

Dr. R K SANGHAVI

Expert, Nutraceuticals

33-years' Experience # Pioneered Nutra Segment in India

>200 Lectures on Nutraceuticals

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Dr Sanghavi has represented the Healthcare industry in various courts in Mumbai, Chennai, Delhi including the Supreme Court to fight against unjust Govt. policies pertaining to Fixed Dose Combinations (FDCs), NDDS products' pricing, and permitting introduction of Nutraceutical products.

Dr Sanghavi has been closely involved in Nutraceutical segment since 30 years & greatly responsible for the wide acceptance of Health Supplements in India. He has spoken at over 250 Doctor CMEs in India as well as for overseas specialist doctors in Bangladesh, Philippines, Sri Lanka & UAE (Dubai, Abu Dhabi).

Dr Sanghavi specializes in conceptualizing designer products for specific disease / disorder management, including OTC brands in launched recent past. His ability to threadbare the pathophysiology is exceptional, and it is this expertise that has resulted in the availability of this product: HEMOCARE SENIOR – a true partner for the Indian elderly.

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PATRON

Indian Academy of Geriatrics Indian Federation of Ageing



23-09-2019

FOREWORD

Due to increased health awareness and improved health facility, the longevity of life is increased. Now the Indian age is around 70 years. Even though the longevity is increased, they suffer with communicable and non-communicable diseases. In addition to that, social problems also add to the existing medical problems.

Elderly may not have any major ailments but still the quality of life is not very satisfactory due to the decline of functional capacity. The fuctional capacity of the elders tend to decrease as they grow older. Now the joint families are no more existing. Many elders are living alone. To look after them independently, they have to take care of their functional capacity. This booklet focused on how the functional capacity can be improved to maintain independency.

Malnutrition is common in more than 50% of the elderly population in India and more than 90% have less than recommended dietary intake due to either social, psychological, physiological factors and illness. Under nutrition is associated with an overall increased risk of all means of mortality.

In India, 1/3rd of the elderly suffer with anemia, the prevalence doubles at the age of 75. Anemia even if it is mild, has been associated with significant negative outcomes like decreased mortality. Hemocare Senior provides all the nutrition for different types of anemia.

Osteoporosis commonly observed in elderly mainly due to insufficient calcium intake, Vitamin D deficiency is commonly observed in elderly, mainly because of lack of exposure to sunlight. Hemocare Senior has a salvation to increase the levels of calcium and vitamin D.

The prevalence of overall hypothyroidism is approximately 5%, but sub clinical hypothyroidism is more common. It is under diagnosed because the symptoms are more or less attributed to ageing process. This tablet provides adequate nutrition to support thyroid functioning.

Prevalence of osteo arthritis is about 22-38%. Hemocare Senior provides protection to the cartilage with its antioxidants and anti-inflammatory ingredients.

ADHIPARASAKTHI CLINIC

No.50 (Old No.18A), Flowers Road, Kilpauk, Chennai 600 010 Tamilnadu, India Telephone: 044-26412030 / 26267282 email: dr_v_s_natarajan@yahoo.com Regarding Dyslipidemia, this tablet provides n-3 fatty acid, garlic along with antioxidants.

India is the diabetic capital of World. The incidence of Type-2 diabetes is 28.2% above the age of 60. Fatty acid, chromium and L-Cysteine in this tablet, assist in increasing insulin sensitivity, thereby reducing blood sugar.

India currently ranks third behind China and USA in dementia. Ginkgo Biloba is useful in improving cognition and memory in ageing associated with dementia.

Ageing causes muscle weakness and decline in muscle mass and strength. Besides antioxidants, Hemocare senior also provides glutamic acid which is useful to combat muscle fatigue and ageing.

Hemocare Senior is a comprehensive blend of ingredients that has potential to manage not only diseases and disorders but even disabilities. Hence, Hemocare Senior is so comprehensive that it will not only add years to life and life to years, but also can facilitate youthful living by fostering functional capacity.

Hemocare Senior is just the right support for the elderly Indian.

(DR.V.S.NATARAJAN)

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Functional Capacity & Healthy Aging

DR R K SANGHAVI

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INTRODUCTION

"Geriatrics" is the branch of medicine dealing with the physiologic characteristics of aging and the diagnosis and the treatment of the diseases affecting the aged. Gerontology is the study of aging, including biologic, sociologic, and psychological changes.

The World Health Organization (WHO) predicts that, globally, by 2050, the world population (7.7 billion) aged 60 years or more (presently 962 million) will double, and those aged 80 years or more will number 400 million.¹

India has thus acquired the label of "an aging nation" with 7.7% of its population being more than 60 years old. "Older people" is sometimes preferred but is equally imprecise; >65 years is the cut-off age often used, but most people should not need geriatrics expertise in their care until age 70 or 75.

Aging is classified as 'normal' and disease as 'abnormal' phenomenon. However, aging and aging-related diseases / disorders are synonymous. If one has to delink from the other positive health needs to be fostered. For this inaction for health promotion should transform to being proactive and adapt preventive measures.



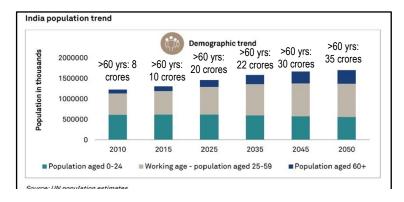
Scientists have now unveiled the secret of aging. It is not only a distant dream realization now that longevity could be fostered but quality of living can be added to life. Adam lived for 930 years and died and in India the Devraha Baba outlived 250+ years healthily.

HEMOCARE SENIOR is one effort by the health supporters to facilitate healthy longer living. Functional capacity emerges as an ideal value for the elderly in order to live independently and autonomously, being able to perform physical and mental activities necessary for maintaining his basic activities such as: bathing, dressing, performing personal hygiene, transfer and move himself, getting up, eating, keeping continence, preparing meals etc. Not only years are added when HEMOCARE SENIOR is started early enough, but exciting and sprightly living coupled with functional capacity independency is added to the extended years.

This booklet on **FUNCTIONAL CAPACITY AND HEALTHY AGING** (Courtesy:HEMOCARE SENIOR) provides an insight into aging process and aging-associated disabilities caused by diseases and disorders and how one can endeavor to halt or retard the same, and thereby ensure functional capacity in the elderly. The Indian elderly consumer deservedly needs to live life without inter-dependency and this monograph provides all the relevant information to enlighten how natural ingredients can provide healthier, enjoyable living even with years passing by.

AGING

Old age refers to ages nearing or surpassing the life expectancy of human beings, and is thus the end of the human life cycle. Terms and euphemisms include old people (worldwide usage), seniors (American usage), senior citizens (British and American usages), older adults (in the social sciences), the elderly, and elders (in many cultures - including the cultures of aboriginal people). In rural India, almost a third of the households (32.5%) have at least one elderly person, whereas in urban areas that proportion is somewhat lower at about 29%.



State - wise data on elderly divulge that Kerala has maximum proportion of elderly people in its population (12.6 per cent) followed by Goa (11.2 per cent) and Tamil Nadu (10.4 per cent) as per Population Census 2011. The least proportion is in Dadra & Nagar Haveli (4.0 per cent) followed by Arunachal Pradesh (4.6 per cent) and Daman & Diu and Meghalaya (both 4.7 per cent).⁵

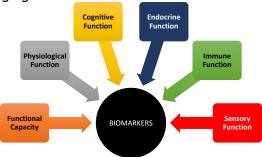
The word "aging" is used specifically to describe the operation of processes within whole organisms or populations of such organisms that result in an exponential increase in the chance of both sickness (morbidity) and death (mortality) with the passage of time (the Gompertz relationship).⁶

MORBIDITIES

BIOMARKERS

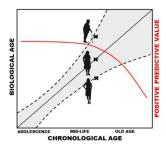
Human aging has now defined biomarkers that can objectively assess the distinguishing features between healthy and unhealthy aging between individuals at older ages.⁷

Fig: Biomarker types for aging.⁷



FUNCTIONAL CAPACITY (PHYSICAL CAPABILITY)

Measures of functional capacity (poor performance in tests of grip strength, walking speed, chair rise time and standing balance⁸), that is, a person's capacity to perform the physical tasks of everyday living, are useful markers of current and future health.⁷/₁⁹Functional capacity</sup> declines progressively in later life with men performing better than women at all ages.^{7,10}



PHYSIOLOGICALFUNCTION

Complex molecular changes affecting the structure and function of most cells, tissues and organ systems are a hallmark of aging.^{7,11}Biomarkers that need to be focussed upon include:

- Lung function [forced expiratory volume (FEV1)]
- Body composition (including bone mass and skeletal muscle) and body mass index (BMI)^{12,13}
- Cardiovascular (CV) function (blood pressure and lipids)
- Glucose metabolism (insulin resistance).⁷

COGNITIVE FUNCTION

Cognitive decline may limit independence and signal dementia.^{7,14} Three domains that need to be assessed include executive function, processing speed and episodic memory.⁷

ENDOCRINE FUNCTION

Age-related changes in the endocrine system, particularly:⁷

- Sex hormones
- Thyroid

IMMUNE FUNCTION

Whilst the field of immunology is well developed, the study of age-related decline in immunity, termed immunosenescence, is more recent.^{7,15}Higher plasma concentrations oftwo inflammatory markers are associated with lower grip strength and gait speed in older adults.^{7,16}

- Interleukin (IL)-6
- Tumor necrosis factor-alpha (TNF- α)

Centenarians show fewer signs of aging of the immune system although some inflammageing is seen⁷ – substantiating that a decline in body's natural defence results in aging-related disturbed immunity disorders.

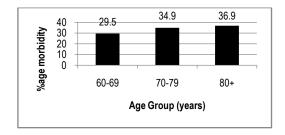
SENSORY FUNCTION

Sensory functions like sight, hearing, taste and touch are critical for normal levels of independence, for interactions with others and to facilitate enjoyment of life's experiences. Loss of these functions is more prevalent in older adults, with loss of audition and vision being the most prominent. Smell dysfunction is among the earliest 'preclinical' sign of neurodegenerative diseases and, interestingly, osteoarthritis (OA) and hearing loss are considered among the top chronic health concerns in older individuals.

INDIAN SCENARIO

India has acquired the label of an "Aging Nation", with 7.4% of the total population being 60 years or above in 2001, 8.6% in 2011 and has been projected to increase to 19% by the year 2050. 18,19,20,21 In terms of the absolute numbers of adults 60 years and older, India is second to China, a standing that is likely to remain constant over the next several decades. 22

Graph: Prevalence of acute morbidities among the elderly Indians. ^{23,24}



The prevalence of chronic illnesses far overshoots the incidence of acute ailments in the elderly Indians.

