



HEALTHY AGING

The Ayurveda Way



Healthy Aging The Ayurveda Way

Demographics of an Aging Society



In most parts of the world, people are living longer than ever before. This, combined with improving survival at young ages, can lead to an increase in the aging population. In some countries like Germany, the proportion of the population over age 65 (22%) greatly outnumbered children under age 14 (12.8%) (CIA 2018). Over the past century, the US census has shown the median age of Americans increased from 30.2 years in 1950 to 38.1 years in 2017. Currently, 47% of Americans are older than age 40.

The likelihood of maintaining good health during the later stages of life varies between countries and regions within countries. Healthy life expectancy (HLE) is a statistic that combines mortality data with health status data to estimate expected years of life in good health at any given age (CDC, 2013). HLE accounts for both the quantity and quality of life. In 2016, the HLE for Americans at birth was 68.5 years (WHO 2018a). HLE varies considerably by state, with southern states having the lowest HLE.

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Healthy Aging is One of the Fastest Growing Wellness Categories

Healthy aging is the focus of the World Health Organisation's work on aging between 2015 and 2030. WHO defines healthy aging as "the process of developing and maintaining the functional ability that enables wellbeing in older age" [WHO 2018b]. Functional ability is about having the capabilities that enable all people to be and do what they have reason to value. This includes a person's ability to:

- **meet their basic needs;**
- **to learn, grow and make decisions;**
- **to be mobile;**
- **to build and maintain relationships; and**
- **to contribute to society.**

Age related decline in mobility, memory, sensory perception, digestion, immune and skin health along with increased stress are known to significantly impact the health of aging population (Rémond et al. 2015). Strategies for healthy aging include eating a balanced diet, getting regular exercise, getting the right amount of sleep, attending periodic health screenings, and remaining socially active. Ideally, people want to continue the same active lifestyle they have in their 40's and 50's until age 65 and beyond.

As a result, the market for healthy aging products is rapidly expanding. Younger consumers are looking for products to maintain their current level of health, while older consumers are seeking products to manage chronic health problems associated with aging. Age 50+ consumers are on course to be the largest, fastest-growing and wealthiest section of the population in most developed markets (Crook 2017).

Management of Health Conditions Linked to Aging



Several health categories are associated with aging including joint, bone, skin, cardiovascular, eye, brain (cognitive and memory), and menopause. Other categories like digestive health, sleep, stress, and sexual health concern both younger and older adults. Table 1 lists health categories primarily associated with aging along with some common OTC /pharmaceutical management groups.

Poor health habits and many factors associated with modern life contribute to compromised health during aging. Sedentary jobs, too much screen time, physical inactivity, not enough time outdoors, lack of sleep, loneliness, and social media are hallmarks of our modern lives. Insufficient sleep and social isolation particularly affect mood and ability to concentrate. Shopping for and preparing healthy meals is burdensome compared to grabbing a quick bite of highly processed convenience foods full of empty calories and preservatives. This is especially true for older adults with disabilities who find food preparation difficult. Poor nutrition can drag down the immune system and digestive health, leaving an individual feeling sluggish. Together, all these ingredients of our modern lives make up a recipe for ill health among older people (WHO 2018c).



Table 1. Health categories, their characteristics, and OTC/Pharma management

HEALTH CATEGORY	HEALTH CONCERN	MANAGEMENT OPTIONS
Joint	Reduced joint function	acetaminophen, anti-inflammatory/NSAIDS
Bone	Risk of fracture	Bisphosphonates
Skin	Wrinkles, loss of firmness	Retinoids
Cardiovascular	Hypertension, cholesterol imbalance	Statins, aspirin
Eye	Age-related macular degeneration	Ranibizumab, Aflibercept
Brain	Cognitive decline, memory loss	Donepezil
Menopause	Hot flashes, night sweats	Estrogens
Digestion	Constipation, heartburn	Fiber, probiotics, antacids, proton pump inhibitors

In addition to vitamins, herbs, natural products, and pharmaceuticals, there are lifestyle approaches to improve or maintain health. Exercise is recommended for both cardiovascular and bone health. Maintaining an active social and intellectual life may help preserve brain and emotional health and extend longevity. Avoiding UV exposure reduces skin wrinkles and the risk of macular degeneration. A heart-healthy diet is recommended for cardiovascular disease. Together, lifestyle approaches can make a significant contribution to health and wellness.

