(figures 1 and 2). At the 12th h of measurement, however, females are exhibiting a higher quantity than males. Female flies in general contain twice the amount of methionine as males[7]. Methionine is one of the essential amino acids which serves as a methylating agent in intermediary pathways. In *Aedes*[8,9] and the boll weevil *Anthonomers grandis*[10], it has the ability to promote egg production. Gamma rays induce a reduction in the level of free amino acids in both the sexes (figures 1 and 2). In rice moth larvae also, whole-body irradiation reduced the tyrosine pool considerably[11]. Richardson and Myser[12] have shown that large doses of radiation increased the total concentration of amino acids in the haemolymph pool of prepupae and last instar larvae of the greater wax moth *Galleria mellonella*. In contrast to these data, there was no influence of irradiation on total concentration of amino acids in adult horn flies *Haematobia irritans*[13]. The increase in free amino acids may be derived from the radiation-induced degradation of protein[14]. Flies treated with caffeine show a strong reduction in free amino acids contents. This may be due to inhibition of macromolecular synthesis[15,16]. Since caffeine interferes with hormone-mediated responses, the lowered level of free amino acids may be due to the failure of protein synthesis associated with ovary development.

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Spatial distribution of the adaptation field of the surround response mechanism in type X cat retinal ganglion cells[1]

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Summary. The surround response mechanism in on-center X-cells in cat retina was found to be bimodally distributed and weak or nonexistent in the receptive field middle. An on-inhibition measure was used to assess surround mechanism gain.

According to Rodieck and Stone[3] the activity of retinal ganglion cells is controlled by 2 spatially overlapping processes. These processes were referred to as the center and surround response mechanisms and each was described by Gaussian curves with peaks in the receptive field middle. Recent studies have suggested that the spatial distribution of the surround mechanism in X-cells may differ markedly from the distribution described in the Rodieck and Stone model. Both Hickey, Winters and Pollack[4] and Hammond[5] present evidence for a receptive field model for X-cells in which the surround mechanism is bimodally distributed and is very weak or nonexistent in the middle of the receptive field center.

1 way to assess the spatial distribution of a response mechanism is to characterize the mechanism's adaptation field. In this type of experiment the size or location of a field adapting target is varied and the effect of these manipulations upon the gain of the mechanism is determined. In order to use this method it must be assumed that the mechanism's adaptive receptive field corresponds to its signal receptive field. This method was used in the present study to assess the spatial distribution of the surround mechanism in X-cells. Specifically, we examined the effect of variations in the size of unmodulated, field adapting stimuli upon the gain of the surround response mechanism. Lacquer coated tungsten microelectrodes, connected in a conventional capacitance-coupled recording system were used to record the action potentials of 38 on-center optic tract fibres from lightly anesthetized (Nembutal) adult cats. Details of the animal preparation, recording system and optical system are described elsewhere[6]. Single units were classified as X-cells if they showed a null position for a contrast reversal stimulus[7,8]. All stimuli in the study were rectangular in time and had a duration of 500 msec and frequency of 0.3 Hz; they were superimposed upon a steady background whose luminance was 0.5 log candles/m^2.

3 experiments were conducted. The 1st experiment examined the effect of varying the size of centrally located, equiluminous adapting spots upon the gain of the surround mechanism. In the 2nd experiment the adapting targets were equiluminous adapting annuli whose outside diameter was 6.0 and whose inside diameter was variable. The 3rd experiment assessed the effect on the gain of the surround mechanism of variable size, centrally located spots whose luminance was adjusted to keep the gain of the center mechanism constant. In all 3 experiments the gain of the surround mechanism was assessed by measuring the ability of flashing annulus (4.0° × 10.5°) placed in the periphery of

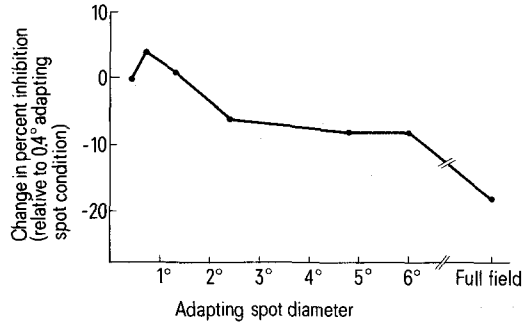

Fig. 1. Change in percent reduction of a constant response to a flashing spot in the receptive field middle by a simultaneously flashing annulus as the size of central steady adapting spots increased. Center flashing spot: 0.71° diameter; 8.71–13.81 cd/m^2; 0.3 Hz. Flashing annulus: 4.1°× 10.2°; 17.37 cd/m^2; 0.3 Hz. Central steady adapting spots: 5.50 cd/m^2. Background illumination 0.19 cd/m^2.

