

**Résumé.** Les effets de l'ablation des ganglions cervicaux supérieurs de *Coturnix coturnix japonica* font l'objet de cet exposé. Chez le mâle la gangliectomie bilatérale n'affecte pas l'activité testiculaire. Par contre chez les femelles la quantité d'œufs pondus est nettement réduite et l'interruption post-opératoire de la pondaison est prolongée; de plus la première ponte des jeunes femelles est retardée. Les *Coturnix* qui ont subi l'ablation des ganglions ont un taux de mortalité plus élevé lorsque les oiseaux sont

exposés à des abaissements de température et des changements de photopériodisme.

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## The Mechanical Response of Isolated Arteries to Potassium

Some studies during the past years have indicated that potassium ions play an essential role as regulators of vascular tone<sup>1-7</sup>. Potassium is released in sufficient amount by exercising muscles and its concentration is immediately increased in the venous blood<sup>4-12</sup>. The effect and extent of vasodilatation induced by intra-arterial infusions of potassium is strikingly similar to that of exercising muscles<sup>4</sup>. These data were obtained on limb preparations and the effect of potassium was proved from the lumen of the arteries.

The question arises whether and how potassium acts if applied from the outside of the arteries, for there is some indication that potassium released during muscular exercise influences vascular tone from the outside of the arteries or rather from the interstitial space. The present studies have been carried out in order to provide quantitative information about the influence of potassium acting from the outside of the vessels.

**Method.** Isolated bovine facial and coronary arteries of 30-40 mm length were stored in defibrinated and oxygenated blood at a temperature of 4°C. The arteries were prepared in Tyrode solution 1 h before testing. The adventitia was removed and the small vessels ligated. They were mounted in a chamber with a constant temperature of 37°C and placed together with Tyrode solution under different pressures (50-120 mm Hg). One end of the artery was closed, the other connected by

means of a fine tube with a pressure transducer (Fa. Schwarzer, Munich, Germany). The arteries were rinsed from the outside with various solutions at a temperature equal to that of the chamber. The Tyrode solution had the usual composition except that glucose had been added. The solutions were aerated with 95% oxygen and 5% carbon dioxide. The potassium content was increased or decreased by replacing NaCl with KCl on an equimolar

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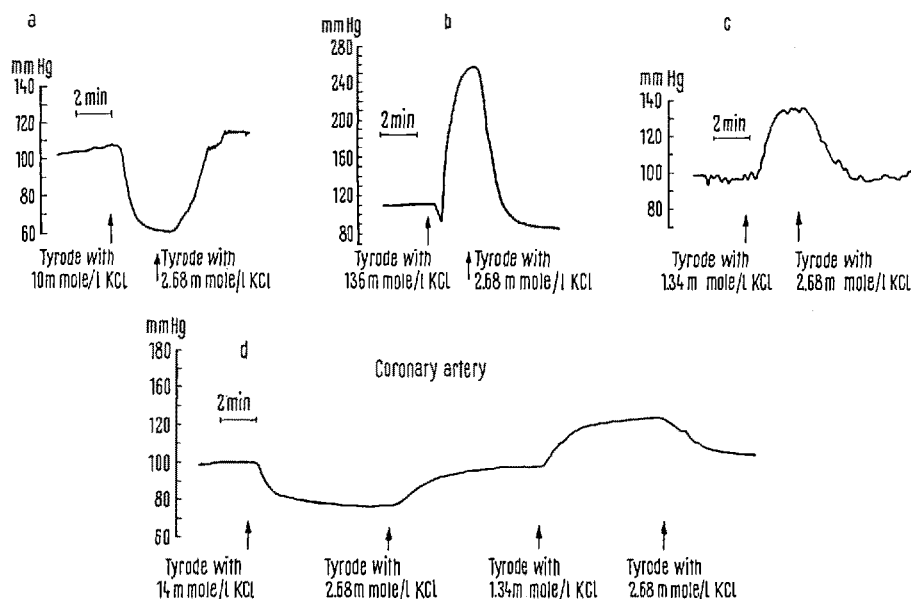
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The effects of variations of the potassium concentration on vascular tone in the facial artery (a-c) and coronary artery (d, e), measured by inside pressure in mm Hg. The normal potassium concentration in the Tyrode solution is 2.68 mmole/l. Arrows indicate the change of the various solutions. (a) Increase in the K<sup>+</sup> concentration to 10 mmole/l; (b) increase in the K<sup>+</sup> concentration to 136 mmole/l; (c) decrease in the K<sup>+</sup> concentration to 1.34 mmole/l; (d) increase in the K<sup>+</sup> concentration to 14 mmole/l; (e) decrease in the K<sup>+</sup> concentration to 1.34 mmole/l.

basis. The osmotic pressure of all solutions was  $300 \text{ mosmol} \pm 1\%$ , the pH 7.15.

