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0014-4754/84/121369-04$1.50 + 0.20/0

Prolonged vibration of cutaneous artery: absence of persisting aftereffects[1]

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Summary. 1–3 h after prolonged (3–16 h) vibration (120 Hz, 0.2–0.3 mm amplitude) of rings of canine saphenous arteries there was no significant change in the contractile response to electrical stimulation, exogenous norepinephrine or of neuronal uptake of tritium labeled norepinephrine. These results did not provide evidence for persistent aftereffects of prolonged vibration.
Key words. Arteries, canine; electrical stimulation; contractile response; aftereffects, persisting; vibration, prolonged; norepinephrine.

The present study was designed to examine possible after effects of prolonged vibration on sympathetic nerve endings and smooth muscle in isolated rings of a small cutaneous artery. Rings (outside diameter approximately 1 mm before stretching, length 2–3 mm) of canine saphenous arteries were suspended between a force transducer and a vibrator (fig. 1). The vibratory oscillations were controlled by a sine-wave generator and monitored by a strain-gauge glued to the vibrator. The rings were superfused (3 ml/min) with aerated Krebs-Ringer solution at 37°C (mmolar composition: NaCl, 118.3; KCl, 4.7; $CaCl_2$, 2.5; $MgSO_4$, 1.2; KH_2PO_4, 1.2; $NaHCO_3$, 25.0; edetate calcium disodium, 0.026; glucose, 11.1). For stimulation of adrenergic nerve endings 2 platinum electrodes were mounted parallel to the rings[4]. To determine the aftereffects of vibration on neuronal uptake the rings were incubated with L-7-^{3}H-norepinephrine following 16 h of vibration. The rings were then washed in physiological salt solution before extracting and measuring tissue content of labeled norepinephrine[2,3]. In all experiments control rings were run in parallel. Rings were stretched to optimal length for contraction, using a standard electrical stimulus, before each determination of contractile response. Optimal length was similar before and after vibration. On contraction many rings showed an initial maximal contraction followed by a smaller stable contraction. Maximal contractions were used for calculation. Results are expressed as mean ± SEM. Statistical evaluation of the data was by Student's t-test for paired observations.

Contractions were evoked by increasing frequencies of electrical stimulation (0.5–16 Hz, 9 V, 2 msec pulse duration) be-

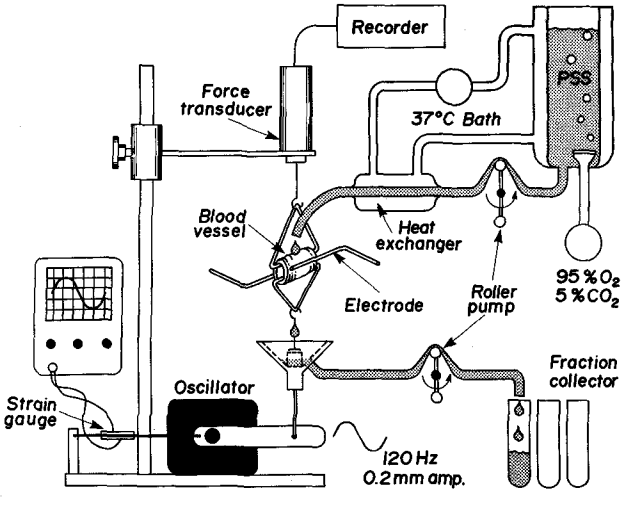

Figure 1. Technique used to determine the response to vibration of rings of canine saphenous arteries.

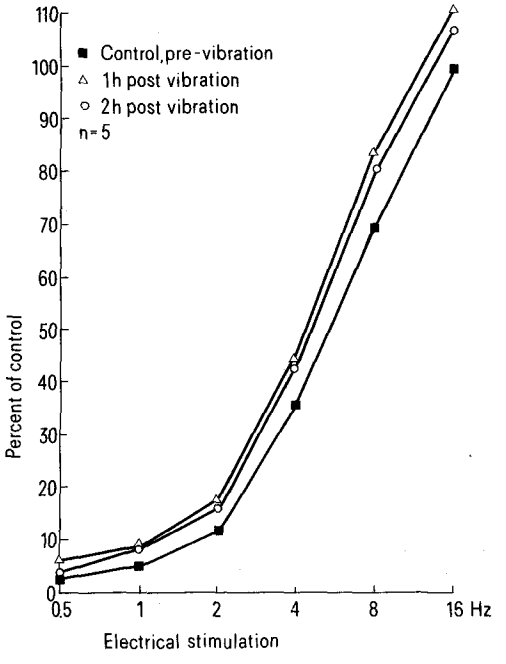

Figure 2. Contractions of rings of canine saphenous arteries to electrical stimulation with increasing frequencies (0.5–16 Hz) before and 1 and 2 h after vibration for 3 h (120 Hz, 0.3 mm amplitude). Data are expressed as percentage of maximal contraction (16 Hz).

fore and 1 and 2 h following 3 h of vibration (120 Hz, 0.3 mm amplitude). The frequency response curves before and after vibration were similar in the rings exposed to vibration and controls (fig. 2). Following 16 h of vibration similar contractions to electrical stimulation (4–16 Hz, 9 V, 2 msec pulse duration) were observed before and 2 h after vibration (120 Hz, 0.2 mm amplitude) (fig. 3).

