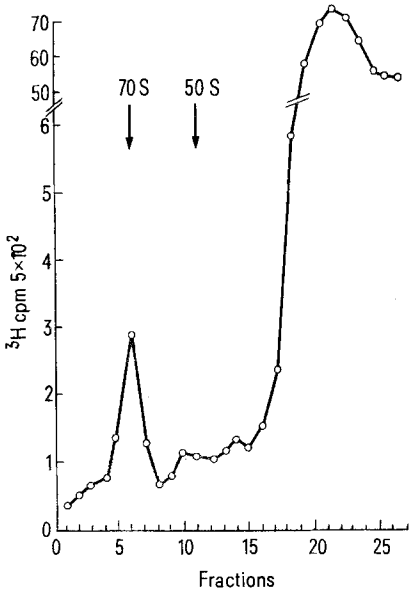


Fig. 3. Sedimentogram of $^3$H-labelled RNA extracted from particles with the density of 1.16 g/ml produced by the culture of human embryo fibroblasts. The position of the marker 50S $P^{32}$ labelled Sendai virus RNA is shown by the arrow.

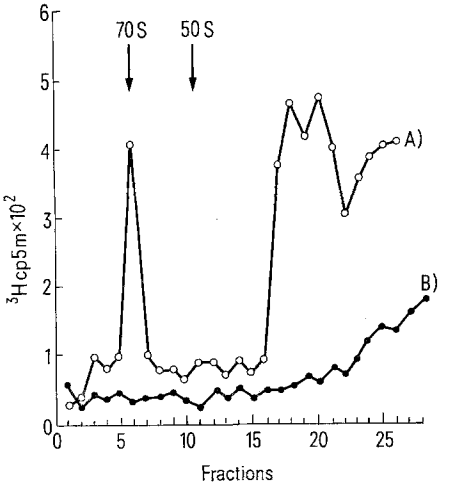


Fig. 4. Sedimentogram of 70S RNA labelled with small fragments of newly synthesized DNA from the culture of human embryo fibroblasts inoculated with the virus from the leukocyte culture (A) and of RNA from the non-inoculated culture (B).

reaction reveals high molecular weights RNA labeled with small fragments of newly syngthesized DNA in the culture, while such structures are absent in non-inoculated human diploid cells (Figure 4).

Our data not only confirm previous observations on presence of C-particles in leukemic leukocyte cultures, but also show the possibility of transmitting the virus to human diploid cells. This opens the way for a broader study of the virus, because the human diploid cells provide a large-scale production of the virus necessary for immunological and molecular-biological studies.

БЫВОДЫ. При выращивании клеток белой крови от больных лейкемией были обнаружены внутриклеточные и внеклеточные вирионы С-типа, характерные для лейковирусов. Материал одной из таких культур был перевит на диплоидные клетки человека. Выделенный вирус имеет основные характеристики онкорнавируса (плотность I, 16г/мл, РНК с константой седиментации 70 S, обратнотранскриптазная активность).

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## Latencies in a Thermosensitive Pathway

In mammals, most skin 'warm' receptors and some skin 'cold' receptors are innervated peripherally by unmyelinated C fibres[1] but it is not known what types of fibre are involved in the central projections from these receptors. Some measurements have been made in the cat of conduction velocities in a pathway leading to thalamic cells which respond to skin heating[2]. The response was conducted predominantly by A $\delta$ fibres but the pathway in question was not specifically thermosensitive because the thalamic cells responded to both thermal and mechanical stimulation of the skin.

We have now measured latencies at units in the entry zone of the dorsal horn and the relay nucleus in the ventrobasal thalamus in a specifically thermosensitive pathway projecting from the scrotum to the somatosensory cortex of the rat. We used a refinement[3] of the method suggested by Martin and Manning[4] in which the thermal receptors are stimulated by the heat of a photographic flash. Rats were anaesthetized with urethane. A ring-shaped xenon discharge tube, rated at 1 kJ, was mounted 100 mm from the shaved scrotal skin.

