

Hormones Responsible for Aging in Humans

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Abstract

Hormones are chemical messengers that are released by the endocrine glands of the body. They are responsible for regulating a variety of an individual's metabolic activities as well as reproductive activity. An imbalance of hormones, whether they are present in excess or deficiency, has the potential to have significant repercussions throughout the body. The normal process of ageing causes very slight changes in the amounts of hormones in the body. It is required to use a variety of methods in order to expand the amount of livestock, dairy products, poultry, and agricultural output in order to fulfill the requirements of an ever-increasing human population. This has led to an increase in the use of chemical compounds such as pesticides, insecticides, herbicides, rodenticides, and many more, all of which have contributed to the pollution of the environment. Individuals might have their entire health negatively impacted by environmental contaminants. Unemployment and the excessive amount of competition to make a living are also another significant difficulty. Because of this, man has become less tolerant and more susceptible to stress, which has compelled him to alter his lifestyle and his eating habits. These alterations induce significant shifts in hormone levels, which ultimately results in hormonal imbalance, which is associated with a wide variety of illnesses and disorders. There is a possibility that medicine might cause a change in hormone levels. The current research investigates some of the indications and symptoms connected to hormone imbalance, which, if they go untreated, might result in a reduction in a person's expected lifespan. It is strongly encouraged to seek the guidance of a health practitioner in order to enhance one's way of life as well as one's eating practices.

Keywords: Hormones, Metabolism, Stress, Hormonal imbalance, Disorders

INTRODUCTION

Aging is an inevitable process that affects all living organisms. It is a complex phenomenon that involves a gradual decline in physical, physiological, and cognitive functions, leading to increased vulnerability to diseases and mortality. Aging is influenced by various factors, including genetics, lifestyle, environment, and hormones. Hormones play a crucial role in regulating the body's physiological processes, and their decline with age is considered to be one of the primary causes of aging. In this paper, we review the current research on hormones responsible for aging in humans.

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Aging is a complex process that is affected by a wide range of biological, environmental, and lifestyle factors. One important aspect of aging is the decline in hormone levels, which can lead to a wide range of age-related diseases and disorders. In recent years, there has been a growing interest in the role that hormones play in aging, with researchers looking to identify the specific hormones responsible for the aging process in humans.

Hormones are chemical messengers or substances that are created by different glands in the endocrine system of the body. Hormones are necessary for the body to be able to sustain its numerous metabolic processes. Without hormones, a kid is unable to develop, a woman is unable to get pregnant, and an individual is unable to sleep or combat stress. An imbalance in the secretion of hormones may be the root cause of a wide variety of issues that make living a miserable experience. This imbalance in hormone levels, which some refer to as a "silent killer," is developing into a genuine pandemic not just in India but also everywhere else in the globe. Privatization, modernization, globalization, intensive advancement in agriculture, overpopulation, and unemployment have all contributed to man's increased susceptibility to irritability, stress, restlessness, mood swings, anger, depression, intolerance, and abrupt changes in behavior in today's rapidly expanding society. The hormonal imbalance has been exacerbated by all of these symptoms. As one becomes older, these consequences become more prominent and difficult to manage. They also grow more common. In addition, studies have been carried out on humans and rats to indicate that environmental contamination due to pollution has devastating effects on the overall health of an individual at most all ages by causing disruptions in hormone levels and a variety of disorders [1-4]. These studies indicate that these negative effects can occur at any time in a person's life. As compared to males, women are more likely to have imbalances of this kind. Whether a woman is menstruating, pregnant, or going through menopause, the variations in hormone output become more obvious. Occasionally the medicine that is used to treat one kind of sickness might produce a disruption in the synthesis and secretion of hormones, as well as interfere with these processes. The purpose of this research is to investigate the indications and symptoms that are seen in people when there is an imbalance in hormone levels. Increased free estrogen levels in women, also known as hyperestrogenism, have been linked to an earlier onset of menarche, eating disorders, premenstrual syndrome, endometriosis, uterine fibroids, menstrual disturbances and difficulties like cramping, pain, and heavy bleeding, as well as infertility and breast cancer [5-9]. [Citation needed] Changes in dietary habits, such as excessive consumption of food, which may lead to obesity, and an increase in the conversion of testosterone to estrogens in the presence of the enzyme aromatase are some of the factors that can contribute to hyperestrogenism. Other factors include: Hyperinsulinism, which is characterized by dysregulated insulin secretion and may result in moderate to severe hypoglycemia, may be to blame for this condition [10]. It does this by raising the amount of testosterone produced by the ovaries and decreasing the amount of sex hormone-binding globulins, which leads to an increase in the amount of free estrogen found in the blood [11, 12]. Diet has a significant impact on the production of estrogen, as well as its metabolism and the activation of its receptors [13]. Drinking alcohol prevents the liver from effectively detoxifying estrogen and causes an increase in the amount of estradiol that is found in the blood. An elevated level of estradiol has been linked to an increased

