

Nature and gardens in prevention and therapeutic care

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Throughout history, the human race has been faced with numerous infectious diseases. Advances in science, with the development of antibiotics and vaccines, as well as progress in sanitation and hygiene, have helped to reduce epidemics. In today's ultra-urbanised society, people are subject to the pressures of time, stress, pollution, social isolation and so on, resulting in an erosion of healthy lifestyles. These new living conditions are strongly implicated in the emergence of chronic illnesses, which now affect almost 20 million French people [1]. These include metabolic diseases, such as diabetes and obesity, as well as cardiological, neurological, vascular, neurodegenerative, cancerous and autoimmune diseases.

Disrupted biological mechanisms

The processes of chronic inflammation, linked to permanent oxidative stress caused by an excess of free radicals, lead to dysregulation of the immune system, immune suppression and disruption of cell duplication, all of which can lead to tumour formation [2; 3]. The environment encountered throughout life, also known as the exposome¹, induces reversible but transmissible epigenetic changes during cell division. In an

unfavourable environment, they can lead to the inactivation of certain essential genes in our innate immune system and promote expression of chronic inflammatory, metabolic or autoimmune diseases. The *phylogenesis* (see glossary) of the human species is intimately linked to ongoing contact with nature. This means that disconnection from or loss of experience of nature is detrimental [4]. This natural environment and all implicit contact with living things are essential to human equilibrium, as argued by Wilson in his theory of biophilia² [5].

Health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity", according to the World Health Organization (WHO) [6]. This definition from 1946 highlights the dynamic continuum of an individual's health, from birth to death, in which the environment and lifestyle are factors in prevention and health promotion. The emergence of a pathology or disability breaks this continuum. The components of nature and our original biotope, which are fundamental to human development, also play an essential role in restoring balance after disease. The therapeutic benefit of plants is at the origin of horticultural therapy³, a concept that has been gaining ground in France since the 1990s.

Gardening therapy is recognised as a form of occupational therapy that addresses physical and psychological health. Numerous studies carried out in psychiatric and geriatric settings have demonstrated real neuropsychological and physiological benefits, including stress management, improved cognitive

KEY POINTS

▣ Our modern lifestyles are disconnected from nature. This situation fuels a number of chronic diseases, often involving alterations to the immune system. Plant aromas play a role in stimulating the body's immunity. For this reason, an increasing number of hospitals, psychiatric units and care homes are offering gardening activities, led by a facilitator.

ability and reduced cardiovascular and respiratory risks [7-9]. For example, after major surgery, simply being able to see a natural space reduces morbidity, mortality and length of stay [10-11].

Besides an opportunity to discover the medicinal and nutritional virtues of plants, what therapeutic properties can gardens offer? When it comes to supporting people with chronic illnesses, anything that combines *coping strategies*, collective resilience, psychological and emotional stimulation and close contact with nature is part of a truly integrative and holistic therapeutic approach.

So, as well as taking pride in the success of your tomato plants or smelling the rosemary, creating a beautiful garden together is a great way to de-stress. Inhaling *terpenes*, the aromas released by plants, induces *oxytocin* secretion and activates our cellular immunity [12]. The immunostimulant action of oxytocin is due partly to the inhibition of chronic secretion of *cortisol*, *adrenaline*, *noradrenaline* and *circulating*

pro-inflammatory cytokines, and partly to the direct activation of *natural killer T cells*. It also stimulates secretion of dopamine, serotonin and enkephalin in the brain, which are neurotransmitters involved in wakefulness, mood and motivation. As demonstrated by Li's 2010 studies on forest bathing⁴, the number and activity of *natural killer cells* correlated with the atmospheric content of pine terpenes [13].

From a sterile to a living environment

In our gardens, the most fragrant plants, such as the Lamiaceae (rosemary, thyme, savory), are also the richest in terpenoids and antioxidant polyphenols, and this has meant that humans have instinctively used them for thousands of years for their culinary and therapeutic benefits. The 94 plants listed in the medieval text *Capitulare de villis* [14] are still recommended by the World Health Organization (WHO) for a balanced nutritional intake [15].

Therapeutic gardens can be found in residential or healthcare facilities. They are used as part of therapeutic support to promote the patient's well-being and recovery. Gardens also contribute to the well-being of the caregiving community and patients' families, helping to increase patient resilience [16]. Every garden is tailored to the suit the facility, according to the types of pathologies and patients treated there. Caregiving staff oversee the garden, usually with the help of a facilitator. When patients can move from a sterile environment into this living environment they can build their resilience and assert their own choices, becoming carers rather than cared for. Through the garden, patients can transform their suffering and isolation into shared pleasures and improve their experience of follow-up care. Gardening in a group also means optimising recovery chances by developing collective resilience.

A therapeutic garden is an asset to a facility if, through its design, construction and use, it meets the needs of patients, carers and families. The success of this kind of

initiative depends on four essential stages: setting up a team that represents the institutional vision; drawing up a plan collectively, specifying the garden's objectives and therapeutic uses; designing and creating the garden in its designated space and landscape; planning how to assess the uses, mediation and benefits offered by the garden. While it may start off relatively modest, the garden will evolve over time, becoming more attractive and meeting the therapeutic objectives of the facility with increasing success, through a process of participation [17-18].

