

DOSSIER · THERAPY

Balneotherapy and Moor Therapy

Balneotherapy and **Moor therapy** are established physical therapy procedures with a long tradition. The database comprises an extensive collection of human studies, around one third of which are controlled trials. The focus lies on **chronic inflammatory and degenerative diseases of the musculoskeletal system**, yet methodological quality varies considerably.

1,113

STUDIES IN
TOTAL

647

IN HUMANS

212

OF WHICH
CONTROLLED

22

IN ANIMALS

10

IN THE LAB

Figures from the IHR study database · Last updated 2026-10-04

How to Read This Dossier

ESTABLISHED

measured in humans, with a comparison group

PLAUSIBLE

supported by mechanism, animal studies or observation

HYPOTHESIS

a likely connection that still needs to be tested

Balneotherapy and Moor Therapy at a Glance

ORIGIN:

Balneotherapy and moor therapy are physical therapy procedures with a long tradition that use natural healing waters, gases or peloids (e.g. peat, mud) in the form of baths, packs or drinking cures. Moor therapy uses specially organically formed sediments such as peat that have developed biochemically over millennia. Both procedures are applied in spa resorts, rehabilitation facilities or outpatient settings and combine thermal, mechanical and chemical effects.

EVIDENCE BASE:

1.113 evaluated studies · 212 controlled human studies · 435 observational studies · 30 review articles · 22 animal studies · 7 cell culture studies

STRONGEST INDICATIONS:

- **Musculoskeletal system:** (chronic pain syndromes) Randomised controlled trials showed significant pain reduction and functional improvements in rheumatoid arthritis, osteoarthritis and chronic back pain after balneotherapy (e.g. radon-carbon dioxide waters). Effects persisted in some cases for up to 6 months, yet often without placebo control.
- **Bones and joints:** (osteoarthritis, hand osteoarthritis) Studies provided indications of short-term improvements in pain, grip strength and function scores (HAQ, AUSCAN) after moor or balneotherapy.
- **Inflammatory processes:** (fibromyalgia, rheumatoid arthritis) Balneotherapy reduced inflammatory markers (PGE₂) and pain in fibromyalgia as well as analgesic consumption in chronic back pain. Radon baths showed significant effects on pain and function, yet with heterogeneous patient groups.
- **Skin:** (psoriasis, atopic dermatitis) Observational studies and systematic reviews reported symptom improvements in psoriasis, yet with methodological weaknesses (lack of blinding, small sample sizes). Mechanisms presumably include immunomodulatory effects.
- **Pain and function** (ankylosing spondylitis) Balneotherapy combined with exercises improved pain, BASDAI and BASFI in ankylosing spondylitis in the short term. Effects persisted in some cases for up to 24 weeks, yet without targeted recording of stress parameters.

LIMITATIONS:

- The methodological quality of the studies is heterogeneous: many works are small, single-centre or without blinding. Sham controls (e.g. tap water) are rare, which favours placebo effects.
- Long-term data are frequently lacking, and transferability is limited because spa resorts use differing healing-agent profiles. Systematic reviews reach contradictory assessments, especially for subjective endpoints such as quality of life.
- Basic research on mechanisms (e.g. biomarkers, structural endpoints) is still outstanding. Preclinical indications (e.g. inhibition of NF-κB by hydrogen sulphide in animal and cell models) point to possible mechanisms of action, yet have not been investigated in humans.

CLASSIFICATION:

Balneotherapy and moor therapy are established physical therapy procedures that showed improvements in studies for chronic-inflammatory and degenerative diseases of the musculoskeletal system, yet whose evidential strength is limited by heterogeneous study quality and unclear mechanisms.

1. What Balneotherapy and Moor Therapy Are

Balneotherapy denotes the therapeutic application of natural healing waters, gases or peloids (e.g. moor, mud) in the form of baths, packs or drinking cures. **Moor therapy** uses specially peat or other organic sediments that have arisen through biochemical processes over millennia. Both procedures are carried out in spa resorts, rehabilitation facilities or outpatient settings. The applications include full or partial baths, local compresses, inhalations or drinking cures. Natural healing agents such as sulphur, brine or radon waters as well as moors contain differing concentrations of minerals, trace elements, organic acids or gases that are used according to indication.

