

Table S1. Clinical (A) and preclinical (B) studies of sulforaphane (SF)/broccoli sprouts extract (BSE) with skin endpoints or clear relevance to skin conditions.

Species / indication	Route & preparation	Nominal SF (or precursor) dose	Approx. SF exposure (mg/kg/day)	Duration	Safety / AE-relevant observations	Ref.
(A) Clinical Studies						
Human – healthy volunteers (Phase I, systemic safety)	Oral BSE: GR-rich (cohorts A,B) or SF-rich (cohort C), q8h	Cohort C: 25 µmol SF q8h = 75 µmol/day ≈ 13.3 mg/day SF Cohort A: 25 µmol GR Cohort B: 100 µmol GR	≈ 0.19 mg/kg/day (70 kg adult)	7 days dosing + 3 days follow-up	Careful clinical and lab monitoring (incl. liver/thyroid): no significant or consistent subjective/objective toxicities with any sprout extract ingestion.	Shapiro, Fahey et al. 2006 [1]
Human – UVB erythema protection (photoprotection, healthy adults)	Topical SF-rich BSE vs vehicle on 2-cm diameter back sites	100-600 nmol SF/site/day ≈ 0.02-0.11 mg/site/day	Local, not systemic	Acute (single/few applications before UVB)	Reduced UVB erythema; no local irritation or systemic AEs reported ; treated skin clinically normal apart from erythema protection.	Talalay, Fahey et al. 2007 [2]
Human – keratin-based disorders feasibility (parents of EBS children)	Topical BSE in jojoba oil vs vehicle, inner arm, occluded overnight	500 nmol SF/mL; 1 mL per 3-cm circle ≈ 0.5 µmol/site/day (≈0.09 mg/site/day)	Local, not systemic	7 consecutive days	“Both BSE- and vehicle-treated skin sites appeared normal on clinical and histologic analysis”; “all subjects denied any adverse effects.”	Kerns, Guss et al. 2017 [3]

Human – post-acne macular scars (cosmetic use)	Topical broccoli stem extract cream (contains SF among other phytochemicals) to face	Not quantified in μmol ; cosmetic-strength BID to facial scars	Local, not systemic	8 weeks	Significant improvement in erythema/melanin indices; no adverse skin reactions ; cream described as “well tolerated”; no AE-related withdrawals.	Syahputri, Putra et al. 2025 [4]
Human – melanoma survivors with atypical nevi	Oral BSE containing SF	50, 100, 200 $\mu\text{mol/day}$ SF $\approx$ 8.9, 17.7, 35.5 mg/day	$\approx$ 0.13, 0.25, 0.51 mg/kg/day (70 kg)	28 days	All 17 patients completed 28 days with no dose-limiting toxicities ; no skin-specific toxicity; only mild, nonspecific complaints (occasional GI upset).	Tahata, Singh et al. 2018 [5]
Human – oral GR→SF $\pm$ curcumin, healthy volunteers (skin biopsies)	Oral Crucera-SG S (glucoraphanin) $\pm$ curcumin capsules	High-dose GR (450 mg) $\approx$ 100–200 μmol SF-equivalent/day $\approx$ 17.7–35.5 mg/day	$\approx$ 0.25–0.51 mg/kg/day (70 kg)	7 days	Modulated Nrf2-regulated enzymes in skin; no serious AEs ; AEs mostly mild GI (bloating, gas, discomfort); no dermatologic AEs.	Chien, Liu et al. 2025 [6]
Human –Phase II RCT (airborne pollutant detoxification)	Oral beverage with GR + SF	600 μmol GR + 40 μmol SF/day $\approx$ 24.8 mg/day SF	$\approx$ 0.35 mg/kg/day (70 kg)	12 weeks	Well tolerated , no serious AEs; main AEs mild, transient GI symptoms (e.g., gas, loose stools); no signal for skin toxicity.	Egner, Chen et al. 2014 [7]

Human – GR-rich vs SF-rich crossover trial	Oral GR-rich and SF-rich BSE beverages	800 µmol/day GR or 150 µmol/day SF ≈ 26.6 mg/day SF	≈ 0.38 mg/kg/day (70 kg)	Controlled feeding periods (7 days × 2) with in-between washout (5 days)	Good overall tolerability; no major toxicity signal; no skin-specific issues noted.	Kensler, Ng et al. 2012 [8]
Human – current smokers (Avmacol® BSSE, detoxification)	Oral broccoli seed & sprout extract tablets	Single-day high doses delivering SF in the tens of µmol range (~5–10 mg SF/day)	≈ 0.07–0.14 mg/kg/day (70 kg)	Two weeks × 2 with in-between washout (2 weeks)	No CTCAE grade ≥3 events; most AEs mild (GI upset, headache); no dermatologic safety signal.	Bauman, Hsu et al. 2022 [9]
Human – prediabetes RCT (metabolic, systemic tolerability)	Oral BSE containing SF	150 µmol/day SF ≈ 26.6 mg/day SF	≈ 0.38 mg/kg/day (70 kg)	12 weeks	GI side effects (nausea, mild diarrhea, abdominal discomfort) commonest; no severe AEs ; no reported cutaneous toxicity.	Dwibedi, Axelsson et al. 2025 [10]

(B) Preclinical Studies

Mouse – DNCB-induced atopic dermatitis (AD)	i.p. SF (solution for intraperitoneal injection)	2.5, 5, 10 mg/kg/injection, 3×/week	Dose per injection: 2.5–10 mg/kg/day on dosing days; averaged over week ≈1.1–4.3 mg/kg/day	3 weeks (9 injections, concurrent with DNCB)	Body-weight curves overlapped AD controls; no SF-related mortality or reported organ toxicity ; focus on improved dermatitis and molecular markers.	Wu, Peng et al. 2019 [11]
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Mouse – DNCB-induced AD (second study)	s.c. SF	1 mg/kg/injection, 3×/week	Dose per injection: 1 mg/kg/day on dosing days; averaged over week ≈ 0.43 mg/kg/day	3 weeks (9 injections, after induction of AD)	Improved lesions and cytokine/apoptosis markers; no mention of death, weight loss, or systemic toxicity ; no dedicated toxicity section.	Alyoussef 2022 [12]
Mouse – IMQ-induced psoriasis-like dermatitis	i.p. SF	5 mg/kg/day	5 mg/kg/day	7 days (concurrent with IMQ)	SF improved PASI-like scores, histology, and signaling; no report of SF-related mortality or overt clinical toxicity ; spleen index not worsened vs IMQ alone.	Ma, Gu et al. 2023 [13]
Mouse – IMQ-induced psoriasis-like dermatitis	i.p. SF	55.3 or 110.6 μmol/kg/day ≈ 9.8 or 19.6 mg/kg/day	9.8 or 19.6 mg/kg/day	14 days total (7 days pre-IMQ + 7 days during IMQ)	Marked improvement in psoriasis-like lesions and Th1/Th17 modulation; no reported SF-specific toxicity ; mortality not an endpoint in this arm and none noted.	Du, Zhang et al. 2022 [14]
Mouse – MRL/lpr SLE (systemic autoimmunity with skin involvement)	i.p. SF	82.9 μmol/kg/day ≈ 14.7 mg/kg/day	14.7 mg/kg/day	27 days (starting at 14 weeks of age)	SF prolonged survival and improved renal pathology vs vehicle; no new toxicity signals reported (no organ damage attributable to SF).	Du, Zhang et al. 2022 [14]

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