Table: Increasing chronic diseases incidence (per 1,000) (2004) with age in Indians.²⁵

AGE GROUP	ACUTE DISEASES	CHRONIC DISEASES
0-9 years	69	5

10-19 years	28	8
20-49 years	30	26
50-59 years	48	73
60+ years	80	218

Aging is the most profound risk factor for almost all non-communicable diseases (NCD), which are chronic, including CV diseases, cancer, diabetes and neurological diseases. ²⁶

- Declining bone mass with age and greater in middle age predict risk for future fracture and mortality.
- Aging is associated with reduced metabolic capacity exemplified by diminished glucose homeostasis.
- High BP in midlife is linked with cognitive decline in later life.
- Onset of cognitive decline is detectable relatively early in adulthood around 45 years of age. ^{7,27}

MORTALITY

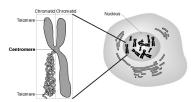
Chronological age is a major risk factor for functional impairments, chronic diseases and mortality.²⁸Telomere length is the most well studied biological age predictor, but many new predictors are emerging.²⁸The epigenetic clock is currently the best biological age predictor, as it correlates well with age and predicts mortality.²⁸

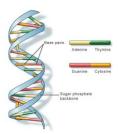
TELOMERE SHORTENING

CHROMOSOMES' CONSTITUTION

Chromosomes, present in the nucleus, contain centromeres and telomeres that are responsible for genetic modelling. Telomeres exist at each end of the two identical chromatids in a chromosome, so there are four telomeres per chromosome, or 194 per cell in humans (46 chromosomes, 4 telomeres each).

Fig: Chromosome.





Telomeres are repetitive deoxyribonucleic acid (DNA) sequences capping chromosomes.DNA has 4 bases:

- 1. Guanine (G)
- 2. Adenine (A)
- 3. Thymine (T)
- 4. Cytosine (C)

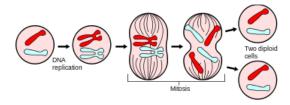
Permutations and combinations of these make up each base and two such pairs constitute a telomere. There are 3,000 base pairs in adults and 1,500 in the telomere of the elderly. This

is because 30-200 bases are lost during each cell division resulting in progressive shortening of telomeres every time cells divide.²⁹

CELL DIVISION

During mitosis (cell division) one part of the telomere is lost since the DNA strands shorten, as the base proteins are lost. When this phenomenon happens the process of cellular aging is triggered. ^{30,31}

Fig: Mitosis.



TELOMERIC LOSS & AGING

A meta-analysis on 36,230 participants, 32 and the largest population-based telomere length study to date (n = 105,539), 33 concluded that women on average have longer telomeres than men. Hence, women have a lower biological age than men as judged from the telomere lengths. 28

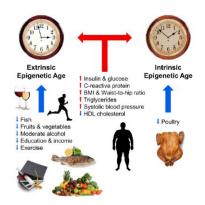
EPIGENETIC CLOCK

An epigenetic clock is a type of a molecular age estimation method based on DNA methylation levels (DNAmAge).²⁸ Pre-eminent examples for epigenetic clocks are Horvath's clock,^{34,35,36,37} which applies to all human tissues/cells, and Hannum's clock,³⁸ which applies to blood.³⁹

DNA methylation refers to the addition of a methyl (CH3) group to the DNA strand itself. A number of mechanisms exist to control gene expression in eukaryotes, but DNA methylation is a commonly used epigenetic signalling tool that can fix genes in the "off" position. 40

The proportion of human immune blood cell types change with age. 41,42,43 Consequently, there are two epigenetic age measures: 41,44

- 1. Intrinsic Epigenetic Age Acceleration (IEAA): This is a measure of cell / tissue senescence from birth due to aging and is independent of blood-cell composition changes.
- 2. Extrinsic Epigenetic Age Acceleration (EEAA): This takes into account the age-related blood cell composition as well.



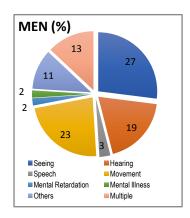
For each one-year increase in the difference between chronological and epigenetic age (the \triangle age),⁴⁵ there is a demonstrated 6% increased risk of developing cancer within three years and a 17% increased risk of dying of cancer in the next five years.²⁸Epigenetic clock acceleration²⁸ has been demonstrated to co-relate with occurrence of Alzheimer's Disease (AD),⁴⁶ Parkinson Disease (PD)⁴⁷ as well as osteoarthritis (OA).⁴⁸Taken together, the epigenetic clock appears to be associated with a wide spectrum of aging outcomes, most consistently mortality.²⁸

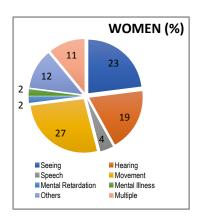
SUCCESSFUL AGING

Successful aging refers to a process by which the deleterious complex of disabilities and diseases of normal ageing are minimized, thereby preserving the body functions until senescence.^{21,49}

DISABILITIES

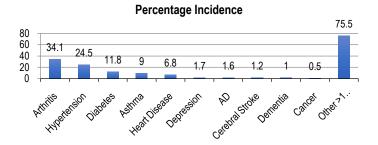
Graph: Disability incidence per 1,000 Indian persons (2011).^{23,50}





NON COMMUNICABLE DISEASES(NCD):

Graph: NCD incidence (%) amongst elderly Indians (2015).²³



MORTALITY

The WHO (2008) projected that NCDs would account for at least seven of 10 deaths occurring in developing regions by $2020.^{51}$ In developing countries, NCDs not only tend to increase but also appear earlier in life. 51,52

Table: Mortality incidence (%) of elderly Indians (>70 years) due to NCD (2001-2003).⁵³

RANK	CAUSE OF DEATH	INCIDENCE
1	CVS	25.7%
2	Senility	15.7%
3	COPD	14.1%
6	Malignancy	4.1%

Amongst the communicable diseases causing death the most frequent is diarrhea whose incidence contribution is 8.5% and ranks 4. Thus, NCD are a more important reason for mortality in old age.

SOLVING AGING PUZZLE

There are multi-organ and tissue affections on account of aging. Each requires to be specifically protected against. However, the process of aging per se, which contributes to the whole cascading events, can be stalled based on modern science revelation.

For assessing which specific morbidities need to be addressed, evaluation of markers can be the guiding factor.

WHAT INCREASES WITH AGE	WHAT DECLINES WITH AGE
Insulin resistance	Aerobic capacity
Systemic BP	Ejection fraction
Body fat content	Muscle mass and strength
Lipids	Immune function
Homocysteine (tHcy)	Vitamin D
Lens opacity	Vision
Malignancy	Hearing defect
Fractures	Bone mineralization
Micronutrient deficiency	Thyroid hormone
Dementia	Mobility

Any intervention that can protect from these changes and reverse the markers is beneficial for the elderly and old age. But, more than this, there must be measures adapted to even stall the mortality mechanisms.

Cells are normally programmed to divide 50-70 times.³⁰But this is possible only if the telomeres have enough dividing capacity and this based on its length.

Telomere length is a popular marker of biological aging.^{28,54} An enzyme called telomerase can slow and stop or perhaps even reverse the telomere shortening that happens during the aging process.^{55,56}

"Telomerase is a ribonucleoprotein that counteracts telomere shortening and can immortalise human cells."

- Ahmed S et al. J Cell Sci 2008; 121: 1046-1053.

The telomerase enzyme availability declines as age progresses.⁵⁷One of the reasons is that telomerase is excluded from the nucleus upon oxidative stress.^{58,59,60,61,62}Increase in free radicals and reactive oxygen species (ROS) lead to oxidative stress and this accelerates telomere shortening.⁶³

Increase in oxidative stress also induces actively aberrant DNA methylation leading to many diseases including cancer. ⁶⁴

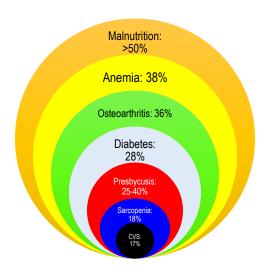
Hence, there is an essential need, *for successful aging*, to provide for interventions that can block telomere shortening, as well as counter the all-prevailing free radicals and ROS.

HEMOCARE SENIOR

HEMOCARE SENIOR is a designer formula for the senior Indian. It provides nearly all the nutrients and nutraceuticals necessary to protect against aging-related morbidities and stall mortality.



Thus, HEMOCARE SENIOR provides nutrients and nutraceuticals totaling 46 for attaining well-being of the elderly. The ensuing data reflects the occurrence and incidence of aging-related affections in Indians and the benefits provided by HEMOCARE SENIOR by virtue of its contents of vitamins, minerals and nutraceuticals.



10% or less incidence is of: cancer (10%), hypothyroidism (5%), osteoporosis / vision defects (4%) and dementia (0.3%). Another concerning issue in the male aging population in sexual dysfunction whose incidence is over 70% in those over 60 years old. HEMOCARE SENIOR benefits nutrient deficiencies, specific aging-related affections as well as free radicals / ROS mediated diseases and disorders.

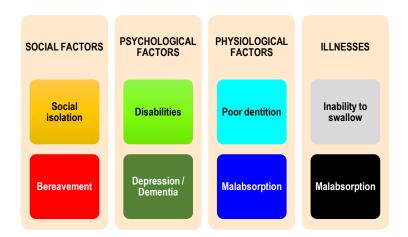
Most important for the elderly aging-population is the functional capacity to live and function independently without having to rely on others for their daily chores. HEMOCARE

SENIOR is one such product that can not only provide health benefits, but also can contribute to functional capacity independency.

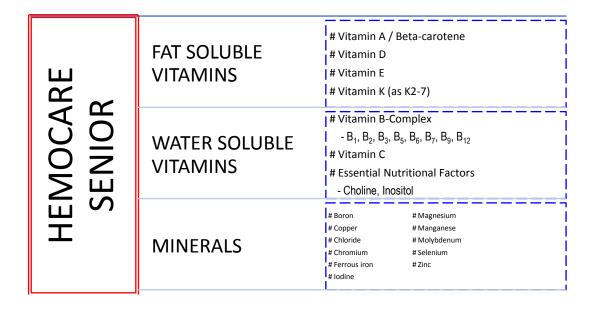
NUTRIENT DEFICIENCIES

MALNUTRITION

Different studies in India have demonstrated more than 50% of the elderly population in India suffer from malnutrition and more than 90% have less than recommended intake⁶⁵due to either social,^{66,67} psychological⁶⁸ or physiological^{66,67} factors and illnesses.⁶⁹



Undernutrition is a great risk among older people, and is associated with an overall increased risk of morbidity and mortality. ^{66,70}

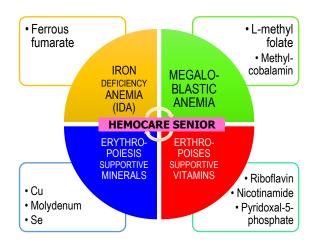


ANEMIA

In India, the prevalence of anemia is 37.88% in the elderly patients. The prevalence doubles to 63.88% in the >75-year age group. 71,72

The presence of even mild anemia has been associated with significant negative outcomes, including decreased physical performance, ^{73,74} increased number of falls, ^{73,75} increased frailty, ^{73,76} decreased cognition, ^{73,76} increased dementia, ^{73,77} increased hospitalization ^{73,78} and increased mortality. ^{73,79}

Given the association of anemia with poorer quality of life, appropriate attention should also be paid towards diet and nutrition of the geriatric population.⁷¹



HEMOCARE SENIOR thus provides all the nutrients for both IDA as well as megaloblastic anemia, including supportive nutrients for optimal hemopoiesis support.