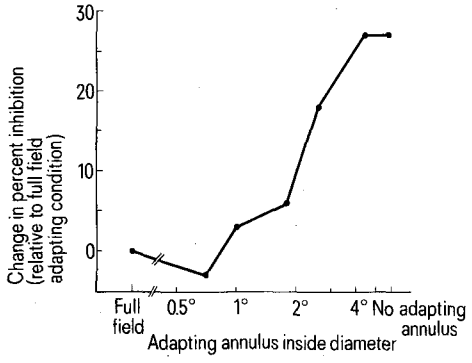

Fig. 2. Change in percent reduction of a constant response to a flashing spot in the receptive field middle by a simultaneously flashing annulus as the inside diameter of a centrally located steady adapting annulus increased. Center flashing spot: 0.71° diameter; 0.65–8.03 cd/m^2; 0.3 Hz. Flashing annulus: 4.1× 10.2°; 0.39 cd/m^2; 0.3 Hz. Centrally located steady adapting annuli: 0.26 cd/m^2. Background illumination, 0.19 cd/m^2.

the receptive field to antagonize an excitatory response generated by a flashing spot placed in the receptive field (RF) center.

Figure 1 shows the results from a typical X-cell in the first experiment. The percent inhibition measure on the ordinate is defined as the ratio of the reduction in response magnitude (peak firing rate) produced by simultaneous presentation of center flashing spot and flashing annulus, compared to the response to the center spot alone, × 100. Since the adapting spots in the R_f-center also changed the gain of the center mechanism, it was necessary to adjust the luminance of the flashing spot presented alone in order to keep this response constant. Thus, percent inhibition was always measured against a constant excitatory signal coming from the center of the receptive field.

The important finding of figure 1 is that adapting targets confined to the central 1.2° of the receptive field of X-cells did not affect the gain of the surround mechanism.

We considered the possibility that our inability to adapt the surround mechanism within the center of the receptive field may have been related to the fact that we summed adaptation effects from the center of the field outward. So in a 2nd experiment adapting annuli with the same outside diameter, but variable inside diameter, were used. Figure 2 shows the results of this experiment. As would be expected from the results of the 1st experiment, X-cells showed the

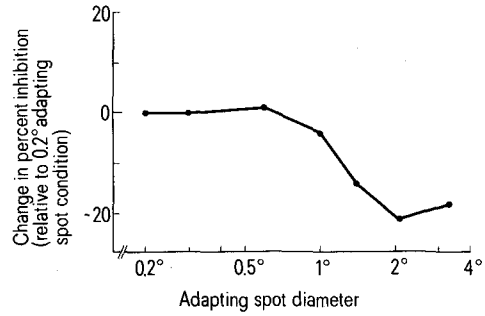

Fig. 3. Change in percent reduction of a constant response to a flashing spot in the receptive field middle by a simultaneously flashing annulus as the size of central steady adapting spots increased. (Center response was kept constant by appropriately adjusting the luminance of the adapting spots). Center flashing spot: 0.71° diameter; 4.05 cd/m^2; 0.3 Hz. Flashing annulus: 4.1°× 10.2°; 0.93 cd/m^2; 0.3 Hz. Central steady adapting spots; 0.45–58.31 cd/m^2. Background illumination, 0.19 cd/m^2.

greatest change in the gain of the surround mechanism for adapting stimuli whose inside diameter fell outside of the central 1.0° of the receptive field. Percent inhibition shows noticeable increases, when the adapting annulus' inside diameter was enlarged progressively from 1.0° to 4.5°.

Although the response from receptive field center was kept constant in the 1st 2 experiments the gain of the center mechanism was not. To insure that the adapting targets of the 1st 2 experiments were not simply changing the ability of the center mechanism to antagonize the surround mechanism we performed a 3rd experiment in which the gain of the center mechanism was kept constant. This was accomplished by using, as adapting targets, variable size spots whose luminance was adjusted to maintain the gain of the center mechanism at a constant level. For spots confined to the middle of the receptive field center this meant keeping flux (illumination × area) constant[9–11].

Figure 3 shows the results of the 3rd experiment for a typical X-cell. As the graph shows, adapting spots which fell within the central 1.0° of the receptive field had no effect on the gain of the surround mechanism, whereas adapting spots larger than 1.0° caused a steady decrease in percent inhibition. These findings are consistent with those of the 1st 2 experiments but under conditions in which the gain of the center mechanism remained constant.

If it is assumed that the signal profile and adaptation profile of the surround mechanism are similar then the data from these 3 experiments support the receptive field model of X-cells[4,5] in which the spatial distribution of the surround mechanism is bimodal with low sensitivity in the middle of the receptive field center.

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