Résumé. La prostaglandine E_1 a causé de l'hyperthermie si on l'injectait dans la région préoptique /hypothalamique antérieure/ des rats et de l'hypothermie au niveau de la région médullaire oblongue. L'EGTA, le Piromen et le vaccin typhoïdes ont rarement causé des changements parallèles dans la température rectale si on les injectait dans les deux régions cérébrales.

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Two Types of Response Patterns from Cat Retinal Ganglion Cells to Moving Stimuli

Recent studies[1-3] have shown that on center (and off center) retinal ganglion cells of cats can be separated into two types. The first or sustained type responds to a step input of light with a high frequency burst of spikes followed by a maintained firing level which is considerably higher than the spontaneous level. This maintained level lasts for the duration of the stimulus. The second or transient type responds to the same stimulus also with a high frequency burst of spikes, but the firing level decays rapidly to a firing close to the spontaneous level. The two types also respond differently at stimulus off; the sustained type shows a strong and long-lasting inhibition while the transient type shows a weak and short-lasting inhibition.

We have examined the responses of retinal ganglion cells of cats to moving stimuli and have found 2 types of response patterns; the type 1 on-center units show a decrease in the firing rate (inhibition) prior to the excitation from the receptive field center (RFC); the type 2 on-center units do not show the decrease prior to the excitation[4]. We wish to present evidence that these 2 types correspond to the sustained and transient types and to point out that the differences can be accounted for by a difference in the spatial arrangement of the center and surround components of the receptive field (RF).

Recordings were made from single optic tract fibres from lightly anesthetized cats with lacquer-coated microelectrodes. The preparation of the animal and recording system have been presented in detail earlier[5]. The stimulus was a square or slit of light moved across the visual field at a constant velocity of 3.6°/sec. The data were analyzed on a PDP-8 computer to give average response histograms.

Average response histograms from a type 1 on-center unit which shows the inhibition prior to the excitation from the RFC are shown in the left column of Figure 1. The stimulus was a 0.7° square which moved at a constant velocity of 3.6°/sec across the RF. The numbers at the left represent the stimulus intensity in log threshold unit, i.e., 0.4 represents a stimulus 0.4 log units above threshold. With a stimulus 0.4 log units above threshold, the firing rate increases from the spontaneous level (40 spikes/sec) to a maximum of 200 spikes/sec as the stimulus passes into the center of the RFC. As the stimulus moves out of the RFC the firing level drops to 25 spikes/sec before returning to the spontaneous level. With the stimulus intensity 1.2 log untis above threshold, there is a decrease in the firing rate just prior to the excitation from the RFC. This inhibition arises from the antagonistic surround of the RF. At 2.0 log units above theshold, the degree of inhibition prior to the excitation is stronger.

Average response histograms from a type 2 unit are shown in the right column of Figure 1. The response

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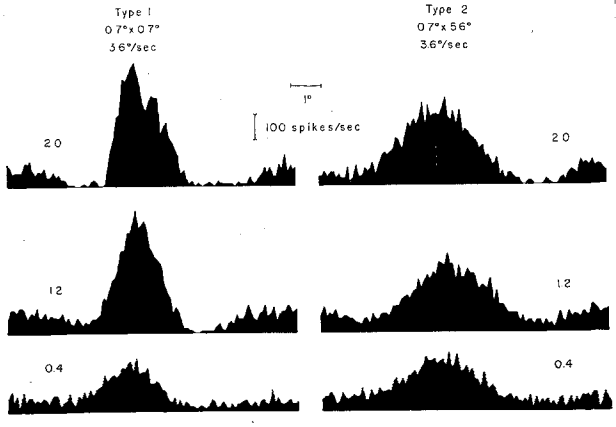

Fig. 1. Average response histograms of type 1 and type 2 on center units. The numbers on the left represent the stimulus intensity in log threshold units. The stimulus was a 0.7° square for the type 1 unit and a 0.7° × 5.6° vertical slit for the type 2 unit. Background luminance was −1.0 log ftl.

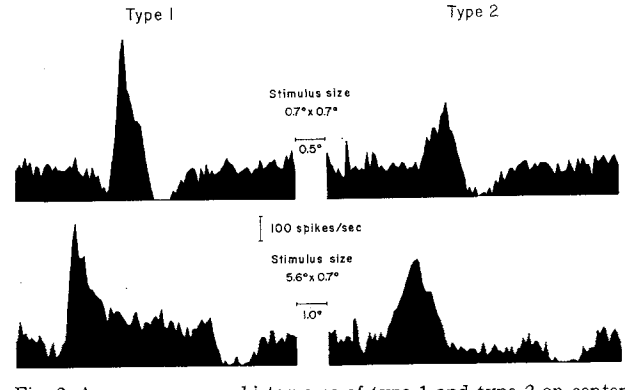

Fig. 2. Average response histograms of type 1 and type 2 on center units. The responses to 0.7° square are shown in the upper row while the responses to a 5.6° × 0.7° horizontal slit are shown in the lower row. The stimulus was 2.0 log units above threshold for all responses. Background luminance was −1.0 log ftl.

pattern differs in several ways from the type 1 unit. First, there is no indication of the inhibition prior to the excitation. We have illustrated the responses to a vertical slit, $0.7° \times 5.6°$, to demonstrate that even when the stimulus is larger than the RFC, there is no indication of the inhibition. Second, the response amplitude is lower. And third, the inhibition when the stimulus leaves the RFC is weaker and shorter-lasting.