OSTEOPOROSIS

In 2013, sources estimate that 50 million people in India are either osteoporotic (T-score <- 2.5) or have low bone mineral density (BMD) (T-score between-1.0 and-2.5).^{80,81}

80% of Indians above the age of 59 years consume <800 mg calcium daily.⁸² Generally, Indians consume 400 mg of calcium per day.⁸³Calcium requirements don't increase for men until the age of 71, when bone loss and fracture risk rise significantly. If whatever calcium intake is via food, it must be absorbed and assimilated by the bones.

HEMOCARE SENIOR provides:

- Vitamin D: for facilitating absorption of calcium from intestine.
- *Vitamin K2-7:* for enhancing uptake of calcium by bones.

VITAMIN D

Vitamin D status in those above 50+ years has demonstrated that 91.2% have vitamin D deficiency and an additional 6.8% Indians have vitamin D insufficiency. ⁸⁴This is because, with age, men and women have a reduced capacity to produce vitamin D through sun exposure. The official recommended dietary allowance for vitamin D increases from 600 IU (international units) to 800 IU at the age of 70. However, many experts recommend adults older than 50 years require supplementation with 1,000 to 2,000 IU of vitamin D each day to maintain sufficient stores. ⁸⁵

VITAMIN K2 MK-7

Osteocalcin (OC), also called bone gamma-carboxyglutamic (Gla)-protein (BGP) is expressed by osteoblasts and odontoblasts. OC is a key protein in building of the bones.⁸⁶

OC belongs to a class of proteins referred to as vitamin K-dependent (VKD) proteins. OC builds up hydroxyapatite in the bones in the right patterns to impart strength. Vitamin K2



regulates the distribution of calcium whilst MK-7 activates OC needed to incorporate the calcium within the bones. ⁸⁷Without vitamin K2 MK-7OC is not carboxylated and thus is inactive and cannot bind to the hydroxyapatite in the bone matrix. ^{86,88,89}

Vitamin K2 MK-7 is low in the Indian dietary items (rich sources include natto, fermented soy, goose liver, cheese, egg yolks,

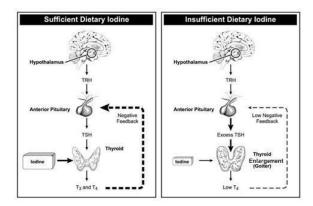
dark chicken meat, butter) and hence needs supplementation for OC carboxylation (carboxylated OC).⁸⁶

HEMOCARE SENIOR provides vitamin D as well as vitamin K2 MK-7 to facilitate absorption of calcium, distribution as well as its uptake into the bones.

HYPOTHYROIDISM

The prevalence of overt hypothyroidism increases in the elderly and approximates 5% in those older than 60 years of age. 90

The thyroid contains two hormones, L-thyroxine (tetraiodothyronine, T_4) and L-triiodothyronine (T_3). Iodine is an indispensable component of the thyroid hormones, comprising 65% of T4's weight, and 58% of T3's. ⁹¹ Thyroid cells are the only cells that can absorb Iodine. The thyroid cells combine the Iodine taken up with an amino acid called tyrosine to make T3 and T4. The normal thyroid gland produces about 80% T4 and about 20% T3, however, T3 possesses about four times the hormone "strength" as T4. ⁹²



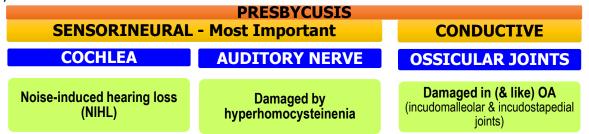
HEMOCARE SENIOR provides adequate iodine for support of thyroid gland functioning.

AGE RELATED HEARING LOSS (PRESBYCUSIS)

Presbycusis is a true sensorineural loss, in which both cochlear hair cells and, to a lesser extent, the spiral ganglion cells in the vestibule cochlear nerve can be affected. 93,94,95,96 The prevalence of presbycusis rises with age, ranging from 25% to 40% of the population aged 65 years, 40-66% in patients older than 75 years, and more than 80% in patients older than 85 years. 97,98

CAUSES

The presbycusis can be due to: changes in inner ear (cochlea), middle ear (bony joints) and / or the nerve. 99



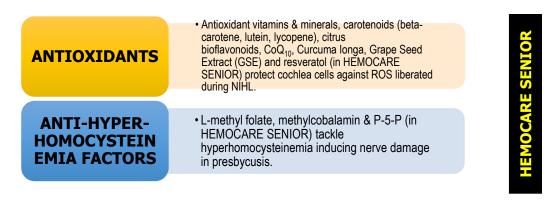
MECHANISMS

Presbycusis or age related hearing loss is caused by several extrinsic and intrinsic factors that damage the auditory system. 100

- 1. Noise-induced hearing loss (NIHL) is the commonest reason for presbycusis. When the ear is exposed to excessive sound levels or loud sounds over time, the overstimulation of the hair cells (sensory cells of cochlea) leads to heavy production of ROS, leading to oxidative cell death. 101 During hair cell death 'scars' develop, which prevent potassium rich fluid of the endo-lymph from mixing with the fluid on the basal domain. 101,102 The potassium rich fluid is toxic to the neuronal endings and can damage hearing of the entire ear. 101
- 2. The function of middle ear structures (tympanic membrane, malleus, incus and stapes) is to convert ear pressure changes into the vibrations of the inner ear fluids. Due to NIHL

the severe vibration results in damage to bones and joints. ¹⁰³As a result there is OA changes in the joints in between incus and malleus [incudomalleolar (IM) joint (IMJ)] and between incus and stapes [incudostapedial (IS) joint (ISJ)]. ¹⁷

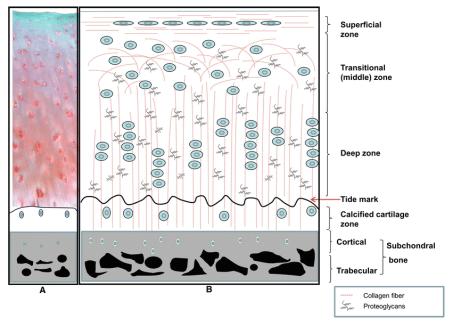
3. Elevated homocysteine concentrations (hyper homocysteinemia) associated with vitamin B_{12} or folate deficiencies may adversely affect blood flow to the cochlea, leading to presbycusis. ¹⁰⁴



NUTRACEUTICAL INADEQUACIES OSTEOARTHRITIS

OA is the most common joint disease with the prevalence of 22%-39% amongst Indians.¹⁰⁵ The physical disability arising from pain and loss of functional capacity reduces the quality of life and increases morbidity among the elderly.¹⁰⁵

OA is an inflammatory process following wear and tear in the cartilage due to aging as well as damaging action of free radicals and ROS.



The cartilage is divided into 3 zones:

- 1. Superficial tangential zone (STZ): first portion of cartilage that is affected.
- 2. Middle zone
- 3. Deep zone

Collagen is concentrated throughout the depth of the cartilage with 10-20% being present in the STZ and 40-60% in the middle and 30% in deeper layers - intermingled with proteoglycans. This structural organization is thought to be essential for the load-bearing capacity of cartilage. ¹⁰⁶This is because 70% of dry weight of cartilage is collagen and 25% is proteoglycans. ¹⁰⁷

HEMOCARE SENIOR benefits collagen integrity of the cartilage since it contains vitamin C and Mn.

- Vitamin C: Collagen protein requires vitamin C for hydroxylation (protocollagen to procollagen), a process that allows the molecule to achieve the best configuration and prevents collagen from becoming weak and susceptible to damage. Vitamin C is required to export the procollagen molecules out of the cell for its subsequent conversion to collagen.
- *Mn:* This mineral aids in the synthesis of both collagen as well as proteoglycans. Mn is required for the activation of prolidase, an enzyme that functions to provide the amino acid, proline, for collagen formation. Mn also activates the enzyme glycosyltransferases that is needed for glycosaminoglycan (GAG) synthesis.¹¹⁰

Besides the wear and tear there are other factors responsible for damage of the cartilage in osteoarthritis. The articular cartilage is unique because it is avascular and its nourishment depends directly on joint movement. Motion of the ligaments and tendons surrounding a joint facilitates delivery of nutrients to the cartilage in part by allowing nearby blood vessels to fully dilate. As long as pressure in the exercising blood vessels exceeds pressure in the synovial cavity, joint nourishment is enhanced. But when movement is absent and the synovial pressure becomes greater than the pressure in nearby blood vessels, the vessels can collapse and hypoxic-reperfusion injury begins. This causes production of ROS, which damages the cartilage. Antioxidants are necessary to combat the free radicals and ROS whilst the omega-3 fatty acids (n-3 fatty acids) as well as Curcuma longa (C longa) provide beneficial anti-inflammatory action.



HEMOCARE SENIOR thus provides protection to the cartilage with its antioxidant and antiinflammatory ingredients, as well as facilitates cartilage matrix regeneration due to vitamin C and Manganese helping in the process of collagen production. Another essential mineral whose deficiency has been demonstrated to co-exist with OA is boron. HEMOCARE SENIOR also contains boron whose regular intake reduces risk of OA.

OSTEOCHONDRITIS DESSICANS

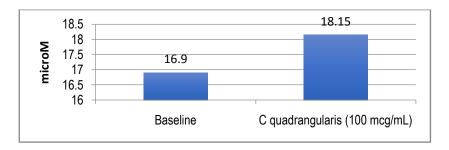
Osteochondritis dissecans (OCD or OD) is a joint disorder in which cracks form in the articular cartilage and the underlying subchondral bone. ¹¹⁴OCD is caused by blood deprivation in the subchondral bone. This loss of blood flow causes the subchondral bone to die in a process called avascular necrosis. The bone is then reabsorbed by the body, leaving the articular cartilage it supported prone to damage. The result is fragmentation (dissection) of both cartilage and bone, and the free movement of these bone and cartilage fragments within the joint space, causing pain and further damage. ^{114,115,116}

The prevalence of OCD is 15 to 29 cases per 1,00,000 population. ¹¹⁷Knee joint (75%) and radiocapitellar joint (6%) are the most common sites for OCD lesions. ¹¹⁸Early detection of osteochondral lesion is desirable because the onset of degenerative arthritis in patients with OCD is estimated to occur 10 years earlier than in normal individuals ¹¹⁹- especially since OA of knee joint is also the commonest (overall prevalence 28.7% ¹²⁰) in India. The reason why OCD and OA are linked is because ischemia precipitates OCD whilst there is mounting evidence that vascular pathology plays a role in the initiation and/or progression of OA. Potential mechanisms are: episodically reduced blood flow through the small vessels in the subchondral bone at the ends of long bones, and related to this, reduced interstitial fluid flow in subchondral bone. ¹²¹

Inflammatory mediators are key players in the pathogenesis of OA and bone destruction. HEMOCARE SENIOR contains Cissus quadrangularis that has anti-inflammatory activity since it inhibits the enzymes responsible for OA namely, cyclooxygenases (COX) and 5-lipoxygenases (LOX), as well as TNF- α . Lagrangularis induces substantial protective effects on bone / cartilage cells in which levels have been demonstrated to be drastically reduced by 64.4% (IL-1 β), and 11.1% [matrix metalloproteinases (MMP-3) – destructive chemicals produced during OA]. In fact, by inhibiting IL-1 β there is direct reduction in COX, LOX, MMPs and ROS production all destructive mediators for OA as well as OCD. As a result, C quadrangularis reduces joint pain, joint swelling and tenderness.

