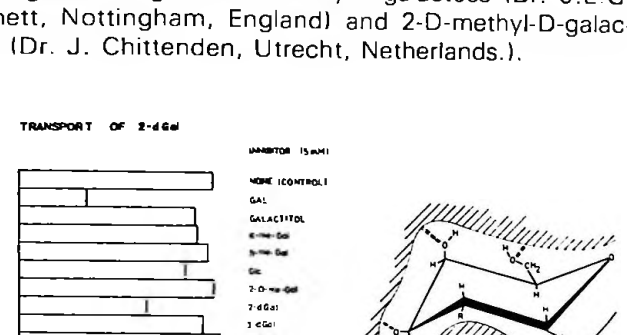
USPHS Grant AM-12619. The authors gratefully acknowledge generous gifts of 3-deoxy-D-galactose (Dr. J.E.G. Barnett, Nottingham, England) and 2-D-methyl-D-galactose (Dr. J. Chittenden, Utrecht, Netherlands.).



29 • 1975

The Specificity of the Transport Systems for Glucose in the renal tubular cells of the Flounder (*Pseudopleuronectes americanus*)

Arnost Kleinzeller, George R. Dubyak and James F. Mullin, University of Pennsylvania School of Medicine, Philadelphia, Pa.

Data on the specificity of both transport pathways for D-glucose found at the antiluminal (basal) face of the renal tubular cells of the winter flounder (*pseudopleuronectes americanus*) have been presented previously (*Kleinzeller, and McAvoy, J. Gen. Physiol. 62:169, 1973; Kleinzeller, Rittmaster, Griffin and McAvoy, Bull., Mt. Desert Island Biological Lab. 14:60, 1974*). These studies have been extended using a broader selection of structural analogs of D-glucose. As in previous investigations, an inhibition analysis of model sugars by teased renal tubules served as the principal technique.

Using 0.5 mM methyl-x-D-glucoside-^{14}C as a model substrate for the transport system shared by D-glucose and both methyl-D-glucosides, the following newly tested sugars (5 mM) were found to be potent inhibitors: -Fluoro-D-glucose, 3-deoxy-3-fluoro-D-glucose. The sugars -thio-D-glucose and 3-deoxy-D-glucose had no effect. These data, taken in conjunction with previously recorded evidence, indicate that an interaction between the transported sugars and the carrier takes place at the following points:hydrogen bridges may be established between the oxygens at C_1, C_3 (in the axial configuration) and C_4 (in the equatorial configuration), a pyranose ring structure appears to be essential; finally, a bond of a firmer nature (covalent ?) may be formed at C_2-OH (in the equatorial configuration).

The specificity of the transport pathway shared by D-glucose, 2-deoxy-D-glucose and D-mannose was studied using the last two sugars as models. Figure 1 summarizes data obtained in previous and the present studies by an inhibition analysis of the tissue uptake of 2-deoxy-D-glucose. The inhibition pattern was identical with that for D-mannose and D-glucose (details not given here). Of the newly tested analogs of D-glucose, only -F-glucose, 3-deoxy-F-glucose, 5-thio-glucose and 6-deoxy-glucose were inhibitory. The scheme given in Figure 1 summarizes the possible points of interaction between the carrier and the transported substrates as follows:

A bond of a relatively firm nature (covalent link to a phosphoryl group at the carrier? See Dubyak, Mullin and Kleinzeller, Bull. Mt. Desert Island Biological Lab 15:000, 1975) is established at C_1-OH; fluoride can replace the hydroxl. Hydrogen bonding at C_3-OH in the axial configuration is indicated by the fact that 3-deoxy-D-glucose, D-allose and D-altrose were not inhibitory, whereas 3-deoxy-3-F-glucose was inhibitory. C_4-OH in the equatorial configuration is essential. A pyranose ring structure is mandatory but no hydrogen bond appears to be formed between the ring oxygen and the carrier in the light of the inhibitory effect of 5-thio-D-glucose.

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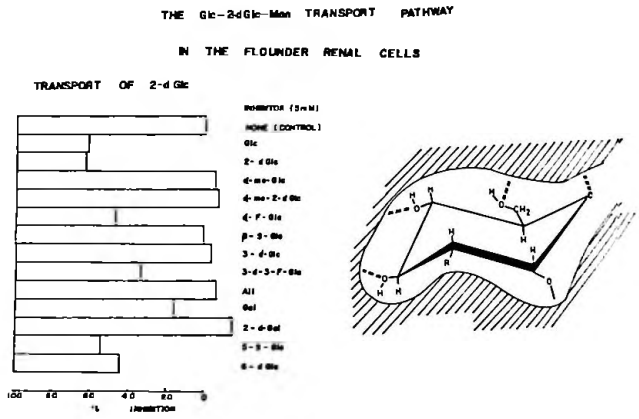

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Configuration of the Skate (*Raja Erincea*) Nephron and Ultrastructure of Two Segments of the Proximal Tubule

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The micropuncture study of skate kidney (*Stolte et al., MDIBL Bulletin, #42, this issue*) presented evidence that the principal site of Mg, Phosphate and Sulphate secretion is the proximal tubular segment II (PTS II) which is located primarily on the ventral surface of the kidney. Since this is the first time that a specific site for secretion of these divalent ions has been localized, it was of interest to study the ultrastructure of this and other segments of the skate renal nephron. The nephron and