



PLATELET SIZE

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INTRODUCTION

Since 1889 it has been claimed incessantly that "platelets gradually decrease in size as they age in the circulation" (Steiner and Baldini, 1969). In 1953 Coulter patented an entirely new principle for highly efficient particle counting. This was "particularly applicable to sizing biological cells" (Kubitschek, 1958); and by 1967 the Coulter system had been used to confirm that in rats young platelets were considerably larger than older ones. In 1967 the aim of this study was, therefore, to make a Coulter estimate of the proportion of large young blood platelets in health and disease in man. This was to give a simple parameter of platelet turnover analogous to the reticulocyte count of the red cell line.

The high expectations of the Coulter system were initially not fulfilled. From a study of platelets with the Coulter system the project developed into a study of the Coulter system with platelets before it became apparent that viable cells behave capriciously in this system. It was necessary to revise Coulter theory for application to electrically reactive biological material. This led to a general examination of the concept of "cell size", a reassessment of the rapid physiological changes in platelet morphology, and a particular analysis of the statistical parameters of various types of platelet "size" distribution profiles.

Widely differing estimates of the "size" of human platelets made by authors using differing methods were largely reconciled; platelet counting with the Coulter counter was revised and simplified; and a new entity - "Mediterranean macrothrombocytopenia" - was identified; phylogenetic canalisation of the platelet count:volume relationship was investigated and the circulating platelet mass was established as a central parameter of thrombopoiesis; the spleen was demonstrated to retain globular cells preferentially and to be enlarged in healthy subjects with Mediterranean macrothrombocytopenia; the size-shape-related behaviour of platelets in vivo and in vitro was explored; a platelet work cycle theory was developed; and finally platelets were shown not to decrease in primary volume as they aged in the circulation, but they may well appear to decrease in diameter and perhaps also in their secondary volumes.

In the historical section and also in the body of the thesis platelet morphology is described in the nomenclature recommended by David-Ferreira (1964). Where this was inadequate for the dynamic changes in platelet morphology and behaviour, the precise terms coined by Bizzozero (1882) and other early workers are used. Several sub-cellular components have been clearly recognised only since 1964 and, finally, a few new terms had to be introduced.