

cannot be ruled out. It may be concluded that factors of hydranth regeneration largely involve reorientation of the cellular configuration in the available material. A detailed report on the manner of cell disposition and its relation to morphogenesis in hydra will be published elsewhere⁵.

Zusammenfassung. An regenerierenden Süßwasser-polypen (*Hydra vulgaris orientalis*) wurde die Gesamtmenge der Epithelmuskelzellen, der interstitiellen Zellen und der Cnidoblasten bestimmt. Dabei wurden sehr grosse Zellverluste, speziell bei den interstitiellen Zellen,

in geringerem Masse bei den Epithelmuskelzellen festgestellt. Die Zahl der Cnidoblasten nahm dagegen etwas zu.

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A Possible Correlation Between Reverse Mutation and Complementation

Results obtained in *Neurospora crassa* (see FINCHAM¹ for references) indicate that mutants exhibiting intra-locus complementation in a heterokaryon form a protein (C.R.M.) related serologically to the functional enzyme of the wild-type strain. Non-complementing mutants form apparently no C.R.M. Recently CRICK et al.² have suggested that mutations induced by proflavine and the majority of spontaneous mutations (FREESE³) are due to the addition or subtraction of base pairs in the DNA, and result in the formation of no specific protein or to one greatly different from the wild-type.

These results may perhaps indicate that mutants arising by addition-subtraction type mutation would produce no C.R.M., and hence be non-complementing when occurring at loci at which intra-locus complementation is known to occur.

Mutants of the complementing type might be expected to be due to transition type mutations, affecting only one base pair of one triplet (FREESE³), and having only one amino acid difference between C.R.M. and the wild-type enzyme (WITTMANN⁴). If this hypothesis is true, complementing mutants would revert on treatment with mutagens causing transitions, such as base-analogues and nitrous acid.

True non-complementing mutants, besides producing no C.R.M., might be expected not to revert with mutagens causing transitions. Further, if no, or only a grossly altered protein is produced they would not be expected to be leaky or temperature-sensitive mutants. Results obtained by LEUPOLD⁵ and personal communication) for the ad-1 and ad-6 loci of *Schizosaccharomyces pombe* show at least 38 of the 40 incompletely blocked mutants tested to be of the complementing type.

Preliminary results obtained with ten mutants at the ad-1 locus of *Schiz. pombe* indicate that at least five of six complementing mutants will revert after treatment with nitrous acid. Three of the four non-complementing mutants will not do so. The fourth non-complementing mutant responds to nitrous acid treatment. It should be pointed out, however, that classification of a mutant as non-complementing is to some extent uncertain, since a given mutant may complement with very few other mutants at the same locus (CATCHESIDE⁶).

This hypothesis, that non-complementing point mutations producing no C.R.M. will not give true back-mutation on treatment with nitrous acid, and other transition-type mutagens, is open to test at a number of loci in *Neurospora* (CATCHESIDE⁷) *Schizosaccharomyces* and *Salmonella* (HARTMAN, HARTMAN and SERMAN⁸).

Résumé. Les mutants présentant la complémentation intra-allélique sont probablement susceptibles aussi de mutation réversible sous l'effet de l'acide nitreux.

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¹ J. R. S. FINCHAM, Brit. Med. Bull. 18, 14 (1962).

² F. H. C. CRICK, L. BARNETT, S. BRENNER, and R. J. WATTS-TOBIN, Nature 192, 1227 (1961).

³ E. FREESE, Brookhaven Symp. Biol. 12, 63 (1959).

⁴ H. G. WITTMANN, Naturwiss. 24, 729 (1961).

⁵ U. LEUPOLD, Arch. J. Klaus-Stift. Zürich 36, 89 (1961).

⁶ D. G. CATCHESIDE, 10th Symp. Soc. Gen. Microbiol. (W. HAYES and R. C. CLOWES, Ed., Univ. Press, Cambridge 1960), p. 181.

⁷ D. G. CATCHESIDE, Proc. Roy. Soc. B. 153, 179 (1960).

⁸ P. E. HARTMAN, Z. HARTMAN, and D. SERMAN, J. gen. Microbiol. 22, 354 (1960).

Presynaptic Inhibition in the Lumbar Cord Evoked from the Brain Stem

It has recently been shown that the presynaptic terminals of primary afferents may be depolarized through spinal reflex actions and that synaptic actions to motoneurons by this mechanism may be inhibited¹. Ia afferents are depolarized from group I afferents predominantly of flexor muscles, the flexor reflex afferents (FRA), on the other hand, from group I afferents and the FRA. Primary afferents may also be depolarized from higher centres, volleys in the pyramidal tract depolarize Ib, cutaneous and high threshold muscle afferents but not Ia afferents².

The present experiments (decerebrate, unanaesthetized cats) have revealed the existence of a brain stem centre from which depolarization can be evoked not only in the above mentioned categories of afferents, which are influenced from the pyramidal tract, but also in Ia afferents.

¹ J. C. ECCLES, R. M. ECCLES, and F. MAGNI, J. Physiol. 159, 147 (1961). – J. C. ECCLES, R. G. KOSTYUK, and R. F. SCHMIDT, J. Physiol. 161, 258 (1962). – J. C. ECCLES, F. MAGNI, and W. D. WILLIS, J. Physiol. 160, 62 (1962). – J. C. ECCLES, R. F. SCHMIDT, and W. D. WILLIS, J. Physiol. 161, 282 (1962).

² P. ANDERSSON, J. C. ECCLES, and T. A. SEARS, Nature, in press. – D. CARPENTER, A. LUNDBERG, and U. NORRSELL, Exper. 18, 337 (1962).

