

So, You've Got Ketoacidosis.

!!! Keep that pH between 7.37 and 7.45 !!!

Normally, blood is slightly alkaline:

proteins suspended in it are alkaline, plus there is the bicarbonate and phosphate.

However, it also contains carbonic acid

THUS there is a balance between the main acid and the main base.

THEREFORE: @ ketoacidosis

- Acetoacetate and beta-hydroxybutyrate are **acidic molecules which release H⁺ ions**
- **These H⁺ ions react with bicarbonate** to form carbonic acid;
- THUS blood becomes even MORE ACIDIC but its good CO₂ acid and can be exhaled
- ...Which is indeed what happens: "Kussmaul's breathing"-style hyperventilation
- This happens because of rising acidity of the blood as sensed by the respiratory centres at the open medulla (floor of 4th Ventricle)

MEANWHILE, BACK AT THE KIDNEY:

bicarbonate ions are resorbed

so as to keep some alkali in the bloodstream while the lungs puff out all that acidic CO₂

PLUS tubule cells **create new bicarbonate**

PLUS the same cells **excrete ammonia in the urine...**

...which scavenges H⁺ ions and thus also sort-of de-acidifies the blood

PLUS you can also excrete amino acidsths way.

THEREFORE slowly doth the balance creep back t'ward the normal range of 7.37 and 7.45 pH

HOW IS ANY OF THAT RELEVANT TO EMERGENCY MANAGEMENT?

1 to 3 day history of gradual decline into ...

- **Peeing lots**
- **Very thirsty and dry**
- **Lethargic**
- **Not eating**
- **Hyperventilating**
- **Breath reeks of nail-polish remover**
- **Maybe stomach pains and cramping...**
 - And amylase raised, but no pancreatitis- so dont fret

Ketones in your urine? Not abnormal!

Normal people can have up to ++ of ketones in their pee after an overnight fast. No cause for dismay, this.

IN MANAGEMENT, WATCH OUT FOR:

Hypokalemia, hypophosphataemia, hypomagnesiemia, thromboembolism, coma from cerebral oedema.

YOU WANT TO...

- **Put a line in and start fluids. DEHYDRATION IS MORE SCARY THAN HYPERGLYCAEMIA.**
 - 1 litre of saline stat, 1 litre over next hour, 1 litre over next 2 hrs, 1 litre over next 4 hrs, 1 litre over next 6 hrs
- **Check glucose: its going to be probably over 20**
 - If so, give **4-8 units of insulin IV. AIM for a glucose fall of 5 mmol/hour.**
 - Change to subcutaneous insulin when ketones below 1, and eating normally.
- **Now, watch them carefully for hypo symptoms and arrhythmias while you run tests:**
 - **LAB BSL**
 - **EUC (!! Potassium!!)** plus hyponatremia as part of compensation for hyperglycaemia; IF **HYPERNATREMIA** the dehydration is dire indeed!
 - PLUS creatinine assays cross react with ketones so you wont et a clear picture of renal function.
 - **BLOOD GAS (!! PH !!)**
 - **FBC** probably high WCC even in absence of infection
 - **Urinalysis for ketones and glucose**

Slightly better now? Not yet out of the dark woods;

- **Continue fluids and K⁺ replacement if warranted**
- **Check glucose and EUC for K⁺ HOURLY**