

Endocrine Control of Salt and Water

There are two important endocrine axes that control the body's salt, fluid and water status. These are two separate axes and it is helpful to think about them separately although they do interact. The first is the renin and aldosterone axis that primarily regulates fluid status (whether you are swollen or dehydrated). Renin is made by the kidney and goes to the adrenal gland to make aldosterone. Aldosterone helps retain salt in the kidneys and helps raise your blood pressure. Patients with low aldosterone lose salt in the urine and can be dehydrated. They will have low blood volume and may be dizzy when they stand up or have palpitations. They could have a high pulse. Their blood pressure is usually low and drops when they stand up. Their pulse also increases when they stand up. In general, a patient's blood pressure drops when standing and pulse post rises when standing but in patients with low aldosterone, this is exaggerated. Patient with low aldosterone often feel tired because they do not get enough blood to their brain and often feel worse on exercise as when the exercise more blood goes to the muscles instead of the brain and they feel worse.

To diagnose aldosterone deficiency, Dr. Friedman measures renin and aldosterone in the blood. He usually both pressure and pulse and renin and aldosterone sitting, but sometimes he measures them both lying and standing. There's no need for a urine aldosterone level. Patients with adrenal problems have low aldosterone and high renin and patient with pituitary or brain dysfunction may have low aldosterone and low renin. Other patients can also trouble with retaining urine sodium and have a high aldosterone and high renin.

Patients whose main manifestation of low aldosterone is low blood pressure, especially on standing and dizziness on standing called neurally-mediated hypotension or NMH. Patients that have high pulse on standing are called postural orthostatic tachycardia syndrome or POTS. Thus the diagnosis of hypoaldosteronism is based on laboratory testing, while the diagnoses of NMH or POTS is based on what happens to blood pressure and pulse on standing. The symptoms and treatment of all three are similar. Some doctors recommend a tilt table test to confirm these diagnoses, however Dr. Friedman has not found tilt table testing to be that helpful.

The treatment for low aldosterone starts off by increasing salt intake. Patient can also take licorice or licorice root or grapefruit or grapefruit juice as these block the enzyme that breaks down cortisol in the kidneys and allows cortisol to bind to the aldosterone receptor in the kidneys and helps raise blood pressure. For more severe cases Dr. Freeman often gives fludrocortisone which is also called Florinef. Florinef is a pretty benign medicine which is a mineralocorticoid unlike cortisol which is a glucocorticoid. These combinations of medicines which raise blood pressure usually help the patient symptoms and gives more energy and less dizziness on standing.

A patient with high aldosterone and low renin could have an aldosterone secreting adrenal tumor. These patients often have high blood pressure and low potassium and patients suspected of having high aldosterone should have a potassium, aldosterone and renin level measured that can be done at any time a day in any position. If low renin and high aldosterone is found, Dr. Friedman usually orders an adrenal CAT scan to look for tumor. If a tumor is found, Dr. Friedman orders other tests to make sure the aldosterone is truly high. He will then refer the patient for adrenal surgery.

The other important axis of water balance is the controlled by the hormone, arginine vasopressin (AVP); it's also called antidiuretic hormone or ADH. This hormone is made by the posterior pituitary and regulates water retention in the kidney, causes blood vessels to constrict and acts, along with CRH, to secrete ACTH from the pituitary which goes to the adrenals to secrete

cortisol. Patient with pituitary problems especially in the posterior pituitary, often from surgery or prior radiation could be deficient in ADH and have a condition called diabetes insipidus (DI). Rarely the diabetes insipidus could be due to problems with the ADH receptor at the kidney. The main symptom of diabetes insipidus are excessive thirst and excessive urination with dehydration and the patient's sodium and osmolality are high. The patient's urine volume is also quite high.

To guide to diagnose diabetes insipidus, Dr. Friedman measures a morning serum and urine osmolality and ADH level after a 12 hour fast that includes no water. A high serum osmolality above 300 and a relatively low urine osmolality usually below 500 and a low ADH confirms diabetes insipidus. Dr. Friedman also looks at the 24 hr urine volume and if it's above 3000 mL, it's consistent with diabetes insipidus. The treatment for diabetes insipidus is a hormone called desmopressin or DDAVP which is usually given as a pill, but can also be given as a spray in the nose. Sodium levels need to be measured to make sure the dose of DDAVP is correct. Dr. Friedman also looks at your urine frequency to make sure you are not urinating too much especially at night. If you are or if your sodium is high, he will raise the dose. If your sodium is low, he will lower the dose.

Too much ADH is a condition called syndrome of inappropriate anti-diuretic hormone (SIADH). This manifests as low sodium and sometimes extra fluid retention, although that's unlikely. This is usually diagnosed with a serum sodium level and is often due to medicines, especially psychiatric medicines, lung disease or brain lesions. It can also be due to drinking too much water. Treatment is usually water restriction.

For more information about Dr. Friedman's practice or to schedule an appointment, go to www.goodhormonehealth.com or email us at mail@goodhormonehealth.com.