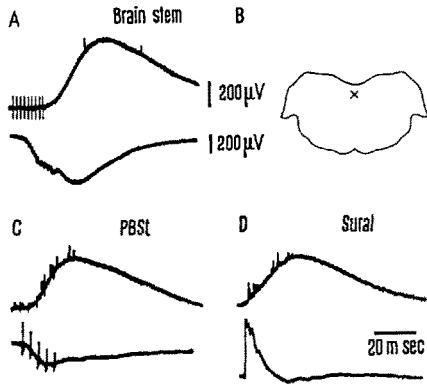


Fig. 1. The upper traces were recorded from a dorsal root filament in lower L₂. The filament was cut 15 mm from the dorsal root entry zone and placed on two electrodes one close to the entry zone and the other on the cut end. Upwards deflection denotes negativity of the central electrode. The lower traces were recorded from the dorsal root entry zone in lower L₂ against an indifferent electrode in the muscle. Record A shows the effect of stimulation of the brain stem at the site shown in B. Record C shows the effect of group I volleys in the nerve to p. biceps-semitendinosus (PBSt) and record D of a single volley in the sural nerve.

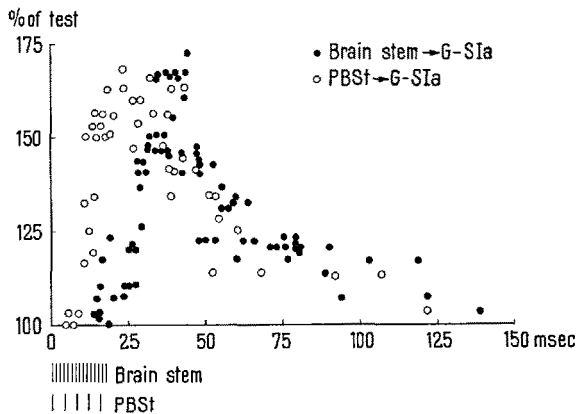


Fig. 2. Effect of conditioning volleys from the brain stem and from the PBSt nerve on the excitability of presynaptic terminals of Ia fibres from gastrocnemius-soleus (G-S). 100% on the ordinate represents the unconditioned test discharge recorded in the nerve to G-S. The testing stimulus was delivered through a micro-electrode inserted into the motor nucleus of G-S at the site where the maximal Ia focal potential could be recorded. The PBSt nerve was stimulated at a strength just maximal for group I afferents. The conditioning stimuli are indicated below the abscissa.

are shown for comparison in C and D. Transverse exploration revealed a very localized optimum in the brain stem. When the electrode was moved 1 mm from the focus shown the stimulus strength had to be considerably increased to evoke action.

The effect was evoked from the medulla and from the caudal pons but not from more rostral pontine levels. Intraspinal preterminal threshold measurements from various categories of primary afferents revealed that on medullary stimulation there was correspondingly an increased excitability in Ia, Ib and in cutaneous afferents. The curves in Figure 2 show the effect of stimulation of the brain stem and of the PBSt nerve on the excitability of Ia fibres from gastrocnemius-soleus measured with a stimulating electrode in the motor nucleus of this muscle. The actions are evoked through ventral spinal pathways: the effect was abolished after transection of the ventral quadrants but remained when only the dorsal quadrants were transected. The site in Figure 1 B corresponds to the location of the medial longitudinal fasciculus, but further investigations are required to decide if this tract is responsible.

Depolarizing dorsal root potentials can also be evoked from other more widespread predominantly ventral regions of the brain stem. Intraspinal threshold measurements revealed depolarizations in Ib afferents and the FRA after a longer latency than the effect in Figure 1 A. The descending pathways are located in the dorsal quadrants. This system may be of interest in relation to the tonic inhibition exerted from the medial brain stem (through descending pathways in the dorsal part of the lateral funicle) on reflex arcs and transmission to certain ascending pathways. It is, however, not known if this tonic inhibition is caused by presynaptic depolarization or, as originally assumed, by inhibition at an interneuronal level³.

To summarize: there is mounting evidence of complex supraspinal actions on primary afferents. The system depolarizing the presynaptic terminals of Ia afferents is of particular interest since it permits supraspinal regulation of monosynaptic Ia actions.

Zusammenfassung. Es wird gezeigt, dass eine elektrische Medulla oblongata- oder Pons(kaudal)-Stimulation eine Depolarisation (präsynaptische Inhibition) von Ia-, Ib- und Flexor-Reflex-Afferenz im Lumbalmark verursachen kann.

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³ R. M. ECCLES and A. LUNDBERG, *J. Physiol.* **147**, 565 (1959). – B. HOLMQVIST and A. LUNDBERG, *Arch. ital. Biol.* **97**, 340 (1959). – B. HOLMQVIST, A. LUNDBERG, and O. OSCARSSON, *Arch. ital. Biol.* **98**, 60 (1960).

importance of the plasma unesterified fatty acids (UFA)¹ and the effect of adrenaline in causing their release from adipose tissue^{2,3} a reappraisal was necessary of the relative

¹ D. S. FREDRICKSON and R. S. GORDON, Jr., *Physiol. Rev.* **38**, 585 (1958).

² V. P. DOLE, *J. clin. Invest.* **35**, 150 (1956).

³ R. S. GORDON, Jr., and A. CHERKES, *Proc. Soc. exp. Biol. Med.* (N.Y.) **97**, 150 (1958).

Blood Glucose and Plasma Unesterified Fatty Acid Changes Induced by the Stress of an Emergency Situation

The discharge of glycogen stores and the rise in the level of blood glucose following the release of adrenaline in an emergency situation was thought traditionally to provide an animal with increased oxidizable substrate for use in impending flight. With the realization of the metabolic