such cells show the same surface changes as those sensitized before hæmolysis.

The facts that changes in the surface of red cells of more than half the cancer patients tested could be detected by electron microscopy, and that the change is readily induced by sensitization with incomplete antibody, suggest that many such cases have a similar type of antibody on their red cells. This would confirm our previous results[3] showing that anti-globulin tests on the red cells of cancer patients were significantly more often positive, albeit weakly, than in non-cancer patients and very much more so than in healthy people.

Judith E. Davis
H. N. Green
Pamela W. Tymms

Department of Experimental Pathology
and Cancer Research,
University of Leeds.

[1] Liu, C. K., and Evans, R. S., *Proc. Soc. Exp. Biol. and Med.*, **79**, 194 (1952). Rebuck, J. W., *Anat. Rec.*, **115**, 4 (1953). de Vries, A., *et al.*, *Harefuah* (*J. Med. Assoc. Israel*) (Jan. 1, 1957). Goldberg, B., and Green, N., *J. Exp. Med.*, **109** (5), 505 (1959).
[2] Hillier, J., and Hoffmann, J. F., *J. Cell. Comp. Physiol.*, **42**, 203 (1953).
[3] Green, H. N., Wakefield, S., and Littlewood, G., *Brit. Med. J.*, ii, 779 (1957).

HISTOCHEMISTRY

Pigment Bodies of the Spinal Neurones of Some Teleosts

Pigment bodies have been observed in the untreated living spinal neurones of the frog *Rana tigrina*[1] and some reptiles[2]. As I could demonstrate corresponding pigment bodies in the spinal neurones of some teleosts, these bodies must no doubt be considered to be of more general importance. The species investigated in this connexion were *Nannostomus beckfordi*, *Phenacogrammus interruptus*, *Corynopoma riisei*, *Otocinclus vestitus*, *Chriopeops goodei*, *Phalloceros caudimaculatus*, *Nanochromis nudiceps* and *Ctenopoma kingsleyi*.

The spinal neurones were studied in the living condition under the phase-contrast microscope and with basic dyes used *super vitam*. In this way the pigment bodies presented themselves as discrete, dirty-yellow to dark-brown bodies. The pigment, a refractile, pale yellow substance, appeared to be confined to certain duplex lipid bodies only. As in reptiles[2], this was not seen in any of the fixed preparations. The living neurones of the teleosts may reveal in addition a diffused pigment in the cytoplasm, like that of *Rana tigrina*[1], and the water snakes[2]. The general coloration of the ganglia in these teleosts and reptiles[2] was not pale yellow, in spite of the pigment in the neurones, unlike that in *Rana tigrina*[1]. As in reptiles[2], the pigment bodies in the teleostean neurones were distributed at random, although they tended occasionally to aggregate. In general, these bodies consisted of spheroids, sub-spheroids and particulates with irregular contours varying in diameter, approximately 1–4μ. Some of these bodies displayed variously distorted binary structures. The cells, which abounded in these pigment bodies, rarely contained lipid particulates.

The formaldehyde-calcium (gelatin and Helly-Zenker-Bouin) paraffin sections of the ganglia, stained with ethanolic sudan black *B*[3], revealed some pigment bodies fairly coloured, while other bodies in the same site were only partly positive. With chrome alum hæmatoxylin the pigment bodies give a strong positive reaction, with periodic acid–Schiff and methyl green/pyronin *G* a faint red coloration, while the reaction to sudan IV was almost negative. The plasmal reaction of these bodies appeared to be negative and the performic acid–Schiff reaction gave erratic results. The fat solvents, ether, chloroform, cold ethanol, cold and hot acetone and hot pyridine, appeared to be resisted by such bodies. The reaction to most of the dyes was negative. A few of them were found to segregate neutral red *super vitam* and coloured somewhat red. A negative result was obtained with Lison's test for carotenoids tried on gelatin sections of formaldehyde-calcium[3] fixed material. Moreover, the other tests for carotenoids (formic acid, hydrochloric acid, sulphuric acid, trichloroacetic acid and Carr–Price reaction), when applied to the living ganglia, reacted negatively with the pigment bodies. As in reptiles[2], on the strength of these results these pigment bodies must probably be considered as lipofuscins. Moreover, accumulations of brownish-black pigment bodies, defying all the histochemical reactions mentioned here, were observed in the surroundings of the entire ganglion.

According to Sharma[2] and correctly in my opinion, these pigment bodies are not the secretory products from the classical Golgi apparatus as claimed by Moussa and Banhawy[4], since one has not found any such apparatus or even a remotely comparable structure either in the living or in the processed young neurones. Identical views are held by Thomas[5], Baker[3], Nath[6] and Malhotra[7]. On the other hand, the pigment bodies appear to have originated as a result of total or partial oxidation of some of the lipid bodies. Cohn[8] also advocated the participation of lipids in the synthesis of pigment. The significance of this oxidation resulting in the pigment accumulation is unknown.

The pale yellow, refractile pigment, which was demonstrated in the cores of certain duplex lipid bodies (*vide supra*) originated in all probability within the interna of the lipid particulates or Golgi bodies of Hirsch in much the same way as described by Baker[3], Lacy, Hirsch and Kanwar[9]. In the neurones of *Iphita limbata* (Hemiptera) a neurosecretory product occurs, which Nayar[10] considers as lipofuscins. At this stage it is unknown whether or not the pigment bodies of reptiles[2] and teleosts could be correlated with the neuro-secretory product of *Iphita limbata*[10]. In any event it is certain that these products bear a close histochemical relationship, inasmuch as both contain lipofuscins.

A. Stolk

Histology Laboratory,
Free University,
Amsterdam.

[1] Gupta, B. L., and Sharma, S. P., *Res. Bull. Panj. Univ.*, **10**, 267 (1959).
[2] Sharma, S. P., *Res. Bull. Panj. Univ.* (N.S.), **11**, 183 (1960); *Experientia*, **17**, 125 (1961); *Res. Bull. Panj. Univ.* (in the press).
[3] Baker, J. R., *Quart. J. Micro. Sci.*, **90**, 293 (1949); *J. Roy. Micro. Soc.*, **74**, 217 (1954); *Sym. Soc. Exp. Biol.*, **10**, 1 (1957).
[4] Moussa, T. A., and Banhawy, M., *J. Roy. Micro. Soc.*, **74**, 162 (1954).
[5] Thomas, O. L., *Quart. J. Micro. Sci.*, **89**, 333 (1948); *J. Comp. Neurol.*, **95**, 73 (1951).
[6] Nath, V., *Nature*, **180**, 967 (1957).
[7] Malhotra, S. K., *Res. Bull. Panj. Univ.* (O.S.), **151**, 179 (1958); *Quart. J. Micro. Sci.*, **100**, 339 (1959).
[8] Cohn, S. A., *J. Histochem.*, **3**, 342 (1955).
[9] Lacy, D., *J. Roy. Micro. Soc.*, **73**, 179 (1953); **74**, 226 (1954). Hirsch, G. C., *Symp. Cell Secretion* (1955). Kanwar, K. C., *Res. Bull. Panj. Univ.*, **10**, 10 (1959); **10**, 99 (1959).
[10] Nayar, K. K., *Biol. Bull.*, **108**, 296 (1955).