Thuja occidentalis–Based Anti-Wart Spray: Phytochemistry, Biological Rationale, Clinical Evidence, Formulation Considerations, and Safety

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doi.org/10.64643/IJIRT209660

***Abstract*—Cutaneous warts are benign epidermal proliferations caused by human papillomavirus (HPV), and their persistence, recurrence, and variable response to treatment encourage interest in complementary approaches. Thuja occidentalis L. (Cupressaceae), commonly called northern white cedar or arborvitae, has a long history of use in traditional and homeopathic preparations. This narrative review summarizes the botanical and phytochemical characteristics of T. occidentalis, proposed biological mechanisms relevant to wart management, available clinical evidence, and considerations for the development of a topical anti-wart spray. Literature was identified through targeted searches of PubMed/PMC, publisher records, and regulatory sources using combinations of "Thuja occidentalis," "wart," "verruca," "homeopathy," "thujone," "topical," and "safety." The evidence base is limited: a published case report describes improvement of resistant warts after use of a Thuja extract, but a case report cannot establish causality or efficacy. A randomized pilot trial of individualized homeopathic medicines, in which Thuja was commonly prescribed, found no statistically significant between-group difference versus placebo and was inconclusive. These findings do not establish that a non-homeopathic Thuja spray is effective. Essential-oil constituents, especially thujone, raise toxicological concerns, and the chemical profile varies with plant part, extraction, and processing. A research formulation therefore requires botanical authentication, chemical standardization, dose justification, stability testing, skin-irritation assessment, and controlled clinical evaluation. Thuja-based spray should be regarded as investigational rather than a proven treatment; established clinical assessment and evidence-based wart therapies should not be delayed.**

***Index Terms*—Thuja occidentalis; cutaneous wart; verruca; HPV; topical spray; thujone; phytotherapy; safety; formulation development.**

I. INTRODUCTION

Warts (verrucae) are common benign epithelial lesions associated with infection by human papillomavirus. Clinical forms include common warts, plantar warts, flat warts, and periungual warts. Many resolve spontaneously, but resolution may take months or years, and some lesions persist or recur after treatment. Treatment choice depends on wart site, size, number, patient age, symptoms, immune status, prior treatment, and patient preference. Salicylic acid and cryotherapy are commonly used options; other clinician-directed treatments may be considered for recalcitrant lesions. Diagnostic review is important when a lesion is atypical, bleeding, rapidly changing, painful, ulcerated, or located in a sensitive area.



Figure 1. Illustrative examples of cutaneous warts (common, plantar, flat, and periungual).

Plant-derived products are frequently investigated as potential topical treatments because they may contain chemically diverse constituents with biological activity. However, traditional use, laboratory activity, anecdotal improvement, and clinical efficacy are

different levels of evidence. In particular, evidence for a highly diluted homeopathic product cannot be assumed to apply to a spray containing measurable quantities of plant extract or essential oil. This review evaluates Thuja occidentalis in that context and outlines a responsible research pathway for a proposed anti-wart spray.

II. REVIEW METHODOLOGY

This is a narrative review, not a registered systematic review. Targeted searches were conducted in PubMed/PMC and publisher/regulatory pages using combinations of the terms Thuja occidentalis, wart, verruca vulgaris, homeopathic medicines, topical preparations, thujone, phytochemistry, and toxicity. Priority was given to peer-reviewed reviews, human clinical reports, randomized studies, and regulatory toxicology information. Reference lists of relevant papers were also considered. Because the evidence is sparse and the formulations differ substantially, no quantitative meta-analysis was attempted. The search was targeted rather than exhaustive; publication bias and selective reporting cannot be excluded.

III. BOTANICAL PROFILE AND PHYTOCHEMISTRY

3.1 Botanical identity

Thuja occidentalis L. belongs to the family Cupressaceae and is an evergreen conifer native to eastern North America. It is known as northern white cedar or arborvitae. Leaves and twigs have been used in traditional preparations, while commercial products may use different plant parts and extraction processes. For research purposes, the plant should be authenticated by a qualified botanist or pharmacognosist, with a voucher specimen deposited in an accessible herbarium.



Figure 2. Thuja occidentalis (northern white cedar/arborvitae); illustrative botanical image.

3.2 Constituents and variability

Thuja preparations may contain volatile-oil constituents, including thujone isomers, along with other terpenoids and non-volatile constituents. The quantitative composition is affected by plant part, growing conditions, harvest, drying, extraction solvent, temperature, and storage. This variability matters because a preparation described only as “Thuja extract” is not chemically defined. Essential oil and concentrated extracts should not be treated as interchangeable with highly diluted homeopathic products.



Figure 3. Close-up of Thuja foliage and cones; illustrative botanical image.

