

Persorption of Particles

G. VOLKHEIMER, F. H. SCHULZ, I. AURICH,
S. STRAUCH, K. BEUTHIN and H. WENDLANDT

(With Plate I and II)

Department of Gastroenterology, Laboratories for experimental
Gastroenterology, First Medical University Clinic (Charité) Berlin
(Med. Dir.: Prof. M. D. F. H. Schulz)

Persorption is the para-cellular passage of large corpuscular food particles through the epithelial layer of the gastro-intestinal tract. The diameter of such persorbed particles lies well within the micron range. The phenomenon of persorption is not a type of absorption: the epithelial cells do not have an absorptive function in this process. Starch granules are excellently suited for the demonstration of persorption as they can be administered orally in adequately large amounts. They can be readily demonstrated in body fluids and in tissues.

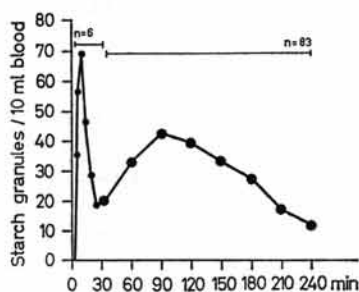


Fig. 1

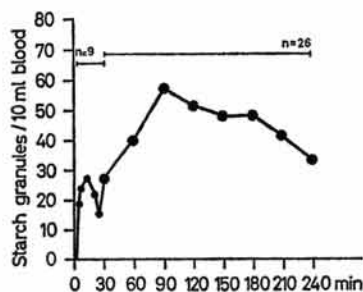


Fig. 2

Fig. 1. Number of potato starch granules in samples of 10 ml each of venous blood in juvenile test persons after oral administration of 200 gms of potato starch.

Fig. 2. Number of wheat starch granules in 10 ml of venous blood each in juvenile test persons after oral administration of 200 gms of biscuits.

Fig. 3-8. Jejunum, rat. Starch granules between epithelial cells.

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After oral administration of starch it is possible to demonstrate numerous unaltered starch granules in the venous blood. It is also possible to demonstrate this with other substances, i. e. cellulose particles, pollen, spores, polyvinyl chloride spherules, diatoms, and others. Quantitative determination of the persorption rate is possible (Figs. 1, 2).

We have observed the persorption process in animal experiments and have attempted to demonstrate the mechanism and the removal pathway:

Material and Method

134 young, white laboratory rats were fed a suspension of potato starch in cream. After different periods of time the animals were killed, the intestine was removed and was separated into segments of 10 mm. These segments were fixed in Bouin's solution. They were embedded in paraffin and stained with hematoxylin or Periodic Acid Schiff's Reagent. Microscopic examination was performed with polarized light.

A total of more than 63,000 sections of the stomach, the small intestine and of the colon were examined. Occasionally it was possible to find starch granules between the epithelial cells, in the subepithelial region, in the lumen of lymph vessels and in the lumen of blood vessels of the intestinal wall (Figs. 3-14).

Discussion

The authors attempt to reconstruct the persorption process from the position of orally administered starch granules in the intestinal wall of the rat. Passage was observed in such segments of the intestinal tract as are covered by a single layer of epithelium. Passage can especially be demonstrated in the region of the desquamation zones of the epithelium. Persorbed starch granules are transported in a basal direction in the subepithelial region. Only in the deeper mucosal layers is it possible to find them in the lumen of lymph vessels and blood vessels.

Summary

After they have been administered to rats, potato starch granules can occasionally be found between the epithelial cells of the intestinal mucosa, in the subepithelial region of the mucosa and in the lumen of

Figs. 9-12. Jejunum, rat. Starch granules in the subepithelial region. Starch administered orally.