We have examined approximately 60 on-center units and have found about equal numbers of the 2 types of units. The question arises whether these 2 types of units correspond to the sustained and transient units described by earlier investigators. Examination of the responses elicited by a moving horizontal slit has provided evidence that the type 1 unit corresponds to the sustained type and the type 2 unit corresponds to the transient type of unit. The average response histograms of type 1 and type 2 units are shown in Figure 2. The responses in the upper row were elicited by a 0.7° square while those in the lower row were elicited by a $5.6° \times 0.7°$ horizontal slit. The stimulus intensity was 2.0 log units above threshold for all of the responses. The differences in the responses of the 2 types of units when a 0.7° stimulus was used are similar to that just described. With the horizontal slit an additional difference can be noted. For the type 1 unit, the high frequency burst of spikes is followed by a maintained firing level which is significantly higher than the spontaneous firing level. In the type 2 unit, the firing level decreases to the spontaneous level after the high frequency burst. The maintained firing level of the type 1 unit is in keeping with the response of the sustained type while the fast decay of the firing level ot the spontaneous level is what would be expected of the transient type of unit. Thus the type 1 units resemble the sustained type of units by showing a maintained firing while the stimulus is within the RFC, and a stronger and longer-lasting inhibition when the stimulus leaves the RFC.

What can account for the differences in the responses of the 2 types of units when a moving stimulus is used? The answer to this question may be provided by the response of sustained and transient units to a large annulus. The sustained type responds to an annulus flashed in the surround with a response characteristic of the surround component, while the transient unit responds to the same stimulus with a response characteristic of both the center and surround[6,7]. This difference has been attributed to a difference in the spatial arrangement of the center and surround components of the RF. For the sustained type, the diameter of the surround component is larger than the center component so that there exists a rim where only the surround component is present as in RODIECK and STONE's[8] model of the RF. For the transient type, the borders of the center and surround components are coincident so that both components are present throughout the RF. Thus for the type 1 or sustained unit, the moving stimulus will encounter first the rim of the surround component which will decrease the spontaneous firing rate. For the type 2 or transient unit, the stimulus will pass into a region where both the center and surround components are present so that the inhibition from the surround will not be noted. Thus our observations can be accounted for by the difference in the spatial arrangement of the center and sourrund components of the RF as proposed by earlier investigators[7].

Résumé. Deux Types de réponses apparaissent dans des cellules ganglionnaires du chat soumises à des stimuli mobiles. Ils correspondent aux unités répondant de façon transitoire ou durable et proviennent d'une différence dans la disposition spatiale du centre et de la périphérie du champ récepteur.

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Effect of Growth Hormone and Thyroxine on the Contractile Properties of Dystrophic Muscle

Strain 129Re muscular dystrophic mice at 3 weeks of age were injected daily with 1 μg thyroxine and 5 μg growth hormone. The effect of hormone treatment was tested by measurement of peak twitch tension, relaxation rate, and 'fatigue' in small strips of excised abdominis muscle, stimulated in oxygenated Ringers solution. While gross differences between normal and dystrophic muscle are reported, no change in the contractile behavior of the hormone treated dystrophic muscle was found. The possible relationship between hormone deficiency and muscular dystrophy is discussed.

Methods. Strain 129Re muscular dystrophic mice[1] were obtained at 3 weeks of age and injected for 14–17 days. Purified bovine growth hormone[2] was dissolved in 9% NaCl, pH 9.0. L-thyroxine[3] was dissolved in 0.01 *N* NaOH. Injections consisted of daily doses of 1 μg thyroxine in 0.025 ml of the NaOH solution and 5 μg growth hormone in 0.025 ml of the NaCl solution. Dystrophic mice were divided randomly into a hormone-injected group (average weight 7.4 g) and a control group (average weight 7.6 g), and injected daily with 0.05 ml 9% NaCl. A third group containing non-dystrophic litter-mates (average weight 11.9 g) were injected with 0.08 ml 9% NaCl, the higher volume being in proportion to the higher mean body weight.

All mice were sacrificed between 14–17 days of injection. Strips of excised abdominis muscle approximately $2 \times 6 \times 1$ mm. (1–3 mg dry weight) were clamped vertically in an oxygenated Ringers solution at 15°C. The apparatus used, which permitted automatic adjustments of resting length and tension has been previously described[4]. The

[1] Mice were obtained from Bar Harbor Laboratory, Bar Harbor, Maine.

[2] Growth hormone was graciously provided by Dr. E. BATES of The National Institute of Health.

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