The results described above include another interesting finding. The endogenous recovery from treatment with an antimitotic drug is essentially shortened in synchronized *Tetrahymena* cultures compared with logarithmic cells. This 'training effect' seems to be most reasonably explained by the assumption that both kinds of treatments, i.e. heat-shocks and colchicine, interfere with the very same compounds in the cell so that the heat-treatment brings about an 'adaptive change' (STUBBLEFIELD[19]) which helps to overcome the treatment with the drug[25,26].

Zusammenfassung. Durch Temperaturschocks synchronisierte Kulturen des Ciliaten *Tetrahymena pyriformis* (Stamm GL, kein Mikronucleus) wurden mit Colchicin behandelt. In Abhängigkeit vom Zeitpunkt der Colchicinzugabe wurden Verzögerungen des ersten synchronisierten Teilungsmaximums festgestellt. Die Ergebnisse werden als weitere Hinweise auf eine Beteiligung von Mikrotubuli bei der Makronucleus-Teilung gedeutet.

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[26] After the preparation of the manuscript the authors got knowledge of a paper by TAMURA et al. [Expl. Cell Res. *55*, 351 (1969)] in which a colchicine-induced disappearance of macronuclear microtubules was reported in *Tetrahymena pyriformis* strain W.

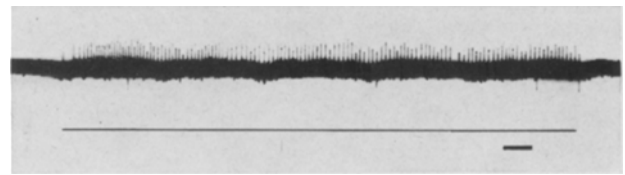
Trigeminal Root and Eye Muscle Proprioception

Proprioceptive impulses from the external eye muscles enter the brain stem through the ophthalmic branch and the trigeminal root in the lamb and pig[1,2]. The stretch of individual eye muscles provoked responses of units localized in the medial dorsolateral part of the semilunar ganglion and in the medial part of the trigeminal root. The responses were of the type induced by muscle spindle excitation[1,2]. Section of the ophthalmic branch abolished the gasserian responses to stretch of ipsilateral extraocular muscles[2,3]. However, no degeneration of the eye muscle spindles occurred after section of the ipsilateral oculomotor nerve[2,3]. The units recorded from the semilunar ganglion and responsive to stretch of single extraocular muscles were regarded as cells following the criteria proposed by DARIAN-SMITH et al.[4]. However, some investigators have claimed that the perikaria of the afferents from the eye muscles are placed in the mesencephalic nucleus of the trigeminus[5], as is the case for the masticatory muscles[5–10]. Thus, in order to state whether our previous records[1,2] were taken from cells or from nerve fibres, experiments were carried out in lambs subjected to chronic section of the left trigeminal root. Such an operation should abolish the gasserian responses to stretch of single extraocular muscles if the cell bodies of the afferents from the eye muscle spindles are placed in the brain stem, while, on the other hand, the responses should persist if the perikaria are located in the semilunar ganglion.

In 8 lambs both the sensory and the motor root of the left trigeminus were cut under Nembutal anaesthesia. The animals were kept alive 7–13 days in order to get complete degeneration of the nerve fibres and disappearance of nervous conduction in the peripheral trigeminal branches[11]. 6 lambs were submitted at the end of survival time to an acute experiment for searching the gasserian responses to stretch of individual extraocular muscles with the technique used in our previous investigations[1,2]; the other 2 animals were employed only for histological purposes.

In all the 6 lambs which underwent the final acute experiment, units were found in the left semilunar ganglion which responded to stretch of single eye muscles; the responses were of the type induced by muscle spindle excitation and exhibited the same features as those recorded from normal lambs (Figure). However, no responses of the type induced by muscle spindle excitation were found in the left semilunar ganglion by stretching the ipsilateral masseter in 2 animals.

The histological control showed normal spindles in the left extraocular muscles, while those of the left masseter were degenerated. No degenerated fibres were seen in the left ophthalmic branch; however, many degenerated fibres were present in the left mandibular branch.



Effect of a stretch of the left superior rectus (lower beam) on the unitary discharge (upper beam) recorded from the medial dorsolateral part of the left semilunar ganglion of lamb No. 77, 13 days after section of the ipsilateral trigeminal root. The units were unaffected by stretch of the other extraocular muscles and by stimulation of other trigeminal receptors. Calibration: 100 msec.

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Thus the conclusion can be reached that the spindles of the eye muscles have their perikaria in the semilunar ganglion, as has been pointed out in our previous papers[1–3]. However, this is not the case for the spindles of the masseter whose perikaria are located in the brain stem.