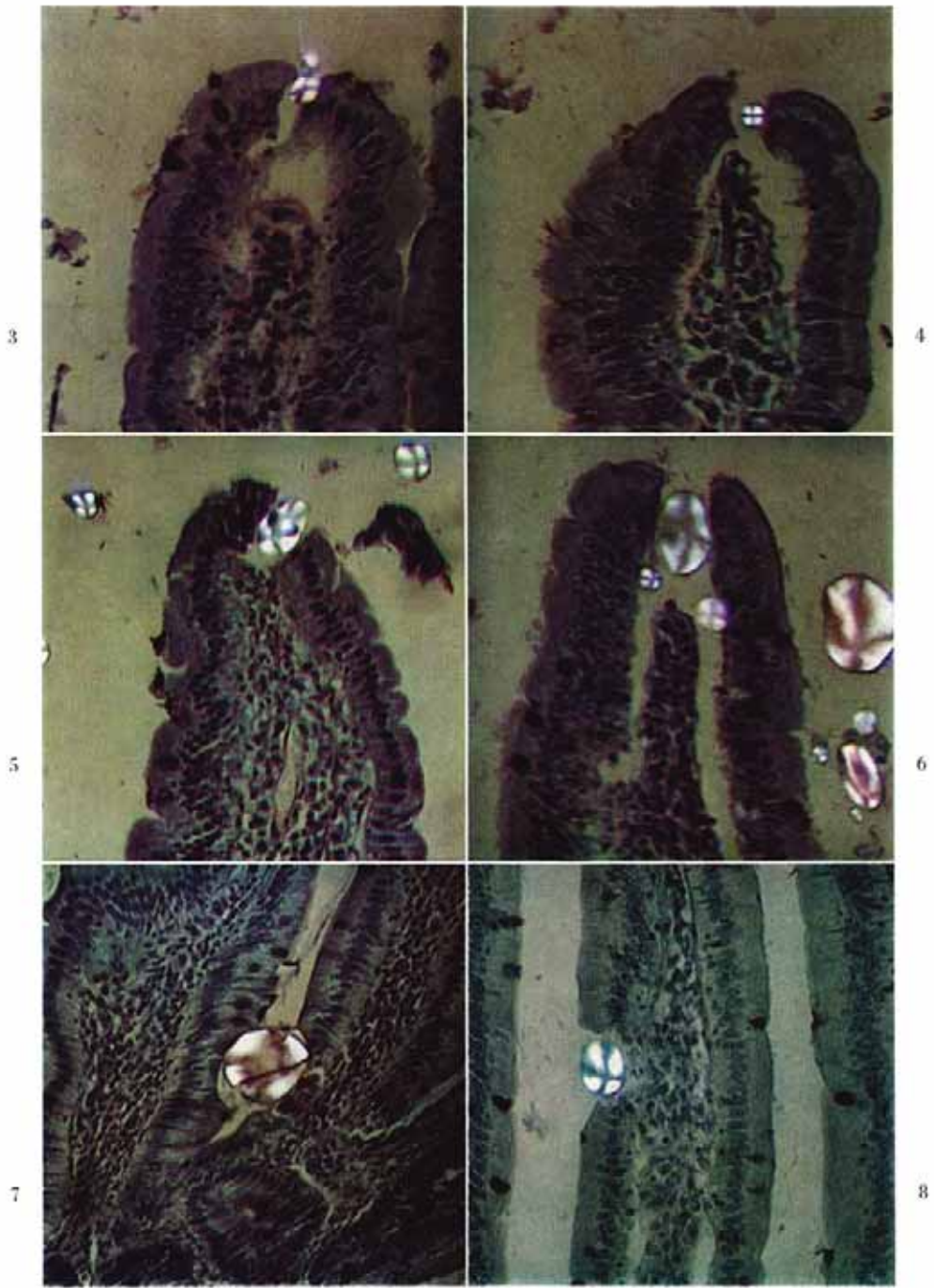
Figs. 13, 14. Starch granules in lymph vessel and blood vessel. Intestinal wall, rat, after oral administration of starch.

lymph and blood vessels of the intestinal wall. On the basis of the position of these particles the persorption pathway is reconstructed.

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Authors' address: G. Volkheimer, M. D., Bayrischer Platz 9, D-1 Berlin 62 (Germany)



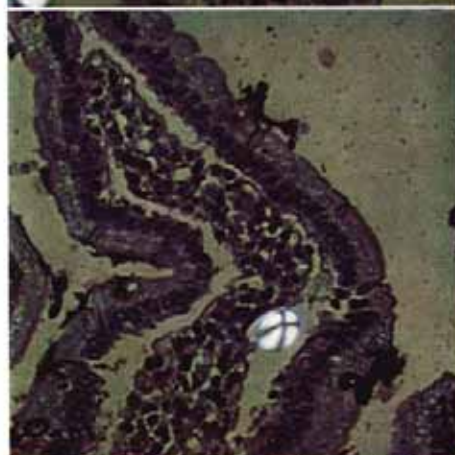
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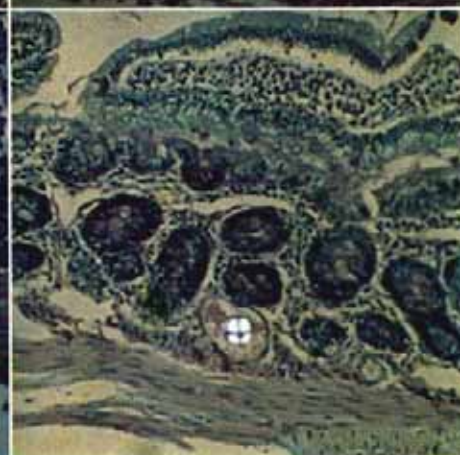
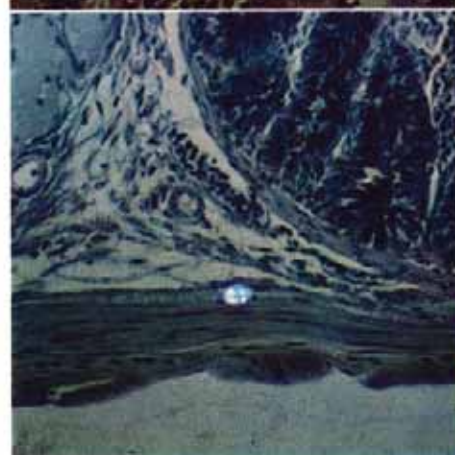
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