Résumé

24 rats mâles castrés furent divisés en 4 groupes de 6. Ils furent traités à des doses physiologiques de benzoate d'œstradiol, de progestérone ou d'une combinaison des deux hormones. On constata que l'administration d'œstrogène augmente la concentration de l'hormone thyréotrope dans le sang des rats, tandis que la concentration de l'hormone gonadotrope en est diminuée. D'autre part l'administration de 0,4 mg de progestérone augmente la concentration des hormones gonadotropes et adrénocorticotropes dans le sang des rats. Le progestérone augmente aussi la quantité d'hormone thyréotrope dans l'hypophyse.

Wirkung des Neurotoxins *Shigella Shigae* auf die Krampfbereitschaft

Es wird der Einfluss des Neurotoxins der *Shigella Shigae* auf experimentelle Krampfanfälle geprüft. Während Dysenterieerkrankungen sind bei Kindern in der Klinik des öfteren Krampfanfälle zu beobachten[1].

Laboratoriumsmäuse erhielten intraperitoneal 0,4 ml dieses Neurotoxins auf 20 g Körpergewicht. Die Verdünnung war 1:100. Bei dieser Dosis wurden in 3 Tagen 20% der Versuchstiere getötet. Von den überlebenden Mäusen zeigten nur einzelne Zeichen einer Intoxikation (Diarrhöe, Benommenheit, Paresen der Extremitäten). 72 h später wurde die Krampfbereitschaft geprüft und zwar mit der Methode der Kardiazol-, Elektroschock- und reflektorischen audiogenen Krämpfe.

Krampfart	Anzahl der Versuchstiere	Davon Krämpfe %	Anzahl der Kontrolltiere	Davon Krämpfe %	Statistische Signifikanz *P*
Kardiazol (60 mg/kg intraperitoneal) . .	30	46,6	30	16,6	0,02
Elektroschockkrämpfe	49	83,7	49	53,1	0,001
Audiogene Krämpfe	26	61,5	26	23,1	0,01

Wie die Tabelle zeigt, war die Krampfbereitschaft bei allen verwendeten epileptogenen Reizen erhöht. Diese Erhöhung ist statistisch gesichert.

Dieses Ergebnis bestätigt den in der Klinik gewonnenen Verdacht, dass Shigellatoxin krampffördernd wirkt.

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II. Kinderklinik der Pädiatrischen Fakultät, Prag, 13. Juni 1957.

Summary

The neurotoxin *Shigella Shigae* increases the readiness for cardiazol, electroshock and reflectory audiogenic cramps.

[1] W. D. DONALD, CH. H. WINKLER und L. M. BARGERON, J. Pediatr. *48*, 323 (1956).

Integrative Pattern of Reflex Actions by Impulses in Large Muscle Spindle Afferents on Motoneurones to Hip Muscles

Motoneurones are influenced by nerve impulses from various kinds of muscle receptors[1]. For example a slight stretch will cause a discharge in the large afferents (Ia fibres) from the muscle spindles. These impulses produce excitatory post-synaptic potentials (EPSP's) in the motoneurones on which they impinge monosynaptically and may thereby give rise to a reflex discharge of impulses.

The connexions which afferent Ia fibres make with different motor nuclei have been studied in detail on muscles operating at the knee and ankle joints by recording reflex discharges[2] and more recently by recording intracellularly the potential change occurring in individual motor nerve cells[3]. The excitatory action by Ia fibres coming from any particular muscle has been found to extend to motoneurones which subserve this muscle and to others which operate synergically at the same joint. One exception to this rule has been observed, namely the ankle extensor, soleus, which can be activated by Ia impulses from the knee extensor vasto-crureus[3].

Impulses in Ia fibres are known to exert inhibitory action on motoneurones of antagonist muscles evoking in them potential changes of opposite sign (so called inhibitory post-synaptic potentials, IPSP's). With knee and ankle muscles these inhibitory effects are strictly limited to the antagonists[4].