Thujone is a key safety-relevant constituent because it can affect the central nervous system at sufficient exposure. The European Medicines Agency has published a scientific statement addressing thujone in herbal medicinal products and the need to control exposure. Therefore, a proposed spray should specify its extract type, drug-to-extract ratio where applicable, solvent, marker compounds, thujone content, and analytical method. “Natural” origin does not guarantee safety.

IV. BIOLOGICAL RATIONALE FOR WART MANAGEMENT

Warts are associated with HPV infection of keratinocytes. Their persistence reflects interactions among viral factors, epithelial differentiation, and host immune responses. A topical product could theoretically act through direct effects on infected tissue, local irritation, or modulation of host responses; however, these hypotheses require direct experimental testing. Reports of antiviral or immunomodulatory activity for Thuja-containing preparations in other

contexts do not demonstrate activity against HPV in human wart tissue.

Any claim that Thuja spray is virucidal, selectively cytotoxic to infected cells, immunomodulatory at the lesion, or capable of preventing recurrence should be supported by appropriate assays. Initial laboratory studies should distinguish cytotoxicity to normal skin cells from any effect on HPV-related endpoints. Irritation or chemical injury can reduce visible tissue but may also cause burns, scarring, or secondary infection and should not be mistaken for a selective anti-HPV effect.

V. CLINICAL EVIDENCE

5.1 Case report involving resistant warts

Joseph and colleagues reported a renal transplant recipient with multiple recalcitrant verrucae in whom a Thuja occidentalis extract was associated with resolution of some lesions after other treatments had failed. The report is clinically interesting because warts can be difficult to manage in immunosuppressed patients. Nevertheless, a single case cannot separate treatment effect from natural fluctuation, concurrent care, or other confounders. It also does not establish an optimal concentration, spray vehicle, treatment schedule, or safety profile for general use.

5.2 Randomized pilot trial of individualized homeopathy

A randomized, double-blind, placebo-controlled pilot trial assessed individualized homeopathic medicines for cutaneous warts. Thuja occidentalis was the most frequently prescribed medicine, but participants received individualized remedies rather than a standardized Thuja spray. The study found no statistically significant between-group differences in wart number or size at three months and concluded that the findings were inconclusive. The trial therefore does not establish efficacy for Thuja, and it cannot be directly extrapolated to a topical botanical extract.

5.3 Overall interpretation

The available clinical evidence is insufficient to conclude that a Thuja-based anti-wart spray is effective. A case report provides a signal for further investigation, while the randomized pilot trial does not demonstrate a significant benefit for individualized homeopathic treatment. Neither study validates a particular spray formulation. Well-designed controlled trials of a chemically characterized topical product are needed before efficacy claims can be made.

VI. FORMULATION AND DEVELOPMENT CONSIDERATIONS FOR A TOPICAL SPRAY

A research spray is a dosage-form concept, not a clinically validated recipe. A suitable formulation cannot be specified responsibly until the intended extract, marker profile, exposure limits, and preliminary safety data are known. A formulation-development programme should document the following:



Figure 4. Example concept image of a Thuja-based spray bottle; not a validated or marketed formulation.

- Raw-material quality: authenticated botanical identity, plant part, voucher specimen, contaminants, microbial quality, pesticide/heavy-metal testing, and batch traceability.
- Extract specification: extraction solvent, drug-to-extract ratio, yield, marker profile, and quantitative assay for thujone and other relevant volatile constituents.
- Vehicle selection: compatibility with the extract, suitable pH where relevant, acceptable sprayability, container compatibility, and avoidance of unnecessary irritants or sensitizers.
- Physical and chemical quality: appearance, odour, pH where applicable, viscosity, spray pattern, delivered dose per actuation, content uniformity, and precipitation or phase separation.

- Stability: real-time and accelerated studies in the intended packaging, with monitoring of marker content, degradation, microbial quality, and spray performance.
- Microbiological quality: appropriate limits and preservative-effectiveness assessment when required for the product type and intended use.
- Safety screening: risk-based irritation and sensitization evaluation, with validated methods and ethical oversight; human testing only after adequate preclinical review.
- Clinical assessment: prospectively defined outcomes, comparator, randomization, blinded assessment where feasible, adverse-event monitoring, and follow-up for recurrence.

The formulation should not be applied to the face, eyes, mucosa, genital or perianal areas, broken skin, or large areas unless specifically evaluated and authorized for that use. Concentrated essential oil or unstandardized home-prepared extracts should not be recommended for self-treatment. Pregnancy, breastfeeding, childhood, seizure disorders, and immunosuppression warrant particular caution and clinician review.