Common Aging Problems Impact Quality of Life

Depending on the severity, any of the health problems associated with aging can have a significant impact on quality of life. Joint pain can persuade a person to give up a favorite sport or hobby. Fractures from osteoporosis, especially hip fracture, cause considerable pain and can dramatically affect mobility. Reduced physical



Side effects from pharmaceuticals can be very troublesome and have a negative impact on quality of life.

activity can lead to or exacerbate problems like obesity, cardiovascular disease, and diabetes. Disabilities and hectic schedules can make healthy food preparation difficult, leading to poor nutrition and digestive problems. Changes in memory are a normal part of aging, but some people experience significant cognitive decline, leading to functional impairments. Demanding life events and daily stressors can weaken the ability to face the challenges of aging and adapt to losses late in life. A stressful, socially isolated lifestyle may reduce mental fitness and the ability to concentrate at work. Side effects from pharmaceuticals can also be very troublesome and have a negative impact on quality of life.

Side Effects of Pharmaceuticals



Pharmaceuticals are recommended for many conditions associated with aging, especially cardiovascular disease, osteoarthritis, mild general pain, brain health, respiratory and gastrointestinal issues. Long-term use of statins to control high cholesterol can cause muscle pain, digestive problems, mental decline, type 2 diabetes, and liver damage (Mayo Clinic 2016). Some people experience digestive problems from low-dose aspirin prescribed to reduce the risk for heart attacks and stroke. Steroidal and non-steroidal anti-inflammatory substances (NSAIDs) are prescribed for osteoarthritis to reduce pain and inflammation; long-term use of NSAIDs can cause digestive problems including peptic ulcers. Oral

corticosteroids have a different set of side effects. Short-term problems include elevated pressure in the eyes (glaucoma), fluid retention, high blood pressure, psychological effects, and weight gain (Mayo Clinic 2015). Longer-term use can cause cataracts, diabetes, increased risk of infection, osteoporosis, and impaired wound healing (Mayo Clinic 2015).

Natural Remedies for Healthy Aging—BacoMind[®], GutGard[®], Tumacin[®], Ocibest[®] and AP-Bio[®]

From maintaining a sharp, stress-free mind to keeping your digestive system moving and maintaining healthy joints, Natural Remedies offers a number of clinically tested herbal ingredients to support healthy aging. BacoMind[®], GutGard[®], Tumacin[®], Ocibest[®] and Ap-Bio[®] all originate from Ayurveda, an Indian medical system that is over 3,000 years old. Ayurveda promotes the use of herbal remedies along with the concept of universal interconnectedness among people and their health. Ayurvedic practitioners recommend individualized health strategies including herbs, diet, exercise, and lifestyle modifications to maintain optimal health during aging.

