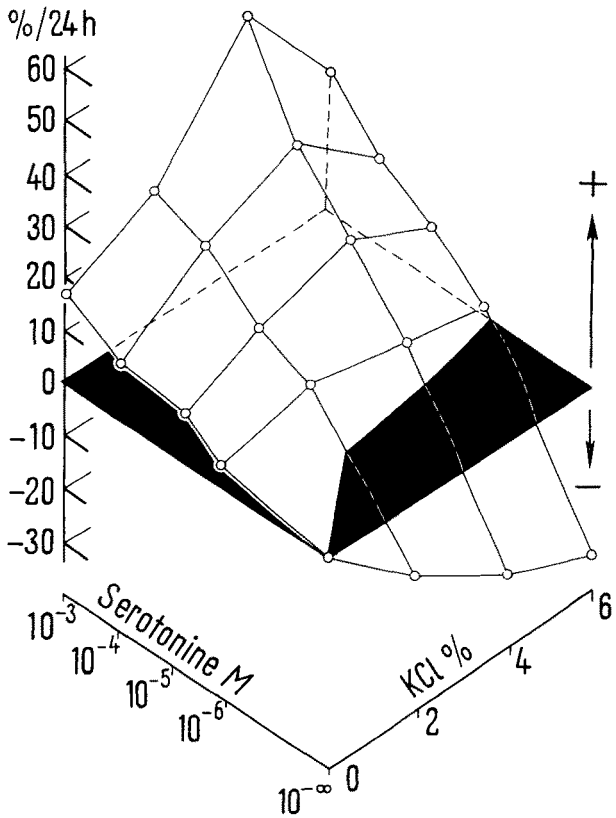
Nous utilisons, en nous inspirant d'une technique précédemment décrite[4,8], des disques de pomme de terre calibrés (diamètre: 15 mm; épaisseur: 4 mm) qu'on dépose sur des supports de verre portant une armature de mousseline et un papier-filtre. Le tout est placé dans des boîtes de Petri (diamètre: 9 mm) contenant 10 ml de solution active (sérotonine et KCl). Au temps 0, et après 24 h (obscurité, 25° ± 0,5), on fait des mesures de poids frais et de poids sec. Les résultats (Figure), qui sont donnés en % d'activité relative (par rapport au lot témoin), permettent de tirer les conclusions suivantes, quant aux variations du poids frais:



% d'accroissement relatif du poids frais de disques de pomme de terre, en présence de sérotonine et de KCl. Mesures après 24 h d'incubation.

(1) seule, la sérotonine est stimulante, et ceci d'autant plus que sa concentration est plus forte;

(2) seul, le KCl se comporte en inhibiteur, d'autant plus efficace qu'il est plus concentré;

(3) mélangées, ces deux substances ont un effet plus qu'additif.

Or il est remarquable de constater que, pour les concentrations où l'on note des stimulations particulièrement caractéristiques, les variations du poids sec sont pratiquement inexistantes:

Sérotonine	$1 \cdot 10^{-3}$ *M*	KCl	4%	Effet	+ 6,1%
	$1 \cdot 10^{-3}$ *M*		6%		− 2,6%
	$1 \cdot 10^{-4}$ *M*		4%		+ 2,5%
	$1 \cdot 10^{-4}$ *M*		6%		+ 5,3%

Ces précédentes observations indiquent donc que la sérotonine et le KCl agissent sur l'entrée de l'eau. Pour expliquer les résultats obtenus, on pourrait imaginer, et cette hypothèse est en accord avec ce que l'on sait de l'action de la sérotonine sur la perméabilité des cellules animales[9], que cette substance faciliterait l'entrée des ions K^+ et modifierait, par conséquent, les caractéristiques osmotiques des tissus végétaux. Or l'importance des échanges d'eau dans les processus métaboliques et dans la croissance des cellules a été démontrée[10].

Summary. The serotonin (5-hydroxytryptamin) which shows a slight influence upon the growth of plant tissues, acts upon water uptake by regulating cellular permeability (latter is activated in the case of K^+).

