**Section 10 | Forest medicine |**

**10-1 Effect of forest environments on human health:**

**An introduction to Forest Medicine**

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Humans have enjoyed forest environments for ages because of the quiet atmosphere, beautiful scenery, mild climate, pleasant aromas, and fresh, clean air.

In Japan, since 2004, serial studies have been conducted to investigate the effects of forest environments on human health (1–13).

We have established a new science called Forest Medicine. Forest Medicine is a new interdisciplinary science, falling under the categories of alternative medicine, environmental medicine, and preventive medicine, which encompasses the effects of forest environments on human health (11).

It has been reported that forest environments have the following beneficial effects on human health:

1. Increase human natural killer (NK) activity, the number of NK cells, and the intracellular levels of anti-cancer proteins in NK cells, suggesting a preventive effect on cancers (1–9, 11).

2. Reduce blood pressure (Fig. 1), heart rate, and stress hormones, such as urinary adrenaline and noradrenaline and salivary cortisol (3, 4, 7, 10–13). Decreases of urinary adrenaline and noradrenaline contributed to the lower blood pressure (10, 11).

3. Increase the activity of parasympathetic nerves and reduce the activity of sympathetic nerves (12–13). These effects indirectly influence the endocrine and immune systems via the psycho-neuro-endocrine-immune network (11).

4. Increase the levels of serum adiponectin and dehydroepiandrosterone sulfate (DHEA-S). Adiponectin is a serum protein hormone specifically produced by adipose tissue. Studies have shown that lower than normal blood adiponectin concentrations are associated with several metabolic disorders, including obesity, type 2 diabetes mellitus, cardiovascular disease, and metabolic syndrome. Epidemiological evidence in humans suggests that DHEA-S has cardioprotective, anti-obesity, and anti-diabetic properties (10, 11).

5. In the Profile of Mood States (POMS) test, reduce the scores for anxiety, depression, anger, fatigue, and confusion, and increase the score for vigor, showing psychological effects as well (2, 4, 7, 10, 11).

These findings suggest that forest environments may have preventive effects on lifestyle-related diseases (9–11).

**Keywords:** Forest Medicine, Forest Environment, Natural Killer Activity, Stress, Hypertension
Figure 1  Effects of walking in a forest park and walking in an urban area on the levels of systolic (A) and diastolic (B) blood pressure. Data are presented as the mean±SE (n=16). *: p<0.05, **: p<0.01, significantly different between the forest and urban trips according to the paired t-test. Cited from Li et al. Eur J Appl Physiol. 2011; 111 (11): 2845–53 with permission from Springer.

References
7) Li Q et al. A day trip to a forest park increases human natural killer activity and the expres-