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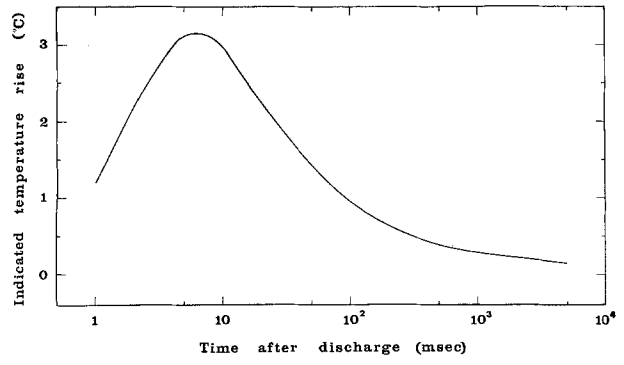


Fig. 1. Temperature rise indicated by a subdermal thermocouple following discharge of a photographic flash.

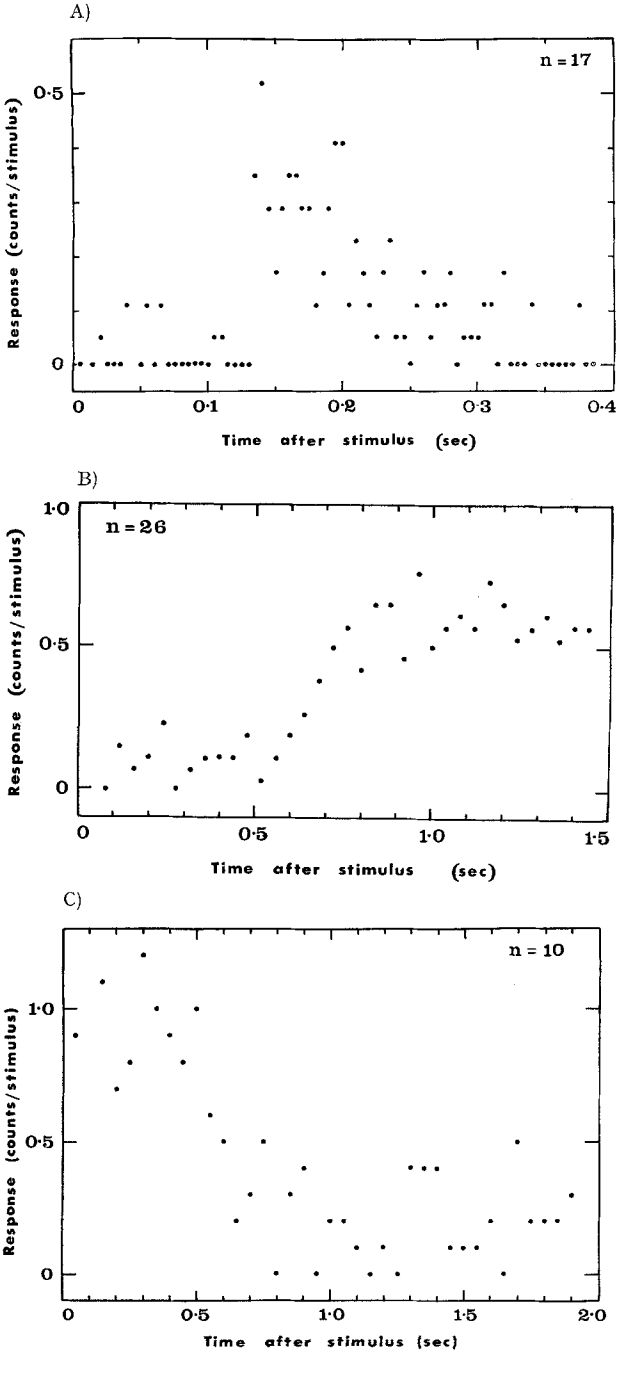


Figure 1 shows the response of a fine (0.15 mm diam.) subdermal thermocouple to a single flash. The response was due to the absorption of radiation penetrating through the skin and not due to conducted heat. If penetrating radiation was eliminated by blackening the skin surface, the peak response was attenuated considerably and occurred at least 1 sec after the stimulus. Because the thermocouple was positioned below the skin, and was not without thermal inertia of its own, the radiant heat from the flash must have penetrated to the level of the receptors in the skin in less than 6 msec.