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[9] I. H. PAGE, Physiol. Rev. *38*, 277 (1960).
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Excitation of Betz Cells by Acetylcholine

In a previous report[1], we have described the excitant action on some cortical neurones of acetylcholine applied iontophoretically. These units were found throughout the cortex, though they tended to be present in higher concentrations in the primary afferent areas. Frequently the units occurred in groups, and they were characterised by a rhythmical spontaneous discharge.

This action of acetylcholine has now been tested on Betz cells in the sensory-motor cortex of cats anaesthetised with Dial. The ipsilateral pyramidal tract was activated antidromically by stimulation of the exposed medullary pyramids. Only those neurones which were invaded with a *constant* latency of less than 5 msec, and which could follow repetitive stimulation at a frequency of at least 100/sec were accepted as Betz cells[2–6]. They were found at depths varying between 0.5 and 2.2 mm and most of them discharged impulses spontaneously in a more or less rhythmical fashion[5].

In eight experiments, a total of 86 Betz cells were tested with *L*-glutamate, acetylcholine and various other drugs, applied iontophoretically from five-barrelled micropipettes. A very high proportion were found to be sensitive to acetylcholine. (The amounts of acetylcholine actually released varied, but the ACh current did not exceed 150 nA (10^{-9} A) and the time application was not usually more than 45 sec). In the precruciate motor cortex nearly all the Betz cells (49 out of 53, i.e. 92%) were clearly excited by acetylcholine, while in the postcruciate area the proportion of sensitive cells was somewhat smaller, although still high (21 out of 33, i.e. 64%). By

[1] K. KRNJEVIĆ and J. W. PHILLIS, Exper. *17*, 469 (1961).
[2] C. G. PHILLIPS, Quart. J. exp. Physiol. *41*, 58 (1956).
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[4] A. L. TOWE and H. D. PATTON, Fed. Proc. *16*, 129 (1957).
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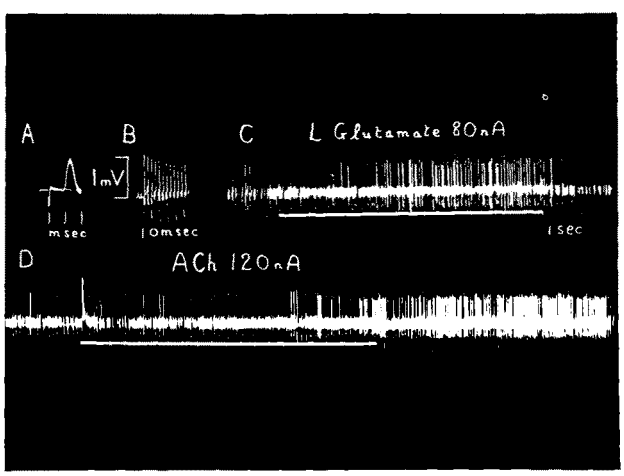
contrast, of 93 other units recorded in the same regions, in the same cats, which were probably not Betz cells, only 18 were excited by acetylcholine (i.e. 19%). This is not very different from the mean concentration of acetylcholine sensitive units found when units are sampled indiscriminately throughout the cortex[1].

Cortical units can be excited by *L*-glutamate and also, to a varying extent, by a number of other more or less closely related amino acids[7]. Betz cells are no exception to this rule, but it is our impression that they are less sensitive to *L*-glutamate than most units, and in several cases they have proved to be more easily excited by acetylcholine than by *L*-glutamate.

The responses of a Betz cell are illustrated in the Figure. At A, there are several superimposed traces recorded during threshold stimulation of the medullary pyramid. All-or-none spikes were produced with a latency of 1.0 msec. The traces in B show that the spikes could be driven at a frequency of 200/sec by antidromic stimulation. The cell's response to *L*-glutamate (C) was typically of quick onset and there was little after-discharge. Acetylcholine (D) had a somewhat delayed action, but the discharge reached a much higher frequency, and it went on for 40 sec after stopping the applying current.