The present investigation has been concerned with the synaptic actions of Ia impulses onto motoneurones of hip flexors (iliopsoas and sartorius) and hip extensors (semimembranosus and adductor femoris). In Figure 1 intracellular records are shown from a typical iliopsoas motoneurone. The EPSP contributed by the nerve from iliopsoas itself (*A*) was of about the same size as that produced by an afferent volley from the synergist hip flexor, sartorius (*B*). In records *C–E* IPSP's are shown evoked as expected by afferent volleys from the antagonist hip extensors: adductor femoris (*C*), semimembranosus (*D*), and anterior biceps (*E*). In *F*, however, it is shown that a volley from the knee extensor, vasto-crureus, also contributed a similar IPSP. In other experiments in which it was possible to distinguish between fast and slow components (Ia and Ib) of the afferent group I volley[5], it has been ascertained that the IPSP's evoked by vasto-crureus volleys in hip flexor motoneurones are indeed produced by the Ia type afferents. This inhibitory action therefore represents an exception to the usual pattern of reciprocal innervation, and moreover, the inhibitory action contributed by the knee-extensor was larger than that coming from any single hip-extensor muscle.

Motoneurones of hip extensor muscles were found to receive excitatory effects from Ia afferents of other muscles than their synergists. Figure 2 shows EPSP's produced in a semimembranosus motoneurone by affe-

[1] C. S. SHERRINGTON, *The integrative action of the nervous system* (New Haven and London, 1906).

[2] D. P. C. LLOYD, J. Neurophysiol. *9*, 439 (1946). – Y. LAPORTE and D. P. C. LLOYD, Amer. J. Physiol. *169*, 609 (1952).

[3] J. C. ECCLES, R. M. ECCLES, and A. LUNDBERG, J. Physiol. *137*, 22 (1957).

[4] D. P. C. LLOYD, J. Neurophysiol. *9*, 439 (1946).

[5] K. BRADLEY and J. C. ECCLES, J. Physiol. *122*, 462 (1953). – Y. LAPORTE and P. BESSOU, C. r. Soc. Biol. (in press 1957). – J. C. ECCLES, R. M. ECCLES, and A. LUNDBERG, J. Physiol. *136*, 527 (1957).

rent volleys from various hip extensor and knee flexor muscles. EPSP's were evoked in this motoneurone by volleys from its own muscle (*A*), from the other hip extensors, adductor femoris (*B*), anterior biceps (*C*), and characteristically also from the knee flexors, posterior biceps (*D*), gracilis (*E*) and semitendinosus (*F*). Inhibitory actions to semimembranosus neurones were

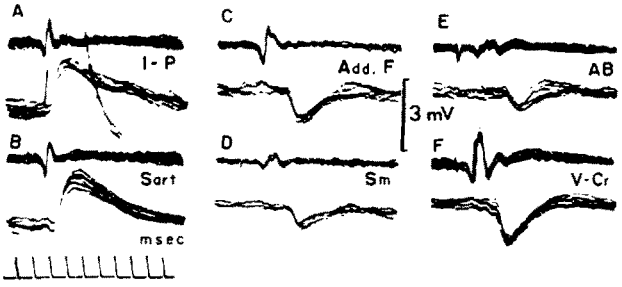

Fig. 1. – Intracellular recording from an iliopsoas motoneurone. Ventral roots were left intact for identification of the motoneurones. All records consist of many superimposed traces. Record *A* was obtained at a stimulus strength that was maximal for the Ia fibres and also at threshold for the motor axon. It illustrates the EPSP and the earlier arising spike evoked when the motor axon occasionally was excited. Record *B* shows the monosynaptic EPSP evoked by a maximal group *I* volley in the sartorius nerve. In records *C–F* are shown the IPSP's evoked by volleys from the adductor femoris (*Add. F.*), semimembranosus (*Sm*), anterior biceps (*AB*) and vasto-crureus (*V.Cr.*) nerves.

contributed by group Ia volleys from its antagonists iliopsoas and sartorius and also by rectus, which is not only a knee extensor, but being a double joint muscle, also a potential hip flexor. The Ia afferents from rectus will therefore be discharged either by flexion of the knee or like those of the proper hip flexors by an extension of

