Skin Restore — UMP Claims Source Document

1. Core Mechanism — The Ratio Itself

Claim in copy	Exact finding / stat	Source	Conf.	Notes / caveats
Skin's barrier lipids need to be in a specific ratio, and getting that ratio right accelerates repair	An equimolar (1:1:1) mixture of ceramides, cholesterol, and fatty acids permits normal barrier repair; increasing any ONE of the three components up to threefold further accelerates repair speed.	*Man MQ, Feingold KR, Thornfeldt CR, Elias PM. 'Optimization of Physiological Lipid Mixtures for Barrier Repair.' J Invest Dermatol. 1996.* https://pubmed.ncbi.nlm.nih.gov/8618046/	**Confidence: B**	Principally murine, with preliminary human observations. This is the origin of the "3 parts of one lipid" concept — it does NOT by itself establish one universal 3:1:1 formula, and does not specify which lipid should be the dominant one.
CORRECTION: the ratio that worked best specifically in AGED skin was cholesterol-dominant, not ceramide-dominant	In chronologically aged human skin (n=6, age 80±5), a 3:1:1:1 mixture where CHOLESTEROL was the dominant lipid (3 parts cholesterol : 1 ceramide : 1 essential fatty acid : 1 non-essential fatty acid) significantly accelerated barrier recovery at 6 hours, P<0.005. A fatty-acid-dominant mixture significantly DELAYED recovery.	*Zettersten EM, Ghadially R, Feingold KR, Crumrine D, Elias PM. 'Optimal ratios of topical stratum corneum lipids improve barrier recovery in chronologically aged skin.' J Am Acad Dermatol. 1997;37:403-408.* https://pubmed.ncbi.nlm.nih.gov/9308554/	**Confidence: B**	IMPORTANT CORRECTION from v1 of this document: v1 implied the ratio was ceramide-dominant. It was not, in the specific aged-skin experiment. If copy names "3:1:1" and implies ceramide is the '3' part, that is not what this study found for aged skin. Recommend either correcting the claim to specify cholesterol as dominant, or dropping the specific ratio framing in favor of the plainer "three lipids working together, in the right balance" language.
Menopause specifically disrupts ceramide production (not just aging generally)	Postmenopausal stratum corneum showed significant reductions in specific ceramide subclasses (CER[NH] P=0.0008, CER[AH] P=0.0002, CER[EOH] P=0.007) and shortened carbon chains across multiple ceramide types, vs. premenopausal skin. This was largely absent in the HRT group.	*Kendall AC, Pilkington SM, Wray JR, et al. Scientific Reports (Nature). 2022;12:21715.* https://pmc.ncbi.nlm.nih.gov/articles/PMC9755298/	**Confidence: A**	Strongest single citation for "estrogen specifically, not just age, breaks the ratio." No single overall percentage is stated in the paper — cite the direction and significance, not a % figure.
Estradiol directly increases ceramide production in skin cells	Treating human keratinocytes with 10nM estradiol for 72h significantly increased	*Kendall et al., Scientific Reports, 2022 (in-vitro arm of the same study above).* https://pmc.ncbi.nlm.nih.gov/articles/PMC9755298/	**Confidence: C**	Direction and significance confirmed; no numerical percentage increase is stated in the text (only shown as a

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	CER[NS] and CER[NDS] production, P<0.05.			normalized graph). Do not invent a % for this.

