Changes in serum and tissue lipid levels induced by metacorticoid hypertension in rats

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There is evidence to suggest that hypertension promotes atherosclerosis in both man and experimental animals (Pickering, 1968). Hypercholesterolaemia has been implicated in the aetiology of atherosclerosis and we therefore considered it of interest to study the effects of experimental hypertension in the rat on serum and tissue lipid levels. In addition, aortic permeability was measured using ^{125}I-albumin.

Previous work has indicated that the blood cholesterol concentration is increased in renal (Goldbatt) hypertensive rats (Daly, Deming, Raeff & Brun, 1963) but not in spontaneously hypertensive rats (Nagaoka, Kikuchi, Kawaji, Matsuo & Aramaki, 1972) fed a normal diet. In the present study, metacorticoid hypertensive rats (Friedman & Friedman, 1949) were used, the hypertension being induced in male Sprague–Dawley animals by subcutaneous implantation of deoxycorticosterone (25 mg) together with unilateral nephrectomy and replacement of the drinking water with 1% w/v NaCl solution for the first 5 weeks. The rats were fed a normal laboratory diet. Systolic blood pressures were recorded at regular intervals, and all rats were killed at 4 months for examination being allowed food and water *ad libitum* until death. Rats with B.P. greater than 160 mmHg were considered hypertensive. Eight such animals were thus selected and a further 8 animals which failed to become hypertensive were used as treated controls. Twelve unoperated rats served as untreated controls.

Hypertensive rats had raised serum cholesterol levels when compared with both 'treated' and 'untreated' controls (122 ± 11, 89 ± 6, 84 ± 4, mg% $\pm$ S.E. of mean, respectively, $P<0.02$), a positive correlation ($r=0.67$, $P<0.001$) between serum cholesterol and B.P. being observed. There was a non-significant increase in serum triglyceride in hypertensive rats.

Aortic non-esterified cholesterol concentration was increased (67%, $P<0.01$) by hypertension, compared with 'treated' controls, but the cholesterol ester concentration was unchanged. Liver cholesterol concentration was reduced ($P<0.001$) in hypertensive rats (2·7 mg/g) compared with 'untreated' controls (3·6 mg/g) but there was also some reduction in the 'treated' control group (3·2 mg/g). Phospholipid levels in the aorta and liver did not differ between groups, but the triglyceride level in the two tissues was significantly reduced ($P<0.05$ for aorta and <0.001 for liver) in hypertensive (aorta 15·7 mg/g, liver 3·4 mg/g) and 'treated' control (aorta 17·2 mg/g, liver 4·3 mg/g) rats compared with 'untreated' controls (aorta 32·2 mg/g, liver 9·3 mg/g). Therefore, the decrease in both aortic and hepatic triglyceride in hypertensive rats appeared to be related to the deoxycorticosterone—NaCl treatment rather than to the induction of high blood pressure. There were no differences in aortic permeability. In an attempt to explain the rise in serum cholesterol, hepatic cholesterogenesis from acetate was studied *in vivo*. Although the mean rate of synthesis was greater in hypertensive rats than in both control groups, the difference was not significant at the 5% level.

The hypertension-induced hypercholesterolaemia seen in this experiment could have implications in the aetiology of atherosclerosis in man.

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