The **diversity of application forms** and the **natural composition** of the healing agents complicate standardisation. Studies often examine specific spa resorts or regional healing springs whose chemical profiles differ. In addition, duration, temperature and frequency of the applications vary. While some works test drinking cures or inhalations, baths and packs predominate. The **thermal, mechanical and chemical effects** are frequently combined, which complicates an isolated evaluation of individual active factors. Measurements concentrate on clinical parameters such as pain, mobility or inflammatory markers, less frequently on biochemical mechanisms.

2. What the Studies Show in Detail

The supporting human studies and the most important reviews — by field of application, with population, duration, preparation, measured variable and result, as the original works report them. Numbers appear only where the work states them.

Distribution of the **controlled human studies** by field of application — the numbers are not additive, as one work may be assigned to several fields:

FIELD OF APPLICATION	CONTROLLED STUDIES
Musculoskeletal system	115
Bones and joints	70
Safety and tolerability	46
Inflammatory processes	44

FIELD OF APPLICATION	CONTROLLED STUDIES
Fatigue and stress	34
Skin	25
Cognition and psyche	19
Cardiovascular system	12

Cognition and Psyche

Individual controlled studies on balneotherapy examined 18-day applications (without specific details on duration or type of baths in the abstract). Primary endpoints were pain and quality of life. Some of these studies showed a statistically significant yet clinically small improvement in symptoms compared with control interventions. However, a portion of the controlled works exhibited methodological limitations, which led to heterogeneity in the results. Large controlled studies with at least 100 participants per group are still outstanding for balneotherapy, so clinical relevance requires further examination.

A randomised controlled study compared the effects of pool-based training (group 1, n=25) with balneotherapy (group 2, n=25) in 50 women with FMS (according to ACR criteria). Balneotherapy consisted of 35-minute baths in a thermal pool without additional movement, three times weekly over 12 weeks. Measured were pain scores, morning stiffness, sleep quality, pressure-pain points, global assessments by patient and physician, Fibromyalgia Impact Questionnaire (FIQ), chair test and Beck Depression Inventory (as indicator for mood changes). After 12 weeks the balneotherapy group showed improvements in all parameters except the chair test ($P < 0.01$). After 24 weeks some effects remained, yet without complete data in the abstract. The study was blinded, yet the small number of participants and the absence of a placebo control limit the evidential strength.

HYPOTHESIS The observed effects of balneotherapy on psychological parameters such as sleep and global assessment could be due to a combination of thermal, mechanical and chemical factors of action that go beyond pure relaxation. However, studies are lacking that specifically capture cognitive or affective endpoints (e.g. anxiety, depression) with validated scales and compare them against active controls (e.g. psychotherapy). In addition, it is unclear whether the effects are attributable to the balneotherapy itself or to the setting effect (e.g. holiday atmosphere).

Bones and Joints

Massages, showers, moor and pool applications) plus standard treatment (daily exercises, usual medication) or only standard treatment. The primary endpoint was the number of patients with minimal clinically important improvement (MCII) after 6 months, defined as ≥ 19.9 mm reduction on the visual analogue scale (VAS) for pain and/or ≥ 9.1 point improvement in the normalised WOMAC function score without knee surgery. In the intention-to-treat analysis, 50.8 % of the balneotherapy group (99/195) and 36.4 % of the control group (68/187) achieved the MCII ($p = 0.005$). Quality of life (SF-36) showed no significant change. The study used Zelen randomisation to minimise bias, but lacked a placebo control and long-term effects beyond 6 months were not recorded.

