The Periellipsoidal Lymphoid Tissue in Chick Spleen:
A Bursa-dependent Area of the White Pulp

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The recent advance in our knowledge about function and ontogeny of the lymphoid cells could not be achieved without morphological analysis elucidating the distinct distributions of two different populations of peripheral lymphoid cells (see, for example, Gatti et al. 1970). For instance, demonstration of thymus-dependency of the periarterial lymphocytes and bursa-dependency of the germinal center cells and plasma cells (Cooper et al. 1965) induced great steps in this field of research. But most workers, who treated chick spleen along this line, payed little attention to an aggregation of lymphoid cells around the Schweigger-Seidel ellipsoids, which is a peculiar lymphoid structure in avian spleen (Dustin 1938, Osogoe 1954, Murata 1959). Only White et al. (1970) noticed the periellipsoidal area as the locus in which the cells bearing the antigen introduced to the chickens could be detected first. On the other hand, morphological data being accumulated in our laboratory tend to point some important peculiarities of the periellipsoidal lymphoid cells in nature and origin, with which this preliminary paper is specially concerned.

The development of the periellipsoidal lymphoid tissue was examined in the White Leghorn chickens ranging from one day to 8 weeks of age. In one-day-old chickens, the ellipsoids were compact masses of the reticular cells sheathing the terminal branches of the arterioles. One or two days later, moderately basophilic, medium-sized lymphoid cells having vesicular nucleus appeared at the periphery of the ellipsoids. In these and slightly older chickens, similar basophilic cells extending their cytoplasmic processes were occasionally found among the palely stained reticular cells of some ellipsoids. By the end of the
second week, these cells formed fairly thick wall, which was observed under low power view as a faintly or moderately basophilic zone circumscribing each ellipsoid. This process suggests that the periellipsoidal lymphoid cells are blood-born and pass through the wall of the sheathed arterioles before they settle themselves at the periellipsoidal zone.

The developmental process of the periarterial lymphoid tissue was quite different. Its first appearance was found in the perinatal chickens as the groups of small lymphocytes with dense nucleus attached to the arteries proximal to the point sending the sheathed arterioles. With later development, the periarterial and periellipsoidal lymphoid tissues came to fuse. But the boundaries between them were clearly discernible, especially in the sections stained with May-Grünwald and Giemsa or Dominici's method.

The dependency of these two lymphoid tissues on the central lymphoid organs was examined by early extirpation or destruction of the bursa of Fabricius or the thymus. In the spleens of bursaless chickens, which were obtained either after injection of testosterone to the eggs or by neonatal bursectomy and immediate exposure to x-irradiation, the development of periellipsoidal lymphoid tissue, germinal center and plasma cells was very poor. The influence of the same treatments on the periarterial lymphoid tissue was far less remarkable. Neonatal thymectomy and subsequent x-irradiation, on the other hand, tended to show reversed effects. Similar or sometimes more exaggerated were the effects of repeated exposure to x-rays of the thymic region: a whole body irradiation at one day of age and successive daily irradiations of the neck for 5 days. The periarterial area of these chickens was lacking in small lymphocytes and mostly occupied by invading periellipsoidal lymphoid cells and plasma cells.

These findings show that the periellipsoidal tissue consists of specific lymphoid cells which are dependent on the bursa of Fabricius. But whether they are identical with the antigen-bearing cells in the same area (White et al. 1970) still awaits further elucidation.

References