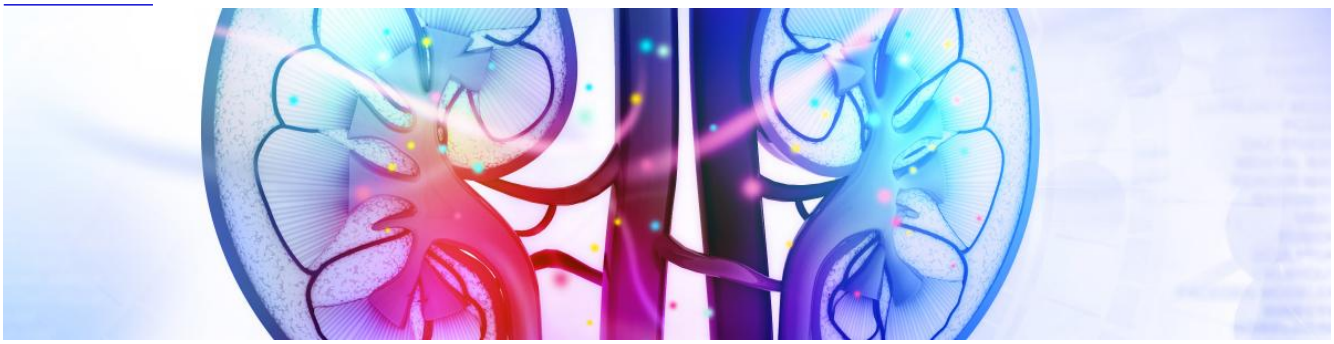
The Blessing Asher Yatzar and the Miracle of the Human Kidney

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Generations of elementary day schoolers have colloquially called the *Asher Yatzar* blessing "the bathroom *Berakha*." As a nephrologist and director of a hemodialysis unit, I am intimately familiar with the terrible medical issues that arise when one is no longer able to make adequate urine because of a loss of kidney function. When looking at this *Berakha* through an understanding of modern science and medicine, its ancient wisdom truly shines.

The 4th century *Amorah* (Babylonian Talmudic scholar) Abayei listed this blessing along with other blessings one is expected to make after waking each morning (*Berakhot* 60b). *Asher Yatzar* opens with "Blessed is He who has formed man in wisdom." I often pondered these words when reciting them while in college cellular biology or biochemistry classes and later in medical school.

The entirety of the human body is nothing short of astounding. Looking at every individual organ system shows an unbelievable functional design down to the smallest and most intricate details. There are more than 3 BILLION DNA base pairs in the human genome in each nucleated cell of the human body, and sometimes the smallest change in just one of those nucleotides can lead to horrifying effects. There are fatal errors in metabolic pathways that some may be born with, such as Tay-Sach disease. Later in life, if a single cell loses its ability to stop replicating, that cell may develop into a life-threatening cancer. After learning about how many mechanisms have to function to maintain normal health on a microscopic level, many young students during their first few years in medical school will come down with the so-called "medical student syndrome," a tongue in cheek expression for the acute form of hypochondriasis associated with learning about all the ways the human body can fail. These students attribute symptoms from common conditions to life-threatening but exceedingly unlikely diseases about which they have recently learned.

In reference to the opening verse of *Asher Yatzar*, I have found great insight in Rashi's explanation. Rashi cites a *Midrash* that states the "wisdom" (from the first verse of the blessing) and "wonder" (from the last verse) of human creation refer to the body's ability to maintain its contents despite all of its openings and pores. In biology, we call this ability of an organism to keep the outside out and its inside in while still interacting with its surrounding environment "homeostasis." Rashi's remark on the human body marvels at the will and effort that the human body expresses when it eliminates waste while retaining its necessities in its never ending quest for maintenance of homeostasis.