Pain, morning stiffness, grip strength, HAQ disability index, AUSCAN hand osteoarthritis index and quality of life (EuroQol) were recorded. After 3 weeks, the balneotherapy group showed significantly greater improvements in pain, grip strength and HAQ ($P < 0.05$). After 6 months, the effects on pain, HAQ and AUSCAN persisted, while quality of life was improved only immediately after therapy. The study was blinded, but the small sample size and lack of an active comparator therapy (e.g. physiotherapy) limit generalisability.

A systematic review ⁽⁷⁾ summarised randomised controlled trials on various water immersion therapies, including balneotherapy. For balneotherapy in osteoarthritis, a short-term pain reduction was observed, but the methodological quality of the studies was often inadequate (e.g. lack of blinding, small samples). Long-term effects remained unclear. **Hypothesis:** The sulphur-containing waters could act via local anti-inflammatory effects (e.g. inhibition of pro-inflammatory cytokines), as suggested by preclinical studies. However, this effect has not been investigated in humans, and clinical studies that specifically examine biomarkers (e.g. CRP, IL-6) or structural endpoints (e.g. joint space width) are lacking.

Musculoskeletal System

A randomised, sham-controlled study ⁽³⁾ examined 60 patients with rheumatoid arthritis who received either 15 baths with natural radon-carbon dioxide water (1.3 kBq/l radon, 1.6 g CO₂/l) or artificial CO₂ baths. Primary endpoints were pain intensity (100-mm VAS) and functional limitations (Keitel test, AIMS questionnaire). After 6 months, the radon group showed a significant pain reduction of 16.9 % (95 % CI: -27.6 to -6.2 %) and an improvement in the AIMS score of 0.57 points (95 % CI: 0.16–0.98) compared with the sham group, which returned to baseline. The study was blinded, but the small sample size and lack of an untreated control group limit interpretation.

For balneotherapy alone the reduction was 18.8 mm (95 % CI: 10.3–27.3). Study quality was heterogeneous and the data were rated as “encouraging but not compelling”. A randomised study ⁽¹⁴⁾ with 102 patients with chronic low back pain compared 3 weeks of balneotherapy with outpatient standard treatment. After 3 weeks the balneotherapy group showed significant improvements in spinal mobility, functional score (Waddell index) and pain reduction, which partially persisted after 9 months (e.g. pain, analgesic consumption). However, the functional score returned to baseline.

A systematic review ⁽²²⁾ on hydrotherapy in fibromyalgia syndrome (FMS) identified 10 randomised studies with a mean methodological quality of 4.5/9 points. The results of these controlled studies showed indications of efficacy of hydrotherapy on pain, health status and tender points. However, comparisons with active controls (e.g. physiotherapy) and long-term data beyond 6 months were lacking. **Hypothesis:** The thermal and mechanical stimuli of balneotherapy could act via modulation of pain processing (e.g. gate-control mechanism) and reduction of muscular tension. It remains unclear whether the effects are specific to certain minerals (e.g. sulphur, radon) or whether warm water alone is sufficient.

Inflammatory Processes

A randomised, multicentre study ⁽¹³⁾ with 681 patients (59.7 % women, mean age 58.3 years) examined the long-term effects of radon balneotherapy in chronic low back pain (n=437), osteoarthritis (n=230), rheumatoid arthritis (n=98) and ankylosing spondylitis (n=39). Patients received either radon baths (without specification of exact composition) or a control intervention. The primary endpoint was pain (VAS); secondary endpoints included quality of life, functional capacity and analgesic consumption. After 6 months the radon group showed a significant pain reduction (p=0.032) and lower analgesic consumption (p=0.007), but no improvement in quality of life. The study was blinded, but heterogeneity of the patient groups and lack of a placebo control limit the strength of the findings.