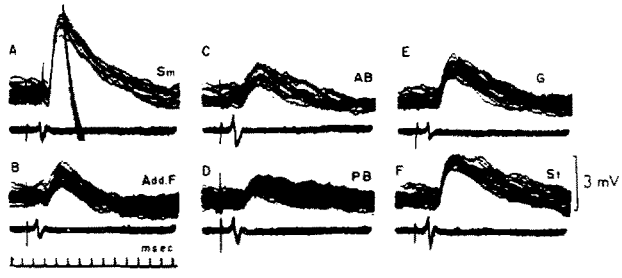

Fig. 2. – Intracellular recording from a semimembranosus motoneurone. Ventral roots were left intact for identification of motoneurones. All records consist of many superimposed traces. Record *A* was obtained with stimulation of the semimembranosus nerve at a strength that was maximal for all Ia fibres and also at threshold for the motor axon. It shows the EPSP and also the spike evoked when the motor axon occasionally was excited. In records *B–F* are shown the EPSP's evoked by volleys from the adductor femoris (*Add. F*), anterior biceps (*AB*), posterior biceps (*PB*), gracilis (*G*), and semitendinosus (*St*) nerves.

the hip, but most effectively by a combination of both movements. A further indication that this combined movement provided very effective inhibition of semimembranosus motoneurones was the finding that Ia impulses from the pure knee extensor, vasto-crureus, often produced some inhibition. Summarizing the reflex actions of the Ia-afferents, semimembranosus motoneurones are maximally excited by hip flexion combined with knee extension, and maximally inhibited by the opposite movement. The motoneurones of another hip extensor, adductor femoris, received no appreciable excitatory action from the knee flexors, but a considerable monosynaptic innervation from the knee extensor, vasto-crureus. The maximal contribution of excitation by Ia afferents to adductor femoris motoneurones would therefore occur during hip flexion combined with knee flexion.

The general conclusion to be drawn from this study is that the reflex innervation of motoneurones by the Ia system is not necessarily limited to muscles operating on the same joint either in its excitatory or inhibitory aspects. However, the reflex interconnexions between muscles operating at different joints are of a type which suggests that the Ia system subserves a sequence of coordinated movement and that these connexions have evolved to assist in the reflex coordination of stepping. For example the inhibition exerted by knee extensor afferents on hip flexor muscles can be seen to have functional significance if one considers that the step is initiated by hip flexion resulting in stretch of hip and knee extensors. This leads to discharge of impulses in Ia fibres from these latter muscles and initiates the next phase of the step beginning with inhibition of hip flexors and contraction of knee extensors and, presumably, of the hip extensor, adductor femoris.

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Department of Physiology, The Australian National University, Canberra, June 25, 1957.

Zusammenfassung

Es werden die intrazellulären Potentiale an Motoneuronen von Hüftmuskeln abgeleitet. Motoneurone des Hüftstreckers *Semimembranosus* werden von Ia-Impulsen der Hüftstrecker und Kniebeuger erregt, Motoneurone des Hüftstreckers *Adductor femoris* dagegen von den Hüftstreckern und Kniestreckern. Motoneurone der Hüftbeuger werden von Ia-Impulsen gehemmt, nicht nur von deren Antagonisten, sondern auch vom Kniestrecker *Vasto Cruralis*.

New Method for Determination of Radioactivity in Vegetal and Animal Tissues

This note is intended to give some preliminary information about the fairly satisfactory results obtained concerning radioactive substrata set in a Langsdorf diffusion chamber (modified type), used for the first time in the biological field.

This method is very sensitive and indicates even radioactivities of very low energy.

While the normal detectors are characterized by a threshold of energy, the diffusion chamber makes it possible to observe with the naked eye, or to photograph, any type of ionizing particles independently of their energy.

A great advantage of this method is being able to see the rising of radioactive particles on the surface of the substratum.

It is possible to identify, by means of the 'chamber', some characteristics of the radiation emitted (charge, mass, energy of the particles) and possibly to count the events which occur during the period of observation. The