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risk of breast cancer [9, 14, 15]. Toxins and chemicals found in the environment are generally thought to be the most significant contributors of xenestrogen (exogenous estrogen) exposure. They include mycotoxins, phytestrogens, which are estrogens obtained from plants, and mycestrogens, which are estrogens derived from fungus. Phthalates, polychlorinated biphenyls (PCBs), and bisphenol A (BPA) are only three examples of the many xenestrogenic industrial manufactured substances [16-21]. The presence of an estrogenic component in dairy products and other foods is the primary source of worry when it comes to an individual's health as well as the health of the community as a whole [13].

The Role of Hormones in Aging: Role of hormones in Aging

The amount of secretion of endocrine glands changes as we age. Hormones are natural chemicals that are released in the bloodstream of our body. As we age the amount of hormone released may also change resulting that amount of hormone produced at the younger age may be less as the age progresses.

The regulatory hormones can remain the same but the endocrine organs can change with the aging factor.

The pituitary gland reaches its maximum size at middle age but become smaller as the age progresses.

Parathyroid hormone affects the calcium and phosphate levels in the body. The secretion of Parathyroid increases as we age which result in osteoporosis.

Several hormones, notably growth hormone (GH), insulin-like growth factor-1 (IGF-1), testosterone, estrogen, dehydroepi and rosterone (DHEA), and cortisol, have been linked to accelerated ageing. Age-related drop in these hormones has been linked to the development of age-related disorders such osteoporosis, cardiovascular disease, and cognitive decline.

Growth Hormone and Insulin-like Growth Factor-1:

Two hormones that are essential to development and growth are growth hormone (GH) and insulin-like growth factor-1 (IGF-1). The pituitary gland secretes GH, which in turn prompts the liver to release IGF-1. Age-related modifications to body composition, such as the loss of muscle mass as well as bone density, have been linked to the fall in both GH and IGF-1 levels.

Many studies have pointed to the potential anti-aging benefits of GH and IGF-1 supplementation, including enhancements in skeletal muscle and bone density, enhancements in cognitive function, and a decreased cardiovascular disease risk. Although GH and IGF-1 supplements have been shown to provide short-term benefits, their long-term implications on health and death are yet unknown.

Testosterone and Estrogen:

Sex hormones like testosterone and estrogen both decrease with age. The ovaries in women as well as the testes in males are responsible for producing testosterone and estrogen, respectively. Both hormones are essential for maintaining both sex life and bone mass.

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Age-related decreases in testosterone and estrogens have been linked to bone loss, cardiovascular illness, and memory loss. The natural fall in testosterone and estrogens levels that comes with becoming older has been proposed to be treated using hormone replacement therapy (HRT). The possible hazards of side effects, such as an increased risk of breast cancer and cardiovascular disease, keep HRT's usage in the spotlight..

Dehydroepiandrosterone:

Adrenal glands produce a hormone called DHEA. Its levels decrease with age, yet it's been linked to anti-aging benefits including better brain power and a lower risk of heart disease. Yet, DHEA supplementation's long-term consequences on health and death are still unknown.