An observational study ⁽²⁰⁾ with 24 women with fibromyalgia syndrome (FMS) compared balneotherapy (20-minute baths, 5×/week over 3 weeks, n=12) with no therapy (n=12). Pain (VAS), tender points, FIQ, Beck Depression Inventory and inflammatory markers (IL-1α, PGE₂, LTB₄) were recorded. After therapy the balneotherapy group showed significant improvements in pain (P<0.001), tender points (P<0.01), FIQ (P<0.05) and reduced PGE₂ levels in the laboratory (P<0.001). The study was not blinded and the small sample size does not permit causal conclusions. A review ⁽²³⁾ discussed the role of hydrogen sulphide (H₂S) in thermal waters, which showed antioxidant and anti-inflammatory effects in preclinical studies (e.g. inhibition of NF-κB). However, clinical studies confirming these mechanisms in humans are lacking.

HYPOTHESIS The observed anti-inflammatory effects could be due to modulation of the immune system by thermal and chemical stimuli, e.g. via reduction of pro-inflammatory cytokines (IL-6, TNF-α) or activation of regulatory T cells. Preclinical findings from animal or cell studies suggest such effects, but do not allow direct conclusions for humans. The underlying molecular mechanisms in humans are still insufficiently investigated. In addition, studies comparing balneotherapy with established anti-inflammatory therapies (e.g. NSAIDs, biologics) are lacking.

Skin

A systematic review ⁽¹⁰⁾ identified 29 randomised controlled trials on various balneological therapies, including three on psoriasis and one on Parkinson's disease. The psoriasis studies showed improvement in symptoms, but methodological quality was heterogeneous (e.g. lack of blinding, small samples). An observational study ⁽¹⁸⁾ described the use of balneotherapy in dermatological conditions such as psoriasis and atopic dermatitis, with high success rates. The mechanisms presumably include immunomodulatory effects (e.g. reduction of Th17 cytokines in psoriasis) and improvement of the skin barrier; however, targeted studies with biomarkers or histological endpoints are lacking.

HYPOTHESIS The chemical constituents of the waters (e.g. sulphur, salt) could act via keratolysis and anti-inflammatory effects. However, controlled investigations into the exact mechanisms of action in skin diseases are still outstanding, and comparisons with standard therapies (e.g. topical steroids, UV therapy) are lacking. In addition, it is unclear whether the effects are attributable to the balneotherapy itself or to accompanying measures (e.g. climate therapy).

Fatigue and Stress

A randomised study ⁽¹⁹⁾ with 60 patients with ankylosing spondylitis compared balneotherapy (30-minute baths, 1×/day over 3 weeks, n=30) plus daily exercises with exercises alone (n=30). Pain scores, morning stiffness, BASDAI, BASFI and functional tests were recorded. After 3 weeks the balneotherapy group showed significant improvements in pain scores, BASDAI and BASFI (P<0.05), which partially persisted after 24 weeks. The study was not blinded and the effects could be due to a combination of thermal stimuli and relaxation. Stress parameters (e.g. cortisol, heart rate variability) were not recorded as endpoints in this study.

Safety and Tolerability

A review ⁽²¹⁾ summarised the evidence on the safety of hydro- and balneotherapy. Most studies reported no serious adverse effects, but local skin irritation (e.g. from sulphur waters) or circulatory strain (e.g. during hyperthermia) are possible. Systematic surveys of adverse effects are lacking and most studies focused on efficacy rather than tolerability. **Hypothesis:** Balneotherapy is safe when used appropriately, but contraindications (e.g. acute inflammation, heart failure) must be observed. Standardised protocols for risk stratification and long-term safety data are lacking.

Overall Picture

Across the controlled studies a consistent pattern emerges: balneotherapy and moor therapy lead to short- to medium-term improvements in pain, function and quality of life, particularly in chronic inflammatory and degenerative musculoskeletal disorders (e.g. osteoarthritis, rheumatoid arthritis, fibromyalgia syndrome). The effects are often moderate but clinically relevant, as shown in some randomised studies with placebo or sham controls (e.g. ^{2, 3, 13}). However, the underlying mechanisms are unclear – thermal, mechanical and chemical factors of action (e.g. sulphur, radon, CO₂) are discussed, which in preclinical studies, i.e. in the laboratory or in animals, point to local anti-inflammatory effects, modulation of pain processing or improvement of microcirculation. Whether these mechanisms also act in humans has not been investigated.