Brain Health



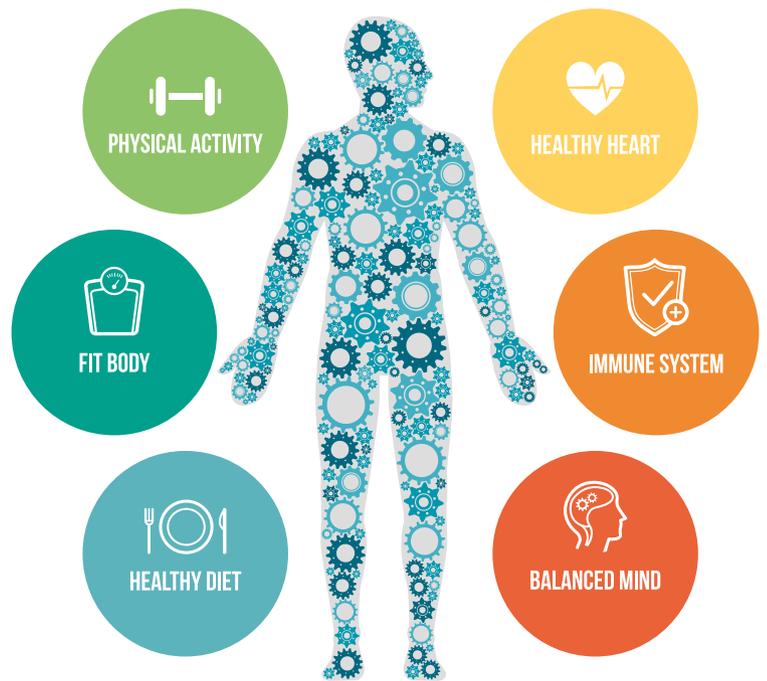
Human aging involves morphological changes in the brain, neurochemical alterations, and increased oxidative stress that are attributed to age-associated cognitive decline (AACD). AACD results in cognitive deficits that lead to reduced quality of life. Morphological changes include a decline in neuronal dendrite length and branching (Merluzzi et al. 2016). Neurochemical changes involve a decline in dopamine, cholinergic, and glutamatergic activity (Anyanwu 2007). Additionally, increased damaging oxidative stress due to an imbalance between reactive oxygen species and antioxidant defenses occurs during aging.

BacoMind[®] is a patented, clinically tested 'memory and cognition enhancing' standardized phytochemical composition containing a unique full-spectrum extract with nine different bioactive ingredients derived from

Bacopa monnieri. Also called water hyssop, *B. monnieri* is rich in triterpenoid saponins called bacosides.

BacoMind[®] has been shown to increase dendritic length and dendritic branching in animal models, helping neuronal communication (Vollala et al. 2011). In an in vitro study

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by Dethe et al. (2016), BacoMind® normalized neurotransmitter activity by inhibiting the enzymes catechol-O-methyl transferase (COMT) and prolyl endopeptidase (PEP). These enzymes degrade neurotransmitters/neuropeptides involved in neurotransmission and cognition. BacoMind® thus spared neurotransmitters such as dopamine, epinephrine, and norepinephrine and neuropeptides such as substance P, making them available for cognitive enhancement. By antagonizing the 5HT6 serotonin receptor, BacoMind® improved cholinergic and glutamatergic transmission (Dethe et al. 2016). It also reduced mitochondrial reactive oxygen species production and protected mitochondrial integrity by inhibiting poly (ADP-ribose) polymerase (PARP) (Dethe et al. 2016). By protecting the mitochondria, it protects against neuronal cell death.

BacoMind® has multiple modes of action affecting dendrite morphology, neurotransmitters, and neuroprotection. These properties may improve cognitive deficits in elderly populations. BacoMind®'s cognitive enhancing effects in the elderly were observed in clinical trials when BacoMind® was administered from 300–450 mg per day for 12 weeks.

In a randomized, double-blind, placebo-controlled clinical trial (Barbhaiya et al. 2008), sixty-two adults age 50-75 without memory impairment received either 450 mg BacoMind® or placebo daily for twelve weeks. A battery of nine neuropsychological tests showed participants in the BacoMind® group had improved attention and verbal memory compared to placebo.

In a 2010 randomized, double-blind, placebo-controlled clinical trial (Morgan and Steven 2010), 98 healthy adults over age 55 received either 300 mg/day BacoMind® or placebo for twelve weeks. At baseline and twelve weeks, subjects underwent neuropsychological testing including audio- verbal and visual memory performance. At the end of the trial, Bacomind® significantly improved memory acquisition and retention compared to placebo (Morgan and Steven 2010).

