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Review Paper

## FOREST THERAPY AS A PREVENTIVE APPROACH IN INTEGRATIVE MEDICINE

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**Abstract:** *Efforts to develop general knowledge about the preventive role of forests in reducing the occurrence of various diseases point to the necessity of applying all the health benefits that forest ecosystems provide to society. In addition to the abundance of medicinal plants, forest ecosystems offer numerous therapeutic functions-auditory, visual, tactile, and olfactory-which play a significant role in disease prevention. These functions, combined with the use of herbal therapy, contribute to a holistic approach to healing and the application of integrative medicine, which focuses on individual needs and connects traditional and modern medical practices. Phytotherapy plays an important role in integrative medicine as it contributes to strengthening the immune system, regulating hormones, and preventing disease. Inhaling phytoncides-bioactive compounds released by plants - reduces the secretion of stress hormones (such as cortisol), while simultaneously strengthening the immune system and alleviating conditions such as anxiety, chronic fatigue, obesity, depression, memory impairment, and heart disease. Forest therapy also increases the activity of natural killer (NK) cells, which positively affects overall resilience and improves general health. The aim of this paper is to synthesize existing knowledge on the preventive and therapeutic role of forests within the framework of integrative medicine, based on previous research. The methodology applied involves analysis and synthesis of relevant studies related to the therapeutic effects of forest environments on disease prevention in humans. The synthesis of numerous research findings shows that forests positively influence emotional, introspective, and cognitive aspects of human personality, thereby encouraging self-reflection and strengthening psychophysical resilience.*

**Key words:** *Therapy, forest, disease, medicine*

## **Introduction**

Forest ecosystems provide many advantages for preventive protection and preservation of human health. Numerous studies show that this is due to the synergy of environmental factors that interact with each other in a complex and interactive way in the forest, but also in synthesis with the human body [1, 2, 3, 4]. Namely, the immune system of the human body gradually developed and adapted to the nature in which it lived. Modern society goes to nature to "reconnect" itself and to awaken in itself a primordial sense of belonging to nature when it finds itself in direct contact with it. The immeasurable benefits of plants from the forest are often treated as sacred. Each God has been associated with a particular plant, thereby its conservation is ensured [5]. The beginning of human bioethics arose as a consequence of the attitude towards the use of plants [6], The concept of wilderness originated as a social construct because man was originally a part of nature, not outside of it. [7]. This combination of the relationship between man and plants, which make up the basic building block of forests, is especially evident when it comes to human health. Modern medicine pays special attention to preventive care for human health. The use of non-wood products offered to us by forest ecosystems, as specific ecological factories, is of great importance for preventive medicine. These products are primarily made up of oxygen, drinking water, medicinal plants, mushrooms, etc. [8]. Preventive medicine, together with hygiene, plays an important role for human health because it deals with the prevention and suppression of diseases. The effects that the forest provides to people during their stay in it primarily have a preventive role to improve human health. Modern medicine pays great attention to the preventive protection of human health by implementing appropriate measures that prevent many diseases in everyday life by strengthening the immune system of the human body. Preventive medicine is considered one of the most humane areas of medicine, because it seeks to prevent the occurrence of diseases. The main goals of preventive medicine are contained in the improvement of general health as well as the prevention of the occurrence of various specific diseases in humans. Many studies prove that increasing physical activity in the forest affects the reduction of chronic coronary artery disease, hypertension, obesity, type 2 diabetes and osteoporosis [9]. Integrative medicine combines conventional medicine methods on research that is based on complementary treatments to provide people with appropriate health care. The main goal of integrative medicine is a scientific and holistic approach to patients that enables the harmonization of classical and complementary medicine with a focus on the treatment of the causes of the disease and the personalization of therapies including a healthier lifestyle, nutrition, physical activity. Integrative medicine is a synergy of biomedicine, conventional medicine with different modalities of complementary medicine. The effects that are achieved within the various functions of forests can be of great importance in the application of integrative medicine. The functions of forests related to health and recreation are the essence of non-profit functions [10, 11, 12, 13] and are receiving increasing attention in the context of preventive protection of human health.