VII. SAFETY AND RISK MANAGEMENT

The principal formulation-specific concern is exposure to thujone and other biologically active constituents. Toxicity depends on concentration, route, dose, duration, and absorption. Oral poisoning from Thuja material has been associated in the literature with gastrointestinal and neurological effects and potential organ toxicity. The risk profile of a particular topical spray cannot be inferred from a different product or from a highly diluted homeopathic preparation.

Potential local adverse effects include irritation, allergic contact dermatitis, pain, blistering, pigmentary change, chemical burns, and scarring. Sprays also introduce inhalation and accidental eye-exposure risks. Product development should include a clear rationale for concentration limits, child-resistant and leak-resistant packaging where appropriate, warnings against ingestion and inhalation, and instructions for accidental exposure. A safety data sheet and pharmacovigilance plan should be prepared for research and any future product development.

A wart-like lesion may be something else, including a corn, callus, seborrhoeic keratosis, or less commonly skin cancer. Clinical assessment is advised for uncertain diagnoses, immunocompromised patients, lesions that change or bleed, and lesions on sensitive sites. Users should not cut, burn, or aggressively scrape lesions at home. Evidence-based options should be discussed with a qualified healthcare professional.

VIII. PROPOSED RESEARCH FRAMEWORK

A staged research programme is preferable to immediate clinical promotion. Stage 1 should establish botanical authentication and chemical characterization. Stage 2 should evaluate formulation performance and stability. Stage 3 should assess relevant in-vitro biological activity alongside cytotoxicity and irritation risk, using controls and prespecified endpoints. Only if these stages support a plausible benefit and acceptable safety should an ethically approved human study be considered.

A clinical study should define the wart type and diagnostic criteria, exclude suspicious lesions, document previous treatment and immune status, and use a comparator appropriate to the research question. Primary outcomes might include complete clearance of the target wart at a prespecified time point and blinded photographic assessment. Secondary outcomes could include time to clearance, recurrence, pain, local tolerability, and patient-reported outcomes. Sample-size calculations, registration, informed consent, transparent reporting, and independent ethics review are essential. Results should be reported regardless of whether, they are positive.

Table 1. Summary of evidence and implications

Evidence type	What it suggests	Key limitation
Case report of Thuja extract	Possible clinical signal in resistant warts	Single patient; cannot establish causality or generalize to a spray
Randomized pilot trial of individualized homeopathy	No, statistically significant between-group benefit; inconclusive	Not a standardized topical Thuja extract or spray

Evidence type	What it suggests	Key limitation
Phytochemical / pharmacological literature	Provides hypotheses and highlights composition variability	Mechanistic findings do not prove clinical wart clearance
Regulatory thujone assessment	Supports careful exposure control and chemical characterization	Does not establish the safety of a specific wart formulation

IX. DISCUSSION

Interest in Thuja for wart management is understandable given the persistence of some lesions and the appeal of plant-derived products. However, the current evidence is weak and heterogeneous. A single positive case report can generate a hypothesis but is vulnerable to bias and cannot establish the probability of benefit. The homeopathy pilot trial is relevant to the broader topic because Thuja was frequently prescribed, yet its results were statistically inconclusive and the intervention differs materially from a botanical spray.

A central translational challenge is that "Thuja anti-wart spray" is not a single reproducible intervention. Different plant parts, extraction solvents, concentrations, and vehicles may yield substantially different exposures. Without standardization, reproducibility and safety assessment are difficult. Given thujone-related concerns, development should be guided by quantitative chemistry and exposure assessment rather than by tradition alone.

A submission-quality review should also acknowledge limitations. This narrative review used targeted searches rather than a registered systematic methodology; no formal risk-of-bias tool or exhaustive duplicate screening was performed. The conclusions should therefore be interpreted as a critical overview of selected evidence, not a definitive systematic estimate of treatment effect. Future reviews could use PRISMA methods if the literature becomes sufficiently developed.

X. CONCLUSION

Thuja occidentalis has a history of traditional and homeopathic use, and limited reports have prompted interest in its possible role in wart management. Current clinical evidence does not establish the efficacy of a Thuja-based anti-wart spray. A randomized pilot trial of individualized homeopathy was inconclusive, while a case report is hypothesis-generating only. Chemical variability and thujone toxicity concerns make botanical authentication, standardization, exposure control, formulation testing, and safety assessment essential. A Thuja spray should be described as investigational until supported by well-designed clinical trials; it should not replace diagnostic assessment or established wart care.

Declarations

Funding: [Insert funding source, or state "No external funding was received" if accurate.]

Conflicts of interest: [Insert accurate declaration.]

Author contributions: [Insert contributions of each author.]

Ethics approval: Not applicable to this literature review. Any future human research requires institutional ethics approval and informed consent.

Data availability: No new datasets were generated for this review.

Acknowledgements: [Optional; include only if applicable.]

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