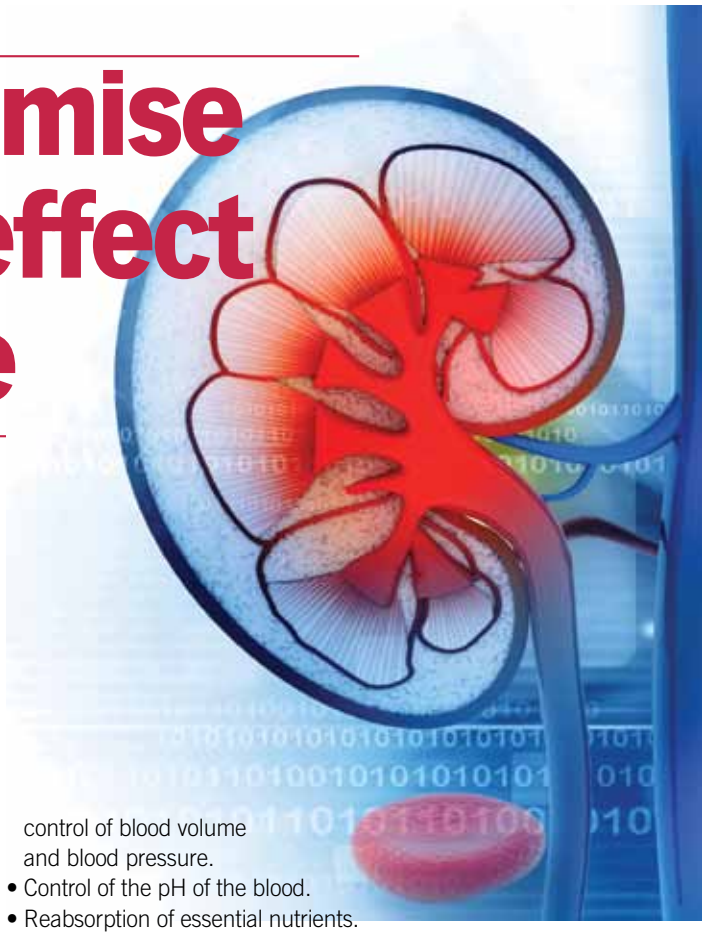
Kidney compromise may be a side-effect of performance



ATHLETES, PARTICULARLY THOSE TRYING TO GAIN SIGNIFICANT MUSCLE MASS, MAY BE PRESSURISING THEIR KIDNEY DETOXIFICATION PATHWAYS. **PAUL EHREN**, VIA PERSONAL EXPERIENCE AND CLINICAL OBSERVATION, CAUTIONS US AGAINST EXTREME PERFORMANCE MEASURES.

Imagine, if you would, a huge industrial site, stretching out in all directions, as far as you can see. The site is full of factories and manufacturing plants turning out as many different products as you can think of: a steel plant, motor factory, Hi Tec laboratories, nuclear plant, and all types of traditional and modern industries doing their thing.

Each of these sites can only keep producing if their raw materials are delivered, their manufacturing machinery works, their transportation systems are in place, and their waste is removed in an efficient manner. If the rubbish wasn't collected and by-products not dealt with, very soon each factory would grind to a halt, and the whole environment would become a polluted, rubbish choked, derelict site.

Keeping this analogy in mind, let's now consider our bodies; millions of cells carrying out the multitude of day-to-day functions that keep us alive and healthy. Add to this load, an intense sporting activity that demands not just normal bodily function, but optimum bodily function, and we can see that our own 'industrial site' must have all of its supporting systems working and communicating in perfect harmony. We would soon become ill, and eventually die, if our waste products were not dealt with properly.

With the extreme dietary, supplementary and pharmaceutical practices of many athletes (particularly competitive bodybuilders and strength athletes), we need to have an understanding of kidney function and care. Otherwise, athletes do run the risk of acute and/or chronic kidney problems, leading to serious ill health.

Kidney anatomy

The kidneys lie to the rear of the abdominal cavity, and sit either side of the spine, between the last thoracic and the third lumbar vertebrae. Each kidney is surrounded by a fascia or capsule, which also encompasses the adrenal gland. A layer of adipose tissue and the musculature of the abdominal area helps keep the kidneys cushioned from regular impacts.

The organs themselves are kidney bean shaped; blood is supplied and removed via the renal artery and vein. Urine is removed from the kidneys via the ureter, which leads to the bladder, which in turn supplies the urethra, from which it is voided from the body.

