Phenol Red Transport as an Indication of Functional Capacity of Developing Chick Mesonephric and Metanephric Tubules

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Modifications of the Forster technique (Science, **108**: 65, 1950) for study of tubular transport were applied to embryonic chick kidneys. Intact mesonephroi and small lobules of metanephric tissue were rapidly dissected from living embryos and placed in an actively aerated solution of salts and lmg% phenol red or chlorphenol red. Attempts to isolate entire tubules that retained their functional ability were unsuccessful. Under conditions suitable for tubular transport the lumens became dark red or purple, in contrast to the light-colored solution and the pale yellow or lavender tubule cells.

No valid procedure was found for quantitative measurements of dye transport, but by subjective estimate of color intensity it was possible to compare different conditions. Good results were obtained with the salt solutions used to study tubular transport in flounder by Forster (1950) and Puck et al (J. Cell. & Comp. Physiol. **37**: 73, 1952) and fair results with the mammalian solution of Cross and Taggart (Am. J. Physiol., **161** 181,1950). Chick tissue culture salt solutions, such as Ringer's, Locke's, Tyrode's and Spratt's minimal gave poor tubular transport. Modifications of the flounder medium in which the amounts of NaCl and $NaHCO_3$ were varied but the total sodium ion concentration kept constant showed little difference between the ranges of 5mM and 30mM $NaHCO_3$. Between the temperatures of 22°C and 39°C little difference in the intensity of maximum color was observed but the time required to reach the maximum was greater at the lower temperatures.

Morphologically distinct tubules could be seen in embryos as early as the second day of incubation but no indication of dye transport was found before the fifth day. In five day embryos (Hamburger-Hamilton Stage 28) the anterior tubules were active but the posterior were not. From this stage until the regression of the mesonephros, between approximately the 18th day and the second day after hatching, all mesonephric tubules possessed the capacity for dye transport. Metanephric activity was first observed in a few faintly colored tubules in the center of the lobule of 13 day (Stage 39) embryos. Older embyros showed progressively more active tubules but the depth of color in the lumen was never as great as that of the mesonephric tubule. Accumulation of dye in metanephric tubules was difficult to observe accurately because of their small size and complex coiling and the large amount of undifferentiated tissue around the periphery of developing lobules.