Since 2008, over a hundred new therapeutic gardens have been created in France, in care homes, hospitals, psychiatric units and clinics.

Oncology: Plants as a medium for healing

Paradoxically, when it comes to cancer, few therapeutic gardens exist to support patients, despite clear demonstrations that physical activity in contact with nature reduces the risk of recurrence by 25% after treatment for breast or bowel cancer [19-20]. Avoiding recurrence is an important issue, as addressed by Objective 8 of the French 2014-2020 Cancer Plan, which focused on reducing "the risk of a second cancer".

In 2021, a therapeutic garden was created as part of the Cité des Soins holistic care programme at the Anjou Clinic in Angers (Maine-et-Loire), to complement the oncology care pathway. It was designed and constructed through a participatory approach involving patients, families, care staff and managers. The 125 m² garden set within the clinic grows vegetables, herbs, flowers and small fruit trees, either in the ground or in raised planters. To achieve health benefits in the medium and long term (tolerating and adhering to treatment, physiological improvements, better performance on psychometric scales, stimulation of immune response and fewer relapses), a facilitator from the Institut Agro Angers-Rennes runs plant therapy sessions for groups of six patients, who are supervised in the garden for two hours a week.

Individual and group feedback is given by questionnaire after each session and at the end of a 14-week cycle. The satisfaction rate is 100%, with respondents reporting a sense of healing, sharing of emotions and an improved ability to tolerate treatment. These results demonstrate collective resilience in the face of disease, through gardening and other activities [21].

Neurocognitive disorders: Active gardening

A number of associations have driven the widespread creation of therapeutic gardens in care homes in response to France's 2008-2012 health plan, which made gardens compulsory for cognitive-behavioural units and high dependency units [18-19]. It is recommended that people with neurocognitive disorders take an active and effective approach to gardening in a safe, natural environment. Multi-sensory stimulation is offered through the presence of plants, water and animals, and the different workshops organised. Touching the leaves, flowers, fruit and bark offers reminiscence therapy. Handling plants and soil delivers the additional benefit of helping to restore the microbiota that is so essential for these patients. These gardens are also an asset for caregivers and patients' families, helping to prevent depression and burnout, the incidence of which is particularly high among those confronted by these illnesses. ■

1. Dr Christopher Wild (former director of the International Agency for Research on Cancer) sets out three types of exposome:

- the internal exposome (hormones, inflammatory stress markers, metabolites);
- the specific external exposome (pollutants, radiation, infectious agents, professions and lifestyles);
- the general external exposome, which relates to the socio-economic environment and living conditions. (Editor's note.)

Source: CNRS, *Le Journal*, January 2023.

2. Fundamental human love for living things. (Editor's note.)

3. Integrating horticulture and gardening activities into a process of therapeutic education or prevention of illness or exclusion, as an occupational and social therapeutic activity. (Editor's note.)

4. Ancient practice known in Japanese as *shinrin-yoku*, which consists of immersion in a forest. (Editor's note.)

Glossary:● **Adrenaline and noradrenaline:**

neuromediators or neurohormones secreted by the adrenal glands in the event of acute stress or physical exertion.

● **Coping strategies:** cognitive and behavioural strategies that an individual uses to manage threatening external or internal events (according to Lazarus & Folkman, 1984).

● **Cortisol:** glucocorticoid hormone secreted by the adrenal glands, which is involved in the processes of carbohydrate and protein metabolism that provide energy for the body. It is also anti-inflammatory.

● **NK or Natural Killer T cells:** specialised cells in our immune system, capable of killing infected, altered or cancerous cells.

● **Oxytocin:** neurohormone secreted by the pituitary gland, known as the “love hormone” because of its major role in childbirth. It is essential to the survival of all mammals, both for its roles in reproduction and social organisation and its immunoprotective quality.

● **Phylogenesis:** the evolutionary history of a species.

● **Pro-inflammatory cytokines:** small proteins that enable cells to communicate with each other and activate or inhibit the synthesis of other molecules.

● **Terpenes:** aromatic compounds released by plants and trees to defend themselves and to communicate.

