The development of autolytic processes studied in some human pathological spleens removed surgically.

by A. Fieschi, and V. Malamani

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General Medical Clinic of the Royal University of Pavia (Italy)  
(Director: Prof. A. Ferrata)

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The Development of Autolytic Processes Studied in  
Some Human Pathological Spleens Removed Surgically

Complex protease action, of the third group of the proteinases  
according to Willstätter, were pinpointed in all the organs and assumed  
special importance in states of acute degeneration of the parenchymas  
(above all the liver). No less important are the experiments which  
demonstrate how the aseptic autolysis of a small fragment of a determined  
tissue can induce fatal degenerative states, as in the well known  
eperiment by Mason on hepatic autolysis.

In the pathology of the spleen the problem is not new. Set forth  
in the first research work by Corper, referred to by Fieschi in a previous  
work, these researchers supplied Roessle with the impetus to affirm  
that splenic autolysis in vivo has considerable importance in infectious  
spleens and in post-hemorrhage spleen tumors, pinpointed and studied by  
him with the cooperation of his pupils (Strauss, etc.).
The importance attributed by Roessle to proteolytic phenomena in vivo also regards the mechanism for the liberation of the reticulo-endothelial cells, a phenomenon which also closely concerns blood pathology and also regards alterations in the pulp (desmolysis, decollation of the endothelia) which are the expression of the biolysis; on the other hand, Roessle's conceptions of a serous inflammation, (of primary importance in splenic pathology and especially spleno-hepatic pathology) are known.

Unfortunately, research work carried out on this subject is meagre and limited to cadaverous spleens. Borger has carried out numerous investigations on autolysis, reaching the conclusion that in the septic forms there is a hyperproteolysis. Strauss also confirms the increase of proteolytic power in septic spleens and in acute post-hemorrhagic spleen tumor, while he observes that fermentative activity is attenuated in chronic forms. Also shown from his research work is the lack of proteolytic activity in the malpighian corpuscles.

Watermann identified a substance contained in many organs other than the spleen, which has cytolytic activity after the addition of lipase traces. This latter observation is of interest to demonstrate how biolysis phenomena are closely interdependent and conditioned by activities which work together in a way which is difficult to define.

The study of autolysis processes have never been extended to spleens surgically removed on account of splenopathic processes, and with special regard to these morbid states, and therefore it seemed useful to us to subject to such investigation the abundant material obtained from the Clinic's case histories, by studying the total nitrogen and that liberated through autolysis as incoagulable nitrogen: we also thought it useful to study the phosphorus liberated during autolysis.
Technique - The spleen removed surgically was, as soon as possible, reduced to a homogeneous pulp: For this purpose wide slices of spleen tissue were cut, and then all the pulp was scraped away with a broad-bladed, blunt knife so that only the structure of the fibrous tissues and capsule remained. Then the various portions were prepared by individual weighings and were distributed in flacons containing a determined volume of a buffer solution of acetate and isotonic sodium chloride solution: a thin layer of toluol (a few drops) was poured in and the receptacles were placed in the thermostat, from which they were removed at the time desired. The precipitation of the proteins was accomplished with trichloroacetic acid, at a concentration of 8%. After filtering, the nitrogen was metered in accordance with Kjeldahl's method. The buffer solution used had a pH value of 3.6 which in the preliminary research work seemed to us to be the most suitable.

For phosphorous we followed the same procedure except that we did not think it appropriate to add buffer solutions. The determination of the total P was conducted according to Neumann's method; the determination of the P directly meterable in the solution without proteins, was carried out according to Briggs' method.

In Figure 1, are shown the absolute values of the protein autolysis of the 8 cases under examination: (1) Terminal sepsis giant cell febrile splenomegaly; (2) Myeloid leukemia; (3) Hypogranulocytemia and myelogenous thrombopenia (sub-normal spleen); (4) Cirrhosis; (5) Hemolytic jaundice; (6) Thrombophlebitis; (7) Chronic thrombophlebitis with enormous sclerosis; (8) Hemolytic jaundice; (9) Werlhoff's disease: the numerical values have been shown in the respective tables. Besides the total amount of incoagulable N, the N fraction effectively liberated (obtained by subtracting from the total the value of the incoagulable N present at the beginning of the
experiment) was calculated; also calculated was the percentage of the total protein effectively separated at the various times of the investigation, and through these values the graphs of Figure 2 were constructed: (1) leukemia; (2) normal spleen; (3) cirrhosis with adenomatosis; (4) hemolytic jaundice; (5) cirrhosis; (6) thrombophlebitis; (7) hemolytic jaundice. Only the last case (Werlhoff's disease) is omitted from the graph because it was observed recently, just a little before the definitive compilation of the work.

The authors study the evolution of autolysis in 9 human spleens pathologically affected by different alterations. The most interesting results were constituted by the greater speed and intensity of this process in hemolytic jaundice, and by the establishment of the fact that in the sclerotic splenomegalyes, the autolysis value is not smaller than the often high normal. Only in one case of Werlhoff's disease was the protein very low, but this datum has not been further confirmed. The evaluations are discussed and related to the histological composition of the said spleens.

The importance of this research work is obvious especially when it is a question of kynotic, thrombophlebitic and Banti's splenomegalyes because it indirectly supplies a confirmation of the hypothesis that the metabolic work of the tissue and the biolysis process are not without importance, especially in view of the heavy increase of the spleen mass.