Gastrointestinal Health

Aging impacts the gastrointestinal tract from taste receptors and chewing to colonic functions. Impairments may affect gut motility/food transit, gastric secretions, intestinal microflora balance, intestinal barrier function/permeability, and intestinal immunity (Firth and Prather 2002; Rémond et al. 2015). These impairments could lead to functional dyspepsia or indigestion, early satiety, gastroesophageal reflux disease (GERD), and/or constipation (Firth and Prather 2002). More importantly, depression and appetite as well as the gut microbiota have been linked to various brain activities, creating a connection between GI health and brain health. Gutgard® is a patented, flavonoid-rich phytochemical composition for improving gut health derived from *Glycyrrhiza glabra*. Gutgard® can be safely incorporated or combined with probiotics and digestive enzymes for improved gut health.

Gutgard® has exhibited profound effects on improving gastric motility in rats (Murugan et al. 2017). In a Gutgard® human clinical trial, these effects contributed to relieving functional dyspepsia symptoms such as loss of appetite, bloating, belching, fullness, heartburn, and regurgitation. Further, Gutgard® restored the intestinal permeability in in vitro gut barrier models and inhibited TNF-alpha-induced disruption in the epithelial barrier.

In a randomized, double-blind, placebo-controlled study (Raveendra et al. 2012), Gutgard® was shown to be beneficial for occasional indigestion. Subjects received either 75 mg Gutgard® (n=25) or placebo (n=25) orally twice daily for 30 days. After 15 and 30 days, the severity of upper abdominal complaints and quality of life improved in the Gutgard® group, with much less improvement in the placebo group.

Gutgard® also inhibits the growth of pathogens such as *Staphylococcus aureus* in vitro (Fukai et al. 2002; Mitscher et al. 1980) but not that of friendly bacteria such as *Lactobacillus casei*, *L. fermentum*, *L. plantarum*, and *Streptococcus thermophilus* (Asha et al. 2017). Accordingly, Gutgard® may help balance the gut microbiota by inhibiting opportunistic pathogens without affecting beneficial bacteria. This is beneficial in maintaining gut-brain axis function, thus improving gastrointestinal and nerve health.

Gutgard® has demonstrated anti-*H. pylori* activity in clinical studies (Possemiers et al. 2011), in vivo (Kim et al. 2013), and in vitro studies (Asha et al. 2013). It inhibits the



Gutgard®

protein synthesis, DNA gyrase, and dihydrofolate reductase (Asha et al. 2013) of the bacteria, compromising its functioning. It also interrupts the inflammatory cascade in an individual (Chandrasekhar et al. 2011; Thiyagarajan et al. 2011) and has antioxidant activity (Mukherjee et al. 2010).

In a randomized, double-blind, placebo-controlled study Gutgard[®] was shown to successfully manage *H. pylori* (Puram et al. 2013). Participants with *H. pylori* infection [positive stool antigen test (HpSA), and 13C-urea breath test (13C-UBT)] received either 150 mg of Gutgard[®] (n=55) or placebo (n=52) orally once daily for 60 days. After 60 days, 28 subjects in the Gutgard[®] group had a negative HpSA, compared to 2 subjects with negative HpSA in the placebo group. Twenty-four participants in the Gutgard[®] group had a negative 13C-UBT compared to one subject in the placebo group.

Joint Health

Turmacin[®] is the first clinically tested water-soluble composition derived from turmeric (*Curcuma longa*) that is completely untouched by solvents and is recommended for joint health.

Turmacin[®] is standardized to contain bioactive polysaccharides called Turmerosaccharides[™]. Unlike most turmeric extracts, it does not contain curcuminoids.

Turmacin[®] has demonstrated analgesic effects (Neha et al. 2009) and anti-inflammatory effects (Bagad et al. 2013; Illuri et al. 2015; Senthilkumar et al. 2014) in vivo. Possible modes of anti-inflammatory action include inhibition of the pro-inflammatory interleukin-12 (IL-12) and prostaglandin (PGE₂) (Chinampudur et al. 2013).