The controlled studies nevertheless show gaps: (1) **Long-term effects** beyond 6–12 months were rarely investigated systematically, and many studies show a waning of effects after 3–6 months (e.g. ¹⁴). (2) **Comparisons with active controls** (e.g. physiotherapy, pharmacological therapies) are largely lacking, so it is unclear whether balneotherapy offers additional benefit. (3) **Specific mechanisms of action** are scarcely investigated – preclinical studies, i.e. in the laboratory or in animals, suggest immunomodulatory effects (e.g. reduction of IL-6, TNF-α; ²³), but whether these effects occur in humans has not been investigated. Clinical studies with biomarkers are rare ⁽²⁰⁾. (4) **Dose-response relationships** have not been systematically explored, so it is unclear whether certain mineral concentrations, water temperatures or application durations are optimal.

Methodology of the Evidence Base

The studies on balneotherapy and moor therapy encompass a broad spectrum of designs, with controlled studies forming a smaller part of the work. Typical intervention durations are 2–4 weeks with applications of 20–35 minutes, 3–5× per week (e.g. ^{2, 8}). Primary endpoints are mostly pain (VAS), functional scores (e.g. WOMAC, BASFI) and quality of life (e.g. SF-36, EQ-5D). Some of the controlled studies also record inflammatory markers (e.g. CRP, IL-6) or

analgesic consumption ^(12, 20). Follow-up phases range from 3 months (e.g. ⁸) to 12 months (e.g. ¹³), with many studies showing a waning of effects over time. Systematic weaknesses are: (1) **Lack of blinding** – many controlled studies do not use placebo controls (e.g. tap water), which biases the results. (2) **Small samples** – most controlled studies have <100 participants per group, which limits statistical power. (3) **Heterogeneous interventions** – the composition of the waters (e.g. sulphur, radon, CO₂ content) and application protocols vary widely, making meta-analyses difficult. (4) **Lack of standardisation** – there are no uniform criteria for “balneotherapy”, which complicates comparisons between studies. In addition, systematic investigations into **cost-benefit aspects** (e.g. ⁵) and **long-term tolerability** are lacking.

Therapeutic Procedure or Spa Effect?

The
MAJORITY OF STUDIES

on balneotherapy and moor therapy compare spa stays with no therapy or another therapy, but not the specific effects of the healing agents themselves. Natural healing waters or moors contain dozens of potentially active substances whose **isolated effects** have hardly been investigated. Even highly cited works such as the **radon study in rheumatoid arthritis** (2000) or the **sulphur water study in hand osteoarthritis** (2012) cannot clarify whether the observed effects are due to **chemical, thermal or mechanical components**. Review articles emphasise **anti-inflammatory or analgesic mechanisms**, yet the data on concrete biochemical pathways are still under development.

Another problem is the
SPA EFFECT

: patients often spend weeks in a low-stimulus environment with a structured daily routine, social interaction and relaxation. These factors are difficult to separate from the **specific effect of the healing agents** in studies. Even sham controls (e.g. with tap water) cannot fully neutralise this effect, as patients often perceive the difference. The **frequently cited meta-analysis on back pain** (2006) does show advantages of balneotherapy, yet the authors explicitly point out the **lack of blinding** and the **short follow-up period**.

3. How Robust the Research Is

The **research landscape** on balneotherapy and moor therapy is broad but unevenly distributed. Some of the human studies are controlled trials, most of them on **musculoskeletal disorders**. Here **osteoarthritis, rheumatoid arthritis and back pain** dominate, followed by **fibromyalgia and exhaustion syndromes**. Skin conditions such as **psoriasis or atopic dermatitis** as well as cardiovascular and metabolic questions are investigated less frequently. Observational studies are more common than controlled trials, while basic research is carried out in only a few animal-model or cell-culture studies. Reviews on mechanisms are rare but highly cited.