For the latency measurements the activity of single units in the thalamus and the dorsal horn was recorded using techniques previously described[5,6]. Only units responding exclusively to scrotal temperature were used. Once a suitable unit had been identified, it was stimulated by discharges of the flash repeated every 10 or 15 sec. The spike train following each discharge was fed into a special-purpose computer[7] which generated a post-stimulus histogram. As a control procedure, the scrotal skin was cooled with a continuous air jet during the sequence of flash discharges. In every case the unit ceased to respond, demonstrating that it was sensitive only to the thermal effects of the flash.

Figure 2(A) shows the post-stimulus histogram generated by superimposing the responses of a unit in the dorsal horn to 17 discharges of the flash. The unit responded to the flash by increasing its firing rate after a latent period of about 130 msec. Figure 2 also shows similar post-stimulus histograms for one unit in the thalamus which increased its firing rate in response to the flash and another which decreased its firing rate.

Histograms like those in Figure 2 were obtained from 10 units in the dorsal horn of 6 rats, and 19 units in the thalami of another 6 rats. In the dorsal horn the mean response latency was 220 msec (SE 25 msec, range 110–340 msec). That in the thalamus was 500 msec (SE 25 msec, range 280–830 msec). In both cord and thalamus the measured latencies formed a unimodal distribution, suggesting that only one type of fibre was concerned in transmitting the response.

Conduction velocities were estimated by dividing the latency measurements into the geometrical path length between the sites of stimulation and recording. The calculated conduction velocities to the cord were 0.43 m/sec (SE 0.05, range 0.25–0.73), and to the thalamus 0.39 m/sec (SE 0.02, range 0.23–0.70); these velocities were not significantly different. The latencies measured at the cord units will be contributed by delays at the receptors, conduction in fibres and possible synaptic delays; latencies at the thalamus will include these factors and additional synaptic delays. Only delays due to conduction will be proportional to path length. The equality of the conduction velocities over the different path lengths to cord and thalamus therefore implies that the receptor and synaptic delays must be negligible in this situation.

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Fig. 2. Post-stimulus histograms generated from the spike trains following repeated discharges of the flash over the scrotal skin. Ordinate: Impulses per stimulus per time bin. Abscissa: Time after triggering of flash. A) Dorsal horn unit, excited, 17 flashes, 5 msec bins. B) Thalamic unit, excited, 26 flashes, 40 msec bins. C) Thalamic unit, suppressed, 10 flashes, 50 msec bins.

The conduction velocities measured along the geometrical path are typical of small unmyelinated fibres. The geometrical length will certainly be an underestimate of the anatomical path length, but even if the anatomical path is twice or 3 times the length of the geometric path, the conduction velocities are still well within the C-fibre range. The information derived from receptors responding to warming of the rat's scrotum is therefore conducted to the thalamus entirely by a C-fibre pathway.

The fact that skin tissue is translucent at the visible and short IR-wave-lengths produced by the flash[8] and that the receptors will respond to the absorbed radiation has two methodological consequences. First, estimates (such as that in Figure 1) of subcutaneous temperature with opaque sensors must result in an overestimation of the temperature rise following a flash[9]. While any suprathreshold change in temperature will be adequate for the latency determination, if the flash method is used to assess the sensitivity of thermoreceptors[4] then the sensitivity will inevitably be underestimated. Second, although the 'cold' receptors are known to be more superficial than the 'warm' receptors in skin[1] the radiation will penetrate rapidly to both levels. It is therefore not possible to judge whether the central units in the thermosensitive path are responding to suppression of 'cold' receptor activity or enhancement of 'warm' receptor activity. In the particular case of the pathway originating in the rat scrotum, the unimodal distribution of latencies implies that if both 'cold' and 'warm' receptor activity is involved, both types of receptor project centrally through unmyelinated C-fibres.

