

## HYDROCORTISONE

### Use

Hydrocortisone has been in use to manage congenital adrenal abnormality and adrenal insufficiency due to hypopituitarism since 1949. Hypotension in the preterm baby often responds to low-dose IV hydrocortisone. Five trials of use to prevent bronchopulmonary dysplasia (BPD) have not delivered much consistent benefit.

### Pathophysiology

The adrenal cortex normally secretes hydrocortisone (cortisol) which has glucocorticoid activity and weak mineralocorticoid activity. It also secretes the mineralocorticoid aldosterone. Physiological replacement in adrenal insufficiency is best achieved by a combination of hydrocortisone and the artificial mineralocorticoid fludrocortisone but, where the problem is secondary to pituitary failure, mineralocorticoid replacement is seldom necessary because aldosterone production is mainly controlled by the renin-angiotensin system.

Various recessively inherited enzyme deficiencies can cause congenital adrenal hyperplasia, but nearly 95% are due to 21-hydroxylase deficiency, and most of the others to 11-hydroxylase deficiency. Salt loss is a problem in the former but not usually in the latter. Diagnosis is relatively easy in girls because of virilisation and sexual ambiguity, but less easy in boys until the child presents with vomiting, failure to thrive and (ultimately) circulatory collapse: some boys are initially misdiagnosed as having pyloric stenosis. Pelvic imaging, an urgent karyotype, a 17-hydroxyprogesterone (17-OHP) measurement, and a urinary steroid profile confirm the diagnosis. Functional adrenal hypoplasia can also present in a similar manner, or with hypoglycaemia. It is diagnosed by the lack of a significant response to tetracosactide (q.v.) and a normal 17-OHP level.

Drug	Equivalent Activity (mg)		Biological Half Life (hr)
	Glucocorticoid	Mineralocorticoid	
Fludrocortisone	0	20	–
Cortisone acetate	25	0.8	8–12
Hydrocortisone	20	1	8–12
Prednisolone	5	<1	12–36
Betamethasone	0.75	0	36–54
Dexamethasone	0.75	0	36–54

### Treatment

**Early neonatal hypotension:** Hydrocortisone (like dexamethasone [q.v.]) often increases blood pressure as effectively as dopamine (q.v.), and may work when a catecholamine does not. A 1 mg/kg dose IV once every 8 hours is usually enough to reduce the need to use other vasopressor drugs. Try and withdraw treatment within 2–4 days, because steroid use increases the risk of fungal infection, and also seems to increase the risk of focal gut perforation, especially if the baby is also given ibuprofen or indometacin.

**Preventing BPD:** Low dose trials (0.5 mg/kg IV twice a day for 12 days, and half this for 3 days) delivered no benefit except to a subgroup with chorioamnionitis. Later development was not affected by such treatment.

**Treating BPD:** 2.5 mg/kg twice a day for 7 days, and a reducing dose for a further 2 weeks, was as effective as dexamethasone in one study, and did not have the latter's detrimental effect on later development.

**Congenital adrenal hyperplasia:** Adrenal suppression using 5–7 mg/m<sup>2</sup> of hydrocortisone once every 8 hours, plus at least 100 micrograms of fludrocortisone once a day, provides a good starting point for neonatal care. Babies with 21-hydroxylase deficiency usually need an additional 2–4 mmol/kg of sodium a day

**Adrenal hypoplasia:** Production of cortisol normally averages 6–9 mg/m<sup>2</sup> per day and, making allowance for absorption, 10–12 mg/m<sup>2</sup> of hydrocortisone by mouth will meet normal replacement needs (although need may rise ten fold during any acute illness).

**Addisonian crisis:** This requires IV glucose and a 10 mg bolus followed by a continuing 100 mg/m<sup>2</sup> a day infusion of hydrocortisone. Rapid fluid replacement may be necessary with 0.9% sodium chloride. The high serum potassium almost always corrects itself, but 2 ml/kg of 10% calcium gluconate and/or an infusion of glucose and insulin (q.v.) may be needed if a cardiac arrhythmia develops.

**Steroid induced adrenal suppression:** See the monograph on dexamethasone.

### Supply

100 mg vials of hydrocortisone (as the sodium succinate powder) cost 93p each. Reconstitute with 2 ml of water. An oral suspension can also be provided. Scored 100 microgram fludrocortisone tablets cost 5p each, and small doses can be given with relative ease because the tablets disperse readily in water.

### References

- See also the relevant Cochrane reviews ©
- Ng PC, Lee CH, Bnur FL, *et al.* A double-blind, randomized, controlled study of a "stress dose" of hydrocortisone for rescue treatment of refractory hypotension in preterm infants. *Pediatrics* 2006;**117**:367–75. [RCT] (See also 516–8.)
- Noori S, Friedlich P, Wong P, *et al.* Hemodynamic changes after low-dosage hydrocortisone administration in vasopressor-treated preterm and term neonates. *Pediatrics* 2006;**118**:1456–66.
- Rademaker KJ, de Vries LS, Uiterwaal CSPM, *et al.* Postnatal hydrocortisone treatment for chronic lung disease in the preterm newborn and long-term neurodevelopmental follow-up. *Arch Dis Child* 2008;**93**:F58–63. [SR]