Riassunto. Lo stiramento di singoli muscoli estrinseci dell'occhio determina nel ganglio semilunare dell'agnello risposte del tipo di quelle indotte dai fusi neuromuscolari anche dopo sezione cronica del tratto pontogasseriano ipsilaterale. Ció prova che i pirenofori delle fibre afferenti dai fusi dei muscoli estrinseci dell'occhio sono realmente contenuti nel ganglio semilunare di Gasser.

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The Neural Lobe of the Neurohypophysis of the Rat: Several Types of Nerve Endings

Since the electron microscope was applied to the study of the structure of the neurohypophysis, it has become clear that most of the nerve fibres forming the infundibular process are neurosecretory axons originated in the supraoptic and paraventricular nuclei. However, the existence of non-neurosecretory axons of other origin has also been reported by many authors on the ground of light microscopy evidence. Review by Christ[1].

The ultrastructure of the neurohypophysis of Wistar rats of both sexes was studied. Rats were decapitated and the neurohypophysis fixed in glutaraldehyde 6.5% overnight and postfixed in osmium tetroxide 2% for 2 h. Both fixatives were buffered at pH 7.4 in Millonig buffer. The glands were embedded in Epon 812 as usual and stained with 1% aqueous uranyl-acetate and then lead citrate following Reynolds[2].

It was seen that most of the nerve fibres and nerve endings belong to the neurosecretory type. The elementary neurosecretory granules range from 1000 to 3000 Å, as had been described previously[3]. In the nerve endings of this type, besides the neurosecretory granules, there are numerous clear vesicles similar to the synaptic vesicles. The diameter of these vesicles is from 200 to 700 Å and they may be seen scattered through all the endings or grouped in clusters (Figure 1,a).

A second type of nerve endings is much less frequent than the first type and its main feature is given by the presence of synaptic vesicles and the complete absence of neurosecretory granules or dense core vesicles (Figure 1,b). This type of axon bulbs has already been described by Kobayashi[4].

A third type is represented by nerve endings in which synaptic vesicles as well as dense core vesicles are found intermingled. The number of the dense core vesicles varies, and their size ranges between 650 and 1400 Å with a mean of 1000 Å (Figure 1,c).

A fourth type of nerve endings contains synaptic vesicles, some round granules of 800 Å diameter, ranging from 600 and 1000 Å and others with oval shape of 1500×900 Å diameter, having a limiting membrane and either a central or an eccentric dense core separated from the membrane by a wide clear space. When the central core is eccentric it is also smaller, and in these cases the electronic density of the granules is higher (Figure 1,d).

It can be concluded from these results that in the neural lobe of the rat there exist several types of nerve endings (Figure 2) which very probably belong to different systems. The more numerous nerve fibres belong to the classic neurosecretory systems. 2 elements have been recognized in the nerve endings of this system: the elementary neurosecretory granules containing oxytocin and/or vasopressin[5] and the clear vesicles known as synaptic vesicles. In the leech 3 kinds of elementary neurosecretory granules varying in size and electron density have been recognized[6]. Our grouping of all the neurosecretory nerve endings in the first type does not mean that in the rat there is only one type of neurosecretory axons; on the contrary, more than one kind can be recognized (unpublished observation).

As regards the second type, that is nerve endings containing pure synaptic vesicles, the first question that might be raised is if they are a definite type or they only represent tangential sections of other types of endings. Although the question cannot be answered conclusively without the study of serial sections, some pictures are very suggestive in the sense that they are a definite type. The characteristics of this type correspond to those of cholinergic terminals.

The third type of nerve endings have the ultrastructure characteristics of those terminals that end around the primary capillaries of the portal system[7]. It has yet to be cleared up whether the terminals of the third type represent an extension to the neural lobe of the endings described by Monroe[7] in the median eminence, or if they belong to another neurosecretory system.

The ultrastructure characteristics of the fourth type correspond to those of adrenergic nerves. Using fluorescent histochemical techniques Björklund[8] has recently described a rich system of monoamine containing fibres in the neural lobe of the rat. Only a few of these fibres disappeared when the rats were sympatectomized. Our fourth type may represent these fibres because, besides having the structural characteristics of monoamineragic fibres they are also very scarce and difficult to find. The remaining ones, those that do not disappear following sympatectomy and that constitute most of the fluorescent fibres found in the neurohypophysis may be our third type. This speculation is consistent with the assumption that our third type could contain a monoamine. However, as Monroe[7] stated for the axons ending around the portal capillaries, it appears much too early to accept as a proven fact that these dense core vesicles are carriers of cathecholamines.

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