Electrical Activity of a Mammalian Vein

RECENTLY it was found (Sutter, unpublished) that spiral strips cut from the anterior mesenteric vein of rabbits showed marked spontaneous contractions when suspended in Krebs–Henseleit solution at 37° C. Vascular smooth muscle is generally considered to be of the multi-unit type and to be devoid of spontaneous conducted activity. It was thought that the spontaneously active anterior mesenteric vein strip might prove a suitable tissue for investigating the electrical activity of vascular tissue.

Spirals, 2 cm in length, were cut from the anterior mesenteric veins of freshly killed rabbits and mounted in a sucrose gap electrode[1]. Arrangements were made, using an R.C.A. 5734 mechano-electronic transducer, to record isotonic contractions of the strip simultaneously with electrical activity. Strips were maintained at a tension of 250–500 mg and a total of 10 preparations were examined. Six of these showed pronounced spontaneous mechanical activity which developed some 30–60 min after mounting in the gap.

Only a single preparation, the second vein tried, showed appreciable electrical activity. Some results from this preparation are shown in Fig. 1. A contraction of the preparation was accompanied by a plateau of depolarization on which spike-like action potentials were superposed. In general, the amplitude and frequency of the spikes were greatest during the active phase of contraction. Some contraction waves were fused giving rise to an increase in tone lasting approximately 30 sec (Fig. 1*c*, *d*). The electrical activity was either continuous (Fig. 1*c*) or showed periods of quiescence (Fig. 1*d*) during these tone increases. A record such as that shown in Fig. 1*d* would be obtained if, during periods of increased tone, individual muscle cells alternated between rest and activity.

The more usual record obtained from anterior mesenteric vein strips is shown in Fig. 2. Strong isotonic contractions were accompanied by either no electrical change (Fig. 2*b*) or by ill-defined depolarizations (Fig. 2*a*). The sucrose gap electrode measures overall electrical activity from a small region of tissue, and only when this activity is synchronous will sharp electrical changes be observed. It is concluded, therefore, that the electrical activity in this tissue is largely asynchronous and poorly conducted.

The method described does not provide a reliable way of investigating spike discharge in this vascular tissue; but we are prompted to publish our results by the dearth of information on electrical activity in vascular smooth muscle in general. So far as we are aware this is the first report on electrical activity in mammalian veins.

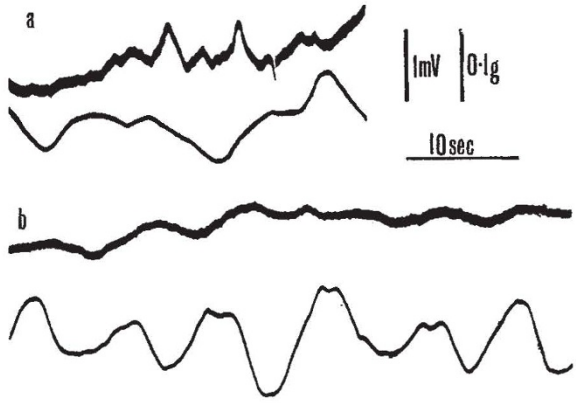

Fig. 2. Oscilloscope record as in Fig. 1. This preparation did not show synchronous electrical activity, although prominent mechanical activity was present. Resting tension 275 mg

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[1] Burnstock, G., and Straub, R. W., *J. Physiol.*, **140**, 156 (1958).

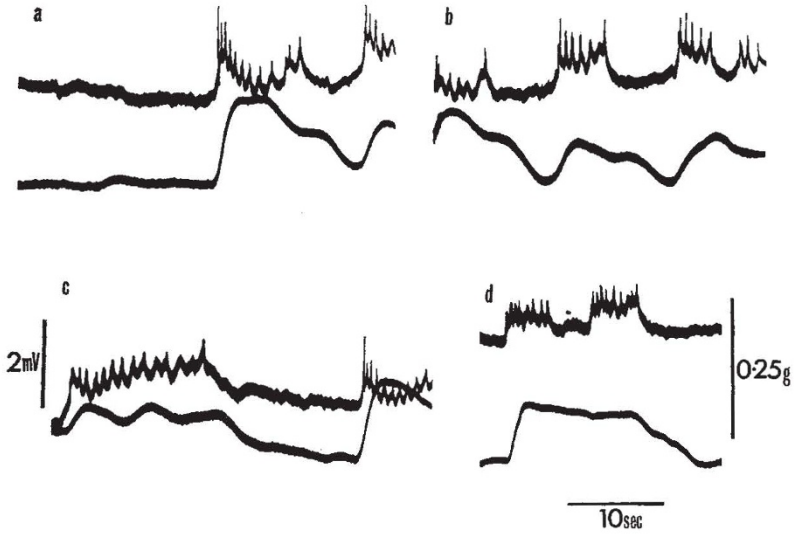

Fig. 1. Oscilloscope record of the electrical (upper trace) and mechanical (lower trace) activity of a spontaneously active strip of anterior mesenteric vein recorded with a sucrose gap electrode. Resting tension 350 mg

Strong Inhibition by 2-Chloroadenosine of the Aggregation of Blood Platelets by Adenosine Diphosphate

WITH a turbidimetric method[1,2] it was shown that the aggregation of platelets that is brought about by adenosine diphosphate (ADP)[3] is inhibited by adenosine monophosphate[4] and, about ten times more strongly, by adenosine[2,5]. The aggregating effect of ADP is very specific[3]. Our work[2,6] suggests that the molecular structure required to inhibit the effect is just as specific. Thus, we determined the inhibitory activities of 19 other substances, all related to adenosine, compared to the activity of adenosine itself. Only four of these substances had an inhibitory activity greater than 1 per cent of that of adenosine; and the most potent of these four, with an activity of 5 per cent, was isoguanosine (2-oxy,6-amino purine riboside). Since the only difference between isoguanosine and adenosine is the substitution of a hydroxyl group for a hydrogen atom in position 2, another analogue of adenosine substituted only in that position, namely, 2-chloroadenosine, has now been compared with adenosine for inhibitory activity.

When the comparison was made as already described[6], using human platelets in their plasma at room temperature (20°–22° C), the inhibitory activities of adenosine and 2-chloroadenosine were similar (Table 1). However, when compared at 37° C, 2-chloroadenosine was found to be more inhibitory than adenosine. The experiments which showed this were based on the observation[2,5] that the inhibitory activities of adenosine and adenosine monophosphate increase the longer the interval of time between their addition to platelet-rich plasma and the subsequent addition of ADP. Fig. 1 shows that this is also true for 2-chloroadenosine. However, whereas at 37° C the inhibitory activity of adenosine increased with intervals of up to 10 min and decreased with longer intervals, the activity of 2-chloroadenosine continued to increase until, with an interval of 40 min.