The positive effects of nature on health and well-being

2nd July 2021, Biella/Lombardy,
Ökosystemleistungen zwischen Stadt, Land & Berg
The human exposome is the totality of all environmental exposures in a person's lifetime, internal and external, including those before birth.

The exposures are from all the chemical, biological, and social agents that influence human health.
Exposome and One Health

an internal environment with internal biological factors such as metabolism, intestinal flora, inflammation and oxidative stress

a specific external environment, including certain contaminants, diet, physical activity, water, tobacco and consumer products

a general external environment including factors such as urban environment, climate factors, social safety net, stress
Urbanization is a major global trend

Degree of urbanization (percentage of urban population in total population) globally and per continent

Urbanization is a global trend:
- **1940** 19% of the world’s population was urban
- **2014** 54% of the world’s population residing in urban areas in 2014
- **by 2050**, 66% of the world’s population is projected to be urban

(CIA Worldfactbook 2014; Macionis & Parillo 2007; Statista 2021)
Advantages and disadvantages of city life

Education opportunities
Leisure activities
Job offers
Childcare
Fine dust pollution
Noise pollution
Less exercise
Nature deficit
Etc.

Source: Clean Air for Europe Programme / www.environment.no
Urbanization, urban lifestyles & civilization diseases

**Bewegungsarmut**

- Altered leisure & nutrition behaviour
  - Obesity, Diabetes II, metabolic syndrome
- Physical inactivity
  - Osteoarthritis, Back Pain, Osteoporosis
- Stress and Crowding
  - Mental disorders, Cancer
- Altered microbioma
  - Allergy & Asthma, Autoimmune diseases

**Changing lifestyles**

- Crowding & andere Stressfaktoren
- Freizeitgestaltung und Essgewohnheiten

**New urban penalties?**

Homo urbanus
E. Oberzaucher,
2017, Springer
Stress and the city

City living and urban upbringing affect neural social stress processing in humans

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(Haddad et al., 2015; Kennedy & Adolphs, 2011; Lederbogen et al., 2011; Lederbogen & Meyer-Lindenberg, 2015)
City and stress experience

People who were born and raised in large cities

- react to a social stressor with a stronger activation of brain regions, which play an important role in the control of stress-responsive systems
  - e.g. Anterior cingulum and Amygdala

People who currently live in a big city

- show a stronger activation of the amygdala ("stress center" of the brain)

Increasing evidence for this urbanity effect

- Disease risk of people in urban populations:
  - Affective disorders ➔ + 38 %
  - Anxiety disorders ➔ + 21 %
  - Depression rate ➔ + 40 %

Schizophrenic disorders

- 130% more common in women
- 190% more common in men

Every third schizophrenic psychosis can be associated with city life

(Haddad et al., 2015; Lederbogen et al., 2011; Lederbogen & Meyer-Lindenberg, 2015; Peen, Schoevers, Beekman, & Dekker, 2010)
Green Exercise

Physical activity and nature have a positive effect on health independently of each other.

Synergistic health effects of training in nature and especially in the Alps.

Physical activity (mountain hiking)

Exposure to Nature

Jo Barton, Director of the Green Exercise Research Group, University of Essex

Pretty et. al. 2005
Empirical evidence: Mountain hiking in the Alps is the best doctor

Mountaineers

... have fewer mental health problems than the average European (14%:38%)

... The more exercise the fewer mental disorders

... The more positive emotions (pos. affective valence in green exercise) the fewer mental disorders
Indoor vs Outdoor Hiking

Synergistic effect of movement and nature/mountains

- Higher positive affective valence during and after the intervention
- Lower negative affective valence during and after the intervention
- Higher activation after the intervention
- Lower fatigue values after the intervention
- Cortisol/HRV/Blood pressure

3h indoor treadmill walking

3h mountain hiking


Article:
A Randomized Crossover Trial on Acute Stress-Related Physiological Responses to Mountain Hiking