Cortisol:

The adrenal glands secrete the hormone cortisol in reaction to emotional or physical stress. When one ages, their cortisol levels rise, and chronically elevated cortisol levels have been linked to a host of age-related maladies from cardiovascular disease to cognitive decline to osteoporosis. The detrimental health impacts of chronic stress may be lessened via the use of stress-reduction strategies such as meditation and physical activity..

Hormone	Function	Effects on Aging
Estrogens	Regulates the female reproductive system	Levels decline with age, contributing to menopause and associated symptoms like hot flashes and mood changes
Testosterone	Regulates male reproductive system and muscle mass	Levels decline with age, contributing to reduced muscle mass and bone density, as well as sexual dysfunction
Thyroid hormone	Regulates metabolism	Levels may decrease with age, contributing to weight gain and reduced energy levels

Table 1.Hormones function and Effect on aging

Hormone imbalance, stress and sleep

Getting enough shut-eye is fundamental to maintaining a fit, productive, and happy life. The body's repair and rejuvenation processes are prioritized during sleep. It follows that sleep deprivation may disrupt many physiological functions. When a disturbance is set in motion, its effects are magnified. Age and time make it so. It's unclear if an unbalanced hormone system leads to sleeplessness or whether insomnia leads to an unbalanced hormone system. As women tend to sleep longer than males across the board, it stands to reason that women are disproportionately affected by sleep issues [22]. Women have a higher incidence of sleeplessness than males do. The estrogens hormone is causally related to sleep [23]. Anxiety, restlessness, and sleep disruption may result from a drop in

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estrogens owing to physical stress, such as extreme exercise, a low-fat or low-carbohydrate diet, underrating/fasting, or a sudden weight loss [24]. Insomnia impairs fertility because it disrupts the body's natural ovulation cycle. Leptin, a hormone secreted by adipocytes, has been linked to better sleep and increased fertility [25]. Reducing hunger is one of its [26] effects. Leptin production cannot be optimised without sufficient sleep. Shorter sleep duration is associated with higher ghrelin and lower leptin levels [27]. Specialized cells in the stomach and pancreas produce ghrelin, a powerful appetite stimulant. Reducing food intake and increasing energy expenditure are two of leptin's main functions. Lack of leptin causes overeating and weight gain. Increased levels of leptin are related with a reduction in appetite and a slowing of the basal metabolism, both of which contribute to obesity. This might help to explain why leptin has a detrimental effect on fertility. Very high levels of serum leptin have been linked to a decrease in fertility in women [40]. Follicle development in the ovary is controlled by leptin through its effects on LH (Luteinizing Hormone) and FSH (Follicle Stimulating Hormone). A somewhat negative correlation exists between leptin, the timing of the LH surge, and ovulation. Hence, irregular menstrual cycles and decreased fertility (i.e., difficulties conceiving) may result from elevated leptin levels, which in turn may be caused by poor sleep quality. Women who work nights often have irregular menstrual cycles and have trouble sticking to normal sleep schedules. The amounts of the hormone melatonin generated by shift workers are affected by the inconsistent timing of light and dark. There is some evidence that going without sleep might increase stress and irritation. Calming anxiety using antidepressants is a common practise. Lack of progesterone is a direct result of daily stress Progesterone levels drop during perimenopause, particularly in stressed women. Ovarian progesterone production declines with ageing and stress.

