

Dehydration and Aging

Water serves a vital role in the everyday operation of cells within the body. The maintenance of water balance is essential for health and is determined by a sophisticated scheme that balances water input (drinking) and water output (perspiration, urine) from the body. Specific mechanisms interact to control thirst, drinking behavior, and the output water from the kidney when the body is faced with a water deficit. However, restoring body water balance following dehydration ultimately depends on mechanisms that regulate fluid intake or drinking. Despite these sophisticated defense mechanisms, the restoration of water balance following dehydration is usually slow and incomplete; a problem termed “involuntary dehydration.” Thus, even healthy young adults should be advised of the benefits of complete water replacement following dehydration.

More importantly, it has become increasingly clear that the ability to regulate fluid balance in response to fluid deprivation or dehydration is compromised in older individuals. Decreased ability to regulate water balance can adversely affect the aging population, leading to increased risk of dysfunction, morbidity, or mortality. In addition, these problems in body fluid regulation are often exacerbated by the presence of other chronic diseases associated with aging, such as hypertension or cerebrovascular disease. As such, the aging population is considered at greater risk for developing dehydration and any associated complication.

Dehydration refers to the process of reducing body water either through illness, physical exertion, thermal stress, or water deprivation. Generally, during dehydration, body water is conserved by defense mechanisms, which act to reduce water output by the kidney. This process is mediated by the release of an antidiuretic hormone and its action on the functional part of the kidney (the nephron) to conserve water. Antidiuretic hormone is released during dehydration by signals from blood that reflect the tonicity (salt concentration) and volume of blood held within the blood vessels. The secretion of antidiuretic hormone during dehydration is not decreased with aging, yet the ability of the kidney to conserve water is reduced. There are several possible explanations for this problem. First, the number of nephrons per kidney begins to decrease by about 10% per decade after the age of 40. Second, nephrons from older kidneys appear less responsive to a given level of antidiuretic hormone than younger nephrons. Thus, both a reduction in number of nephrons and their sensitivity to antidiuretic hormone limit the ability of older individuals to conserve water and predisposes the older individual to dehydration.

The ability to maintain water balance is highly dependent on thirst, a sensation thought to provide the drive for fluid ingestion. Clearly, it is only through the ingestion of fluid that a water deficit can be replaced. Fluid ingestion is characterized by two types of drinking behaviors – **primary drinking**, which is driven by deficits in body water and acts to restore those deficits, and **secondary drinking**, where drinking occurs when no apparent need is present (thirst associated with excessive talking). Primary thirst is regulated by plasma tonicity and the volume of blood within the blood vessels (similar to antidiuretic secretion).

Unlike antidiuretic hormone secretion, however, the increase in thirst following dehydration decreases with aging. During dehydration older individuals report less thirst despite having similar increases in plasma tonicity as younger individuals. This lower perceived level of thirst is associated with reduced level of fluid ingestion. As mentioned earlier, most people will not drink enough water to replace their original fluid deficit, and this problem is exacerbated with age. Thus, thirst cannot be used as a reliable indicator of the fluid requirements of older individuals. This is probably an expected conclusion since a variety of sensory functions (e.g. hearing, vision, smell and touch) are also generally reduced with aging.

In summary, the important body mechanisms used to regulate body water content are compromised with aging. The capacity to respond to dehydration and retain water is limited while thirst sensations, and thus the drive to replace fluid, is also reduced with aging. In addition, other factors associated with aging can exacerbate this problem. For example, hormonal changes associated with menopause, the occurrence of chronic medical conditions (e.g. hypertension), the use of certain medications or behavior adjustments to solve urinary incontinence problems, can increase the risk of water imbalance in older individuals. Older individuals and their families must be aware of the age-related changes in hydrational needs in an effort to reduce the risk or prevent disturbances in fluid balance.

Written for the American College of Sports Medicine by Gary W. Mack, Ph.D.

Current Comments are official statements by the American College of Sports Medicine concerning topics of interest to the public at large.

Street Address: 401 W. Michigan St. • Indianapolis, IN 46202-3233 USA
Mailing Address: P.O. Box 1440 • Indianapolis, IN 46206-1440 USA
Telephone: (317) 637-9200 • FAX: (317) 634-7817