Martin Niedermeier 1, Carina Grafstätter 2, Arnulf Hartl 2 and Martin Kopp 1

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Institute of Ecomedicine

- **Evidence-Based Medicine**
  - Randomized, controlled clinical trials
  - Evidence-based health tourism products and services
- **Hiking and Alpine bathing**: Immunosenescence, 65+
- **Mountain sports and health** with Alpenverein/UBIK
- **Hiking**: HICO Studie - (Hiking and Coaching) Hiking & cardiorespiratory fitness
- **Speleotherapy**: Allergy and Asthma
- **Winter sports**: Dust mite allergy, Knee Endoprosthesis
- **Alpine bathing and Mountaineering**: Osteoporosis prevention, chronic back pain, marital quality
- **Waterfalls**: Allergy/Asthma and Stress/Burnout
- **Mountain forest & Mindfulness**: primary prevention [www.klimatherapie.eu](http://www.klimatherapie.eu) in Lagundo, ITA
- **Mountain forest & Waterfall**: primary prevention
- **Alpine meadows**: Microbioma, Parkinson, prim. prevention
- **Green Virtual Reality**: nature to bedside (COVID, COPD)
Randomized, controlled clinical studies

Treatment of different indications with specific alpine landscapes and natural health resources

- **Waterfalls** against **Allergy and Asthma**
  *Hohe Tauern Health Study*
  Immunological disease – hypersensitivity against allergens

- **Hiking and Balneotherapy** against **chronic low backpain**
  *Albenbad Study*
  Musculoskeletal disorder
Prevalence of Asthma is rising

In Austria 11% of all children and 6% of all adults suffer from asthma.

In 2025 the half of all European people will suffer from some kind of allergic disease.

Urbanization, Allergy and Asthma

Asthma-prevalence is associated with the degree of urbanization.

Children living in a neighborhood street with much traffic suffer more often from asthmatic, spastic and obstructive bronchitis.

The Urban Environment and Childhood Asthma Study

James E. Gern, MD
Professor of Pediatrics and Medicine, University of Wisconsin-Madison

Abstract

Childhood asthma is not distributed evenly throughout the population, and children who grow up in crowded urban neighborhoods have higher rates of asthma and experience greater morbidity due to asthma. There are several environmental and lifestyle factors associated with urban living that are suspected to promote the development of asthma, particularly in the first few years of life. Collectively, this information suggests the hypothesis that exposure in early life to adverse environmental and lifestyle factors associated with disadvantaged urban environments modifies immune development to increase the risk for allergic diseases and asthma. The Urban Environment and Childhood Asthma birth cohort study was initiated in 2004 to test this hypothesis. The study population was recruited prenatally, and consisted of 560 families from four urban areas who were at high risk for allergies and/or asthma on the basis of parental histories, along with an additional 49 families without atopic parents. Immune development, respiratory illnesses, and exposure to stress, indoor pollutants, microbial products, and allergens were measured prospectively, and the major study outcomes are recurrent wheeze at three years of age and asthma at age seven. This review summarizes the study design, methods, and early findings of the URECA study.
Farmer’s children are less susceptible

Microbial factors in cow dung affect the immune system!

airways harbour a unique microbiota
Krimml Waterfalls and National Park

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Waterfall Aerosols

- High concentration of negatively-charged, finely atomized breathable water fragments
- Oxygen radicals

Waterfall aerosols

(Laakso et al., 2007, Kolarz et al. 2012)
Negatively charged Nanoaerosols

➢ The droplet size is 200 times smaller than the droplets in an emergency asthma spray
➢ The miniscule size allows them to penetrate deep into the respiratory tract and to develop an immune modulatory effect

Analysis of the influence of waterfall aerosols on functional, molecular and immunological parameters of allergies and asthma.

Randomized controlled clinical trial "packed" in an asthma camp for kids

- 54 kids ages 8-14 years
- Mild to severe bronchial asthma
- Duration: 3 weeks
- Waterfall group: 1 h exposure to waterfall/day
- Control group: control site, no exposure to waterfall
- Methods of analysis: blood parameters, lung function (PEF), FeNO, ACT symptoms score, health related quality of life (HRQOL) etc.
Waterfall vs Control Group

3 weeks daily intervention 1h/day
Control point 4km distance to the waterfall
standardized rooms, meals and daily routine
Outdoor sports programme (hiking, soccer)

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Significant better lung function