Kidney function

The primary function of the kidneys is to remove metabolic waste and toxins from the body, thus preserving homeostasis: this is crucially important for an athlete. However, there are other extremely important roles of the kidneys:

- Monitoring, regulation and control of blood volume and blood pressure.
- Control of the pH of the blood.
- Reabsorption of essential nutrients.
- Control and regulation of electrolytes.

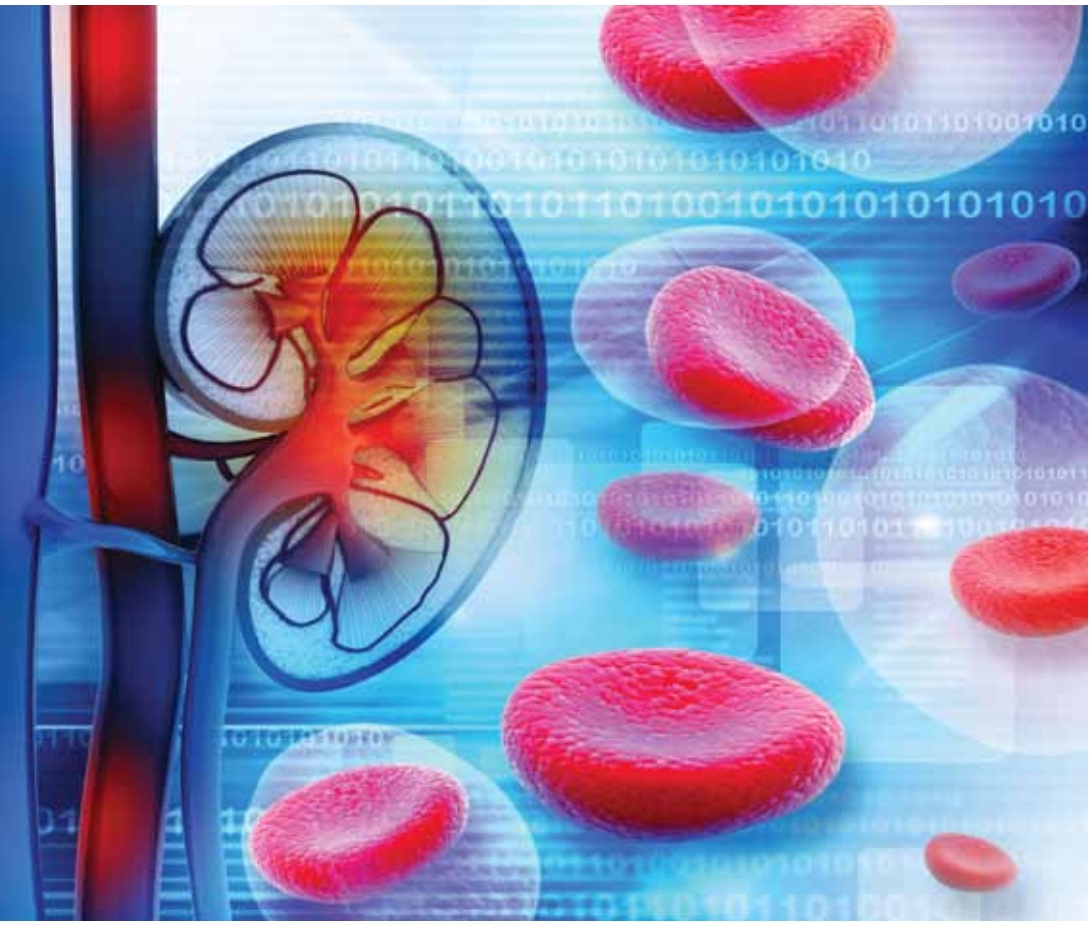
We'll now consider each of these functions in slightly more detail.

Removal of wastes and toxins

The waste products that we, as athletes, need to primarily concern ourselves with are called the nitrogenous wastes, including urea, creatinine, ammonia and uric acid. The two I will focus on are urea and creatinine.

Urea is a waste caused by the breakdown of amino acids. As you will be aware, our bodies are in a constant process of both catabolism and anabolism. Catabolism would be represented by the breakdown of dietary protein into amino acids or the breakdown of dietary carbohydrate to glucose. Anabolism would be the building of muscle tissue from the amino acid pool, and glucose stored as bodily glycogen.

As athletes (especially bodybuilders), we are constantly trying to tip the balance in favour of anabolism to repair the results of strenuous training and to build additional lean muscle tissue. This extra tissue is over and above the needs of homeostasis – i.e. we don't actually need it to survive



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or reproduce. As such, we resort to dietary, supplementary and pharmaceutical assistance that takes us outside what may be described as 'normal' patterns of behaviour.