Turmacin

Turmacin[®] relieved joint pain and restored function in a randomized, single-blind, placebo-controlled trial (Madhu et al. 2013). Participants (n=120) with primary knee osteoarthritis received either placebo (400 mg twice daily), Turmacin[®] (500 mg twice daily), glucosamine sulphate (750 mg twice daily), or a combination of Turmacin[®] and glucosamine sulphate for 42 days. Efficacy was assessed during the treatment period, on day 21 and day 42. Post-treatment scores of subjective pain and function of the affected knee and clinical examination showed a significant decrease in the Turmacin[®] group compared to placebo.



Stress Management



OciBest[®] is a clinically proven, standardized phytochemical composition derived from the holy basil plant, *Ocimum tenuiflorum*. OciBest[®] has been shown in clinical and pre-clinical studies to substantiate its beneficial effect in stress management.

In a pre-clinical study, OciBest[®] significantly increased body weight gain and decreased immobility time compared to placebo (Jothie et al. 2016). This suggests animals in the OciBest[®] group experienced less stress. Possible modes of action include inhibition of the adrenal stress response [inhibition of cortisol release and 11 β -

hydroxysteroid dehydrogenase type 1 (11 β -HSD1)] and reduced anxiety [inhibition of catechol-O-methyltransferase (COMT) activity and corticotropin-releasing hormone receptor 1 (CRHR1) receptor antagonist activity].

In a human clinical trial, OciBest[®] controlled generalized stress in a randomized, double-blind, placebo-controlled study. Participants received either placebo (n = 79) or OciBest[®] (n = 71; 1200 mg of actives per day) for six weeks. Severity of stress-related symptoms was self-evaluated by subjects at weeks 0, 2, 4 and 6 of the trial period using a symptom rating scale. After six weeks, subjects in the OciBest[®] group saw an improvement in forgetfulness, sexual problems of recent origin, frequent feeling of exhaustion, and frequent sleep problems of recent origin compared to control (Saxena et al. 2012).

Immune Health



Aging presents several challenges for the immune system. Although the incidence of common cold declines with age, the severity of symptoms and the risk of complications such as lower respiratory illness are higher in elderly individuals (Nicholson et al. 1996). Managing symptoms and boosting the immune response can help reduce the progression of uncomplicated upper respiratory tract infection and complicated lower respiratory illness.

AP-Bio[®] is a clinically tested, standardized phytochemical composition derived from the plant *Andrographis paniculate*,



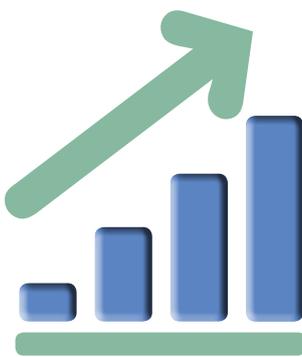
which is used widely in Ayurvedic medicine. Its activity is most often attributed to the diterpene andrographolide and related phytochemicals. Andrographolide has been reported to have in vitro anti-inflammatory and immunostimulant properties (Shen et al. 2002, Kumar et al. 2004;

Sechet et al. 2018). *Andrographis paniculata* extracts have been tested in several pre-clinical and clinical trials for its immune health efficacy (Melchior et al. 1997; Caceres et al. 1997; Melchior et al. 2000; Gabrielian et al. 2002; Saxena et al. 2010).

In three randomized, double-blind, placebo-controlled clinical studies, a total of 582 adults with uncomplicated acute upper respiratory infections using 200-1020 mg *Andrographis paniculata* extract for 3-5 days showed about 50-86% improvement in symptoms after three days compared to placebo (Melchior et al. 2000; Saxena

et al. 2010; Gabrielian et al. 2002). The improvement was greater with higher dose *Andrographis paniculata* (1020 mg), where patients showed 86% improvement on day 3 compared to only a 23% improvement in placebo (Gabrielian et al. 2002). AP-Bio® (>30% andrographolide w/w) reduced upper respiratory symptoms such as cough, nasal discharge, headache, fever, sore throat, fatigue, and sleep disturbance from day one, but provided more benefits than placebo from day 3-5 of the study (Saxena et al. 2010).

