

# Physiology of Aging of Older Adults

## Systemic and Oral Health Considerations



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### KEYWORDS

- Physiology • Aging adults • Oral health • Normal aging • Age-dependent changes • Systemic

### KEY POINTS

- Oral health plays a vital role in several functions that contribute to life quality, longevity, and functional independence.
- The oral cavity, when functioning properly, provides and contributes to the enjoyment of taste and smell; the appropriate steps needed for deglutition and nutrition; maintenance of facial anatomy; and self-esteem.
- Older adults differ more from one another physiologically than do younger adults, which makes geriatric care a greater challenge for the clinician.

### INTRODUCTION

Much has been written about the nature and extent of the demographic shift taking place in the United States. By 2030 the baby-boomer generation will reconstruct the population pyramid into a population rectangle, with the fastest growing segment of that polygon being the oldest of the old (>85 years). As the population ages it becomes more heterogeneous, with a wider distribution of physiologic reserve for each individual. Cognitive status, chronic multiple diseases, and medications add to the heterogeneity of this physiologically diverse population segment. Normative aging studies demonstrate a wider distribution around the mean in most physiologic measures. In simpler terms, healthy older adults are more unlike each other than equally healthy younger adults in most studies of physiologic function. Though less thoroughly

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studied, changes in oral health over the life span seem to observe the same principles of normative physiologic aging that apply to other organ systems and physiologic processes. “Oral aging” is as relevant as any other health care challenge facing an aging society. Many well-studied physiologic functions of the older adult population affect the oral cavity. Many of these physiologic changes contribute to the lower threshold for the development of oral disease, nutritional and swallowing problems, taste and smell impairment, chronic pain, and psychological distress. This article reviews the concepts of physiologic reserve, the normative aging processes of the cardiovascular, neurologic, and musculoskeletal systems that are applicable to oral health, and age-related changes in the oral cavity itself, and reflects on how they may contribute to disease management by oral health care providers. The article is not intended to focus on disease related to aging but rather aims to explore the normal physiologic changes associated with aging dentition and systemic changes related to age, thus enabling clinicians to obtain a better understanding of the presentation of older adults and how it may change their approach to diagnosis and treatment.

### PHYSIOLOGY OF AGING

When considering aging physiology, it is first important to understand that we are unsure of where aging ends and disease begins. Wherever that line divides normative physiologic changes of aging and disease, it is clear that aging alone changes the physiologic threshold for any individual to withstand physiologic challenges, whether brought on by medications, stressful interventions such as surgery, severe environmental conditions, or other illness. What we do know is that, in the elderly, physiologic reserve is reduced and the ability to maintain the physiology within the healthy is blunted. Take, for example, elderly patients and the ability to adapt to a salt load delivered by dietary means or the health care system. This process primarily involves both cardiac and renal adaptation. Studies reveal that healthy older adults have “stiffer” hearts and, therefore, do not achieve as much increased cardiac output induced by ventricular stretch and Starling curve with this volume expansion. Just as important, even in healthy older kidneys, salt excretion occurs less efficiently and takes longer. This lowered threshold for maintaining homeostasis, coined homeostenosis, results from a decreased ability of the systems built to interact with and modulate such deviations from physiologic normal. Another example of this involves changes in the autonomic nervous system. Changes in receptor sensitivity and feedback-loop automaticity result in a loss of variation in heart-rate response to stimuli. In the salt-load example, even in the normal healthy older adult, the ability to increase heart rate is limited and impedes the cardiorenal system from filtering salt as rapidly as in younger adults. One can discern from these examples that in describing systemic physiologic changes it becomes difficult to isolate each system or organ, because of how they work together and respond to one another while adjusting and adapting to carry out daily functions. The next section explores more specifically the relationship between known normative age-related changes in physiology and their impact on oral health.

### SYSTEMIC CHANGES ASSOCIATED WITH ORAL HEALTH

#### *Cardiovascular*

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Normal cardiovascular changes with age are both structural and functional. There is an overall decreased cardiovascular reserve with a loss of and hypertrophy of myocytes; 90% of pacemaker cells in the sinus node are lost by the age of 75 years,<sup>1</sup> resulting in slower resting and maximum heart rates. As described by Cefalu,<sup>1</sup> normal aging increases stiffness of the left ventricle, resulting in a decrease in left ventricular

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