**Results.** Even a slight increase in the potassium concentration reduced the pressure of the facial arteries (vasodilatation). A maximum dilatation was reached with 10 mmole/l potassium chloride (average decrease in pressure of about 50 mm Hg, Figure a). A further increase in the potassium concentration to about 35 mmole/l still produced vasodilatation, but the extent of vasodilatation was diminished with increasing concentrations. Concentrations of more than 50 mmole/l potassium chloride invariably led to contracture (Figure b). A decrease in the potassium concentration below the normal level always increased the pressure, and the increased pressure was maintained for a long period of time (observed up to 60 min) (Figure c).

Increase in the potassium concentration also induced vasodilatation in the coronary arteries (Figure d). But this effect could be elicited only with higher concentrations of potassium and the extent of vasodilatation was much smaller compared with that of the facial artery.

Decrease in the potassium concentration and a concentration of more than 50 mmole/l produced vasoconstriction in the same way as in the facial artery, but the force of contraction was much smaller in the coronary artery (Figure e).

**Discussion.** There seems little doubt that potassium ions play an essential role in regulating the skeletal muscle blood flow during muscular exercise<sup>1-7,13,14</sup>. The results obtained on resistance vessels in perfused limb preparations were complemented by our experiments on isolated arteries, demonstrating that potassium is able to influence vascular tone from the outside of the arteries or from the interstitial space. The increase in the potassium concentration found in human subjects during exercise decreased the pressure in our experiments at an average of about 30 mm Hg. But one can assume that the local concentration of potassium in the interstitial fluid during muscular activity reaches higher levels than in the venous blood<sup>3</sup>.

Principally the same reaction of vasodilatation, although smaller, could be observed in the coronary artery,

but the results of these experiments seem not to support the hypothesis that potassium plays the same essential role in regulating coronary blood flow as it does in skeletal muscle blood flow.

The increase in pressure with decreasing potassium concentration observed in the facial and coronary artery might be partially compared with the results obtained on *Taenia coli*<sup>15,16</sup>, where decreasing potassium concentrations decreased the membrane potential and increased spike activity. The increase in pressure with a potassium content of more than 50 mmole/l is probably due to a direct depolarizing action.

The site of action of potassium on vascular smooth muscle as regards vasodilatation and vasoconstriction (low or zero potassium) has not been established. Some evidence points to a direct action and it might be possible that there exists a  $\text{Ca}^{++}$ - $\text{K}^{+}$ -antagonism<sup>4,13,14,17</sup>. But further studies are necessary to investigate the different potassium effects<sup>18</sup>.

**Zusammenfassung.** Die vasodilatatorische Wirkung der  $\text{K}^{+}$ -Ionen wird bei Applikation von aussen auf Segmente der Art. facialis des Rindes, die in einer feuchten Kammer unter Druck gesetzt wurden, nachgewiesen. Die Befunde werden im Hinblick auf die Bedeutung des Kaliums für die Durchblutungsregulation im Muskel diskutiert.

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## Uptake of <sup>35</sup>S-Sulphate in Dimethylbenzanthracene Painted Mouse Skin

Previous studies using radioactive sulphur, <sup>35</sup>S, as a tracer have shown that sulphated compounds exist throughout the body, being especially concentrated in the connective tissue. The acid mucopolysaccharides of the ground substance of dermal connective tissue play an important role in the responses of the dermis to injury. Two days after peritoneal injection, practically all the <sup>35</sup>S-sulphate is found in sulphomucopolysaccharides in various tissues, among others the skin (BOSTRÖM and GARDELL<sup>1</sup>). In epidermal carcinogenesis, these substances have been thoroughly studied. The results of analyses for mucopolysaccharides and collagen in the skin of dimethylbenzanthracene painted mice were described by KETKAR<sup>2</sup>. By incorporating <sup>35</sup>S-sulphate in skin connective tissue, it is possible to obtain information about the metabolic activity of the sulphomucopolysaccharides. The aim of the present study was to investigate the uptake of <sup>35</sup>S-sulphate in mouse skin painted with 0.5% 9,10-dimethyl-

1,2-benzanthracene in benzene once a week for 4, 8 and 12 weeks.

**Materials and methods.** Forty female ST/Eh mice aged 6 weeks and weighing about 20 g each, were maintained on a laboratory diet with free access to water. The animals were divided into 3 experimental and 2 control groups, so that initial mean body weights were as close as possible. Group 1 consisted of 8 mice serving as untreated controls. Group 2: 8 animals were painted on the abdominal skin with 0.05 ml thiophene-free benzene once a week for 6 weeks. Group 3, 4 and 5: 24 mice were painted on the abdominal skin with 0.05 ml of 0.5% 9,10-dimethyl-1,2-benzanthracene in benzene once a week for

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