Besides, providing symptomatic relief and protecting the cartilage in OA, C quadrangularis also helps in chondro building.

Graph: Glycosaminoglycans (GAG) production independently stimulated by C quadrangularis. ¹²²



Not only in OA, C quadrangularis also facilitates healing of bone in OCD on account of its content of steroidal substances. 125

"Studies worldwide have shown 60%-90% of arthritic patients are resolving to undertake complementary and alternative treatments (such as HEMOCARE SENIOR) as an alternative to conventional therapeutics."

- Kanwar JR et al. Drug Des Devel Ther 2015; 9: 2927-2940.

CARDIOVASCULAR DISEASE

India accounts for about a fifth of CV deaths globally with CV diseases (CVD)¹²⁶being a leading cause of mortality among middle aged and older adults.¹²⁷ The current prevalence estimates is 10-12% in urban and 4-5% in rural Indians.^{127,128}

DYSLIPIDEMIA

•45-59 years: 73.4% incidence •≥60 years: 81.4% incidence

CORONARY HEART / ARTERY DISEASE (CHD / CAD)

45-54 years: 10.9% incidence
55-64 years: 14.4% incidence
65-74 years: 22.7% incidence
>75 years: 51.4% incidence

CONGESTIVE / HEART FAILURE (CHF / HF)

•1% incidence and upto 80% sufferers are elderly Indians.

Dyslipidemia incidence: India;¹²⁹ CAD incidence: India;¹³⁰ CHF incidence in elderly:^{131,132} India¹³³

DYSLIPIDEMIA

The presence of dyslipidemia among the elderly poses a substantial risk of coronary events and stroke. ¹³⁴The WHO estimates that dyslipidaemia is associated with more than half of global cases of CVD accounting for more than 4 million deaths per year. ¹³⁵

The low-density lipoprotein (LDL) particle carrying cholesterol (LDL-C) in its nature form is not atherogenic. However, oxidatively modified LDL (damaged by free radicals / ROS) is responsible for atherosclerosis and plaque formation. The oxidised LDL-C (oxLDL) is preferentially taken up by macrophages via scavenger receptors, subsequently leading to formation of foam cells, endothelial dysfunction and progression of atherosclerosis. ¹³⁶

There is increasing evidence that hypertriglyceridemia is also singularly associated with incremental atherosclerotic CAD risk. ¹³⁷In individuals without a history of cardiovascular events, low concentrations of high density lipoprotein (HDL)-C are inversely associated with the risk of future cardiovascular events. ¹³⁸

For dyslipidemia, HEMOCARE SENIOR provides n-3 fatty acids, ¹³⁹ time-tested garlic along with antioxidants to protect against formation of atherogenic oxLDL.

- The American Heart Association, addressing TGs and cardiovascular disease, recommends 2 to 4 g/day of EPA plus DHA for patients who need to lower TG levels. 140 More recently, the Endocrine Society suggested that omega-3 fatty acids alone or in combination with statins could be considered a treatment option for patients with moderate-to-severe TG levels. 141 Omega-3 fatty acids administered as fish oil supplements lowers plasma TG levels by 25% to 34%. 142,143
- Garlic is effective in reducing total serum cholesterol by 17±6 mg/dL and LDL-C by 9±6 mg/dL in individuals with elevated total cholesterol levels (>200 mg/dL), provided it is consumed for longer than 2 months. HDL-C levels improve only slightly, and triglycerides are not influenced significantly.¹⁴⁴

Thus, n-3 fatty acids and garlic supplement each other in correcting dyslipidemia; garlic reduces cholesterol whilst n-3 fatty acids are more useful for hypertriglyceridemia. The plaque-derived excess cholesterol uptake by liver is also mediated by n-3 fatty acids and the reverse cholesterol transport (RCT) final step is facilitated by these PUFAs.¹⁴⁵

HEMOCARE SENIOR also contains antioxidants: carotenoids (lutein, lycopene), citrus bioflavonoids, C longa, CoQ_{10} , GSE and resveratrol. Particularly CoQ_{10} is most powerful as an antioxidant, even as compared to vitamin E. Only when 100% of CoQ_{10} is utilized can the free radical damage the LDL; ¹⁴⁶ in the case of vitamin E oxidization of LDL commences when even 5% depletion in its concentration occurs, for beta carotene it is 20%! ¹⁴⁷

ATHEROSCLEROSIS

Atherosclerosis is an inflammatory disease. Proinflammatory cytokines can act at different stages in the process: IL-1 and TNF- α can regulate the expression of adhesion molecules involved in early and late leukocyte recruitment. Indeed, IL-1 and TNF- α can induce local production of growth factors, including fibroblast growth factors (FGF) and platelet-derived growth factor (PDGF), which attract smooth-muscle cells from the tunica media into the intima. This causes the initial luminal narrowing in stage of atherosclerosis known as smooth muscle proliferation and migration.

C-reactive protein (CRP) [hs = high sensitivity; (hsCRP)] is an acute phase reaction protein, produced by the liver and triggered especially by interleukin-6 (IL-6), which is often used in the clinic as an inflammatory marker in "classical" inflammatory disease such as infections, vasculitis and tumours. When all these conditions are excluded, CRP, even in the lower range of detection, could be useful to monitor subclinical inflammatory state deriving from atherosclerosis. 148,151

Hypertension is indeed an important risk factor for endothelial dysfunction, and an essential step in the pathogenesis of atherosclerosis. Magnesium plays a crucial role in modulating vascular smooth muscle tone and endothelial function. Magnesium plays a crucial role in modulating vascular smooth muscle tone and endothelial function.

CORONARY ARTERY DISEASE(CAD)

The vascular endothelium contributes to smooth muscle relaxation by tonic release of NO.¹⁵⁴ Release of NO thus contributes significantly to microvascular vasodilation and is almost entirely responsible for the epicardial vasodilation. Reduced NO bioavailability during stress in patients with atherosclerosis or risk factors for atherosclerosis may contribute to myocardial ischemia by limiting epicardial and microvascular coronary vasodilation.¹⁵⁴ HEMOCARE SENIOR contains L-arginine,a semi-essential amino acid, which is the substrate for the enzyme endothelial nitric oxide synthase (eNOS), that is responsible for synthesis of NO.¹⁵⁵Hence, availability of L-arginine enhances NO synthesis and thereby improves the endothelium vasodilator function both in coronary arteries and peripheral blood vessels¹⁵⁶ to

benefit CAD as well as high blood pressure (respectively). The Grape seed extract (in HEMOCARE SENIOR) additionally stimulates the eNOS¹⁵⁷ and compliments the action of L-arginine.

In the past, CAD was thought to be a simple, inexorable process of artery narrowing, eventually resulting in complete vessel blockage [and myocardial infarction (MI)]. However, in recent years the explanatory paradigm has changed because it was realized that a whole spectrum of

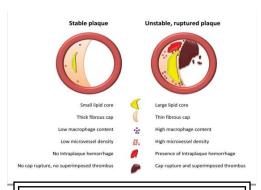


Fig: Stable and unstable plaque.

coronary plaques exists – from stable (lipid-poor, thick fibrous cap) to unstable (lipid-rich, thin fibrous cap). When an unstable plaque ruptures – (more unstable it is, the more likely it is to rupture) – the subsequent release of prothrombotic and vasoconstrictive factors increases the likelihood of complete occlusion of the artery.¹⁵⁸

In CAD, thus, there are two prevalent approaches to manage a vulnerable plaque, namely, plaque stabilization and plaque regression. Plaque stabilization focuses on stabilizing the content of plaque and strengthening the overlying endothelium, while plaque regression focuses on the overall reduction in plaque volume and to reverse the arterial endothelium to its normal functional state.¹⁵⁹

- *Plaque regression:* This requires reduction in the cholesterol deposited which is attained by statins and also by raising HDL. Also the lessening of inflammation by n-3 fatty acids (in HEMOCARE SENIOR) can beneficially cause plaque regression.¹⁵⁹
- Plaque stabilization: Stability of plaque, rather than its size, is critical factor for causing MI. Various anti-thrombotic therapies like anti-platelet drugs and fibrinolytics promote plaque stabilization.¹⁵⁹

Plaque calcification develops by the inflammation-dependent mechanisms involved in progression and regression of atherosclerosis. Macrophages within the arterial wall are classified as:¹⁶⁰

- 1. *M1 macrophage:*This is activated by interferon (IFN- γ) and lipopolysaccharide (LPS) to produce proinflammatory cytokines, initiate an immune response and protect against microbes (by generating ROS and nitric oxide).
- 2. *M2 macrophage:* This is activated by exposure to IIs. M2 macrophages induce proliferation, collagen production and promote wound healing and tissue repair.

In plaque progression, predominant M1 macrophages promote the initial calcium deposition within the necrotic core of the lesions, called as micro calcification. During plaque regression M2 macrophages are engaged in the healing response to plaque inflammation and facilitate macroscopic calcium deposition, called as macrocalcification.

Macrocalcification leads to plaque stability, while microcalcification is more likely to be associated with plaque rupture. Vitamin K2 MK-7 binds with matrix Gla-protein (MGP); MGP, following its activation (by vitamin K2 MK-7) binds with the free floating calcium and prevents its deposition in vascular smooth muscle cells cells microcalcification. Thus, vitamin K2 MK-7 (in HEMOCARE SENIOR) has potential to prevent plaque rupture.