Contractions to exogenous norepinephrine (3×10^{-6} M) were studied in 6 rings before and 2 h following 3 h of vibration (120 Hz, 0.2 mm amplitude). After correction for time dependent changes in the control rings contractions to norepinephrine were on the average 42.6 ± 20.7% greater than before vibration. In individual rings, however, contractions were either augmented (n = 4), unchanged (n = 1) or depressed (n = 1) and the difference induced by vibration was not significant.

Neuronal uptake of tritium labeled norepinephrine was not significantly different in six control rings (9989 ± 1585 dpm/mg) and in 6 rings vibrated (120 Hz, 0.2 mm amplitude) for 16 h (7980 ± 1085 dpm/mg).

Azuma et al.[5] reported that prolonged vibration (3 h, 50 Hz, 500 µm amplitude) of helical strips (length 15 mm) from canine femoral arteries were followed by augmented contractions to exogenous norepinephrine 2–5 h after vibration. This suggested a possible pathogenetic mechanism for 'white fingers' induced by the prolonged use of vibrating tools. However, with the procedures outlined in this study, 3–16 h of vibration was not sufficient to uncover any significant persistent abnormality in a canine cutaneous artery following cessation of vibration.

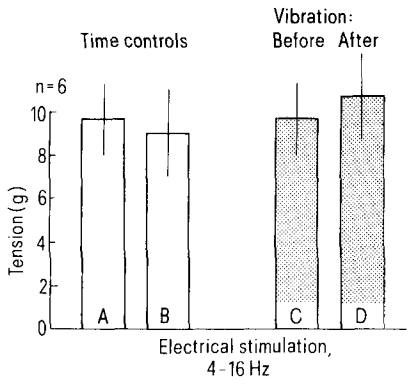

Figure 3. Absence of effect of 16 h vibration (120 Hz, 0.2 mm amplitude) of rings of canine saphenous arteries on contractions to electrical stimulation. Studies were made before (C) and 2 h after Vibration (D) (hatched rectangles). Control rings (clear rectangles) were studied at similar times (A and B, respectively).

1 Acknowledgments. Supported in part by NIH grant HL 05883 and the Swedish Work Environmental Fund.

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0014-4754/84/121372-02$1.50 + 0.20/0

Cholesterol content and cholesterol esterifying activity of various organs in guinea pigs[1]

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20 December 1982

Summary. In various organs of the guinea pig, the total cholesterol content of an organ was significantly correlated with the percentage of esterified cholesterol present in this organ. Cholesterol esterifying capacity was shown in most organs, with highest activities in the adrenals, the spleen and the liver. The significant correlation found between the cholesteryl ester content of an organ and its acyl cholesterol acyltransferase activity suggests a possible role of this enzyme in determining the level of the total and esterified cholesterol in a tissue.
Key words. Guinea pig; cholesterol content; cholesterol esterifying capacity; cholesterol, total; cholesterol, esterified; acyl cholesterol acyltransferase.

Esterification of cholesterol constitutes a major step in cellular metabolism[3]; nevertheless, little is known about the cholesterol esterifying activity of different tissues and the possible role of this esterification capacity in regulating cholesterol metabolism in normal and in cholesterol-fed animals. Thus, we decided to study the degree of cholesterol esterification and the cholesterol esterifying capacity (acyl Co-A cholesterol acyltransferase; ACAT, EC 2.3.1.26) in various organs. As experimental animals, guinea pigs were chosen because when they are fed a cholesterol rich diet, a marked plasma and tissue cholesterol accumulation (mainly in the esterified form[4–7] ensues.

Material and methods. Thirty-five male guinea pigs were used; they were on a standard diet for periods extending from 1 to 24 months and weighed between 225 and 1100 g when sacrificed. Twenty-nine guinea pigs weighed between 225 and 595 g; five animals weighed between 965 and 1100 g.

The diet was prepared by Hope Farms BV, Woerden (The Netherlands). The animals had free access to food and water containing ascorbic acid (1 g/l). Animals were sacrificed between 08.00 and 10.00 h and were not fasted. The tissues were quickly excised, placed in ice-cold 0.9% saline and weighed. The following organs were studied; stomach, small intestine (divided into three equal portions named proximal, middle and distal parts), colon, liver, kidneys, adrenals, lungs, spleen and aorta. For free and esterified cholesterol determinations[8], tissue samples were homogenized in 0.9% saline and extracted with petroleum ether. For measurement of the tissue cholesterol esterifying capacity, tissues samples were homogenized in