Some Effects of Inorganic Ions on the Active Transport of Phenol Red by Isolated Kidney Tubules of the Flounder.*

Theodore T. Puck, Karlman Wasserman,
and Alfred P. Fishman**
Colorado, Tulane, and Harvard Universities

1) A method is described for measuring quantitatively the uptake of phenol red in the isolated kidney tubules of the flounder. Data are presented showing the time course of phenol red accumulation in the lumen of such tubules when a balanced salt medium is employed. Under optimal conditions the dye concentration achieved in the lumen is 4000-6000 times as great as the external solution.

2) The relative concentrating power of the tubule for phenol red decreases as the concentration of the dye in the external solution increases. Hence, some process within the tubule appears to reach a saturation point at high phenol red concentrations.

3) If the salt solution bathing the tissue is relatively low in K^+ and high in Ca^{++}, accumulation of phenol red is limited to the lumen, and none is detectable in the cells. In salt solutions containing a high K^+ concentration and no Ca^{++}, the dye accumulates in high concentration in the tubule cells, with little or none appearing in the lumen.

4) The accumulation of dye in the tubule cells in high K and low Ca media is inhibited by specific agents like PAH and diodrast which compete for the normal phenol red tubular transport mechanism. PAH competition exhibits the same concentration relationships for cellular and lumen accumulations; therefore, it is proposed that the mechanism which leads to accumulation in the cells is part of the normal transport mechanism.

5) In the complete absence of K^+ no phenol red uptake in cells or lumen occurs. In the absence of Ca^{++}, the dye is taken up only in the cells, but not in the lumen. Moreover, under the latter condition, the rate of accumulation of dye in the cells is directly proportional to the concentration of K^+ in the medium.

6) The above phenomena are explicable on the assumption that tubular transport involves two steps: transposition into the cell requires K^+, and transposition from cell to lumen, which requires Ca^{++}.

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** Established Investigator of the American Heart Association.