Extracellular action potentials of a Betz cell recorded by the central saline-filled barrel of a 5-barrelled micropipette. The cell was located at a depth of 1.4 mm in the posterior sigmoid gyrus of a cat. (Other barrels were filled with strong solutions of *L*-glutamate, acetylcholine, hexamethonium and dihydro-β-erythroidine.) A. Several superimposed traces showing all-or-none spikes during threshold pyramidal stimulation. B. Repetitive firing at 200/sec during pyramidal stimulation at that frequency. C. Excitation caused by passing an inward current through barrel containing *L*-glutamate. D. Excitation caused by passing an outward current through barrel containing acetylcholine. White lines indicate times during which substances were released.

Like other acetylcholine sensitive cortical units, Betz cells are excited by a number of cholinomimetic drugs (such as succinylcholine and acetyl-β-methylcholine) and the action of acetylcholine can be potentiated by anticholinesterase agents. On the other hand, excitation by acetylcholine is prevented by atropine or hyoscine, and, in many cases, by gallamine. Atropine and hyoscine, as reported before[1], have a general depressant effect on all cortical neurones, whether sensitive to acetylcholine or not, depressing excitation by *L*-glutamate. However, both atropine and hyoscine have a particularly powerful blocking action on excitation by acetylcholine. When atropine (or hyoscine) was applied iontophoretically the action of acetylcholine vanished before that of *L*-glutamate; furthermore, whereas the responses to *L*-glutamate always returned within 10–60 sec after stopping the application of atropine (or hyoscine), acetylcholine did not become fully effective for another 20–30 min. Unlike the Renshaw cells of the spinal cord[8], Betz cells could not readily be made insensitive to acetylcholine by applying dihydro-β-erythroidine.

In the same cats, we have confirmed our earlier finding of acetylcholine units in other regions of the cortex, particularly in the primary visual and auditory areas. These could not be excited by antidromic activation of the pyramidal tracts. However, like the Betz cells and like practically all other units that have responded to acetylcholine, these units showed a characteristic spontaneous activity. We have not yet determined whether this spontaneous activity is predominantly of the 'projection' type or of the 'burst' type, as defined by DEMPSEY and MORISON[9]. Nevertheless it is tempting to suggest that all cortical cells which are excited by acetylcholine may be activated synaptically by cholinergic fibres from a common source, and that Betz cells are especially likely to have a supply of these fibres.

Résumé. 86 cellules de Betz ont été identifiées par activation antidromique des voies pyramidales bulbaires du chat. Nous avons pu exciter la grande majorité d'entre elles avec de l'acétylcholine et plusieurs substances cholinomimétiques appliquées directement par iontophorèse, en utilisant des micropipettes. La gallamine et l'atropine ont bloqué sélectivement l'action de l'acétylcholine.

K. KRNJEVIĆ and J. W. PHILLIS

A.R.C. Institute of Animal Physiology, Babraham, Cambridge (England), January 15, 1962.

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Über virusähnliche Teilchen in den Schweigger-Seidelschen Hülsen einer Hundemilz

In einer vorangegangenen Veröffentlichung berichteten ZWILLENBERG und ZWILLENBERG[1] über elektronenmikroskopische Beobachtungen an den Hülsenarteriolen einer Hundemilz. Für die technischen Angaben sei auf diese Arbeit verwiesen. Der Krankengeschichte des Tieres, die ich Herrn Prof. Dr. U. FREUDIGER (Klinik für kleine Haustiere der Universität Bern) verdanke, ist zu entnehmen, dass es sich um eine 12jährige Schäferhündin handelte, die vor einigen Jahren ovario-hysterektomiert worden war und nun ein mehr als faustgrosses, exulzerierendes Hautsarkom an der Unterbrust aufwies.

Im Cytoplasma der Hülsenzellen der Schweigger-Seidelschen Hülsen dieses Hundes wurden verhältnismässig häufig Einschlüsse mit Kristallgitterstruktur ge-

[1] L. O. ZWILLENBERG und H. H. L. ZWILLENBERG, Exper. *18*, 136 (1962).