Hormone imbalance and precocious puberty

Beginning between the ages of 12 and 15, puberty marks the beginning of adolescence and the development of sexual maturity. Until the age of 8 or 9 years old, it is termed precocious. Increased contact with environmental estrogens has been linked to this phenomenon that have been reported to cause hormone imbalance in the body

Hormone imbalance and memory

Proven evidence suggests estrogen has cognitive and memory effects. It improves the brain's access to oxygen and glucose. Those who don't get enough carbs have trouble remembering things. The consumption of foods high in simple carbs has been linked to low mood. The neuroprotective and neurotrophic effects of estrogens have long been documented. They boost neurotransmitter levels, enhance the body's sensitivity to nerve growth factor, and reduce the neuronal development of Alzheimer's disease-linked beta-amyloid peptides]. The risk of developing Alzheimer's disease (a kind of dementia) has been linked to fluctuations in estrogen levels that occur naturally with age. The chance of acquiring Alzheimer's disease is reduced by estrogen at normal amounts, but this does not seem to halt or reverse the progression of the illness once symptoms have begun to manifest. Women who used estrogen replacement treatment during or soon after menopause had a lower risk of developing Alzheimer's disease compared to those who did not. Memory loss and impairment have

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been linked to the chronic elevation of glucocorticoids (cortisol) that occurs during times of stress, ageing, and other stressful circumstances.

Hormone disturbance, weight gain and weight loss

The body's metabolic rate at rest is known to be controlled by thyroid hormones. Several physiological changes may occur if the amounts of their secretion are either decreased (hypothyroidism) or increased (hyperthyroidism). Weight gain, depression, hair loss, poor energy, constipation, dry skin, and sensitivity to cold are all symptoms of hypothyroidism. Hyperthyroidism is characterized by an elevated metabolic rate, excessive energy, and diarrhoea. Cortisol imbalances are another factor that contributes to weight gain. These conditions are linked to a predominance of estrogen. Mood, mental and physical performance, energy, libido, sex desire, and sleep patterns are all controlled by cortisol. Cortisol levels rise and fall in response to stress, leading to hyper or hypoglycemia, insulin resistance, increased or decreased appetite, and suppression of the thyroid. As a result, your metabolism slows down and you put on extra pounds.

Hormone imbalance and insulin resistance (hyperinsulinemia)

The pancreas secretes insulin, which controls the metabolism of carbohydrates, proteins, and fats. Immediately after a blood meal, blood glucose levels are lowered by this. Ability to produce and utilise insulin adequately is critical for maintaining healthy blood sugar levels, which in turn supports efficient metabolic function and, ultimately, good health. Diseases and conditions may be triggered by even a little change in insulin levels. Damaged insulin receptors prevent cells from responding to insulin. This condition is medically referred to as insulin resistance. It causes a spike in blood sugar levels and the accumulation of fat, which in turn causes type II diabetes and obesity. Acne, infertility, increased facial hair development, decreased head hair loss, neck discoloration, and skin tags may all be caused by an increase in androgens, which are triggered by insulin resistance.

Hormone imbalance and depression

It has been observed that optimal levels of estrogen are required to increase and sustain levels of serotonin, a neurotransmitter that helps prevent bloating, mood shift, irritability, migraines, and depression. A drop in estrogen levels has been linked to reduced serotonin levels, which in turn has been linked to feelings of sadness, anxiety, and inability to sleep. When estrogen is administered, the breakdown of serotonin is reduced, and the mRNA and protein levels of several serotonin indicators are altered, resulting in an increase in serotonin availability. Premenstrual syndrome, postpartum depression, and mood swings before and after menopause may all be directly affected by these changes. Progesterone and other synthetic progestational drugs affect the production and release of several neurotransmitters and neuropeptides in response to certain physiological and pathological stimuli. GABA (gamma aminobutyric acid) receptors in the brain are influenced by progesterone, which has a calming effect on the body. It's useful for reducing irritation, sadness, and other negative emotions. In conclusion, it is safe to say that a shift in the estrogen-to-progesterone ratio might affect mood and increase the risk of developing depression. Insomnia, melancholy, anxiety, and an inability

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to cope with stress have all been linked to chronically elevated cortisol levels. Thyroid hormone deficiencies are also associated with slowed metabolism and emotional decline.