2. Water Loss / Hydration

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Estrogen improves the skin's ability to hold onto water	Water-holding capacity of the stratum corneum was significantly improved at the treated site in menopausal women receiving transdermal estrogen vs. untreated (pilot study, 15 vs 15 women).	*Pierard-Franchimont C, Letawe C, Goffin V, Piérard GE. Maturitas. 1995;22:151-154.* https://pubmed.ncbi.nlm.nih.gov/8538484/	**Confidence: A**	Direction confirmed, small pilot study. No numerical capacitance % change is stated in the accessible abstract — cite as "significantly improved," not with an invented percentage.
A second, more nuanced HRT/barrier study — worth knowing before using HRT-improves-barrier as a blanket claim	In a 2024 randomized study, postmenopausal women ON HRT actually showed a GREATER TEWL increase after a standardized irritant (SLS) challenge than women not on HRT (P<0.05), though their filaggrin/keratin-10 layers were thicker (P<0.01). Visible redness/blood flow response did not differ.	*'The impact of irritant challenge on the skin barrier and myeloid cell response in postmenopausal women following hormone replacement therapy.' British Journal of Dermatology. 2024;191(5):746.* https://academic.oup.com/bjd/article/191/5/746/7685827	**Confidence: A**	This complicates a simple "estrogen = better barrier, always" claim. Worth being aware of even though it won't go in TOF copy — a sophisticated reader digging into the science could find this and see nuance we didn't disclose.
"Water escapes faster" (TEWL increases a specific % after menopause)	CONFIRMED GAP: no primary study locating a clean baseline-TEWL percentage increase specific to menopause. The classic aged-skin study (Ghadially) shows aged skin's defect is DELAYED RECOVERY after damage, not simply a higher resting TEWL.	*Ghadially R, et al. J Clin Invest. 1995;95:2281-2290 (see Section 4 for full detail).* https://www.jci.org/articles/view/117919	**Confidence: C**	Do not use a specific TEWL percentage. Safe claim: "skin loses its ability to hold water" / "barrier repair is delayed," not "TEWL rises X%."
Natural hyaluronic acid has dropped 50% by age 50 — RE-EXAMINED, recommend dropping this claim	No original peer-reviewed source substantiates a universal '50% by 50' figure. Reviews describe epidermal HA declining markedly with age while total DERMAL HA remains relatively stable — collapsing these two separate compartments into	*Reviewed via: 'Hyaluronic acid: A key molecule in skin aging.' PMC.* https://pmc.ncbi.nlm.nih.gov/articles/PMC3583886/	**Confidence: C**	A second AI-generated report submitted alongside this audit cited 'Meyer and Stern 1994' as direct support for exactly this 50%-by-50 claim. That citation was specifically checked and could not be verified — treat it as unconfirmed, not as a source to cite. Recommend dropping this

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	one number is not defensible.			claim from copy entirely rather than continuing to chase it.

3. Texture / Skin Cell Turnover

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Aged skin's barrier structure is much more fragile / easily disrupted	Aged human skin (>80y) barrier was fully disrupted by an average of only 18±2 tape strippings, vs. 31±5 strippings needed for young skin (20-30y) — aged barrier fails under roughly half the mechanical stress.	*Ghadially R, Brown BE, Sequeira-Martin SM, Feingold KR, Elias PM. J Clin Invest. 1995;95:2281-2290.* https://www.jci.org/articles/view/117919	**Confidence: B**	General aging study, not menopause-specific, but a strong, precise, quotable number for barrier fragility.
Dead skin cells stop shedding on schedule / build up with age — FLAG: one study found the opposite direction	One general-aging facial-surface study actually found GREATER (not reduced) measured corneocyte desquamation with age (P=0.0007), alongside smaller lipid droplets and fewer lipid crystals.	*General-aging desquamation study, referenced in the audit; original sample sizes could not be confirmed with confidence.* Not independently re-verified — flagged for caution, not for use as-is.	**Confidence: C**	This directly complicates the 'dead cells pile up because shedding slows' framing used in current landing page copy. It does not necessarily mean the copy claim is wrong (larger corneocytes and slower TURNOVER are separately well-supported — see below) but 'desquamation' and 'turnover' are not interchangeable terms, and at least one study measured MORE surface desquamation with age. Recommend using 'corneocytes get larger, turnover slows' rather than 'shedding slows / cells build up,' which is the more precisely supported claim.
Postmenopausal women have larger corneocytes (slower cell turnover)	Postmenopausal women show significantly larger corneocytes than premenopausal women, attributed to differing sex hormone levels.	*Corneocyte Size and Cell Renewal: Effects of Aging and Sex Hormones — Springer Nature reference chapter, citing Sauerbronn AV et al., Int J Gynaecol Obstet, 2000.* https://link.springer.com/rwe/10.1007/978-3-662-47398-6_36	**Confidence: A**	This remains the safer, more precise claim to use — "turnover slows / corneocytes enlarge" rather than "shedding slows," given the contradictory finding above.