The blood tests that we at Physical Frontiers offer on behalf of our clients, consistently show high urea levels in bodybuilders and strength athletes, and this has made me reassess my own protein needs and how I structure my intake.

As you can imagine, the breakdown of protein, over and above what our bodies can utilise, can result in additional wastes produced by the metabolic activity, causing stress to the kidneys as they try to keep up with the clearance process. However, research has shown that the kidneys will tolerate levels of protein intake up to at least 1.5g per kg bodyweight over an extended period (1).

Leaving aside the possibility of disease or other medical conditions (2), these high urea levels can best be addressed by taking a few simple measures:

- We need to address our actual dietary protein intake; more is simply not the answer if you want to stay healthy.
- Cycle your protein levels with spells where you give your body a rest from regular high doses of, particularly, supplementary protein.
- Your hydration status also needs to be adequate, so pay careful attention to your water intake.
- Understanding how many grams of protein that you require is very individual. The only real way of knowing if you are taking too much or too little is to undertake a blood test.

Creatinine is generally formed during the breakdown of muscle tissue. Muscular contractions are fuelled by adenosine triphosphate (ATP), which is then resynthesised from creatine phosphate (CP). The breakdown of CP, in turn, produces the waste creatinine, which needs to be excreted.

Creatinine will therefore be produced during periods of muscle breakdown, or if excessive supplemental CP is being taken.

Hydration status, along with levels of supplementary CP and drug use, all need to be addressed here to keep creatinine levels within normal range. Creatinine will therefore be produced during periods of muscle breakdown or if excessive supplemental CP is being taken. Anabolic/androgenic steroid (AAS) use can also contribute to excess levels, as one of the secondary effects of steroid use is the additional formation of CP within the muscle tissue.

Anabolic and androgenic steroids

I know that the topic of AAS use leaves many people uncomfortable, but as Cain Leathem and I have explained during recent FSN Academy sessions, AAS use is extremely widespread, and needs to be dealt with in an informed, educated fashion.

Once the substance has been ingested, it will either enter the bloodstream from an inter-muscular injection, or via the gastrointestinal tract and liver, if taken orally. A huge number of biochemical reactions are then triggered, potentially resulting in binding with a suitable receptor site and the creation of additional protein synthesis. Once this job has been completed, the steroid molecule will return to the bloodstream for re-use, or, structurally altered, rendered ineffective and excreted via the urine.

It is therefore not hard to see that AAS use will place additional strain on the organs, with a potentially high level of this toxic waste floating around in the blood waiting to be expelled. As far as I can ascertain, clinical use of AAS drugs is generally well-tolerated by the renal system, to the point that they can be prescribed for conditions related to kidney problems (3). Well-constructed, documented trials of side-effects in performance-enhanced athletes are always very difficult to come across, and even though some suggestions have been made of certain conditions likely to be caused by the direct effect of steroids, evidence appears very sketchy.

However, this is certainly not any form of 'get out of jail free' card. Clinical dosage is one thing; the mega dosages used by athletes makes the whole thing that much more of a lottery. Also, please bear in mind that the toxicity of the drug is one thing; secondary areas such as elevated blood pressure are potentially just as harmful to the continued health of the renal system (4).

Other functions of the kidneys

The basic functional unit of the kidneys is the nephron, consisting of the glomerulus, proximal and distal convoluted tubules and the ascending and descending loops of Henle. Blood arrives at the glomerulus via a small vein called the afferent arteriole, blood pressure forces water, dissolved nutrients, electrolytes and wastes out of the blood and through a filtration barrier into the tubules. It is during the passage of this filtrate along the tubules and loops that selective reabsorption and secretion of the many elements held in solution takes place.

For example, many of the nutrients still required by the body, such as water, amino acids, glucose and fatty acids, will be reabsorbed by the blood very early in the process. As the filtrate continues its journey, dependent on the body's needs, many of the other substances contained within it (e.g. sodium, potassium, calcium and wastes) will be either gained or lost from the liquid that is to become urine. When everything is working well, we end up with urine that excretes everything that the body either doesn't want or doesn't need. In this way, blood acidity and electrolyte balance are maintained within the range needed for the continuance of good health.

The kidneys are very sensitive to changes in blood pressure, and a cause and effect situation exists where high (or excessively low) blood pressure can damage the kidneys. Conversely, kidney problems can also cause high blood pressure (BP). The kidneys control BP to some extent by the amount of water passing into the urine, which is why diuretic drugs are often prescribed for high blood pressure. On the subject of diuretics; they tend to work by preventing many of the electrolytes from being reabsorbed by the body, thereby increasing the concentration of these elements in the urine. In order to dilute the concentration of electrolytes in the urine, reabsorption of water by the kidneys will be restricted and you end up urinating more. You also end up losing those electrolytes out of the system, which can cause all sorts of problems. These electrolytes have an important role in muscle contraction, which at one level might cause mild to severe muscle cramps, but when you remember that your heart is also a muscle, the whole thing takes on a much scarier scenario.