Higher levels of circulating Magnesium are associated with lower risk of CVD, mainly ischemic heart disease and coronary heart disease. A growing body of evidence from epidemiological studies, randomized controlled trials and meta-analyses have indicated inverse associations between Magnesium intake and CVD. 152

HEART FAILURE(HF)

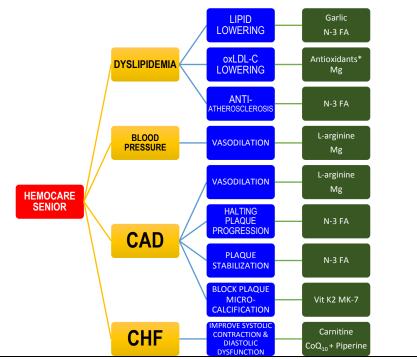
HF is associated with metabolic changes that cause a progressive impairment of cardiac and skeletal muscle high-energy phosphate (ATP) production. The reduced production of ATP has important implications for both systole and diastole in HF with both preserved and reduced left ventricular function. ¹⁶⁴

 CoQ_{10} exists in two different forms: a reduced form, as ubiquinol ($CoQ_{10}H_2$), and an oxidized form, ubiquinone (CoQ_{10}). ^{165,166}About 95% of CoQ_{10} in circulation exists in the reduced form

of ubiquinol. 167,168,169 CoQ $_{10}$ is endogenously produced (besides being mainly available from meat 166,170), and converts between the two forms-UBIQUINOL & UBIQUINONE. CoQ $_{10}$ is an antioxidant but its main role is as an integral part of the mitochondria respiratory chain for energy production; deficiencies in CoQ $_{10}$ impair energy production with implications in HF. 165,171 This is because CoQ $_{10}$ is a key component in the mitochondrial electron transport chain (ETC) for ATP generation, and exists in abundance in the myocardium, as compared to other tissues. 166,170 Trials with CoQ $_{10}$ in HF patients reported improvements in functional parameters such as ejection fraction, stroke volume and cardiac output, with minimal side effects. 166

It was recently demonstrated that plasma levels of CoQ_{10} are an independent predictor of survival in patients with chronic HF. 165,172 HEMOCARE SENIOR provides sufficient CoQ_{10} . 165 The primary concern with CoQ_{10} intake is its poor bioavailability, namely, mere 2-3% only is absorbed. 167,173 Intestinal absorption is 3-fold faster if CoQ_{10} is administrated with food intake. 174,175 Concomitant piperine (in HEMOCARE SENIOR) intake(with CoQ_{10}) also increases bioavailability of CoQ_{10}^{176} by enhancing its absorption from intestine 177 as well as by decreasing its first pass metabolism in the liver. 178 30% increase in bioavailability has been demonstrated following piperine intake along with CoQ_{10} .

In addition to CoQ_{10} , HEMOCARE SENIOR also contains L-carnitine, which is derived from an amino acid. It is primarily important for benefitting heart contractility which is typically dependent on fatty acid metabolism. The free-floating fatty acids, released from adipose tissues to the blood, bind to carrier protein molecule known as serum albumin that carry these fatty acids to the cytoplasm of target cells such as the heart, skeletal muscle and other tissue cells, where they are used for fuel. But before the target cells can use the fatty acids for ATP production and β oxidation, the fatty acids with chain lengths of 14 or more carbons must be activated and subsequently transported into mitochondrial matrix of the cells in three enzymatic reactions of the carnitine shuttle. About 98% of L-carnitine stores are contained in muscles, along with trace amounts in liver and blood. As far as heart failure is concerned, L-carnitine plays an important role in facilitating the transport of long-chain fatty acids (LCFAs) across the mitochondrial membrane for utilizationin ATP production that is needed for myocardial cells for improving contractility and thereby functioning.



* Antioxidants = Carotenoids (Beta-carotene, Lutein, Lycopene), Citrus bioflavonoids, CoQ₁₀, Cu, C longa, Mn, Resveratrol, Se, Vits E & C, Zn

Several risk factors, in addition to dyslipidemia play a central role in the etiology of CVD. Combinations of suitable and targeted nutraceutical ingredients together with a cholesterol-lowering action, when associated with suitable lifestyle, furnishes an alternative and synergy to pharmacotherapy to lowerCVD risk.¹⁸⁴

OMEGA-3 FATTY ACIDS

A very important nutraceutical for CVD iso mega-3 fatty acids (or n-3 fatty acids). These benefits have been now proven to be associated with their high intake of eicosapentaenoic and docosahexaenoic acids (EPA / DHA) – the two principle n-3 fatty acids. The WHO 185 today acknowledges the benefit of omega-3 fatty acids' intake and recommends the same:

- Polyunsaturated fats [PUFA (polyunsaturated fatty acids)]: 3-7% of calorie intake
- Omega-6 fatty acids: 3% of calorie intake
- Omega-3 fatty acids: 0.5-1% of calorie intake

This means that if the daily calorie consumption is 2000 Kcal, 10-20 Kcal must as omega-3 fatty acids i.e. 1-2g daily (since fatty acids typically provide 9 Kcal/g). Usually the dietary fats obtainable from all sources [cereals, pulses, vegetables, fruits, milk products, non-vegetarian items(except marine)], are in the form of omega-6 fatty acids (linoleic acid). Fenugreek, soybeans,

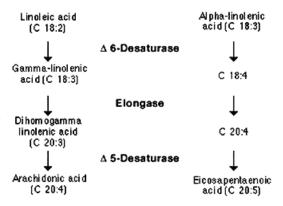


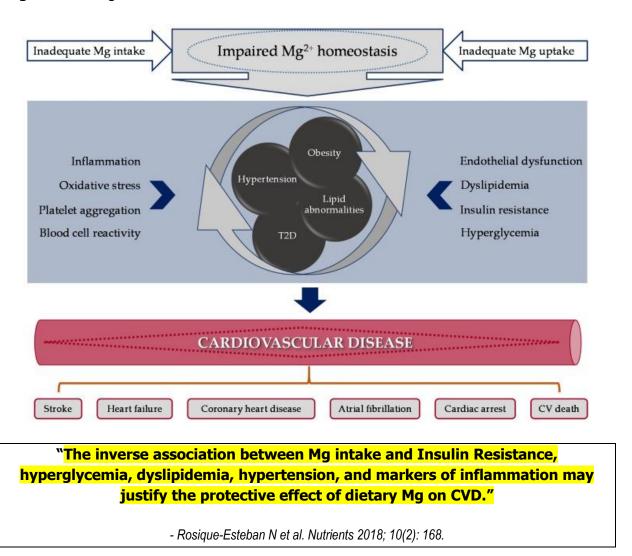
Fig: N-6 and N-3 fatty acids cascade.

walnuts, flaxseed provide n-3 fatty acid but as alpha-linolenic acid (ALA).

Both linoleic acid and ALA are converted to arachidonic acid and EPA (respectively) by the same enzymes. However, due to larger quantities of linoleic acid consumed as food articles the conversion of ALA to EPA is suppressed, ^{186,187} since most enzymes are utilized for the conversion of linoleic acid to arachidonic acid. ALA definitely needs to be converted to EPA / DHA to exert the benefits of n-3 fatty acids:only 8-20% of ALA is converted to EPA and 0.5-9% to DHA in humans! ^{185,188}

Hence, regular intake of EPA / DHA (as supplement in HEMOCARE SENIOR) normalizes the very vital balance between omega-3 and omega-6. The current recommendation by WHO¹⁸⁵ is to maintain omega-3 to omega-6 ratio of 1:5 to 1:10¹⁸⁶ as against the prevailing ratio of 1:20 to 1:25¹⁸⁹, ¹⁹⁰ on account of consuming current western diets. If omega-3 fatty acids (as in HEMOCARE SENIOR) are consumed regularly achieving the closer to recommended ratio will protect importantly against heart disease and diabetes. Magnesium (in HEMOCARE SENIOR) plays an important beneficial role CVD directly, as well as indirectly by benefitting vasodilation, endothelial function, lipid peroxidation, heart contractility including in acute myocardial infarction by virtue of its anti-arrhythmogenic property. ¹⁵²

Fig: Role of magnesium in CVD.

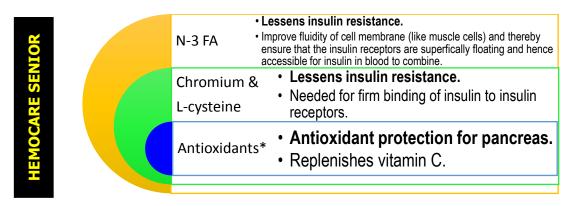


DIABETES

There are 3.5 crore diabetics in India and the figures are predicted to rise to 5.2 crores by the year 2025. WHO has declared India as the "*Diabetic Capital of the World*" with more than 53% diabetics being above 60 years of age and more than 85% above the age of 45 years. ¹⁹¹The incidence of type 2 diabetes mellitus (T2DM) is 28.2% in Indians at or above the age of 60 years. ¹⁹²

T2DM is primarily the outcome of increased insulin resistance or diminished insulin sensitivity. Insulin resistance occurs when the body doesn't respond as well to the insulin that the pancreas is making and thereby glucose is less able to enter the cells. Age-related insulin resistance appears to be primarily associated with adiposity, sarcopenia and physical inactivity. 193,194

N-3 Fatty Acids, chromium and L-cysteine (in HEMOCARE SENIOR) assist in increasing insulin sensitivity.



* Antioxidants = Carotenoids (Beta-carotene, Lutein, Lycopene), Citrus bioflavonoids, CoQ₁₀, Cu, C longa, Mn, Resveratrol, Se, Vits E & C, Zn

Additionally, the antioxidants in HEMOCARE SENIOR provides the much required protection against free radicals and ROS, since:

- Diabetics have extremely low antioxidant glutathione peroxidase (enzyme) activity within the beta cells of pancreas;¹⁹⁵ selenium (in HEMOCARE SENIOR) is essential for adequacy of glutathione peroxidase.
- Diabetics lack the antioxidant enzyme catalase in the mitochondria of pancreas. ¹⁹⁶Zinc and copper (in HEMOCARE SENIOR) facilitate availability of catalase.
- Diabetics overall have documented low antioxidant protection, particularly that of vitamin C.¹⁹⁷Since HEMOCARE SENIOR also contains vitamin C it replenishes this antioxidant nutrient that is particularly deficient in diabetics.

DEMENTIA

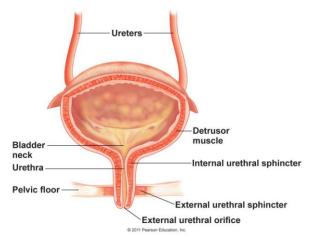
As per the Dementia India Report 2010, the estimated population of demented elderly in India is 3.7 million, which is expected to double over the next 20 years, making dementia a very important national health problem. With this documented number of elderly people suffering from dementia, India currently ranks third behind China and USA. ¹⁹⁸

Ginkgo biloba is useful for cognition and memory in aging-associated dementia (AD) and cerebral insufficiency. ¹⁹⁹ Compromised vascular flow is the hallmark of dementia, and Ginkgo biloba can improve cognition by enhancing cerebral blood supply. ²⁰⁰ In AD, ginkgo extract is also beneficial since it has an anti-amyloid aggregation effect. ^{201,202}

INCONTINENCE(URINARY & FECAL)

Urinary and fecal incontinence are common, and could be self-defeating challenges in dementia. Almost invariably, the person with dementia will develop incontinence as the disease progresses. In term 'functional incontinence' has hence been applied. Maintenance of continence requires mobility, manual dexterity, mental capacity and motivation.

On account of the anti-OA beneficial effects of the ingredients in HEMOCARE SENIOR the mobility is maintained. Also, the antioxidants and glutamic acid additionally present reduce muscle weakness so as to facilitate the elderly to freely move around rather than be bed ridden. Both these benefits stall the urinary and fecal incontinence that is otherwise common due to the aging process in those with associated dementia.