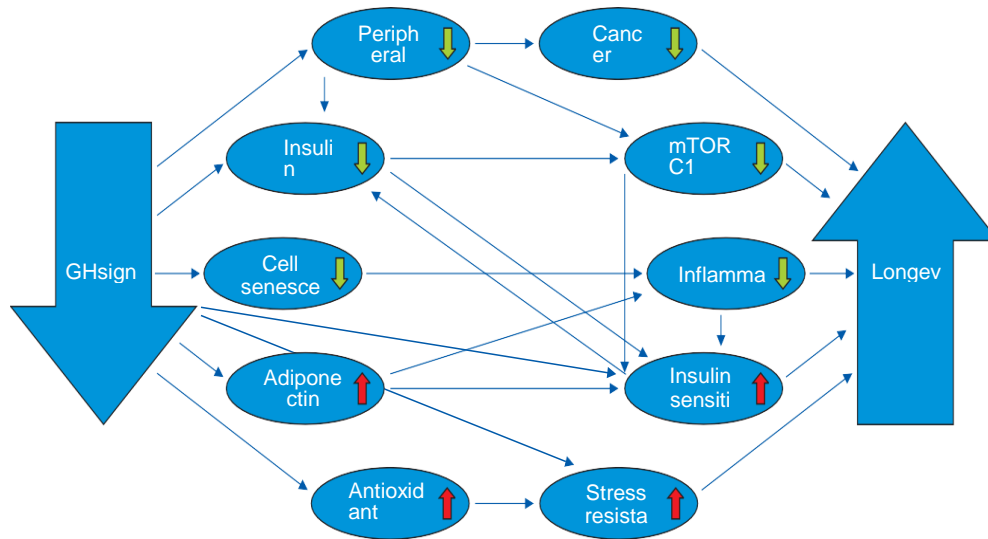


Figure 1. Key mechanisms mediating the effects of reduced growth hormone (GH) signaling on aging and longevity

Hormone imbalance, hysterectomy and osteoporosis

Fertility and genital tract issues have emerged as a result of environmental disturbances and nutritional shifts. Xenestrogens in food may produce estrogen dominance, the primary cause of hypothyroidism. Breast cancer and fibroids are two of the most common female reproductive health issues. As a result, the levels of estrogen, progesterone, and testosterone drop precipitously when a woman has her uterus (hysterectomy) or ovaries (ovariectomy) removed surgically. Bone density, muscular mass, heart palpitations, stress, and sadness are all potentially impacted by this.

Growth Hormone Releasing Hormone (GHRH) And Growth Hormone Secretagogues (GHS)

There is an increase in GH secretion in response to GHRH and GHS. Studies of therapy with GHRH or GHS are limited since most AGHD is caused by pituitary lesions and these patients, unlike healthy seniors, are insensitive to these medicines.

Treatment with GHRH or GHS is thought to result in a more physiological GH replacement, with a pulsatile rather than sustained spike in GH and without interfering with the body's capacity for negative feedback regulation of GH via raising IGF-I. Modulators of endogenous GHRH secretion, such

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as negative feedback via somatostatin, also affect the effects of GHRH and GHS. As a consequence of this typical negative feedback control, overdosing should be mitigated. GHRH therapy has adverse effects that are comparable to those of GH treatment, but less severe and less common. GHS may be taken orally, transversally, or nasally since their molecules are smaller than GH's and they are resistant to digestive enzymes.

CONCLUSION

While ageing itself is not a disease, it does cause changes in body composition and functional deterioration, leading to frailty and eventually loss of independence. Since it has not yet been shown, interventions that halt this decline may increase independent living time and quality of life. The decline in trophic hormones such as sex steroids and growth hormone that occurs with age is not known to be adaptive or harmful. While there is no single hormone responsible for aging in humans, certain hormones have been shown to play a role in the aging process. Hormones such as growth hormone, insulin, cortisol, estrogen, testosterone, and thyroid hormone can all have effects on various aspects of aging, including muscle and bone mass, skin elasticity, metabolism, cognitive function, and reproductive health. However, the aging process is complex and influenced by many factors beyond hormones, including genetics, lifestyle, and environmental factors.

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