Comparative Investigation of Immune Globulins of Various Vertebrate Classes

During the past few years our knowledge of the immunoglobulins of man and mammals has been substantially extended. The method of making antiglobulin sera developed by Milgrom *et al.* in 1956 (ref. 1) has played a decisive part in this particular connexion. As is well known, this method makes it possible to prepare antisera which react, in addition to γ-globulins (IgG, IgA, IgM), with complemental factors, if any[2]. Since our knowledge of non-mammalian immunoglobulins is limited[3–10], I prepared (using a modification of Milgrom's method[2]) antisera to the globulins of mammals (horse, cattle, hog), birds (duck, goose), turtles (*Testudo hermanni* Gmelin), and fishes (*Cyprinus carpio* L., *Tinca tinca* (L.), *Perca fluviatilis* L., and *Ictalurus nebulosus* Le Sueur). The serum concentration used to bring about coupling with erythrocytes was chosen so that, for the mammals, only antibodies were detectable against the γ-globulins during immunoelectrophoresis. In this connexion, distinct precipitate lines of the IgG and IgM globulins were always observed. Moreover, for both horse and hog a weak line was observed corresponding to the IgA globulin. The antisera prepared against the globulins of goose and duck showed wide identity during immunoelectrophoresis. Two parallel lines were found that could be assigned to the IgG and IgM globulins (Fig. 1*A*). Clearly visible is a splitting up of the IgG line in the anodic region.

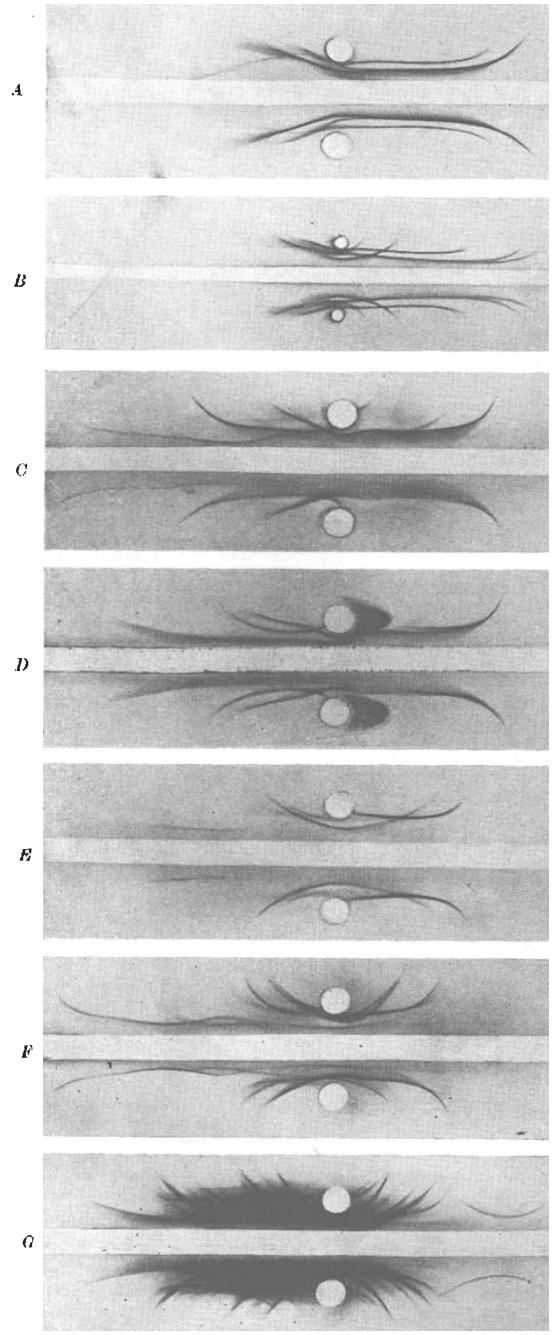

Fig. 1. Immunoelectrophoresis of 'immunoglobulins' (see text) from: *A*, duck; *B*, *Testudo*; *C*, *Cyprinus*; *D*, *Tinca*; *E*, *Ictalurus*; *F*, *Perca*; *G*, normal immunoelectrophoresis from *Perca*. Anode to the left