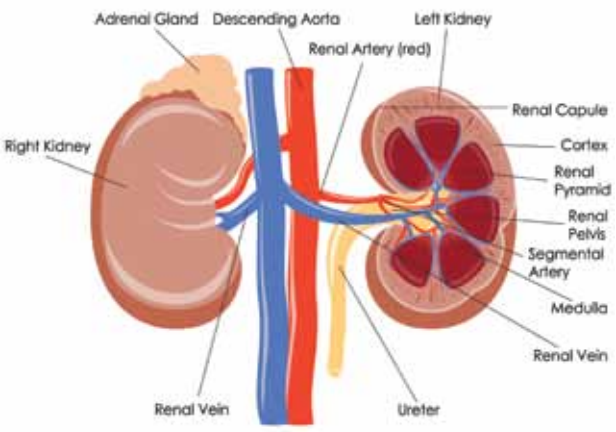
In a similar fashion, the presence of excessive wastes such as urea in the filtrate solution, will trigger the retention of more water; again, leading to higher than normal urine volume and possible dehydration.

Conclusions

To draw all of these threads together; we are looking at a population of athletes who are involved in extreme training, who are subject to high levels of muscle breakdown (and the release of potentially toxic kidney waste products), and who are consuming large amounts of dietary and supplementary protein. In some cases, these athletes are likely to be mildly or severely hypertensive, and are possibly consuming other supplements and alien AAS drugs, that will all need to be excreted via the renal system. That all adds up to an awful lot of stress on internal systems over and above the norm.

If we rule out the possibility of congenital kidney problems, such as glomerulus disease or autosomal dominant polycystic kidney disease, and some of the more extreme athletic practices, general recommendations for kidney health would, I suggest, include the following:

- Obtain a blood test that will give you full details of your own level of kidney efficiency (estimated glomerular filtration rate) and nitrogenous wastes – urea, creatinine, ammonia and uric acid.
- Monitor/cycle protein intake. I use levels of up to three grams per kilogram body weight during certain periods, but I will also cut this by at least half at other times of the training cycle.
- Check blood pressure and general markers of cardiovascular health. As previously mentioned, hypertension can cause kidney problems, and kidney problems can cause hypertension. For this reason, it is very worthwhile keeping a check on your sodium intake.
- Check fasting blood glucose levels and, if necessary, HbA1c (glycated haemoglobin), as diabetes is a major factor in kidney disease.
- Maintain good levels of hydration at all times, particularly when in periods of hard training/high protein consumption.



The recommendation of foods and particularly supplements for kidney health is something of a minefield, and is dependent on our own individual genetic makeup. Protein and creatine supplements are two obvious examples of substances that remain perfectly safe for the majority, but will cause the unfortunate few considerable problems, especially if consumed in excess.

The maintenance of a good healthy diet, high in immune boosters and natural antioxidants (fruits, cruciferous vegetables, berries, oily fish, olive oil, egg whites, garlic, red peppers etc) have all been recommended for kidney health by the *American Journal of Kidney Disease* (5), together with fairly obvious suggestions as cutting out high saturated/trans fats, processed foods, not smoking, and maintaining a healthy body weight. The situation does get much more complicated when actual kidney disease is present, and the National Kidney Foundation (6) makes a series of recommendations of foods and supplements to avoid. As does the paper by Steven Gabardi et al (7): "A review of dietary supplement induced renal dysfunction." FSN

• Disclaimer – I am not medically qualified, and as such, nothing I say or infer can be taken as bona fide medical advice. Any medical matters can only be explored, reviewed and commented upon by a qualified medical professional.

About the author

Paul K Ehren has run his Personal Fitness practice in London/Essex for the last 15 years, and is a founding director of Physical Frontiers, who specialise in the health and performance of strength athletes and martial artists. Paul remains a competitive athlete, and as a masters bodybuilder has won one British title (UKBFF), placing 2nd twice, along with two South East titles (NAABA), the latest being 2014, a Midlands title (UKBFF), and has represented GB in Europe (WAABA). He is currently in the early stages of a 12 week diet/prep phase, which will hopefully culminate in the retention of his South East title in April this year. Paul may be contacted directly on PEhren@aol.com.

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