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Pharmacology

Phs 212 assignment

Body fluid ( micturition )

Questions

Q1. Discuss renal handling of glucose and electrolytes?

Q2. Discuss the physiology of micturition?

The effects of hyperglycemia and hyperinsulinemia on renal handling of sodium, calcium, and phosphate were studied in dogs employing the recollection micropuncture technique. Subthreshold sustained hyperglycemia resulted in an isonatric inhibition of proximal tubular sodium, fluid, calcium, and phosphate reabsorption by 8-14%. Fractional excretion of sodium and phosphate, however, fell (P is less than 0.01) indicating that the increased delivery of these ions was reabsorbed in portions of the nephron distal to the site of puncture and in addition net sodium and phosphate transport was enhanced resulting in a significant antinatriuresis and antiphosphaturia. The creation of a steady state plateau of hyperinsulinemia while maintaining the blood glucose concentration of euglycemic levels mimicked the effects of hyperglycemia on proximal tubular transport and fractional excretion of sodium and calcium. Tubular fluid to plasma insulin ratio fell, similar to the hyperglycemic studies. These results suggest that the effects of hyperglycemia on renal handling of sodium and calcium may be mediated through changes in plasma insulin concentration. In contrast to hyperglycemia, however, hyperinsulinemia cuased a significant fall in tubular fluid to plasma phosphate ratio with enhanced proximal tubular phosphate reabsorption (P is less than 0.02). This occurred concomitantly with a significant inhibition of proximal tubular sodium transport. These data indicate that insulin has a direct effect on proximal tubular phosphate reabsorption, and this effect of insulin is masked by the presence of increased amounts of unreabsorbed glucose in the tubule that ensues when hyperinsulinemia occurs secondary to hyperglycemia. Fractional excretion of phosphate fell significantly during insulin infusion but unlike the hyperglycemic studies, the fall in phosphate excretion could be entirely accounted for by enhanced proximal reabsorption.

Micturition or urination is the process of expelling urine from the bladder. This act is also known as voiding of the bladder. The [excretory system](https://www.toppr.com/guides/biology/excretory-products/human-excretory-system/) in humans includes a pair of kidneys, two ureters, a urinary bladder and a urethra. The kidneys filter the urine and it is transported to the urinary bladder via the ureters where it is stored till its expulsion. The process of micturition is regulated by the [nervous system](https://www.toppr.com/guides/biology/control-and-coordination/nervous-system/) and the [muscles](https://www.toppr.com/guides/biology/locomotion-and-movement/muscle/) of the bladder and urethra. The urinary bladder can store around 350-400ml of urine before it expels it out.

Stages of Micturition

The urinary bladder has two distinct stages or phases:

Resting or filling stage

Voiding stage

Resting or Filling Stage

It is in this phase of the bladder that the urine is transported from the kidneys via the ureters into the bladder. The ureters are thin muscular tubes that arise from each of the kidneys and extend downwards where they enter the bladder obliquely.

The oblique placement of the ureters in the bladder wall serves a very important [function](https://www.toppr.com/guides/maths/relations-and-functions/functions/). The opening of the ureter into the urinary bladder is not guarded by any sphincter or muscle. Therefore, this oblique [nature](https://www.toppr.com/guides/business-studies/business-services/nature-and-types-of-services/) of opening prevents the urine from re-entering the ureters. At the same time, the main muscle of the urinary bladder, the detrusor muscle, is relaxing allowing the bladder to distend and accommodate more urine.

Voiding Stage

During this stage, both the urinary bladder and the urethra come into play together. The detrusor muscle of the urinary bladder which was relaxing so far starts to contract once the bladder’s storage capacity is reached.

The urethra is controlled by two sets of muscles: The internal and external urethral sphincters. The internal sphincter is a smooth muscle whereas the external one is [skeletal](https://www.toppr.com/guides/biology/locomotion-and-movement/skeletal-system/). Both these sphincters are in a contracted state during the filling stage.

Physiology of Micturition

As mentioned earlier, the process of [micturition](https://www.toppr.com/guides/biology/excretory-products/micturition/) is governed by both the nervous and muscular systems. Within the nervous system, the process is governed by the autonomous nervous system and the somatic system. Once the urinary bladder reaches its maximum capacity, the stretch receptors in the walls of the bladder send an impulse via the pelvic nerve to the brain via the spinal cord.

The micturition reflex is ultimately generated from the level of the spinal cord after it receives reflexes from the pontine region in the brain. Once the bladder and the urethra receive the signals to empty the bladder, the two sphincters relax and the detrusor muscle causes the contractions of the bladder.

Along with these muscles, the muscles of the abdomen also play a role by putting [pressure](https://www.toppr.com/guides/physics/force-and-pressure/introduction-to-pressure) on the bladder wall. This leads to complete emptying of the bladder.