4. Barrier Recovery Speed

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Older skin repairs a damaged barrier much more slowly than young skin	PRECISE VERIFIED NUMBERS: young human skin (20-30y) recovered 50% of barrier function at 24 hours and 80% at 72 hours after experimental disruption. Aged human skin (>80y) recovered only 15% at 24 hours, with recovery still delayed over the following six days.	*Ghadially R, Brown BE, Sequeira-Martin SM, Feingold KR, Elias PM. 'The aged epidermal permeability barrier.' J Clin Invest. 1995;95:2281-2290.* https://www.jci.org/articles/view/117919	**Confidence: B**	REPLACES the 'barrier recovery takes 2-3x longer' framing used in v1 and in a lot of secondary-source content. 50% vs 15% at 24h is NOT mathematically equivalent to '3x slower' — use the exact percentages, not a derived multiplier. General aging study, not menopause-specific, but this is the strongest and most precise number available.
An optimized lipid mixture can correct this delayed recovery in aged skin specifically	The cholesterol-dominant 3:1:1:1 mixture (see Section 1) significantly accelerated recovery in the same aged human cohort at 6 hours, P<0.005.	*Zettersten et al., J Am Acad Dermatol, 1997 (same as Section 1).* https://pubmed.ncbi.nlm.nih.gov/9308554/	**Confidence: B**	This is the direct link between "here's the problem" (delayed recovery) and "here's what fixes it" (the correct lipid ratio) — both from the same aged-skin research program, which makes them a strong pair to cite together.

5. Collagen & Elastin Decline

Claim in copy	Exact finding / stat	Source	Conf.	Notes / caveats
'Women lose 30% of skin collagen in the first 5 years after menopause' — RETIRE THIS EXACT PHRASING	This specific formulation does not appear as an author-reported statistic in the primary Brincat papers, despite being repeated across dozens of secondary sources (including a second AI-generated report submitted alongside this audit). What the original papers actually report is below.	*See replacement claims immediately following.* —	**Confidence: C**	Recommend retiring this exact number/phrasing from all copy. The replacement numbers below are precise, verifiable, and arguably more persuasive.
REPLACEMENT: hormone-treated postmenopausal women had 34% greater skin collagen than untreated women	Untreated: 164.8 (SEM 8.4) µg/mm². Hormone-treated (estradiol + testosterone implants, 2-10 years): 221.12 (SEM 12.1) µg/mm². Authors report this as 34% greater, P<0.001. Treated n=52, untreated n=66.	*Brincat M, Moniz CJ, Studd JW, Darby AJ, Magos A, Emburey G, Versi E. 'Long-term effects of the menopause and sex hormones on skin thickness.' Br J Obstet Gynaecol. 1985;92:256-259.* https://pubmed.ncbi.nlm.nih.gov/3120067/	**Confidence: A**	Strong, precise, author-reported number. Note the treatment was estradiol PLUS testosterone implants, not estrogen alone — be accurate about this if the mechanism is described in detail anywhere.

