THE ANTIGENICITY OF REGENERATING TAIL TISSUE IN THE NEWT DIEMICTYLUS VIRIDESCENS*

By

C. EDWARD QUINN**

With 6 figures in the text

(Received July 17, 1962)

Abstract

Young adult male rabbits were inoculated with antigens prepared from regenerating (blastema stage) and nonregenerating tail tissues of the newt Diemictylus viridescens. Blood was collected from these rabbits after six weeks of semiweekly injection, two weeks of respite, and two more weeks of injections. A Freund adjuvant was added to the antigen preparations at the time of injection in order to elicit the anamnestic effect.

Ouchterlony agar diffusions of the newt antigen preparations vs. the rabbit antisera were carried out. The resulting patterns of precipitation bands were compared and photographed.

The strongest precipitation reactions of a given series were those between the antigen preparations made from nonregenerating tissue and their homologous antisera. The weakest reactions occurred between regenerating tissue antigens and regenerating tissue antisera. The strength of the antigen-antibody reactions was judged by the number of bands appearing in the diffusion plate and by the distinctness of these bands. Reactions of intermediate strength occurred between regenerating antigens and nonregenerating antisera, between nonregenerating antigens and regenerating antisera, and between antigens and antisera of different series.

The loss of antigenicity during the blastemal period was considered to be related to the destruction of tissue in the wound areas at this time, and to indicate a quantitative rather than a qualitative loss of protein in regenerating tissue.

* This work is taken from data submitted to the Department of Biology of Fordham University in partial fulfillment of the requirements for the degree of Doctor of Philosophy, and was supported in part by a grant from the New York City Cancer Committee of the American Cancer Society.

** The author acknowledges his indebtedness to Dr. ALEXANDER WOLSKY of Fordham University, under whose direction this investigation was carried out, and Dr. JOHN J. CORBETT of Manhattan College and Lederle Laboratories.
Introduction

The results of early attempts to apply immunological methods to the study of experimental embryology were puzzling. Braun (1906) and Uhlenthal and Haendel (1910) failed to establish any antigenic identity between frog adults and eggs or between toad adults and larvae, but Kitchevsky (1914) showed antigenic similarity between larvae and adults of Rana esculenta. Cooper (1946, 1948) demonstrated the antigenic similarity of eggs, larvae, and adults of Rana pipiens; and Schechterman (1947) showed the presence of common or similar antigens in chicken egg yolk, embryo extracts, and adult serum.

But while antigenic similarities in developing tissues were noted, antigenic differences were likewise observed. Burke, Sullivan, Peterson, and Weed (1944) demonstrated that certain antigenic components of adult chicken tissue appeared over a period of several days during incubation. Thus red blood cell antigens did not appear before the fourth day or eye lens antigens before the sixth day of development. Biles, McGibbon, and Irwin (1948) obtained similar data. Teller and Williams (1953) found only quantitative antigenic differences in the blood of larval, pupal, and adult Cecropia moths, except for a single antigen that appeared only in the 5th instar larval and the pupal stages. Flickinger, Levi, and Smith (1955) showed the absence of adult lens antigens in early stages of frog and chick embryonic development, and observed that frog lens antisera, upon being made organ specific, gave a positive precipitin reaction with antigens prepared from the head region, but not with antigens made from the more posterior parts of the larva.

The work of the above investigators as well as others (Cooper 1950, Ebert 1950, Spar 1953, Nace 1953) point to one general pattern. Most adult tissue antigens are present in all except the earliest embryonic stages, but there are definite times, however early, at which these antigens first appear during development.

The striking similarity between regeneration and embryonic development suggests the application of immunological methods to the study of the former process. Until now little has been done in this area. De Haan (1956) has shown that regenerating limb muscle of the axolotl (Ambystoma larva) contains proteins immunologically indistinguishable from the actomyosin of the fully formed larval striated muscle. Using the gel diffusion technique of Ouchterlony (1958), Laufer (1959) has shown a correlation between the progress of newt limb regeneration and the appearance of nucleoprotein, myosin, and actomyosin in the regenerate. Yet the immunology of tail regeneration in the adult newt Diemictylus viridescens has not been reported.