

Calcification of the Islets of Langerhans and Renal Cortical Tubular Epithelium in Alloxan Treated Calciphylactic Rats¹

It is evident from the works of SELYE² on calciphylaxis, that this type of specific reaction 'can be elicited selectively at predetermined sites' after the intravenous administration of challenging agent having particular affinity for a certain organ. It appears that the specific induction of the calcification and their localization is dependent upon the nature of the challengers. We have suggested, therefore, that the action of alloxan will also induce specific lesions of the islets of Langerhans and renal cortical tubuli with their calcification of this type.

Method. As experimental animals white rats were used. The weight of rats of both sexes varied between 120–200 g. The calciphylactic state was induced in 16 rats by means of intravenous administration of 3 mg of vitamin D₂ and or by the intramuscular administration of 3¹/₂ mg of Calciferol (Spofa – D₂ vitamin in oil solution). Alloxan in 5% aqueous solution was also administered on the second day in amounts of 100–150 mg per kg weight intravenously. Control animals received only alloxan or vitamin D alone.

The rats died spontaneously beginning the 2nd or 3rd day or were killed up to the tenth day of the experiment. The tissues were fixed in 10% formalin solution, paraffin sections were stained with hematoxylin and eosin, and Kossa's calcium phosphate reaction was performed routinely also. Histological sections were not in the final stage of procedure treated with thiosulphate, and were counterstained with a dilute solution of polychromic methylene blue.

Results. In the group of experimental calciphylactic rats treated with alloxan, there was a marked and sometimes even massive calcification of the majority of islets of Langerhans in the pancreas (Figures 1 and 2). The calcium deposits were dustlike or fine granular, and only rarely were crystalloid in shape. Some islets showed heavy calcification of all cellular elements so that the differentiation of the individual parenchymal cells became impossible. Contrary to these findings, some islets contained smaller amounts of calcium precipitate, so that some cells were free from it. To a minor extent some deposits were seen in the walls of small blood vessels too. The exocrine pancreatic parenchyma showed no significant calcification.

In the kidneys there were heavy deposits of calcium salts predominantly in degenerated cortical tubuli of all alloxan-treated calciphylactic animals. Some calcium deposits in minimal extent were seen in the kidneys of the control group, but the degree of calcification in the calciphylactic animals was several times greater.

In other tissues, no significant calcium precipitations were noted.

Discussion. As has been shown in our experimental calciphylactic animals, the induction of marked acute calcification can be produced in pancreatic islets and in renal cortex following the administration of the conventional dose of alloxan. The extent of calcification of the islets varied from massive to weak precipitate or was entirely negative. It is suggested that the alloxan in animals is a challenger substance in the sense of SELYE's theory of calciphylaxis. The mode of action is probably that of specific alloxan lesion of the islet epithelium undergoing calcification. Minor degree of calcium deposits in some islets of Langerhans will probably permit (using differential staining procedures) the precise localization of the lesion on the niveau of A-/B- system of parenchymal insular cells.

Cortical lesions of kidneys can be explained as well by the lesion of the tubular cells with alloxan. The 'alloxan nephrosis' apparently favours this type of calcification.

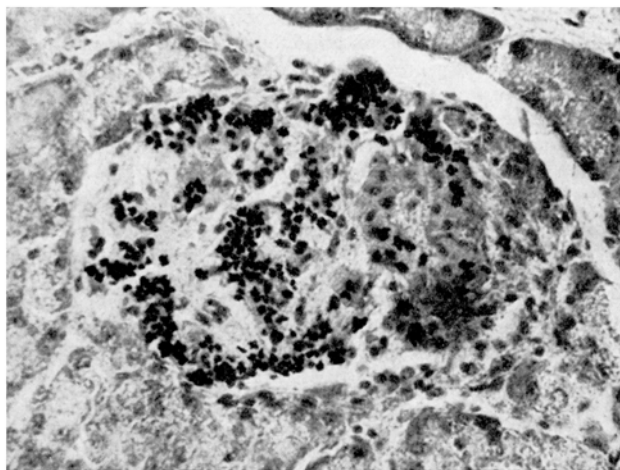


Fig. 1

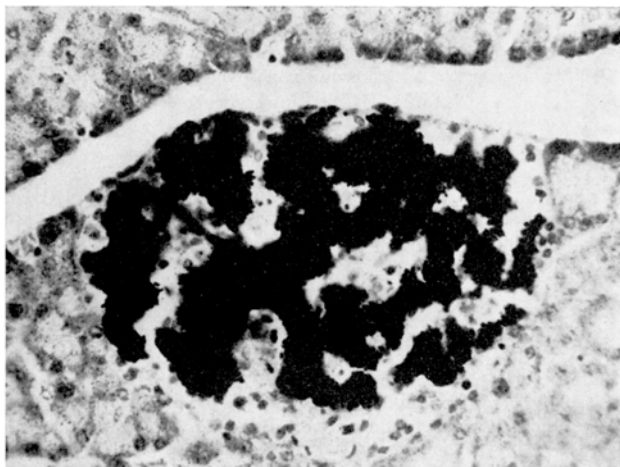


Fig. 2

Zusammenfassung. Es wird über das Vorkommen der akuten Calcifikation im Bereich der Langerhans'schen Inseln und des renalen Tubularepitheliums mit Alloxan behandelter Ratten während des calciphylaktischen Zustandes berichtet.

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² H. SELYE *et al.*, Arch. int. med. 110, 290 (1962).