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REPLACEMENT: hormone-treated women also had 30% thicker skin	Treated (n=30): 1.19mm (SEM 0.02). Untreated (n=33): 0.93mm (SEM 0.03). Authors report treated skin as 30% thicker, P<0.001.	*Same Brincat 1985 BJOG paper as above.* https://pubmed.ncbi.nlm.nih.gov/3120067/	**Confidence: A**	Same study, same strength of evidence as the 34% collagen figure.
REPLACEMENT: collagen content measured at two real points in time shows the decline directly	Mean skin collagen was 183.11 µg/mm² at 3 months after menopause, and 129.6 µg/mm² at 9 years after menopause — a difference of 53.51 µg/mm², author-reported.	*Same Brincat 1985 BJOG paper.* https://pubmed.ncbi.nlm.nih.gov/3120067/	**Confidence: A**	IMPORTANT: the authors explicitly describe this decline as exponential and caution against calculating a uniform annual or five-year rate from it — a flat percentage would overstate the loss in years 2-4 and understate it later. Use the two actual data points, not a derived rate.
The plain, author-reported annual collagen loss rate	Skin collagen, skin thickness, metacarpal index, and forearm bone mineral content each declined by "between 1-2% per year after the menopause" — this is the exact wording used in the abstract.	*Brincat M, Kabalan S, Studd JWW, et al. 'A study of the decrease of skin collagen content, skin thickness, and bone mass in the postmenopausal woman.' Obstet Gynecol. 1987;70:840-845.* https://pubmed.ncbi.nlm.nih.gov/3120067/	**Confidence: A**	Use "1-2% per year" if a flat annual rate is needed in copy — this is the actual author wording, unlike "2.1%/year" or "30% in 5 years," which are not.
A broken barrier triggers inflammation, which speeds up collagen/elastin-degrading enzymes	Barrier disruption upregulates gene expression of TNF-α, IL-1α and IL-1β in skin (mechanism confirmed); a separate, more severe barrier-disruption study found systemic serum amyloid A rose over 200% at 2h and over 100% at 6h (P<0.001) alongside significant IL-1/TNF-α mRNA increases.	*Wood LC, et al. Exp Dermatol. 1997;6:98-104 (mechanism). Hu L, et al. J Invest Dermatol. 2017 (serum amyloid A magnitude).* https://pubmed.ncbi.nlm.nih.gov/9209892/ | https://pmc.ncbi.nlm.nih.gov/articles/PMC5441930/	**Confidence: B**	IMPORTANT: the 200%/100% figures belong specifically to serum amyloid A, NOT to IL-1 or TNF-α directly — do not attach that percentage to "inflammation" generically. Neither study is menopause-specific; both use severe experimental barrier disruption in mice.
Estrogen reduces MMP-1 and increases collagen-supporting signaling in aged human skin	Topical 0.01% 17β-estradiol for 2 weeks in aged human skin (n=13) increased extracellular matrix synthesis markers and reduced MMP-1 protein.	*Son ED, Lee JY, Lee S, et al. J Invest Dermatol. 2005;124:1149-1161.* Not independently located in this pass — verify before citing by page/volume.	**Confidence: B**	CORRECTION from v1: this paper is framed around TGF-β signaling, NOT direct estrogen-response-element (ERE) suppression of MMP-1/MMP-3. No primary human-skin paper was found supporting the specific 'estrogen directly

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				suppresses MMP-1/MMP-3 through classical EREs' mechanism as stated in earlier copy. Use the safer, TGF-β-framed version of this claim, or the plainer 'estrogen reduces MMP-1 activity' without specifying the exact receptor mechanism.
The damage is self-reinforcing — once it starts, it accelerates	MMP-1-mediated collagen fragmentation reduces fibroblast mechanical tension; fibroblasts in fragmented collagen develop increased oxidative stress and increased MMP-1/AP-1 signaling — a self-reinforcing cycle. A 4.3-fold figure appears in the primary paper but its exact experimental replicate count could not be confirmed with confidence in this pass.	*Fisher GJ, Quan T, Purohit T, et al. 'Collagen Fragmentation Promotes Oxidative Stress and Elevates MMP-1 in Fibroblasts in Aged Human Skin.' Am J Pathol. 2009;174:101-114.* https://ajp.amjpathol.org/article/S0002-9440(10)61269-2/fulltext	**Confidence: B**	Mechanism is solid B evidence for the 'snowball, not a slope' claim. Do NOT use the 4.3-fold figure as a marketing-ready statistic until the sample size behind it is directly confirmed from the full paper.

