



# KIDNEY FACTORS™

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## THE KIDNEYS

The body has two kidneys, each about 4-5 inches in length and reddish in color. The kidneys are located just above the waist, behind the abdominal cavity. Each kidney contains the *hilus*, through which the ureters are connected. Blood vessels and lymphatic vessels also are connected at the hilus, with the blood entering through the renal artery.

Three layers of tissue surround each kidney. The *renal fascia*, made of a dense connective tissue, anchors the kidneys to surrounding structures.<sup>1</sup>

## KIDNEY FUNCTION

In addition to their excretory function, the kidneys also regulate body water and the concentrations of essential electrolytes, such as sodium, potassium, calcium, phosphorus, chloride, bicarbonate and many biologically valuable organic compounds, such as glucose and amino acids. They also help to regulate body pH by excreting acid or base.<sup>2</sup>

The functional unit of the kidneys is the *nephron*. Its basic functions include filtration, secretion, and reabsorption.<sup>3</sup>

Tubular secretions are a major mechanism for the excretion of hydrogen ion, uric acid, and many other organic compounds. When the hydrogen ion concentration changes, the kidneys excrete either an acid or alkaline urine. This helps to readjust the hydrogen ion content of the body fluids back to normal. It is obvious that several feedback systems are in place, working at maintaining homeostasis.

## FEEDBACK SYSTEMS

A feedback system is any circular situation in which information about the status of the body's conditions are continually monitored and reported to central control areas, which in turn affect changes in the system.<sup>4</sup> These effectors cause responses which alter the condition and return the controlled condition to a state of homeostasis. Body elements, such as hormones and nerves, are at work within the system, serving as both receptors and effectors.

The mechanisms by which the normal kidney controls the excretion of electrolytes,

water, and acid are remarkably sensitive and precisely regulated phenomena, controlled by complex processes occurring within and without the kidney.

The kidneys also contain networks of lymphatic capillaries, found in the capsule and in the *parenchyma*. Nerve fibers, sent from the *celiac plexus*, are also present in the organs and are part of the feedback systems.<sup>5</sup>

The excretory passages convey the urine from the parenchyma of the kidney to the outside. Their walls are provided with a well developed coat of smooth muscle. Its contractions move the urine forward. The calyces show periodic contractions. This muscular activity is believed to assist in moving the urine out of the papillary ducts into the calyces.<sup>6</sup>

The urinary system operates as a valuable tool in maintaining the homeostasis of the blood system. In its filtration process, the system serves by regulating the composition and volume of the blood, removing wastes from it and excreting them in the form of urine.

## THE KIDNEY'S ROLE

With the number of functions the kidneys perform for the body, it is easy to imagine a large industrial park within the organ, full of factories which process and manufacture different products. One factory serves as the filter unit. Other factories add nutrients back into the blood. Another factory works to maintain the pH balance, while yet another is working to metabolize different nutrients and chemicals for the smooth operation of the other factories.

This row of factories includes the one responsible for the manufacturing of ammonia and glutamate. Ammonia is the end product of protein metabolism. Glutamate plays a role in the process of *gluconeogenesis*, in which a factory manufactures the body's food source, glucose.

Yet another factory works on the metabolism of vitamin D, both a vitamin and a hormone in the body. The process which begins in the factory in the liver, is transferred

to the kidneys and further synthesized to an active form which acts on the appropriate tissues throughout the body.

An important factory produces *eicosanoids*, including *prostaglandins*. These derivatives of fatty acids act as support of the other factories within the kidneys and other organs within the system.<sup>8</sup> Prostaglandins work within the kidneys to inhibit sodium and water reabsorption, modify intrarenal blood flows and pressures, and lower blood pressure.<sup>9</sup>

The *erythropoietin* factory produces a hormone that is released into the blood system in response to low oxygen levels. It controls the production of erythrocytes and is able to raise the oxygen-carrying capacity of the blood.<sup>10</sup>

There are factories for production of the enzymes and hormones, for the degradation of amino acids and small proteins, as well as peptides.<sup>11</sup> So, picture this industrial park of the body and its incredible importance. But, don't consider the park as a blight on the landscape of the body. Unlike most of industrial parks which come to mind, this complex works to nourish and clean the body and disposes of its pollution in a controlled and sensible manner.

## NUTRITIONAL SUPPORT

The factories of the kidneys and the urinary system require raw materials to support their manufacturing processes and maintain the system itself. In order for the complex organs of the system to function properly, the muscles, nerves, blood vessels, and other tissues must be properly nourished. Adequate amounts of water and the maintenance of proper sodium, calcium, and magnesium levels is also important.

The following information is provided to help you better understand the role that certain nutrients play in kidney function and in the overall health of the body. Those nutrients are:

**VITAMIN D** becomes active in the body, after its synthesis in the kidneys. Vitamin D is absorbed in the presence of bile salts, transferred to the kidneys from the liver and synthesized into the most active form of the vitamin, for distribution throughout the body. Vitamin D

also plays a role in the absorption of calcium in the intestines and reabsorption by the kidneys.

**B COMPLEX** vitamins play roles in kidney and endocrine function. Vitamin B-1 is stored and excreted by the kidneys.

**VITAMIN B-2** is important as part of the electron transport chain in a series of oxidation-reduction enzyme systems, which include glutamates, amino acids, and beta oxidation of fatty acids.