Product Development and Innovation—Trends and Opportunities



BacoMind® offers a clinically validated solution to manage age-associated cognitive deficits. BacoMind® is available as a free flowing powder that can easily be formulated into gummies or tablets. Its unique soft extraction process retains active ingredients. BacoMind® has been safety tested in adults, and is GRAS approved with a recommended dosage of 300 to 450 mg/day.

Gutgard®'s powder form, neutral taste and small dose load (150 mg) provide flexibility in formulation, making it suitable for tablets, functional foods, and beverages. Its low water activity ensures compatibility with prebiotics, probiotics, and digestive enzymes; laboratory studies have confirmed that Gutgard® does not affect the viability of these ingredients when formulated together (Asha et al. 2017).

Turmacin® is a spray-dried water-soluble extract for easy formulation. It is rich in Turmerosaccharides™ and untouched by solvents during the extraction process. It can be formulated in both solid and liquid products such as gummies, capsules, tablets, and powdered beverages.

OciBest® is chemically and biologically standardized to contain > 0.1% w/w ociglycosides, with five bioactive anti-stress agents. It is manufactured in a GMP, ISO 9001:2000 and ISO 22000:2005 certified manufacturing facility with Kosher and Halal certifications. The recommended dose for adults is 1200 mg/day in 3 divided doses.

AP-Bio® is available as a free-flowing powder, custom formulated and specifically tailored to meet dietary/nutraceutical specifications. All Natural Remedies brands are non -GMO Project Verified.

About Natural Remedies

Natural Remedies is a global -research driven botanical healthcare company whose core competency lies in manufacturing standardized herbal extracts. It's branded portfolio which include BacoMind[®], Gutgard[®], Turmacin[®], OciBest[®] and Ap- Bio[®] are clinically substantiated, scientifically validated innovations. Known as a leader in scientifically based botanical extracts, Natural Remedies has contributed to various international pharmacopeia including over 100 monographs internationally and over 220 phyto-compounds isolated for global reference standards. Its vision is to harness nature and apply science for health and happiness.

Write us to learn more about our products: hnp@naturalremedy.com

Citations

- Anyanwu EC. Neurochemical changes in the aging process: implications in medication in the elderly. *The Scientific World Journal*. 2007;7:1603–1610.
- Asha MK, et al. In vitro anti-Helicobacter pylori activity of a flavonoid rich extract of Glycyrrhiza glabra and its probable mechanisms of action. *Journal of Ethnopharmacology*. 2013;145(2):581–6.
- Asha MK, Debraj D, Dethe S, Bhaskar A, Muruganantham N, Deepak M. Effect of flavonoid-rich extract of Glycyrrhiza glabra on gut-friendly microorganisms, commercial probiotic preparations, and digestive enzymes. *J Diet Suppl*. 2017;14(3):323-333.
- Barbhaiya et al. Efficacy and tolerability of BacoMind[®] on memory improvement in elderly participants - A double blind placebo controlled study. *J. Pharmacol. Toxicol*. 2008;3:425–434.
- Bagad AS, Joshuallan AJ, Natarajan B, Amit A, (2013), Comparative evaluation of anti-inflammatory activity of curcuminoids, turmerones, and aqueous extract of Curcuma longa. *Advances in Pharmacological Sciences*. 2013:805756.
- Caceres DD, Hancke JL, Burgos RA, Wikman GK. Prevention of common colds with Andrographis paniculata dried extract. A pilot double blind trial. *Phytomedicine*. 1997;4:101–104.
- CDC. State-Specific Healthy Life Expectancy at Age 65 Years — United States, 2007–2009. *Morbidity and Mortality Weekly Report (MMWR)*. 2013;62(28):561–566.
- Chandrasekaran CV, et al. Dual inhibitory effect of Glycyrrhiza glabra (Gutgard[®]) on COX and LOX products. *Phytomedicine*. 2011;18(4): 278–84.
- CIA. *The World Factbook 2018*. Washington, DC: Central Intelligence Agency, 2018.
- Crook I. Healthy Aging: Targeting Older Consumers. *Nutraceuticals World*. 05.01.17. https://www.nutraceuticalsworld.com/issues/2017-05/view_features/healthy-aging-targeting-older-consumers/1191