Urgency (U) and urge incontinence (UI), especially urinary, are common in the elderly.²⁰⁵The walls of the bladder are mainly formed of detrusor muscle. The detrusor muscle remains relaxed to allow the bladder to store urine, and contracts during urination to release urine. The treatment of frequency, urgency, urge incontinence and nocturia caused by detrusor instability or sensory urgency is frustrating.^{206,207}Magnesium (in HEMOCARE SENIOR), by decreasing the smooth muscle contractions,²⁰⁸is beneficial for the treatment of detrusor instability or sensory urgency translating to providing relief in U and UI.²⁰⁶

WEAK ANTIOXIDANT DEFENSES

MUSCLE LOSS AND MUSCLE WEAKNESS (FRAILITY)

Aging causes muscle weakness and disability (Fraility) in the aging population.²⁰⁹ Aging and inactivity or disuse is associated with a decline in muscle mass, structure and strength.^{209,210,211,212,213,214}



•Age-related muscle wasting.

Dynapenia

Age-related muscle weakness.

17.5% of the elderly above the age of 65 in India suffer from sarcopenia²¹⁵ hence, increasing the burden of reduced mobility and physical inactivity among the elderly. Interestingly, the loss of muscle mass begins by the age of 30 years and only accelerates around 60 years.²¹⁶

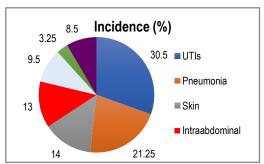
Current perspective and hypothesis are that mitochondrial deterioration in muscles and motor neurons is the primary initiator of sarcopenia. It is initiated by an aging-associated insult to mitochondria in muscle cells and motor neurons.²¹⁷ Mitochondrial stress in aging can originate from greater levels of oxidants and resultant DNA damage.^{217,218,219}

VIOCARE ENIOR	ANTIOXIDANT VITAMINS	# Vit C # Vit E
	ANTIOXIDANT MINERALS	# Copper (Cu) # Selenium (Se) # Manganese (Mn) # Zinc (Zn)
HEN	ANTIOXIDANT NUTRACEUTICALS	# Beta-carotene # Citrus bioflavonoids # CoQ ₁₀ # Curcuma longa # GSE # Lutein # Lycopene # Resveratrol

Besides the above antioxidants, HEMOCARE SENIOR also provides glutamic acid, which is useful to combat the muscle fatigue due to aging. ²²⁰Glutamic acid is in the same amino acid family group as glutamine and they can alter their structure to transform into each other. Muscles require glutamic acid more than any other amino acid, and the muscles rapidly use glutamine during exercise. ²²¹Thus, glutamic acid (in HEMOCARE SENIOR) is unique in that it provides endurance and strength to the muscles.

IMMUNE DEFICIENCY

Immunity is adversely affected by the aging process, ^{222,223} and its dysfunction is associated with increased susceptibility to infection. ²²⁴ There is strong evidence that a poorly functioning immune system can contribute to decreased disease resistance and reduced life expectancy in the elderly. ^{224,225}



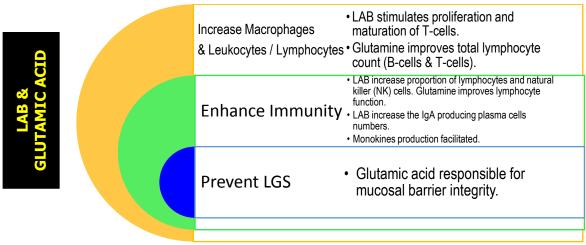
Graph: Sites of infections and their incidence in elderly Indians (68 years).²²⁴

Optimum natural immunity-Longevity is correlated with optimal natural immunity.²²⁶The health-promoting effects of lactic acid bacteria (LAB) are well recognised, making them a popular functional food ingredient. The beneficial role played by these microorganisms on the immune system, has been extensively reported.²²⁷

T-cells:The mucosal immune system is responsible for 60% of the daily production of immune-globulins (Ig). ^{228,229} Also the lymphocytes of blood enter the space between the epithelial cells where they persist as intra-epithelial lymphocytes (IEL). 27% of gastrointestinal mucosal cells are IEL, and these also constitute 40% of the peripheral T-cell population (that participate in immune mechanism). ²³⁰

Lymphocytes are crucial to maintaining the tight junctions between intestinal lining cells – they insure an intact gut barrier thereby preventing the leaky gut syndrome (LGS).²³¹

Plasma cells/Immunoglobulin A: The lymphoid tissue in gastric mucosa also give rise to B-cells and a fully differentiated form (secreting a single Ig) of latter is called plasma cell. For toxins that make it to the mucosa, the plasma cells produced IgA tag them causing attraction of macrophages and other white blood cells that consume the toxins.²³²



Monocytes of blood are converted to macrophages within tissues and organs. 1 billion monocytes produced daily and converted to macrophages (equivalent to 3-8% of leukocytes in blood). Each macrophage can destroy 100 bacteria & even remove dead tissue and cells.

4 R approach to treat LGS: 233,234,235

- Remove: aggravating and precipitating factors
- Replace: enzymes that have been disturbed
- Reinoculate: with commensals like <u>LAB</u> (in HEMOCARE SENIOR)
- **Repair:** by healing agents such as <u>glutamine</u>(in HEMOCARE SENIOR)

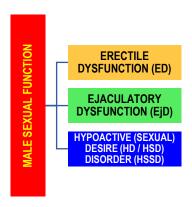
There is aging-related decline Interferon (IFNs) production²²⁷and LAB (in HEMOCARE SENIOR) strongly enhances their production resulting in increase in resistance towards pathogens.^{227,236}LAB²³⁷(in HEMOCARE SENIOR) also enhances immunity by increasing the phagocytes,²³⁸ NK cells²³⁹ as well as levels of IgA.²³⁸

Glutamine (in HEMOCARE SENIOR) strengthens gut barrier^{240,241} by sealing tightly the junction between the two epithelial cells (paracellular pathway).²⁴² It also increases T-lymphocytes²⁴³ and plasma cells,²⁴⁴ as well as facilitates production of the antioxidant glutathione peroxidase.^{245,246}

Allergy: LAB (in HEMOCARE SENIOR) also decreases the prevalence of allergies in susceptible elderly individuals.²⁴⁷

MALE SEXUAL DYSFUNCTION

Sexual dysfunction is among the highly prevalent disorders in elderly men that affect their quality of life, which is also a commonly ignored aspect of healthcare.²⁴⁸



Only 27.4% of the individuals in India above 60 years were sexually active, and it progressively dropped as age advanced and none were sexually active after 75 years of age.²⁴⁹

Fig: Incidence of sexual dysfunction in elderly Indian males.²⁴⁸

AGE GROUP	Overall Sexual Dysfunction
50-59 years	21.7
60-69 years	60.0
70-79 years	16.7

Physiological ED is most common (>80% occurrence) – the rest being of psychological etiology. ²⁵⁰Two of the most common risk factors for organic ED are diabetes and aging. ²⁵⁰The reasons for the erection difficulties are manifold.

- 1. In the aging male, the vascular supply to the penis is compromised due to increasing degrees of atherosclerotic vascular alterations in the arterial bed of the penis.^{251,252}
- 2. Erectile function, which is dependent on sinusoidal vasodilation in penis, is compromised since reduced plasma NO levels²⁵³ prevail due to inactivation²⁵⁴ of eNOS in elderly.²⁵¹
- 3. Smooth muscle mass of corpora cavernosum steadily decline with aging;^{253,255}replacement of these with collagen impairs the erectile functioning of the penis.²⁵¹

Antioxidant stress is responsible for the decline in NO availability as well as for destruction of smooth muscles and contractile tissue of penis. ²⁵¹Diminished testosterone concentrations are also responsible for the enhanced collagen deposition in the corpus cavernosum. ²⁵¹

HEMOCARE SENIOR is useful for improving erection in male sexual dysfunction because of its content of necessary nutraceuticals.

- 1. L-arginine increases availability of NO by facilitating its production.
- 2. Antioxidants [carotenoids (lutein, lycopene), citrus bioflavonoids, CoQ₁₀, Cu, C longa, GSE, Mn, resveratrol, Se and Vitamins (C& E) and Zn tackle the oxidative stress responsible for destruction of erectile tissue.
- 3. Ginseng improves penile erection as well as inhibits the fibrosis of corpus cavernosum.²⁵⁶

VISUAL IMPAIRMENT

As per National blindness survey the prevalence of blindness is 8% in individuals above 50 years of age in India. 257,258 Most common causes of vision impairmentamong the elderly are 1. Cataract,

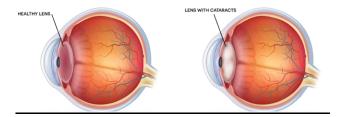
- 2. Age-related macular degeneration (ARMD / AMD),
- 3. Glaucoma and
- 4. Diabetic retinopathy. 259

Cataract is the principle reason of blindness in those over 40 years whilst ARMD is the leading cause for those over 65 years of age.²⁵⁹

Table: Incidence of vision loss in the elderly Indian (national study of 16 district in 15 states). ^{260,261}

AGE GROUP	VISION LOSS INCIDENCE
55-59 years	1.91%
60-64 years	3.65%
64-70 years	4.92%
>70 years	7.42%

CATARACT

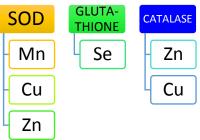


The prevalence of unoperated cataract in people aged ≥60 is 58% in north India and 53% in south India. ²⁶²A substantial body of evidence implicates oxidative damage to the development of cataracts. ^{263,264,265,266,267}The lens contains all the three antioxidant enzymes:

- Superoxide dismutase (SOD)
- Glutathione peroxidase
- Catalase

These 3 antioxidant enzymes tackle the ROS [hydrogen peroxide (H_2O_2)] as well as free oxygen radicals. In the elderly there is a 70% decline in concentrations of both SOD as well as glutathione peroxidase enzymes and this has been demonstrated to coincide with the onset of cataractous changes in the lens.²⁶⁸

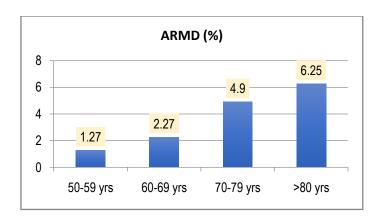
HEMOCARE SENIOR provides all the minerals that are necessary to support each of these 3 antioxidant enzymes.



AGING-RELATED MACULAR DEGENERATION

The prevalence of AMRD in India has been increasing over the years, besides with aging,²⁶⁹ and has become the leading cause of visual impairment and blindness in India.²⁷⁰

Graph: Increasing incidence of ARMD in elderly Indians.²⁷⁰



MACULAR PIGMENTS

The macula lutea contains pigments in the axons of its photoreceptors. The macular pigment ('yellow spot') consists of the xanthophyll isomers — namely, lutein, meso-zeaxanthin and zeaxanthin. Macular pigments account for 20-30% of total carotenoids in the human serum, but 80-90% of carotenoids in the human retina. The Fovea the ratio of lutein to zeaxanthin to meso-zeaxanthin is 1:1:1 versus 3:1:0 respectively in the retina periphery.