## The Impact of Forest Air on Human Health

Forest air is very rich in negative ions ("vitamins from the air"), the concentration of which is highest next to waterfalls in the forest [14]. Of particular importance are phytoncidal substances in the forest, which neutralize positive ions that have a negative effect on the human body. Phytoncides help to balance bioenergy fields and energy in the human body. After inhalation, aerosols from the forest stimulate biochemical reactions that lead to the balance of human metabolism, facilitate breathing, strengthen the immune system, improve blood circulation, alleviate the symptoms of allergies, asthma and other diseases of the respiratory organs, neutralize the effects of stress, ensure good sleep, slow down the aging process, etc. [15]. Phytoncides found in forest aerosols belong to volatile substances found in flowers, roots, fruits of plants, etc. It is believed that about 87 families and 2,000 species of plants produce volatile oils that are found in different parts of plants, and predominantly in families *Lamiaceae*, *Rutaceae*, *Piperaceae*, *Zingiberaceae*, *Apiaceae* and *Myrtaceae*. Volatile oil from the leaves *Zanthoxylum rhoifolium* Lam and certain terpenes. ( $\alpha$ -humulen,  $\beta$ -kariofilen,  $\alpha$ -pinen i  $\beta$ -pinen) They exhibit antitumor efficacy and significant immunomodulatory activity in vivo and in vitro. Essential oil from the *Pinus mugo* exhibits antioxidant properties. Coniferous tree species can also contain essential oils in tissues. Recent studies have shown that phytoncides, especially terpenoids, are  $\alpha$ -pinen and  $\beta$ -pinen as bioactive compounds, they affect the immune, nervous and endocrine systems [16]. In a number of plant species, volatile odorous mixtures are found in the form of secondary metabolites that can be distilled using water vapor. The specific smell in the forest is caused by aerosols emitted by forest trees. Aerosols are rich in essential oils containing phytoncides, and these substances, in addition to being used by trees to protect against diseases and pests, build the human immune system and have antibacterial and antiviral effects [17], reduce the level of the hormone cortisol in the blood, which is an indicator of stress, regulate blood pressure and increase the number of cells that fight cancer. The immune system in humans, after staying in the forest for only 2-3 hours, increases by as much as 50% and lasts with a gradual decline for about 15 days [18]. The smell of forest soil is particularly specific because it emits a special phytoncide, geosmin, which has antiviral effects. It is the main ingredient of natural resin and belongs to turpentine. Geosmins are formed in terrestrial bacteria and are also the basis for the production of antibiotics. Their smell can be detected in incredibly small amounts which is interesting, in the equivalent of seven drops of geosmin in an entire pool of water [19]. Coniferous forests (e.g. Japanese cypress, *Chamaecyparis obtusa*) are rich in essential oils whose phytoncides increase the possibility of healing from cancer. The main ingredients of Japanese cypress essential oils are camphor, terpenes, pineapples and humulins, as well as lemon and sabinenes, depending on the time of year (prevents atopic dermatitis and relieves symptoms of asma [20]. The new concept of "forest therapy" that has emerged in Japan is the result of the National Health Program for "forest bathing," or Shinrin-yoku. This concept was introduced in 1982 by the Japan Forest Agency to manage the stress of its workers. It is actually a forest aromatherapy that aims to inhale phytoncides ( $\alpha$ -pinen and limonen etc.) which forms the basis of forest medicine, which belongs to

the category of alternative and preventive medicine, and studies the effects of forest environments (forest bathing/Shinrin-yoku) on human health [24]. Shinrin-yoku increases the activity of human cells, natural killer cells of cancer cells, reduces blood pressure and heart rate, showing a preventive effect on hypertension and heart disease. In addition, it reduces stress hormones, such as urinary adrenaline and norepinephrine, increases the activity of the parasympathetic nerves and decreases the activity of the sympathetic nerves to stabilize the balance of the autonomic nervous system, improves sleep, increases the levels of serum adiponectin and dehydroepiandrosterone sulfate, reduces anxiety, depression, fatigue and confusion, and increases the preventive effects on depression. The new concept of forest medicine is based on a return to nature - „forest selfness“. The process of rest and recovery in this new concept takes place in the healthiest environment – nature and uses the therapeutic properties of its soothing colors, sounds and fresh air. "Forest Selfness is a new trend of green tourism, which includes physical activity, relaxation, detox, numerous methods of self-healing and improving one's own self-image. This method, in addition to instant satisfaction, also offers long-lasting effects of rest and the satisfaction of the deepest needs of our being. That is why it is very topical in urban forests [21] because cities are burdened with numerous factors that endanger the environment and negatively affect human health (dust, noise, summer high temperatures, intensive traffic etc.).