- Dethe S, Deepak M, Agarwal A. Elucidation of molecular mechanism(s) of cognition enhancing activity of Bacomin®: a standardized extract of *Bacopa monnieri*. *Pharmacogn Mag.* 2016; 12(Suppl 4): S482–S487.
- Illuri R et al. Anti-inflammatory activity of polysaccharide fraction of *Curcuma longa* (NR-INF-02). *Anti-inflammatory & Anti-allergy Agents in Medicinal chemistry.* 2015;14(1):53–62.
- Firth M, Prather CM. Gastrointestinal motility problems in the elderly patient. *Gastroenterology.* 2002;122(6):1688-700.
- Fukai T, Marumo A, Kaitou K, Kanda T, Terada S, Nomura T. Anti-*Helicobacter pylori* flavonoids from licorice extract. *Life Sci.* 2002;71(12):1449–63.
- Gabrielian ES, Shukarian AK, Goukasova GI, Chandanian GL, Panossian AG, Wikman G, Wagner H. A double blind, placebo-controlled study of *Andrographis paniculata* fixed combination Kan Jang in the treatment of acute upper respiratory tract infections including sinusitis. *Phytomedicine.* 2002;9(7):589–97.
- Jothie RE, et al. Anti-stress activity of *Ocimum sanctum*: Possible effects on hypothalamic-pituitary-adrenal axis. *Phytotherapy Research.* 2016;30(5):804–15.
- Kim JM, Zheng HM, Lee BY, Lee WK, Lee DH. Anti-*Helicobacter pylori* properties of Gutgard®. *Preventive Nutrition and Food Science.* 2013;18(2):104–110.
- Kumar RA, Sridevi K, Kumar NV, Nanduri S, Rajagopal S. Anticancer and immunostimulatory compounds from *Andrographis paniculata*. *J Ethnopharmacol.* 2004;92(2-3):291–5.
- Madhu K, Kulkarni C, Saji MJ. Safety and efficacy of *Curcuma longa* extract in the treatment of painful knee osteoarthritis: a randomized placebo- controlled trial. *Inflammopharmacology.* 2013;21(2):129–36.
- Mayo Clinic Staff. Prednisone and other corticosteroids. Nov. 26, 2015. <https://www.mayoclinic.org/steroids/art-20045692>
- Mayo Clinic Staff. Statin side effects: Weigh the benefits and risks. April 26, 2016. <https://www.mayoclinic.org/diseases-conditions/high-blood-cholesterol/in-depth/statin-side-effects/art-20046013>
- Melchior J, Palm S, Wikman G. Controlled clinical study of standardized *Andrographis paniculata* extract in common cold—a pilot trial. *Phytomedicine.* 1997;3:315–318.
- Melchior J, Spasov AA, Ostrovskij OV, Bulanov AE, Wikman G. Double blind, placebo-controlled pilot and phase III study of activity of standardized *Andrographis paniculata* Herba Nees extract fixed combination (Kanjang) in the treatment of uncomplicated upper-respiratory tract infection. *Phytomedicine.* 2000;7:341–350.
- Merluzzi et al. Age-dependent differences in brain tissue microstructure assessed with neurite orientation dispersion and density imaging. *Neurobiol Aging.* 2016; 43: 79–88.
- Mitscher LA, Park YH, Clark D, Beal JL. Antimicrobial agents from higher plants. Antimicrobial isoflavonoids and related substances from *Glycyrrhiza glabra* L. var. *typica*. *J Nat Prod.* 1980;43(2):259-69.
- Morgan A, Stevens J. Does *Bacopa monnieri* improve memory performance in older persons? Results of randomized, placebo-controlled double-blind trial. *The Journal of Alternative And Complimentary Medicine.* 2010;16(7):753–759.
- Mukherjee M, et al. Anti-ulcer and antioxidant activity of Gutgard®. *Indian Journal of Experimental Biology.* 2010;48:269–274.
- Murugan S, Velusami CC, Bethapudi B, Illuri R, Mundkinajeddu D. Effect of flavonoid rich root extract of *Glycyrrhiza glabra* on gastric emptying and gastrointestinal transit in Albino Wistar rats. *SOJ Pharmacy and Pharmaceutical Sciences.* 2017;4(2):1–4.
- Neha S, Ranvir GD, Jangade CR. Analgesic property of different extracts of *Curcuma longa* (Linn): an experimental study in animals. *Veterinary World.* 2009;2(8):304–306.
- Nicholson KG, Kent J, Hammersley V, Cancio E. Risk factors for lower respiratory complications of rhinovirus infections in elderly people living in the community: prospective cohort study. *BMJ.* 1996;313(7065):1119–23.
- Possemiers S, Bolca S, Verstraete W, Heyerick A. The intestinal microbiome: A separate organ inside the body with the metabolic potential to influence the bioactivity of botanicals. *Fitoterapia.* 2011;82(2011): 53–66.
- Puram S, et al. Effect of Gutgard® in the management of *Helicobacter pylori*: A randomized double blind placebo controlled study. *Evidence-Based Complementary and Alternative Medicine.* 2013:263805.
- Raveendra KR, et al. (2012) An extract of *Glycyrrhiza glabra* (Gutgard®) alleviates symptoms of functional dyspepsia: A randomized, double-blind, placebo-controlled study. *Evidence Based Complementary and Alternative Medicine,* 2012: 216970.
- Rémond et al. Understanding the gastrointestinal tract of the elderly to develop dietary solutions that prevent malnutrition. *Oncotarget.* 2015 Jun 10;6(16):13858-98.