*Zusammenfassung.* Mittels photographischem Blitzlicht wurden die Wärmerezeptoren des Ratten-Hodensacks erwärmt und die Nervenleitgeschwindigkeit in der afferenten Bahn bis zum dorsalen Horn und dem ventrobasalen Thalamus gemessen. Bei einer Nervenleitgeschwindigkeit von 0.4 m/sec erwies sich der ganze nervöse Weg als aus marklosen C-Fasern bestehend.

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*National Institute for Medical Research, Mill Hill, London NW7 1AA (England), 14 May 1974.*

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## Glycine, Strychnine and Retinal Inhibition

The evidence that glycine can act as an inhibitory neuro-transmitter was originally presented by Aprison and Werman[1] in 1965. Glycine has been found to have inhibitory actions in the retina in vitro by Ames[2] and in vivo by Korol[3]. There have been no histological or electrophysiological studies of the retina in vivo, which firmly satisfy general criteria for glycine as a synaptic transmitter in the retina. The criteria for evaluation of a substance as a synaptic transmitter is based on its presence, storage, release, postsynaptic action and inactivation.

Cohen[4] showed in mice a large concentration of glycine in the inner retina. The retina uptake of glycine, storage and retention mechanisms were demonstrated by Bruun and Ehinger[5], Ehinger and Falck[6] and Ehinger[7]. The inhibitory action of glycine is antagonized by strychnine[8–12] in other regions of the CNS. Völker[13] showed that strychnine increases the b wave of the rabbit retina in vitro. The previous paper[3] shows the action of glycine on rabbit retina in vivo after intravitreal injection. This was characterized by a reversible loss of the oscillatory potentials of the ERG.

*Material and methods.* Averaged ERG were recorded on 24 rabbit's eyes (unanesthetised). Group I: 18 rabbit eyes were injected with 3 mg of glycine in the vitreous body to determine time of onset, of maximal effect and of total recovery. Group II: 6 rabbit eyes were injected 2 h after glycine injection with strychnine (2 eyes: 1 mg; 2 eyes 0.25 mg and 2 eyes: 0.12 mg).

*Results.* Group I: Loss of oscillatory potentials after 1 h of glycine injection. Maximal inhibition between 3 and 10 h with full recovery by 20–24 h. Group II: a) Abolition of b wave of glycine ERG with strychnine 1 mg; b) no effect on b wave of glycine ERG with strychnine 0.25 mg; c) recovery of oscillatory potentials with strychnine 0.12 mg. There was an increase of b wave amplitude 6 min after strychnine and initial recovery of oscillatory potentials 1, 2 and 3, 12 min after strychnine with maximal effect by 45 min (Figure). There was recovery of 3rd OP to normal voltage level and recovery of 1st and 2nd OPs' to an increased voltage level. The effect of strychnine is reversible with recovery of glycine effect by 2 h[14,15].

*Conclusion.* Glycine has an inhibitory effect on rabbit retina in vivo (group I), evidenced by loss of oscillatory potentials and reduction of amplitude. This effect is reversible and can be antagonized by appropriate concentration of strychnine (group II).

*Discussion.* Glycine is regarded as putative inhibitory neurotransmitter. The papers of Bruun and Ehinger[5], Ehinger and Falck[6] and Ehinger[7] suggest that glycine may be an inhibitory neuro-transmitter in certain nerve cells of the inner plexiforme layer, mainly the amacrine cells. The present paper shows the inhibitory reversible action of glycine on the rabbit retina observed by ERG's changes. The effect of glycine is antagonized by strychnine

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