1. **Renal handling of glucose and electrolytes**

**Renal handling of glucose**

Conservation of glucose through renal reabsorption is an adaptive response to help meet energy needs between meals. This process unfortunately becomes maladaptive in diabetes, and glycosuria is not observed until the plasma glucose concentration is substantially higher than 11 mmol/l, the glucose concentration threshold in nondiabetics. Increased SGLT2 transporters maintain the elevated plasma glucose concentration, instead of allowing the kidney to excrete the excess filtered glucose in the urine and correct the hyperglycemia. The renal glucose reabsorption may be augmented in absolute terms by an increase in the renal Tm for glucose. In both type 2 and type 1 diabetes, the TmG is increased by approximately 20%. Human exfoliated proximal tubular epithelial cells (HEPTECs), which can be isolated from urine, have been used to study the expression of a variety of proximal tubular markers, including SGLT2. In a study, HEPTECs isolated from individuals with normal glucose tolerance (NGT) and T2DM were cultured in a hyperglycemic environment. The cells from T2DM patients expressed significantly more SGLT2 and GLUT2 proteins than cells from NGT individuals. In addition, renal glucose uptake, measured using the glucose analogue methyl-α-D-[U14C]-glucopyranoside, a nonmetabolizable glucose analogue, was significantly greater in the T2DM HEPTECs than the NGT cells. These results suggest that chronic hyperglycemia upregulates SGLT2/GLUT2 transport expression

**Renal handling of electrolytes**

The handling of electrolytes by the kidney is essential for homeostasis. However, the heritability of these processes, the first step in gene discovery, is poorly known. To help clarify this, we estimated the heritability of serum concentration, urinary excretion, renal clearance, and fractional excretion of sodium, potassium, magnesium, calcium, phosphate, and chloride in a population-based study. Nuclear families were randomly selected from the general population in Lausanne, Geneva, and Bern, Switzerland, and urine collected over 24-hour periods. We used the ASSOC program (S.A.G.E.) to estimate narrow sense heritability, including sex, age, body mass index, and study center as covariates in the model. The 1128 participants, from 273 families, had a mean age of 47 years, body mass index of 25.0 kg/m2, and an estimated glomerular filtration rate (CKD-EPI) of 98 mL/min/1.73 m2. The heritability of serum concentration was highest for calcium, 37% and lowest for sodium, 13%. The heritability of 24-hour urine clearances, excretions, and fractional excretions ranged from 15%, 10%, and 16%, respectively, for potassium to 45%, 44%, and 51%, respectively, for calcium. All probability values were significant. The heritability for phosphate-related phenotypes was lower than that for calcium. Thus, the serum and urine concentrations as well as urinary excretion and renal handling of electrolytes are heritable in the general adult population. The phenotypic variance attributable to additive genetic factors was variable and was higher for calcium. These results pave the way for identifying genetic variants involved in electrolyte homeostasis in the general population

1. **Micturition**

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 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 and the muscles of the bladder and urethra. The urinary bladder can store around 350-400ml of urine before it expels it out.

**Physiology of Micturition**

As mentioned earlier, the process of 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 on the bladder wall. This leads to complete emptying of the bladder.