Let us look at the function of the kidney in the light of Rashi's explanation of "wisdom" and "wonder." The kidney is a remarkable organ that functions as the body's filter for the blood, removing not only excess water, but also excess salts as well as the toxins the body produces in the process of breaking down our foods. Kidneys are so active, in fact, that despite weighing only about 1 pound each, they receive about one quarter of the body's blood flow – that is to say that every time the heart beats to pump blood, a quarter of that blood will go to the kidneys. The filter is only the very first part of the kidney's job, however. An individual with normal kidney function may be able to pass more than 100 milliliters of water from the blood through the filter each minute. If there were no fluid reclamation process, then with 60 minutes in each hour and 24 hours in a day, a human would have to drink nearly 40 gallons (144 liters) of water each day to replace the fluid filtered and then

lost through the kidney. Not only water is filtered, but a large component of our blood is sodium, at about 3.2 grams (140 millimoles) in each liter of blood. A person filtering 144 liters of blood daily would need to eat more than 1 pound (464 grams) of sodium each day to replace what the kidneys filter out. This is, obviously, not what we do, and in fact drinking even half of that much water or taking in half that much sodium in a single day is enough for an individual to poison himself. So, to prevent overwhelming dehydration or salt loss, the kidney has a remarkable system of tubes, one after each filter, that reabsorbs the vast majority of our filtered water and electrolytes while allowing excesses of each as well as our water-soluble toxins to leave our bodies.

Prior to 1967, kidney failure was a death sentence. Now, we have a remarkable medical procedure known as dialysis. With even a moment to reflect about dialysis, one realizes that the kidney is the only organ in the body that is absolutely essential for life, but, due to modern technology, a person can live without any function of said organ… indefinitely. This is beyond remarkable and has yet to be replicated for any other organ system. If someone loses his or her heart, lungs, liver, gastrointestinal tract, skin, or brain, that person has an extremely short life expectancy (minutes to days depending on the organ lost). Not so with the loss of the kidneys.

However, even with our remarkable modern technology, we still have yet to fully replicate the kidney's function other than with complete replacement through transplantation. We are able to cleanse the body of toxins, but there are still many aspects of this process we have yet to fix. For example, for a variety of reasons, people on dialysis build up plaque in their arteries much quicker than their non-dialysis bound peers. Even under ideal circumstances, with the very best care and the very best patient adherence to the tremendous diet and lifestyle adjustments a dialysis patient must make, he or she has a much higher likelihood of dying from a heart attack than a non-dialysis bound individual. In fact, even a modest reduction in kidney function that does not require dialysis comes with an increased risk for heart disease. When considered from this standpoint, I marvel that 1700 years ago, Abayei wrote of the closing of necessary openings when discussing urine output, because constriction and closure of the coronary arteries, the small arteries that supply the heart's blood supply, is the main cause for mortality in individuals with kidney disease.

Let me close with a story I first heard almost 20 years ago, when I was a Yeshiva student. The author is Dr. Kenneth Prager, an internal medicine physician and professor of medicine at Columbia University. He recounted the story of a young Yeshiva graduate, Josh, who, at age 19, sustained a terrible injury to the cervical vertebrae and spinal cord of his neck. After initially being paralyzed for months, Josh slowly regained use of his arms and legs, going from a tetraplegic to a hemiplegic (able to fully control only half of his body) and eventually being able to walk with the help of a leg brace and a cane. Despite the almost miraculous return of some of Josh's extremity function, he still required self-catheterizations for neurogenic bladder, a condition where one is unable to empty the bladder as the nerves leading to it are no longer functioning. An individual with this condition will have to deal with life-long bladder infections, urinary obstructions, and, if persistent, can eventually lead to complete renal failure and need for dialysis. In an individual as young as Josh, all of these complications were almost a certainty. His physicians had never seen neurogenic bladder from this degree of trauma recover before.

Dr. Prager ended his story as follows: "Then the impossible happened. I was there the day Josh no longer required a urinary catheter. I thought of Abayei's *Asher Yatzar* prayer. Pointing out that I could not imagine a more meaningful scenario for its recitation, I suggested to Josh, who was also a yeshiva graduate, that he say the prayer. He agreed. As he recited the ancient *Berakha*, tears welled in my eyes." At the end of the story, Dr. Prager revealed that this patient was indeed his son, Joshua Prager, who would go on to become an award-winning writer for the Wall Street Journal, author, and speaker. I strongly recommend that you watch his TED Talk.

"Blessed are You Lord our God, Ruler of the universe. In wisdom You have formed humans, creating within them channels innumerable. In Your sublimity, You know that were they rent or obstructed, we could not subsist even a short while. Blessed are You, Lord, Who heals all flesh and does wondrously."