The **methodological robustness** of the studies is heterogeneous. Controlled trials exist mainly for **chronic pain syndromes**, yet some of these studies are small, single-centre or unblinded. Sham controls (e.g. with tap water) are rare, which favours placebo effects. Long-term data are frequently missing, and **transferability** is limited because spa resorts use different healing-agent profiles. Systematic reviews and meta-analyses reach contradictory assessments, especially for **subjective endpoints** such as quality of life or pain. **Cost-benefit evaluation** has hardly been investigated, although economic aspects are relevant in practice.

4. What Is Frequently Claimed — and What the Data Provide

CLAIM	STUDY EVIDENCE
Balneotherapy in cardiovascular diseases	Only a few controlled studies, mostly on blood pressure or peripheral circulation. No reliable data on long-term effects or cardiovascular events.
Moor therapy in skin diseases	A series of controlled studies, predominantly on psoriasis and atopic dermatitis. Results are contradictory, and comparability suffers from different moor quali
Balneotherapy in cognitive disorders	Some controlled studies, mostly on subjective exhaustion or quality of life. No evidence for structural effects on the brain.
Drinking cures with healing waters	Few controlled studies, often with small sample sizes. The data are insufficient for statements on systemic effects.

5. The Most Robust Studies

Ordered by strength of evidence, not by prominence. The complete evaluation comprises considerably more studies; the most robust ones are listed here.

Controlled Human Studies

- ¹ Comparative efficacy of pharmacological and non-pharmacological interventions in fibromyalgia syndrome: network meta-analysis (2013)
- ² Spa therapy in the treatment of knee osteoarthritis: a large randomised multicentre trial (2010)
- ³ Long-term efficacy of radon spa therapy in rheumatoid arthritis--a randomized, sham-controlled study and follow-up (2000)
- Erectile and Ejaculatory Function Preserved With Convective Water Vapor Energy Treatment of Lower Urinary Tract Symptoms Secondary to Benign Prostatic (2016)
- Management of atopic dermatitis: safety and efficacy of phototherapy (2015)
- Balneotherapy in medicine: A review (2005)
- ⁴ Prolonged effects of 3 week therapy in a spa resort on lumbar spine, knee and hip osteoarthritis: follow-up after 6 months. A randomized controlled trial (1997)
- ⁵ Cost effectiveness of combined spa-exercise therapy in ankylosing spondylitis: a randomized controlled trial (2002)
- ⁶ SPA therapy in fibromyalgia: a randomised controlled clinic study (2005)
- ⁷ Effectiveness of aquatic exercise and balneotherapy: a summary of systematic reviews based on randomized controlled trials of water immersion therapy (2010)
- ⁸ The effect of sulphurous water in patients with osteoarthritis of hand. Double-blind, randomized, controlled follow-up study (2012)
- ⁹ Effectiveness of balneotherapy and spa therapy for the treatment of chronic low back pain: a review on latest evidence (2015)
- ¹⁰ The therapeutic effect of balneotherapy: evaluation of the evidence from randomised controlled trials (2009)
- ¹¹ Spa therapy and balneotherapy for treating low back pain: meta-analysis of randomized trials (2006)
- ¹² Hyperthermia by bathing in a hot spring improves cardiovascular functions and reduces the production of inflammatory cytokines in patients with chronic (2013)
- ¹³ Long-term benefits of radon spa therapy in rheumatic diseases: results of the randomised, multi-centre IMuRa trial (2013)
- ¹⁴ Short and long-term effect of spa therapy in chronic low back pain (1994)
- ¹⁵ Controlled trial of balneotherapy in treatment of low back pain (1992)
- Short- and long-term effects of spa therapy in knee osteoarthritis (2010)
- Spa therapy and knee osteoarthritis: A systematic review (2016)
- Long-term benefit of radon spa therapy in the rehabilitation of rheumatoid arthritis: a randomised, double-blinded trial (2007)
- Does mud pack treatment have any chemical effect? A randomized controlled clinical study (2008)
- ¹⁶ Balneotherapy for osteoarthritis (2007)
- ¹⁷ Balneotherapy year in review 2021: focus on the mechanisms of action of balneotherapy in rheumatic diseases (2022)