REFERENCES

- [1] A. Grimaldi, Y. Caillé, F. Pierru, D. Tabuteau. *Les Maladies chroniques : vers la 3^e médecine*. Paris: Odile Jacob, 2017.
- [2] G. Lorimier. *Cancer : La Nature source de prévention*. Coolibri, 2019.
- [3] M. Le Van Quyen. *Cerveau et Nature*. Paris: Flammarion, 2022.
- [4] C. Fleury, A.-C. Prévot. *Le Souci de la nature : apprendre, inventer, gouverner*. Paris : CNRS Éditions, 2023.
- [5] E.O. Wilson. *Biophilia*. Harvard University Press, 1984.
- [6] *Cadre conceptuel de la santé et de ses déterminants*. Quebec: Direction des communications du ministère de la Santé et des Services sociaux (MSSS), 2012.
- [7] H. Kamioka, K. Tsutani, M. Yamada, H. Park, H. Okuizumi, T. Honda *et al.* Effectiveness of horticultural therapy: A systematic review of randomized controlled trials. *Complementary Therapies in Medicine*, 2014, vol. 22, no. 5: p. 930-943. Online: doi: 10.1016/j.ctim.2014.08.009
- [8] M. Soga, K. J. Gaston, Y. Yamaura. Gardening is beneficial for health: A meta-analysis. *Preventive Medicine Reports*, 2016, vol. 14, no. 5: p. 92-99. Online: doi: 10.1016/j.pmedr.2016.11.007
- [9] T. Lanki *et al.* Acute effects of visits to urban green environments on cardiovascular physiology in women: A field experiment. *Environmental Research*, November 2017, vol. 159: p. 176-185. Online: doi: 10.1016/j.envres.2017.07.039
- [10] J. Maas, R.A. Verheij, S. De Vries, P. Spreeuwenberg, F.G. Schellevis, P.P. Groenewegen. Morbidity is related to a green living environment. *Journal of Epidemiology and Community Health*, December 2009, vol. 63, no. 12: p. 967-973. Online: doi: 10.1136/jech.2008.079038
- [11] R.S. Ulrich. View through a window may influence recovery from surgery. *Science*, April 1984, vol. 224, no. 4647: p. 420-421. Online: doi: 10.1126/science.6143402
- [12] L.J. Young, Z. Wang. The neurobiology of pair bonding. *Nature Neuroscience*, October 2004, vol. 7, no. 10: p. 1048-1054. Online: doi: 10.1038/nn1327
- [13] Q. Li, M. Kobayashi, H. Inagaki, Y. Hirata, Y.J. Li, K. Hirata *et al.* A day trip to a forest park increases human natural killer activity and the expression of anti-cancer proteins in male subjects. *Journal of Biological Regulators and Homeostatic Agents*, 2010, vol. 24, no. 2: p. 157-65. Online: <https://pubmed.ncbi.nlm.nih.gov/20487629/>
- [14] J. Barbaud. Le Capitulaire De Willis et le développement des jardins médicaux sous Charlemagne. *Histoire des sciences médicales*, 1989, vol. 23, no. 4: p. 299-308. Online: <https://www.biusante.parisdescartes.fr/sfhm/hsm/HSMx1989x023x004/HSMx1989x023x004x0299.pdf>
- [15] E. Riboli, K. J. Hunt, N. Slimani, P. Ferrari, T. Norat, M. Fahey *et al.* European Prospective Investigation into Cancer and Nutrition (EPIC): study populations and data collection. *Public Health Nutrition*, December 2002, vol. 5, no. 6b: p. 1113-1124. Online: doi: 10.1079/PHN2002394
- [16] G. Galopin. Hortithérapie. In B. Andrieu and G. Boëtch (dirs.), *Les Mots de demain : un dictionnaire des combats d'aujourd'hui*. Neuilly-sur-Seine: Éditions Atlande, 2024: p. 287-291.
- [17] M. Girard, K. Charras, V. Lulier, G. Galopin. *Guide pratique. Conception et élaboration de jardins à l'usage des établissements sociaux, médico-sociaux et sanitaires*. Paris: Fondation Médéric Alzheimer, 2020. Online: <https://www.fondation-mederic-alzheimer.org/wp-content/uploads/2023/03/2020-guide-jardins.pdf>
- [18] T. Rivasseau-Jonveaux, A. Pop, R. Fescharek, S. Bah Chuzeville, C. Jacob, L. Demarche *et al.* Les jardins thérapeutiques : recommandations et critères de conception. *Gériatrie et psychologie Neuropsychiatrie du vieillissement*, 2012, vol. 10, no. 3: p. 245-253. Online: https://www.jle.com/fr/revues/gpn/e-docs/les_jardins_therapeutiques_recommandations_et_criteres_de_conception_293269/article.phtml
- [19] D. Schmid, M.F. Leitzmann. Association between physical activity and mortality among breast cancer and colorectal cancer survivors: a systematic review and meta-analysis. *Annals of Oncology*, 2014, vol. 25, no. 7: p. 1293-1311. Online: doi: 10.1093/annonc/mdu012
- [20] R. Aerts, O. Honnay, A. Van Nieuwenhuysse. Biodiversity and human health: mechanisms and evidence of the positive health effects of diversity in nature and green spaces. *British Medical Bulletin*, 2018, vol. 127, no. 1: p. 5-22. Online: doi.org/10.1093/bmb/ldy021
- [21] C. David. Séances de médiation végétale au Jardin de l'Anjou pour des patients en cancérologie à la Clinique de l'Anjou. *Sciences du Vivant* [q-bio]. 2021. ffdumas-03356725f HAL Id: dumas-03356725. Online: <https://dumas.ccsd.cnrs.fr/dumas-03356725>