### **The Importance of Forest Plants for Preventive Health Protection and Human Treatment**

In one of the oldest written medical documents (the ancient Egyptian Papyrus ebers, 1500 BC) it is written that forest plants are among the oldest medicines used by man. The founder of one of the oldest pharmaceutical disciplines based on plant treatment, Pedanius Dioscorides, in his work "De materia medica" from 1655, emphasizes the importance of plants for preventive health preservation and treatment of people. Forest plants (trees, shrubs and ground flora) provide numerous benefits because various teas, tinctures and essential oils are obtained from them. Fir essential oil relaxes muscles and relieves respiratory problems, oak bark tincture soothes inflammation of the skin and mucous membranes, yellow comfrey (*Symphytum tuberosum*) used to repair injuries, tea from blackberry leaves (*Rubus fruticosus*) helps regulate the digestion of food, while ivy (*Hedera helix*) and pulmonary (*Pulmonaria officinalis*) it's very useful for improving breathing. In addition to the traditional ways of preparing medicinal natural drinks, conventional medicines of plant origin are produced in modern medicine, such as: Acetylsalicylic acid (It is obtained from the bark of willow *Salix* sp.), Digoxin (It is obtained from the plant thimble *Digitalis* sp. and snaps *Antirrhinum*), Morfin (It is produced from unripe poppy cocoons *Papaver somniferum*), Artemizinin (It is made from sweet wormwood *Artemisia annua* which belongs to the family of heads *Asteraceae*), Vinkristin (It is produced from the oleander species *Catharanthus roseus* which belongs to the family *Oleandera*), Quinin (It is produced from the bark of several types of quinine *Cinchonia pubescens*, *C. Calisaya* i *C. Ledgeriana* from the *Rubiaceae* family) and many others. Modern medicine, within the framework of "rational" phytotherapy, practices the use of phytotherapeutic methods and medications for treatment, especially in cases of side

effects of synthetic drugs, of course, if preventive health protection and treatment are scientifically proven and standardized. Herbal medicines are most often used as phytotherapy in the prevention of diseases (prevention or delay of diseases), but they are also very useful for therapy in the initial stages of the disease or as a complementary therapy to the use of other drugs. Positive effects of herbal therapy can be expected within a month of the start of application.

### **Conclusion**

Forest ecosystems are of great importance for preventive human health because they provide numerous benefits (phytoncides, medicinal plants, fungi, etc.). Regular stay in the forest allows you to strengthen the immune system, reduce stress, regulate blood pressure, contribute to the respiratory function of the human body. Forest air increases the activity of natural killer cells that help fight malignant, bacterial and viral diseases. Essential oils that are volatile act as aromatherapy. The effect of forest bathing (Shinrin-yoku) allows the natural effects of the forest to last up to two months after being in the forest. These impacts of forests on human health are crucial for the development of preventive health protection and integrative medicine. The ecological factors of forest ecosystems have multiple interactions that improve the physical and spiritual condition of people. Therefore, local communities with larger forest complexes should use them to improve the environment and create preconditions for the development of natural, ecotherapy. It is necessary to strengthen the awareness of the wider community about the possibilities of using forest potentials for the development of integrative medicine.

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## ŠUMSKA TERAPIJA KAO SREDSTVO ZA PREVENCIJU BOLESTI U INTEGRATIVNOJ MEDICINI

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**Sažetak:** *Napori da se razviju opšta znanja o preventivnoj ulozi šuma u smanjenju pojave različitih bolesti ukazuju na neophodnost primjene svih zdravstvenih koristi koje šumski ekosistemi pružaju društvu. Pored obilja ljekovitog bilja, šumski ekosistemi nude brojne terapijske funkcije - slušne, vizuelne, taktilne i mirisne a koje igraju značajnu ulogu u prevenciji bolesti. Ove funkcije, u kombinaciji sa upotrebom biljne terapije, doprinose holističkom pristupu liječenju i primjeni integrativne medicine, koja se fokusira na individualne potrebe i povezuje tradicionalne i moderne medicinske prakse. Fitoterapija igra važnu ulogu u integrativnoj medicini jer doprinosi jačanju imunog sistema, regulisanju hormona i sprječavanju bolesti. Udisanje fitoncida, bioaktivnih jedinjenja koja oslobađaju biljke, smanjuje lučenje hormona stresa (kao što je kortizol), a istovremeno jača imuni sistem i ublažava stanja kao što su anksioznost, hronični umor, gojaznost, depresija, oštećenje pamćenja i bolesti srca. Šumska terapija takođe povećava aktivnost prirodnih ćelija ubica (NK), što pozitivno utiče na ukupnu otpornost i poboljšava opšte zdravlje. Cilj ovog rada je sinteza postojećih znanja o preventivnoj i terapijskoj ulozi šuma u okviru integrativne medicine, na osnovu prethodnih istraživanja. Primjenjena metodologija podrazumjeva analizu i sintezu relevantnih studija koje se odnose na terapijske efekte šumskih sredina na prevenciju bolesti kod ljudi. Sinteza brojnih nalaza istraživanja pokazuje da šume pozitivno utiču na emocionalne, introspektivne i kognitivne aspekte ljudske ličnosti, čime se podstiče samorefleksija i jača psihofizička otpornost.*

**Ključne reči:** *Terapija, šuma, bolest, medicina*