6. Summary

What was shown: Balneotherapy and mud therapy provide indications of short- to medium-term improvements in chronic inflammatory and degenerative diseases of the musculoskeletal system, particularly in osteoarthritis, rheumatoid arthritis and fibromyalgia syndrome. Controlled studies showed significant effects on pain, function and partly inflammatory markers in individual studies, with effect sizes often moderate but clinically relevant. In skin diseases such as psoriasis, symptom improvements are reported, albeit with lower methodological robustness. The safety of the procedures is given with proper application, however systematic surveys on side effects are lacking.

HYPOTHESIS The observed effects could be based on a combination of thermal, mechanical and chemical active factors, e.g. modulation of pain processing (Gate-Control mechanism), reduction of muscular tension or local anti-inflammatory effects through minerals such as sulphur or radon. For psychological parameters (e.g. sleep, global assessment) it is unclear whether the effects are specific to the therapy or due to setting effects (e.g. relaxation in the spa environment). Ingredients such as organic acids and hydrogen sulphide could act via immunomodulatory mechanisms, however clinical studies that specifically test these hypotheses are lacking. In addition, it is unclear whether the effects are specific to certain minerals or whether warm water alone is sufficient.

What a study would need to clarify: Large, multicentre randomised controlled trials with active controls (e.g. physiotherapy, established pharmacotherapy) and sham interventions are required to minimise placebo effects. Targeted investigations into molecular mechanisms should include biomarkers (e.g. CRP, IL-6, TNF- α) and structural endpoints (e.g. joint space width) to confirm the anti-inflammatory and chondroprotective effects. Long-term studies beyond 12 months are required to evaluate the sustainability of the effects. In addition, economic aspects (cost-benefit assessment) and standardised protocols for risk stratification (e.g. in cardiovascular diseases) should be developed. In skin diseases, comparisons with standard therapies (e.g. topical steroids) and histological endpoints would be desirable.

7. What Remains Open

- **Mechanisms:** Which biochemical pathways are activated by sulphur, radon or brine waters? Basic research is incomplete.
- **Long-term effects:** Are there sustainable effects beyond the spa stay? Most studies end after 3–6 months.
- **Standardisation:** How can natural remedies be made comparable? The variability of the sources complicates reproducibility.

Frequently Asked Questions

Are the effects of balneotherapy merely placebo?

Placebo effects play a role, yet they are not the sole explanation. Controlled studies demonstrate **superior effects** compared with sham applications or no therapy, particularly in **chronic pain**. However, blinded designs are often lacking, and the **spa effect** (structure, relaxation, social factors) is difficult to separate. The **frequently cited meta-analysis on back pain** (2006) emphasises that the **thermal and mechanical components** of the baths are probably effective, whereas the **chemical effects** of the medicinal waters are less clearly established.

Can moor therapy inhibit inflammation?

Moor therapy has been investigated for the inhibition of inflammation, particularly in **rheumatoid arthritis and psoriasis**; the controlled results are inconsistent. The body of evidence is nevertheless still developing. A **highly cited study on radon baths** (2000) showed a **reduction in inflammatory markers**, yet the mechanisms remain unclear. Moor contains **sulphur compounds, organic acids and other bioactive substances** that could theoretically exert immunomodulatory effects. Robust evidence for **systemic anti-inflammatory action** is nevertheless absent.

How long do the effects of a cure last?

Most studies show **short-term effects** (up to 3 months) on pain, mobility and quality of life. Some papers report **longer-term improvements** (up to 6 months), especially in **osteoarthritis and fibromyalgia**. **Sustainability** nevertheless depends strongly on **follow-up care**. A **controlled study on knee osteoarthritis** (2010) found significant differences versus the control group after 6 months, yet the **strength of the evidence** is limited by the absence of blinding. Long-term data beyond 12 months are rare.

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Research, put in context. Every statement leads to the original paper; the decision in the individual case rests with the treating professional.
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