The immunoelectrophoretic analysis of the antiserum against turtle globulins yielded 4–5 precipitin lines (Fig. 1*B*). Of these, the IgG line shows, at both ends, a splitting that cannot be simply attributed to ageing of the serum. In addition to the typical IgM line two distinct lines were also present in the α_2 region; it is possible that these correspond to complemental factors.

Whereas the analysis of the antisera against mammalian, bird, and turtle globulins shows a certain conformity, the fish globulins differ both from the others and from one another to a considerable extent. It is true that lines corresponding to the IgG globulin are thus found for *Cyprinus*, *Tinca*, and *Ictalurus*, but they are lacking for *Perca* (Figs. 1*C–F*). Also, the immunoelectrophoresis with one antiserum against the complete serum proteins of *Perca* confirms the absence of a typical IgG fraction (Fig. 1*G*). Here, only a faint but entirely uniform fraction is found in the cathodic region.

The immune sera prepared using Milgrom's method precipitate for fishes, quite a large number of fractions extending into the α-globulin region, and for *Perca* and *Cyprinus* even into the pre-albumin region. Although further investigations will be required in order to clarify which of these fractions are genuine immunoglobulins, the present results already give some indication of the strong heterogeneity of the immunoglobulins for fishes.

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[1] Milgrom, F., Luszczynski, T., and Dubiski, S., *Nature*, **177**, 329 (1956).
[2] Fairley, G. H., and Harris, G., *Vox Sang.*, **7**, 175 (1962).
[3] Uhr, J. W., Finkelstein, M. S., and Franklin, E. C., *Proc. Soc. Exp. Biol. and Med.*, **111**, 13 (1962).
[4] Benedict, A. A., Brown, R. J., and Hersh, R., *Proc. Soc. Exp. Biol. and Med.*, **113**, 136 (1963).
[5] Grey, H. M., *J. Immunol.*, **91**, 819 (1963); *Proc. Soc. Exp. Biol. and Med.*, **113**, 963 (1963).
[6] Ambrosius, H., and Lehmann, R., *Zt. Immun- u. Allergieforschg.*, **128**, 81 (1964); ibid. (in the press).
[7] Ashbach, N. E., Finstad, J., Sarnecki, J. C., and Pollara, B., *Fed. Proc.*, **23**, 346 (1964).
[8] Finstad, J., and Good, R. A., *J. Exp. Med.*, **120**, 1151 (1964).
[9] Good, R. A., and Papermaster, B. W., *Adv. Immunol.*, **4**, 1 (1964).
[10] Papermaster, B. W., Condie, R. M., Finstad, J., and Good, R. A., *J. Exp. Med.*, **119**, 105 (1964).

PATHOLOGY

Leptomeningeal Sarcomata and Gliomata induced in Rabbits by Rous Sarcoma Virus

Much has been written in recent years about the ability of Rous sarcoma virus (RSV) to induce malignant neoplasms in mammals.

Heterozygotic albino mice[1], rats[1–6], hamsters[7,8], guinea-pigs[9], and monkeys[10] were found to be susceptible to the Carr-Zilber[3] strain or Schmidt-Ruppin strain of RSV (ref. 1). Recently, Bryan[11] strain and Mill-Hill (Harris)[12] strain of RSV were found to be oncogenic for hamsters[13,14].

Zilber[15] was the first to inoculate rabbits with Rous sarcoma virus. Numerous fibrous nodules and punctate haemorrhages in various organs were observed following repeated subcutaneous inoculation of Carr-Zilber strain RSV. Usually the fibrous nodules underwent reabsorption[16]. Later, Ahlström[17] subcutaneously inoculated rabbits