Tris(1-Aziridinyl)Phosphine Oxide: Caution on Use

We read with interest the report by Holmsen and Leasure (*1*) in which they reported the growth-inhibiting property of tris(1-aziridinyl)phosphine oxide (APO) on grasses. We feel that one of the most important biological properties of the chemical was not mentioned in the report, namely, the ability to induce mutations. Indeed APO is a powerful mutagen; APO (or triethylenephosphoramide, TEPA) produces a high frequency of mutations in *Bracon hebetor* when the latter is allowed to walk on an APO-coated surface (2×10^{-9} g per square millimeter) for five or more minutes (*2*). Arizidinyl compounds, of which APO is one, produce sex-linked recessive mutations in *Drosophila* (*3*) and sterilize male insects by inducing dominant lethal mutations (*4*). Furthermore, chemicals in this class efficiently break human chromosomes (*5*).

Our purpose is to caution against the use of APO, or any aziridinyl compound, where there is risk of the populace being exposed to it.

WALDEMAR KLASSEN
T. H. CHANG
U.S. Department of Agriculture, Metabolism and Radiation Research Laboratory, Fargo, North Dakota

References and Notes

1. T. W. Holmsen and J. K. Leasure, *Science* **153**, 1659 (1966).
2. J. Palmquist and L. LaChance, *ibid.* **154**, 915 (1966).
3. M. L. Alexander and E. Glanges, *Proc. Nat. Acad. Sci. U.S.* **53**, 282 (1965).
4. O. G. Fahmy and M. J. Fahmy, *J. Genet.* **52**, 603 (1954).
5. K. E. Hampel and H. Gerhartz, *Exp. Cell Res.* **37**, 251 (1965); T. H. Chang and F. T. Elequin, *Mutation Research*, in press.

14 October 1966

Computer-Plotted Receptive Fields

Spinelli (*1*) reports the results of programming a computer to plot out the receptive fields of optic nerve fibers from the cat retina, but those of us who have done the same job by hand wonder if computer PDP-8 is spoofing Spinelli, or if Spinelli is spoofing his readers. The receptive fields reported certainly differ from those obtained by manual exploration and plotting, but this can possibly be explained by differences of techniques only remotely connected with the use of a computer.

Spinelli used a background intensity of 0.02 cd/m^2. The human increment threshold at this background would be about one tenth of this, or 0.002 cd/m^2, and in our experience a cat's ganglion cell would respond well to a spot only a few times brighter if it fell optimally in its receptive field. Spinelli's exploring spot was at an intensity of 200 cd/m^2, 10,000 times the background intensity. It is hardly surprising that he obtains unusual receptive fields, but we also wish to raise the possibility that some of his plots are not receptive fields at all, for there are two known effects of light falling far away from the receptive field as ordinarily defined. The first is the "periphery effect," described by McIlwain (*2*), in which light falling upon a remote retinal region can elicit a change in firing rate as a result of intraretinal interactions (*3*). The computer might show these effects very clearly, but as far as is known there should be no localized effects such as Spinelli reports. The other, more mundane possibility arises from light scattered or reflected outside the expected image area. Spinelli gives no details of the preservation and correction of the optics of his cats' eyes, but in our experience the optics can be truly horrifying if one does not take good care of the cornea and apply the right correction, preferably combining this with an artificial pupil.

Streaks and star-shaped images can easily result from poor optics, and this may be all that is required to account for some of Spinelli's results, but one must also remember that the inside of the eye is roughly spherical, and hence every point on the retina has an uninterrupted view of every other point. Thus, if a bright spot of light is shone on one point, all other points will be illuminated at an intensity that depends primarily upon the reflectance characteristics of the region illuminated by the spot. In the cat retina the brightly reflecting tapetum covers only part of the fundus, and the amount of intraocular scattered light would decrease dramatically if a spot of light was moved across the border. Thus, it could happen that a peripheral ganglion cell, whose own receptive field was never traversed by the scanning spot, might respond when, and only when, the scanning spot crossed the tapetal border.

There are other regions of the fundus possessing different reflectances, for instance, the optic disc and its radiating blood vessels. When Spinelli's method is used, these discontinuities might well appear as the "receptive fields" of ganglion cells lying outside the area scanned, and it is instructive to look at his figures with these ideas in mind. Might not the "spiders" be the optic disc and blood vessels, and the "edges" the tapetal border? Naturally, verification or refutation depends upon checking the actual experimental arrangements. Do the spider-shaped "receptive fields" correspond approximately to the position of the optic disc or blind spot? Has computer PDP-8 presented the receptive fields with their horizontal axes vertical? What kind of receptive field plots are obtained if the luminance of the plotting spot is reduced to about one hundredth of its present intensity?

It is worth remembering that the 25° by 25° area scanned in Spinelli's experiments covers less than one twentieth of the visual field of the cat's eye. Accordingly, Spinelli should have found it necessary to adjust the position of his X-Y plotter in a high proportion of trials in order for it to cover the units' true receptive fields; it would be interesting to know in what proportion of trials he found this necessary.

Many years ago L. C. Thomson built himself a monochromator of unparalleled power in order to investigate color vision in the rabbit. At first he found that a light anywhere in the rabbit's visual field would excite the retinal ganglion cells, and it was only after encouragement from others, and much tedious exploration of the visual field, that he finally located regions of much greater sensitivity—the true receptive fields (*4*). Is it possible that Spinelli's sophisticated plotting and detecting techniques have obscured the need for performing careful controls? Is manual experimentation outmoded?

H. B. BARLOW
W. R. LEVICK
G. WESTHEIMER
Neurosensory Laboratory, School of Optometry, University of California, Berkeley 94720

References

1. D. N. Spinelli, *Science* **152**, 1768 (1966).
2. J. T. McIlwain, *J. Neurophysiol.* **27**, 1154 (1964).
3. W. R. Levick, C. W. Oyster, D. L. Davis, *ibid.* **28**, 555 (1965).
4. L. C. Thomson, *J. Physiol. London* **119**, 191 (1953).
5. Supported by NIH grants NB 03154 and NB 05215.

8 July 1966