- Saxena et al. Efficacy of an extract of *Ocimum tenuiflorum* (OciBest[™]) in the management of general stress: A double-blind, placebo-controlled study. *Evidence-Based Complementary and Alternative Medicine*. 2012; 894509.
- Sechet E, Telford E, Bonamy C, Sansonetti PJ, Sperandio B. Natural molecules induce and synergize to boost expression of the human antimicrobial peptide β -defensin-3. *Proc Natl Acad Sci U S A*. 2018;115(42):E9869–E9878.
- Senthilkumar A, Joshua AJ, Bharathi B, Amit A. Anti-inflammatory effects of Turmeric (*Curcuma longa*) extracts on acute and chronic inflammation models. *Journal of Korean Society Food Science and Nutrition*. 2014;43(1):612–617.
- Shen YC, Chen CF, Chiu WF. Andrographolide prevents oxygen radical production by human neutrophils: possible mechanism(s) involved in its anti-inflammatory effect. *Br.J.Pharmacol*. 2002;135:399–406.
- Thiyagarajan P, Chandrasekaran CV, Deepak HB, Agarwal A. (2011) Modulation of lipopolysaccharide-induced pro-inflammatory mediators by an extract of *Glycyrrhiza glabra* and its phytoconstituents. *Inflammopharmacology*, 19(4):235–41.
- Vollala VR, Upadhy S, Nayak S. Effect of *Bacopa monniera* Linn. (brahmi) extract on learning and memory in rats: A behavioral study. *Journal of Veterinary Behavior*. 2010;5(2):69–74.
- WHO 2018a. Life expectancy and Healthy life expectancy Data by country. World Health Organization, Geneva.
- WHO 2018b. Ageing and life-course. <http://www.who.int/ageing/healthy-ageing/en/> Accessed October 01, 2018.
- WHO 2018c. Risk factors of ill health among older people. World Health Organization, Geneva. <http://www.euro.who.int/en/health-topics/Life-stages/healthy-ageing/data-and-statistics/risk-factors-of-ill-health-among-older-people>