**VITAMIN B-6** is synthesized to its active form in the brain, liver, and kidney and stored in muscle as the major component of the body's pyridoxine pool.<sup>12</sup> The active form of B-6 participates as a coenzyme in the synthesis and catabolism of amino acids and metabolites such as dopamine, serotonin and nicotinic acid.<sup>13</sup> It also serves as a precursor to the enzyme phosphorylase, important in the breakdown of glycogen.

**L-GLYCINE** is important in the formation of proteins in the body. The kidney converts glycine to serine, which is found in many proteins throughout the body.

**L-GLUTAMINE** is an amino acid which works to form ammonia in the urine.

## HOW TO OBTAIN NUTRITIONAL SUPPORT

The proper functioning of the urinary system requires adequate nourishment. **MICHAEL'S® KIDNEY FACTORS™** contains nutrients known to be essential for the proper functioning of the kidneys. **MICHAEL'S® KIDNEY FACTORS™** contains vitamin D, calcium, and magnesium and is complemented with the herbs hydrangea and uva ursi, both known for their healthful attributes.

## ABOUT MICHAEL'S® PRODUCTS

Seasoned health food shoppers already know that a combination of nutrients is always more effective than taking single nutrients one at a time. Add in the cost savings of taking combinations, with herbs included, and the math proves to be more efficient, too. Combinations increase assimilation and reduce the amount of binders and fillers. That's why **MICHAEL'S®** created the **FACTORS OF LIFE®** programs. Your life is busy enough as it is. Why worry when synergistically complete nutrition is conveniently at hand?

**MICHAEL'S®** products include an expiration date to ensure freshness. He personally guarantees purity and specified content. Each product is hypo-allergenic with no artificial colors or flavors. The formulas contain cold-pressed, wild-crafted or organically grown (when available) herbs to ensure the highest quality. Additionally there is no sugar, dairy, wheat, corn, gluten, sodium, or anything artificial in any of our supplements. These high-potency, all-natural products are even manufactured with food-grade fillers, binders and enteric coatings. Most are suitable for vegetarians and tell you so right on the front label. Every product is double safety sealed with an outer shrink wrap and inner bottle freshness seal. As is normal in all-natural products, some color and texture variations may occur, but do not affect product purity, potency or assimilation.

Above all else, all **MICHAEL'S® NATUROPATHIC PROGRAMS** are designed to produce physical results you can feel, due to the innovative nutritional supplementation with specific, targeted **FACTORS OF LIFE®** programs. As always, the newest developments, the finest ingredients and the most effective formulations for your total healthcare from **MICHAEL'S® NATUROPATHIC PROGRAMS**.

### Sources Cited:

- <sup>1,3</sup>Tortora, Grabowski. *The Principles of Anatomy and Physiology*, 7th ed. New York: HarperCollins, 1993. p. 865-866  
<sup>2</sup>Bloom, William, M.D. and Fawcett, Don, M.D., *A Textbook of Histology*, 10th ed. Philadelphia: W.B. Sanders, Co., 1975. p. 782  
<sup>4</sup>Tortora, Grabowski, p. 11.  
<sup>5</sup>Bloom, Fawcett, 783-788.  
<sup>6</sup>Bloom, Fawcett, pp. 794-798.  
<sup>7</sup>Tortora, Grabowski, p.10.  
<sup>8</sup>Lehninger, Nelson, Cox. *Principles of Biochemistry*, 2nd ed. New York: Worth Publishers, 1993. p. 258.  
<sup>9</sup>ibid, 1233.  
<sup>10</sup>Glanze, Anderson, Anderson, eds. *The Mosby Medical Encyclopedia*. New York: Plume Books, 1992, 296.  
<sup>11</sup>Shils, Maurice E., M.D. and Young, Vernon R., Ph.D., *Modern Nutrition in Health and Disease*, 7th. ed. Philadelphia: Lea & Febiger, 1988. p. 1233.  
<sup>12</sup>Paige, David *Clinical Nutrition*, 2nd ed. St. Louis: Mosby Company, 1988. p. 564.



| Amount Per Serving                          |        | % Daily Value |
|---|--------|---------------|
| Vitamin D (as Calciferol)                   | 100 IU | 25%           |
| Niacinamide (as Nicotinamide)               | 20 mg  | 100%          |
| Vitamin B-6 (as Pyridoxine)                 | 2 mg   | 100%          |
| Vitamin B-12 (as Cobalamin)                 | 10 mcg | 167%          |
| Calcium (as Calcium Amino Acid Chelate)     | 25 mg  | 3%            |
| Magnesium (as Magnesium Amino Acid Chelate) | 50 mg  | 13%           |
| Celery Seed (Apium graveolens)              | 100 mg | *             |
| Gravel Root (Eupatorium purpureum)          | 100 mg | *             |
| Hydrangea Root (Hydrangea arborescens)      | 100 mg | *             |
| Juniper Berry (Juniperus communis)          | 100 mg | *             |
| Glutamine (as L-Glutamine)                  | 100 mg | *             |
| Glycine (as L-Glycine)                      | 100 mg | *             |
| Parsley Leaf (Petroselinum sativum)         | 100 mg | *             |
| Buchu Leaf (Barosma betulina)               | 75 mg  | *             |
| Uva Ursi Leaf (Arctostaphylos uva ursi)     | 75 mg  | *             |
| Bromelain (from Pineapple)                  | 30 mg  | *             |

\*Daily Value not established.

OTHER INGREDIENTS: Dicalcium Phosphate, Maltodextrin, Magnesium Stearate and Stearic Acid.