example. In the light of the above results it appears less improbable that photosynthetic oxidants, of standard potentials lower than 0.0 v, may be quite strongly reduced by illuminated, freshly isolated chloroplasts in the absence of oxygen. Better methods of isolation (*7*) and of storage (*5*) of chloroplasts should help to establish such a postulate. A specific oxidant of low potential, the reduced form of which is not autoxidizable, may not require the absence of oxygen for its strong reduction.


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## Observations on the Solubility of Some Cortical Hormones


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Several reports (*1, 2*) have indicated a difference in the clinical response of patients with arthritis to cortisone and hydrocortisone given by intra-articular or intramuscular injection as a saline suspension. In this connection, it became of interest to determine the solubility of these compounds in various biological fluids. The following report presents the results of solubility determinations of several crystalline derivatives of cortical hormones in distilled water, normal human plasma, a solution of human serum albumin, and human synovial fluid.

The normal human plasma was a commercially available, freeze-dried, irradiated product. It was restored to its original volume at time of use by the addition of sterile, pyrogen-free 0.1% citric acid solution. The normal human serum albumin was a salt-poor, concentrated solution containing 25 g of human serum albumin/100 ml.[1] The synovial fluid was obtained from arthritic joints of patients prior to intra-articular administration of steroid suspensions.[2]

A saturated solution was prepared by shaking an excess of the crystalline solid with 10 ml of test fluid in a centrifuge tube at 25° C for 1 hr. The clear solution obtained after centrifugation and filtration was used for analysis. The concentrations of dissolved material were determined by ultraviolet spectrophotometry or by the colorimetric method of Mader and Buck (*3*). Both methods were used in many of the determinations and showed good agreement.

A summary of the solubility data is given in Table 1. These data indicate that hydrocortisone acetate is much less soluble in the biological fluids tested than cortisone acetate, even though the solubilities in water are comparable. Both steroids are much more soluble in the unesterified form. No significant differences were apparent, however, in the solubility of the unesterified forms of cortisone and hydrocortisone in the fluids tested. The marked increase in solubility of cortisone tricarballylate in the biological fluids as compared with water undoubtedly is the result of salt formation. In sodium bicarbonate solution, the solubility of cortisone tricarballylate is in excess of 10 mg/ml at pH 7.5.

TABLE 1

SOLUBILITY OF CORTICAL HORMONES IN WATER AND BIOLOGICAL FLUIDS (mg/ml)

| | Water | Human plasma | Human serum albumen | Human synovial fluid |
|---|---|---|---|---|
| Cortisone acetate | 0.02 | 0.16 | 0.72 | 0.36 |
| Cortisone (free alcohol) | .28 | .75 | 1.28 | .56 |
| Hydrocortisone acetate | .01 | .02 | 0.04 | .04 |
| Hydrocortisone (free alcohol) | .28 | 0.70 | 1.46 | 0.25 |
| Cortisone tricarballylate (*4*) | .07 | 5.44 | 5.78 | 8.20 |
| Cortisone propionate (*4*) | .008 | 0.14 | *ca.* 0.1 | 0.09 |
| Cortisone caprylate (*4*) | 0 002 | 0.20 | *ca.* 1.0 | 0.14 |


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