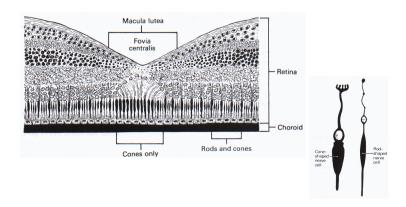
Lutein / zeaxanthin / meso-zeaxanthinplays an important role in vision: 271,277

- The macular carotenoids reduce the effects of light scatter and chromatic aberration on visual performance. ^{281,282}
- The damaging photo-oxidative effects of blue light, following its absorption, are blocked by macular carotenoids.^{283,284,285}
- The damage to the macula is attributed to excessive free radicals.^{271,286,287,288}Protection is afforded against the adverse effects of photochemical reactions generating free radicals and ROS because of the antioxidant effects of the carotenoids (lutein / zeaxanthin / meso-zeaxanthin) present.^{289,290}

LYCOPENE IN ARMD

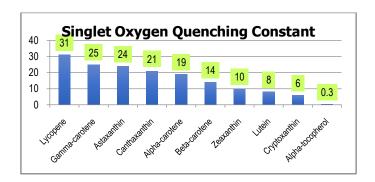
Light induces singlet oxygen formation in the retinal pigment epithelium (RPE) and choroid but not in human retina. Lycopene, a biologically occurring carotenoid, exhibits the highest physical quenching rate constant with singlet oxygen.²⁹¹In the human eye, lycopene is present in the RPE-choroid, and also in the ciliary body-iris.²⁹²However, the majority of macular carotenoids are located in the inner retina - far away from the RPE and hence it is unlikely that the naturally present macular carotenoids (lutein / zeaxanthin) can effectively quench the singlet oxygen.²⁷⁷

Fig: Retinal photoreceptors (rods and cones).



Lycopene (in HEMOCARE SENIOR) exhibits the highest physical quenching rate constant with singlet oxygen.²⁹¹

Graph: Singlet oxygen quenching capacity of various antioxidants.²⁹¹



Lycopene is richest in tomatoes, watermelon, pink grapefruit, asparagus and red cabbage. The intake of lycopene is estimated at 1.93 mg/person/day²⁹³ versus required amounts²⁹⁴ of 10-30 mg daily. Lutein and zeaxanthin are available from common foods such as cantaloupe, pasta, corn, carrots, orange/yellow peppers, fish, salmon and eggs.²⁵⁹Meso-zeaxanthin is not available from food – in retina, it is solely derived from lutein by conversion.²⁹⁵

ANTIOXIDANTS

High carotenoid intake and its serum levels are associated with a 43% risk reduction for exudative ARMD. 277,296 The Age-Related Eye Disease Study (AREDS) 297,298 demonstrated that the combination of an oral supplement consisting of antioxidant vitamins C (500 mg), E (400 international units), and β -carotene (15 mg), minerals [zinc (60 mg of zinc oxide) with copper (2 mg cupric oxide)] reduced the risk of intermediate AMD developing to advanced AMD by 25%. Furthermore, the risk of moderate vision loss was decreased by 19% in a five-year follow-up. 299 HEMOCARE SENIOR provides all the antioxidant vitamins and antioxidant minerals.

RESVERATROL & N-3 FATTY ACIDS

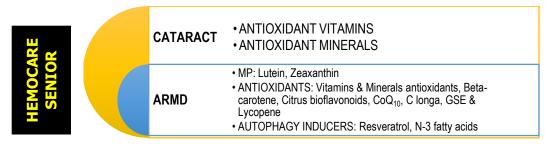
There is increasing evidence thatlong-term oxidative stress, impaired autophagy clearance and inflammasome mediated inflammation are involved in the pathogenesis of ARMD.³⁰⁰ Autophagy is the major intracellular degradation system by which cytoplasmic

materials are delivered to and degraded in the lysosome. However, the purpose of autophagy is not the simple elimination of materials, but instead, autophagy serves as a dynamic recycling system that produces new building blocks and energy for cellular renovation and homeostasis.³⁰¹

Impaired RPE function in dry ARMD causes the formation of extracellular deposits called drusen, which accumulate between the RPE and Bruch's membrane (BM). Dry AMD could transform to the wet form at the latest stage of the disease if there is dysfunctional autophagy. The wet form of ARMD involves choroidal neovascularization followed by formation of a disciform scar. Dysregulated autophage results in increased oxidative stress to the RPE. As a result of damage by free radicals to the RPE cell membrane PUFA (polyunsaturated fatty acids), malondialdehyde (MDA) is liberated. MDA, in turn, induces vascular endothelial growth factor (VEGF) and this VEGF is responsible for choroidal neovascularization and precipitation of wet ARMD.

Combination of resveratrol and n-3 fatty acids (in HEMOCARE SENIOR) benefits ARMD by dual mechanisms:

- 1. Induce autophagy in the aged RPE (ARPE). This prevents and even tackles the early changes in dry ARMD.²⁹⁹
- 2. Synergistically modulate the VEGF to inhibit the signaling only when ARMD present (not in normal eyes).³⁰⁶



MALIGNANCY

Indian men and women age ≥ 60 years are at high risk for the major cancers. Data shows that for the men have been ≥ 60 years have a risk 15 times greater and in women 8times greater than the persons having age < 60 years.³⁰⁷ In 1961 the incidence of cancer in elderly



Prof Philip Lawley

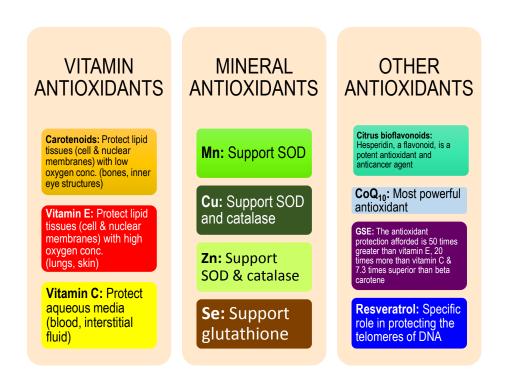
Indians (>60 years age) was 5.6%, which increased to 7.5% and is projected to be 12.4% by 2026.

Research conducted at The Institute of Cancer Research (ICR) in the 1950 and 60s provided the first conclusive evidence indicating that DNA damage is the root cause for cancer. Proteins within cells regulate growth and division, and were widely assumed to be the targets for cancer-causing

chemicals. However, Professor Philip Lawley and his fellow researcher Professor Peter Brookes demonstrated that cancer is caused by DNA damage, not by proteins.³⁰⁸

Oxygen from our lungs enters the bloodstream to be carried to each and every cell. During ATP generation the mitochondria uses 85% of the oxygen that enters the cell. In the process some 20 billion free radicals are produced in every each cell each day! In one year, 100 trillion cells in the average human body will have produced 700 million quadrillion free radicals (weighing nearly 5 pounds or 2.3 kgs). The DNA in each cell, as a result, gets 10,000 free radical hits per day!³⁰⁹

Free radicals and ROS not onlythe bases but also the deoxyribosyl backbone of DNA. Endogenous DNA lesions are genotoxic and induce mutations leading to cancer.³¹⁰



HEMOCARE SENIOR provides all the above antioxidants and also C longa or turmeric. The active constituent is curcuminoids of which the most important is curcumin. Besides its antioxidant properties, which are useful for cancer, curcumin inhibits cancer cell proliferation, local spread and metastasis, as well as also suppresses the cancer genes. The side effects of cancer chemotherapy and radiotherapy are also lessened by C longa. Piperine (in HEMOCARE SENIOR) increases bioavailability of curcuminoids by 150-200% and this is important since the absorption of turmeric constituents is otherwise very poor. State of the constituents is otherwise very poor.

HEMOCARE SENIOR also contains lycopene, which has specific anticancer actions: facilitates destruction of cancer cells, and also curtails metastasis.³¹⁴

SUMMARY

Almost 15 million elderly Indians live all alone and close to three-fourths of them are women. In some states like Tamil Nadu the proportion of such 'single elders' is even higher with one in eleven of those aged above 60 living alone. One in every seven elderly persons in India lives in a household where there is nobody below the age of 60. In states like Andhra Pradesh and Tamil Nadu, a quarter of the elderly population lives in such all-elderly households.⁴

Hence, it is extremely essential that in today's context those above 40 evaluate their risk of suffering from any of the varied aging-related affections.

AFFECTION	INCIDENCE (>60 yr Indian)	HEMOCARE SENIOR INGREDIENTS	REMARKS
	>50%	4 fat soluble vitamins	Vit Kavailable as K2 MK-7 for special beneficial action in osteoporosis and atherosclerotic plaques.
Malnutrition		11 water soluble vitamins	B ₆ , folic acid & B ₁₂ provided as active moieties – P-5-P, L-methyl folate (0.75 mg = 5 mg folic acid) & methylcobalamin (respectively).
		11 minerals	All required antioxidant minerals are provided.
Anemia	38%	Fe fumarate, B ₆ , B ₇ , B ₁₂ active moieties, B ₂ , B ₃ , Cu, Se	Fe fumarate is safer from side effect perspective.
Osteoporosis	4%	Vits D & K2 MK-7	Vit D known for influencing Ca absorption but uptake of dietary Ca by bones facilitated by vitamin K2 MK-7.
Hypothyroidism	5%	I_2	Supported by vitamins D, E, B ₆ , B ₇ , B ₁₂ (active moieties), C& minerals (Cr, Se, Zn).
	22-39%	Vit C, Mn	Ensure collagen integrity and their build up in cartilage.
OA		Antioxidants	Protect cartilage.
		N-3 FA	Reduce inflammation of joint.
	<i>Dyslipidemia:</i> 81%	Garlic	Reduce cholesterol.
		Antioxidants	Block LDL oxidation.
CVS		N-3 FA	 Reduce triglycerides and facilitate RCT. Prevents arterial damage causing atherosclerosis changes.
	<i>CAD:</i> 14-22%	L-arginine, GSE	Increase coronary blood flow by vasodilation due to enhanced NO formation.
		N-3 FA	Regresses & stabilizes plaque.
		Vit K2 MK-7	Halt plaque macrocalcification & rupture.
	<i>CHF:</i> 0.8%	CoQ ₁₀ L-carnitine	Improve both systole as well diastole.