6. Wound Healing Speed

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Topical estrogen speeds up wound healing in aged skin	Randomized double-blind trial, 18 women (mean age 74.4) and 18 men (mean age 70.7), standardized 4mm punch wounds. Day-7 wound area significantly smaller in estrogen-treated group (n=5/group, P=0.04 women / P=0.02 men). Collagen (hydroxyproline) significantly increased at day 7 (P<0.05, n=5/group) and remained elevated at day 80 in women.	*Ashcroft GS, Greenwell-Wild T, Horan MA, Wahl SM, Ferguson MW. 'Topical Estrogen Accelerates Cutaneous Wound Healing in Aged Humans Associated with an Altered Inflammatory Response.' Am J Pathol. 1999;155:1137-1146.* https://pmc.ncbi.nlm.nih.gov/articles/PMC1867002/	**Confidence: A**	CORRECTION: this replaces the previously uncertain 'Ascroft 1997 Nature Medicine' citation from v1 with the correct, verified, directly-read paper. No specific percentage (e.g. '18% smaller') is stated by the authors — some secondary summaries attach a percentage to the graph, but it is not an original reported statistic. Cite the significance and sample size, not an invented percentage.

7. Secondary / Supporting Claims — Confirmed Gaps

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Skin microbiome shifts as a result of barrier breakdown	A menopause-specific pilot study exists (Frontiers in Aging, 2024) but no primary result quantitatively ties menopause → barrier lipid loss → a specific % microbiome shift.	*'Menopause and facial skin microbiomes: a pilot study.' Frontiers in Aging, 2024.* https://www.frontiersin.org/journals/aging/articles/10.3389/fragi.2024.1353082/full	**Confidence: C**	Now confirmed as a genuine gap by a second, independent research pass — likely not resolvable without a new dedicated study, not just better searching.
Weaker defense against UV / environmental damage	Barrier permeability is lipid-dependent, but UV photon penetration is not equivalent to transepidermal chemical permeability, and no primary menopause study quantifies increased UV penetration from lipid deficiency specifically.	*Audit conclusion — no single primary citation.* —	**Confidence: C**	Keep UV/photoaging claims and barrier-permeability claims separate rather than implying one causes a specific amount of the other.
Stinging / nerve reactivity without visible irritation	Plausible mechanism (impaired barrier → sensory nerve exposure), but the menopause-specific study located does not report an incidence or percentage.	*Paquet F, et al. Maturitas. 1998;28:221-227.* https://pubmed.ncbi.nlm.nih.gov/9571597/	**Confidence: C**	Real menopause-specific study exists and can be cited for the mechanism/direction, just not for a number.
New-onset eczema at menopause with no prior history	No population-quality incidence study located; only retrospective dermatology-clinic case series, which cannot establish a true population percentage.	*Audit conclusion — no defensible primary source.* —	**Confidence: C**	Do not use an incidence percentage for this claim.

8. Note on the Second Submitted Report — Why It Is Not Reflected Here

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'HA reaches only 50% of its capital at age 50' (cited to Meyer & Stern, 1994)	This is the exact claim the independent audit specifically searched for and could not verify from an original source — the audit found epidermal and dermal HA behave differently, which the '50% by 50' framing collapses into one misleading number.	*Contradicted by the audit — see Section 2.* —	**Confidence: C**	Do not use this citation or this number.

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'Women lose up to 30% of their total skin collagen within the very first five years after menopause' (cited to Brincat et al. 1987)	The audit read the same Brincat papers directly and found the actual author-reported figure is 1-2% per year, with no five-year-cliff statistic stated anywhere in the primary text.	*Contradicted by the audit — see Section 5.* —	**Confidence: C**	Do not use this number. Use the 34%-greater-collagen / 30%-thicker-skin / two-timepoint figures instead — they are precise, verified, and arguably stronger for copy anyway.
'Barrier recovery in aged skin is approximately 3.3 times slower' (derived from Ghadially 50% vs 15%)	This is a computed ratio the original study does not report or endorse — converting a percent-recovered-at-one-timepoint comparison into a time multiplier is not a valid statistical operation, and the audit explicitly flags this exact error pattern.	*Contradicted by the audit — see Section 4.* —	**Confidence: C**	Use the exact percentages (50% vs 15% at 24h) instead of any derived multiplier.