Figure 4. Lung function and significances from day 3 to day 19. *p≤0.05, **p≤0.01. Error bars are shown as SEM.
Induction of IL-10 producing cells

- ELISPOT
  Induction of anti-inflammatory IL-10 producing cells
Immunological changes and Asthma Control Test (validated symptom/medi.score)

- Significant induction of **regulatory T-cells** in both groups (CD4+ CD25+ CD127low)

- Reduction of **IL-13** in the Waterfall group compared to the control group after the camp

- Significant reduction of **Eosinophil Cationic Protein** and induction of **IL-10** in both groups

- Significant and sustainably lower **FeNO** in the WF group
The Krimml Waterfalls induce a balancing immune response and sustainably improve functional, immunological and clinical parameters of allergic asthma.

The Krimml Waterfalls are a new natural health resource as proven by criteria and methods of evidence based medicine.
Chronic Low Back Pain (LBP)

- Persistence of pain beyond 3 months of symptoms
- 2 mio patients in Austria suffer from LBP
- Most common reason to consult a MD
- Lifetime prevalence 84% in the West
- Rising prevalence of LBP in children and young adults
- 44%-78% relapse after improvement
- Enormous health care costs
Major causes of LBP

- motion poverty
- Adipositas
- Chronic stress and mental burden
- Poor posture
- Degenerative changes in the spine, inflammatory processes or metabolic dis.

20% Organic causes
- Disc prolapse
- Rheumatic diseases
- Infectious diseases
- Osteoporosis
- Cancer
- Fractures

80% unclassifiable pain syndromes
Alpine Nature Therapy
Therapy option for LBP?

Albenbad Study
Grins bei Landeck in Tirol

Influence of exercise (mountain hiking) and balneotherapy on unspecific chronic low back pain

Lechtaler Alps
very steep alpine region!
Pinewood forests up to 1700, high-alpine vegetation

Albenbad
Mg/Sulfur water, local remedy
Randomized controlled clinical trial

Study-population

✓ >19 Jahre <65 years
✓ Chronic Low Back Pain
✓ Repeated medical attendance because of LBP in the last 3 years

— No Rheuma
— No disc prolapse
— No Osteoporosis
— No contraindications of balneotherapy

3 groups: n = 80
• Exercise (n = 27)
• Exercise + Balneotherapy (n = 25)
• No intervention (n = 28)

7 days intervention with 6x standardized hiking tours (600hm-1000hm)
+/- 20min Balneotherapy
Sunny weather...
...Rainy weather
Overview

- 52 probands in 5 weeks
- +28 in the control group
- 259,31 km mountain hiking
- 14670 hm
- 156 Bathes in the Albenbad

- 560 Surveys
- 160 Spine measurements
- 160 Blood analysis
- 160 Serum/Plasma collection
Pain reduction, immediate and long term

Statistics: linear mixed models for continuous longitudinal data

- Hiking + bathing
- Hiking
- Control
Wellbeing - WHO 5

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Mobility of the spine

% Change from Baseline

-20 0 20 40

time (days)

0 20 40 60 80 100 120 140

Baden
Kontrolle
Wandern

n.s.

Medimouse

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Exercise in Alpine landscapes in combination with a local healing water

In comparison to a control group, a multimodal nature intervention (hiking + bathing) induces:

• Long term bettering of orthopedic parameters (4 month)
• Sustained improvement of wellbeeing and health related quality of life (4 month)
• Sustained pain reduction (4 month)

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A week of mountain/thermal holidays in the Alps sustainably improves the quality of marriage/relationships (but only for 50-65 year olds)


Résumé – Alpine Nature works..

- **Therapeutic:** Back pain, Allergy & Asthma, ADHD, Immunosenescence
- **Preventive:** Immune-boosting, Burnout-preventive, Cardiorespiratory fitness, Balance-fall prevention
- **Rehabilitative:** Depression/suicide, Metabolic syndrome, Cognitive performance, Quality of life
- **Health tourism and regional value added:** Job creation, higher qualification, quality improvement and cross-sectoral innovation
- **Nature conservation to preserve an important European health remedium – the Alps!**
Thank you for your attention!

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