AFFECTION	INCIDENCE (>60 yr Indian)	HEMOCARE SENIOR INGREDIENTS	REMARKS
	28%	Cr, L- cysteine, N- 3 FA	Enhance insulin sensitivity.
T2DM		Vit C, Se, Cu, Zn	 Replenishes the deficient antioxidant vit C. Encourages formation of glutathione peroxidase and catalase that are deficient in diabetes.
Dementia	0.3%	Ginkgo biloba	Improve blood flow.Benefit AD.
Immune	Nearly all elderly	LAB	Increases lymphocytes & NK cells.Enhances IgA concentrations.Produces IFN to fight pathogens.
deficiency		Glutamic acid	 Seals the gut barrier. Increases lymphocytes & plasma cells. Improves production of glutathione peroxidase.
Urinary incontinence	36-43% ³¹⁵	Magnesium	 Prevents hyper-contractility of detrusor muscle of bladder.
	27.4%	L-arginine	Facilitates NO production required for increasing the blood flow necessary during erection.
Male sexual dysfunction		Antioxidants	Fights the destruction of erectile tissue by oxidative stress.
		Ginseng	Improves penile erection.Inhibits fibrosis of corpus cavernosum.
Sarcopenia	18%	Antioxidants	Protect mitochondria.
	Cataract: 53-58%	Antioxidants	Protect lens.
	<i>ARMD:</i> 2.3%	Lutein	Replenish MP.
Vision		Lycopene	Protect free radicals / ROS damage to RPE.
		Resveratrol / N-3 FAs	Promote autophagy and hence prevent damage to ARPE. Inhibit VEGF and tackle wet ARMD.
		Antiovidants	
Malignancy	7.5-12.4%	Antioxidants C longa	Protect DNA. Inhibits cancer cell proliferation, local spread and metastasis. Suppresses cancer genes. Reduces side effects of chemo-/radiotherapy.
		Piperine	 Enhances bioavailability of curcumin by 150-200%.
		Lycopene	Facilitates programed cancer cell death (apoptosis).Curtails metastasis.

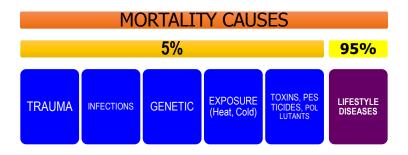
Besides the aging-related diseases and disorders, disability pose a challenge to the quality of life in the elderly. The link between aging and disability is a biological fact, and disability in the elderly is an important health indicator pointing to jeopardized quality of life. Types of disability are defined using only one aspect of disability, such as impairments sensory, physical, mental, intellectual. However, the International Classification of Functioning, Disability and Health (ICF) defines disability as an umbrella term for impairments, activity limitations and participation restrictions. In an Indian study 73% respondents felt that their age affected their functional capacity (FC) in day-to-day life and 58% reported that their age partially affected their activities of daily life (ADL).

The World Health Organization (WHO) criteria³¹⁹ found that the most common type of disabilities were mental, locomotor, hearing, speech and visual.^{316,320} In India, the reported prevalence of functional limitations among the geriatric population were speech disability (4%), hearing disability (10%), visual disability (56%), and agility (locomotion, walking, climbing stairs, body movement and dexterity; 33%), respectively.^{316,321}

DISABILITY	IMPLICATIONS	INGREDIENT/S IN HEMOCARE SENIOR	ACTION / BENEFIT
Speech Disability	Vocal cords loose elasticity and muscles of larynx weaken. ³²²	Antioxidant Vitamins: Carotenoids, C, E Antioxidant Minerals: Cu, Mn, Se, Zn	Can antagonize free radical mediated damage of vocal chord. ³²³
		Nutraceutical Antioxidants: Citrus bioflavonoids, C longa, CoQ ₁₀ , GSE, Resveratrol	Prevent speech disability due to aging changes per se.
		Antioxidants	Protect against NIHL.
Hearing Disability	Presbycusis	Anti-homocysteine vitamins	Protect against hyperhomocysteinemia-induced nerve damage in presbycusis.
	Cataract	Antioxidants	Protect lens.
		Lutein	Replenish MP.
Visual Disability	ARMD	Lycopene	Protect free radicals / ROS damage to RPE.
		Resveratrol & N-3 FA	Promote autophagy and hence prevent damage to ARPE.
			Inhibit VEGF and tackle wet ARMD.
Agility(Fraility)	Muscle weakness	Antioxidants	Protect mitochondria in dynapenia.
		Glutamic acid	Provide strength and endurance to muscles, especially during exercise.
	Frequent tendency to fall	Vitamin D	Reduces falling tendency without any reason (spontaneous) & thereby fracture rate. ³²⁴

DISABILITY	IMPLICATIONS	INGREDIENT/S IN HEMOCARE SENIOR	ACTION / BENEFIT
	Backache	Vit D & K2-7	Prevents osteoporotic backache.
	OA	Antioxidants	Protects cartilage
		N-3 fatty acids, C	constituents against the
		longa	damaging free radicals.
		Mn, Vit C	Builds collagen of cartilage.
		Boron	Protects against OA.
	Urinary/Fecal incontinence		Ensures control of U and
		Magnesium	UI and thereby facilitates unhindered mobility.

Major causes of human death are on account of lifestyle associated disease and this constitutes to 95% of the mortality.³²⁵



HEMOCARE SENIOR prevents trauma by decreasing the risk of falls, increases immunity to fight infections and contains an array of antioxidants to tackle the menace of cancer due to pollutants and toxins. Above all, increased oxidative stress that is responsible for the lifestyle diseases are warded off by a battery of antioxidants in HMEOCARE SENIOR.

It is impractical to measure the quantum of free radicals and ROS but markers are available to indicate the early occurrence of most lifestyle diseases. Suitable markers and indicators can be evaluated by simple testing of blood to ascertain the plausibility of being afflicted by aging-related diseases and disorders.

MARKERS (Blood)	LEVELS	IMPLIES	INDICATES	
Vit B ₁₂ , folic acid	Low	Vitamin deficiency	Malnutrition	
			Megaloblastic anemia	
D	Low	Vit D deficiency	Osteoporosis	
			Cancer / CAD risk	
Hb	Low	Fe deficiency	IDA	
Ferritin	Low	Reduced iron stores	IDA	
TSH	High	I ₂ deficiency	Hypothyroidism	
Lipid profile				
- LDL-D	High			
- TG	High	Dyslipidemia	Risk of atherosclerosis	
- HDL-C	Low			

MARKERS (Blood)	LEVELS	IMPLIES	INDICATES
tHcy	High	Hyperhomocysteinemia	
		Low B ₁₂ , folic acid	
hs-CRP	High	Arterial inflammation	CAD
Uric acid	High	Hyperuricemia, Gout	? CAD
Fasting insulin	High	Insulin resistance	Prediabetes
C-peptide	High	Trisuiiri resistance	
Cancer markers	High	CEA, CA 19-9, AFP	Intestine, pancreas, liver (resp.)
		,	Ca
		Males: PSA	Prostate Ca
		Females: CA-125	OvariesCa

P-5-P = Pyridoxal-5-Phosphate; Ca = Cancer

HEMOCARE SENIOR has been designed such that its regular intake by elderly endeavors to result in normal values for most markers as aging progresses. HEMOCARE SENIOR even stalls the aging process due to its contents of Resveratrol and 14 antioxidants incorporated to impart a youthful appearance.

Slower aging. Resveratrol is found in skin of red grapes and other fruits. It activates a class of proteins called sirtuins that are found naturally in cells. In particular, resveratrol activates one of the seven sirtuin proteins³²⁶— SIRT1 and minimizes telomeric damage with resultant slower telomere shortening and impeded aging-related changes. The decrease in telomere shortening has even been demonstrated to inversely correlate with levels of n-3 fatty acids (also present in HEMOCARE SENIOR) in blood.³²⁷

In 2003, Resveratrol was reported to extend lifespan of yeast, and in 2006 the Italian scientists demonstrated 56% increase in lifespan in humans.³²⁸A glass of red wine (150 mL) contains 0.30-1.07 mg³²⁸ depending on the grape variety compared to amounts provided by every HEMOCARE SENIOR unit swallowed.

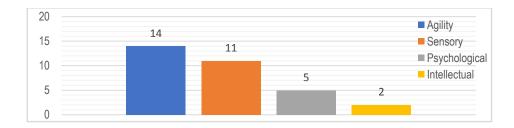
Youthful aging. Photoaging [due to ultraviolet (UV)-A light] accounts for most age-related changes in skin appearance. The most important and abundant structures of the dermal extracellular matrix (ECM) are collagen, elastin and Glycosaminoglycans(GAG) (keep the skin hydrated). WA rays-induced ROS stimulate the synthesis of matrix metalloproteinsase (MMPs) that are responsible for the degradation of extracellular matrix (ECM). In particular, MMPs can fully degrade collagen and this is responsible for skin wrinkling, typical of aging processes. All the antioxidant ingredients in HEMOCARE SENIOR combat the wrinkling process, which is the consequence of collagen destruction by enhanced oxidative stress. Also, after the age of 20 years, a person produces about 1% less collagen in the skin each year: 332 even photo aged fibroblasts make more collagen than aged fibroblasts!

- VITAMIN E protects against skin aging by blocking H₂O₂.
- VITAMIN C (which concentrates in dermis³³⁴ and its levels decline with aging³³⁵)overcomes the reduced proliferative capacity of elderly dermal fibroblasts, as well as increases collagen synthesis in aging skin.^{336,337}

- BETA CAROTENE has been demonstrated to improve facial wrinkles and elasticity significantly.³³⁸
- ANTIOXIDANT MINERALS (Cu, Mn, Se, Zn) ensure activity of three endogenous antioxidant enzymes: SOD, catalase and glutathione peroxidise.³³⁹
- CoQ₁₀not only tackles the free radicals and ROS that damage skin but also combats signs
 of aging starting at cellular level in dermis due to its ability to re-kindle the mitochondrial
 functioning (that declines with aging and responsible for the wrinkling).³⁴⁰

Aging should not be treated as synonymous with disability as a large proportion of older people live with good health status.³¹⁶ Physical activity is a continuum of physical behaviour: 1) Activities of Daily Living (ADL); 2) Instrumental Activities of Daily Living (IADL); 3) General activity and Exercise; 4) Fitness exercise; and 5) Exercise training. 341,342 There is no doubt that physical activity is a crucial factor in maintaining functional health throughout the life span. As the musculoskeletal system deteriorates with increasing age, mobility problems increase.³⁴¹Thecapacity of the human body to make use of muscle strength peaks between ages 20 and 30 and from there on steadily declines with age, most significantly between ages 50 and 60.34130% of men and 50% of women aged 65-74 years did not have sufficient muscle strength to lift 50% of their weight. 341,343 One of the most crucial factors determining functional capacity is mobility.341 HEMOCARE SENIOR caters to bones, joints and muscles facilitates bone mineralization (vitamins D & K2-7), health of cartilage (chondroprotectives, Mn & Vit C), and protects the muscles' strength (antioxidants & glutamic acid) to power ADL as well as IADL. Another hindering concern to independency is Urge Incontinence for which HEMOCARE SENIOR provides adequate magnesium equivalent to the RDA.

Graph: Incidences (%) of functional disabilities in the elderly.³⁴⁴



HEMOCARE SENIOR is a comprehensive blend of ingredients that has potential to manage not only diseases and disorders but even disabilities. Hence, HEMOCARE SENIOR is so comprehensive that it will not only add years to life and life to years but also can facilitate youthful living by fostering functional capacity.

HEMOCARE SENIOR is just THE right support for the elderly Indian.

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