{2+} -free condition. FCCP (uncoupler of oxidative phosphorylation in mitochondria) shortened the time-to-peak of contraction induced by H_2O_2 . Both PKC and MAPK inhibitors failed to inhibit H_2O_2 -induced contractions.
4. H_2O_2 increased intracellular Ca^{2+} concentration both in the presence and absence of extracellular Ca^{2+} . H_2O_2 did not affect Ca^{2+} -induced contraction in skinned arterial preparations.
5. H_2O_2 significantly reduced cellular ATP contents in the rat thoracic aorta.
6. Contractions evoked by 5 HT or KCl were potentiated by H_2O_2 at low concentrations but inhibited at high concentrations. The inhibitory effect of H_2O_2 was reversible and endothelium-independent.
7. These results suggest that H_2O_2 caused extracellular Ca^{2+} -and endothelium-independent, sustained contractions accompanied with sustained rise in Ca^{2+} concentration. The H_2O_2 -induced contractions seem to be partly related to mitochondrial dysfunction, but not Ca^{2+} release from the endoplasmic reticulum, activations of PKC and MAPK and change in Ca^{2+} sensitivity to contractile machinery. These vasoactive responses to H_2O_2 may explain some causes of abnormal vasoactivity due to oxidative stress, produced by inflammation, ischemic-reperfusion injury and atherosclerosis.