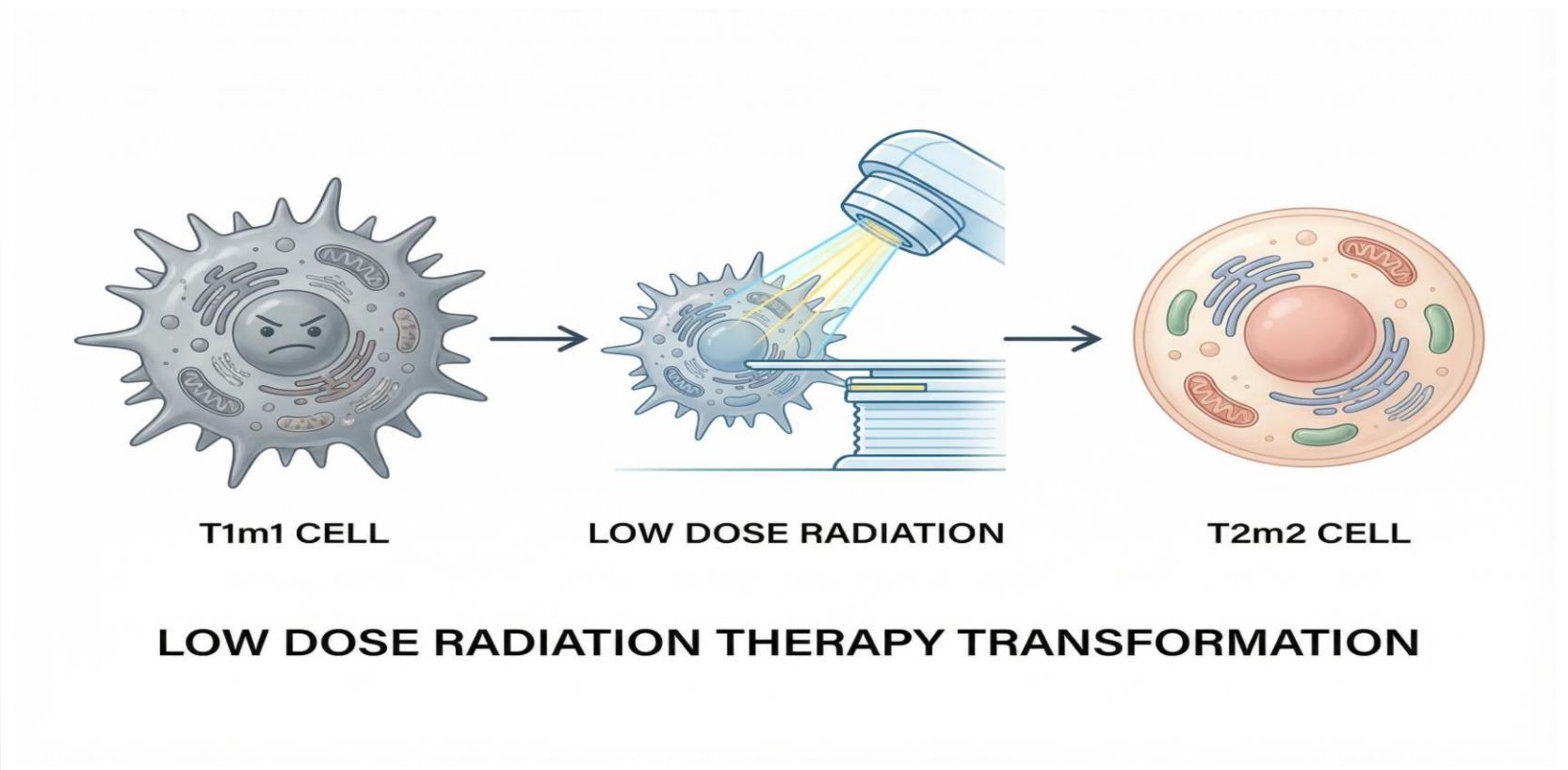
Heelex

LOW-DOSE RADIATION THERAPY

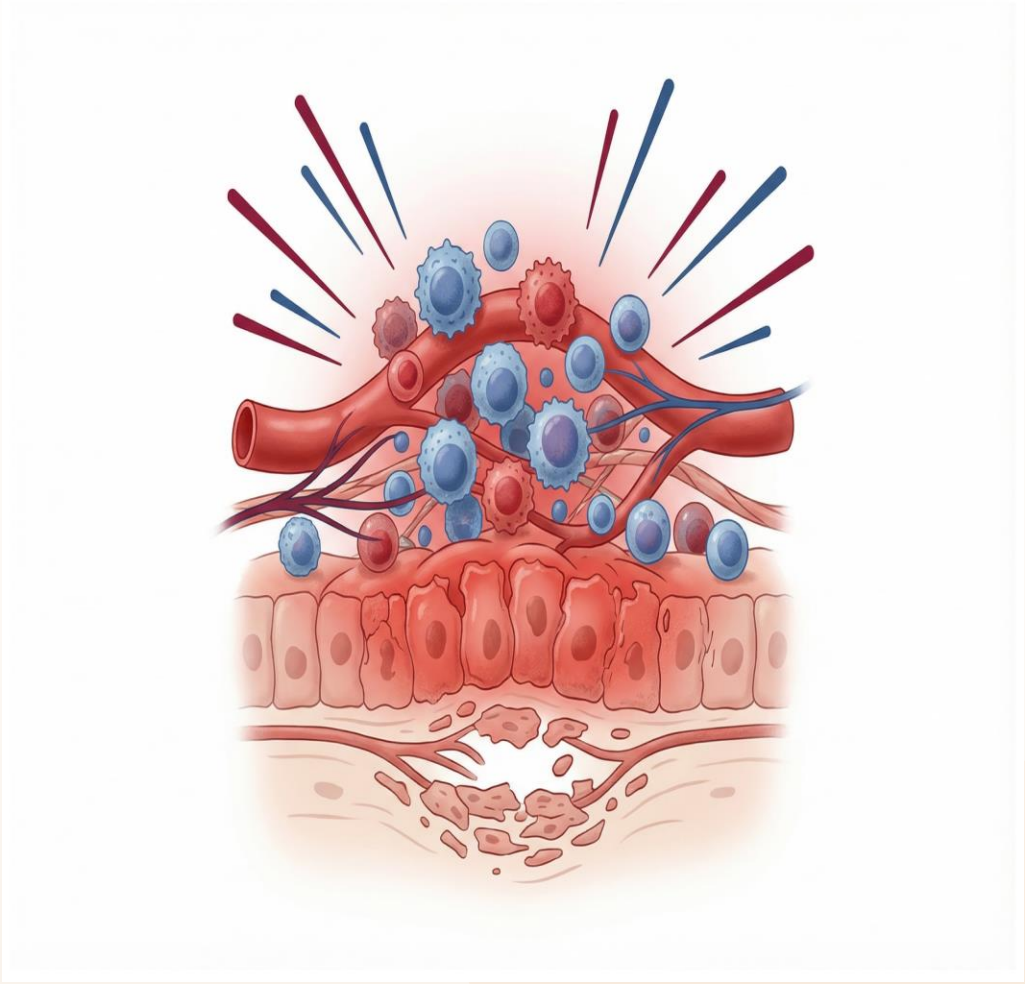
IMMUNE MODULATION: FROM INFLAMMATION TO HEALING

THE CURIOUS CASE OF DR. JECKYL AND MR. HYDE



WHAT YOU SEE EVERY DAY

- Patients with chronic conditions driven by persistent inflammation
- An immune system that stays activated longer than it should
- Despite your best efforts, these patients often struggle with:
  - Ongoing pain
  - Tissue irritation
  - Delayed healing



CONDITIONS WE TREAT

Low-dose radiation therapy addresses a wide range of inflammatory and benign conditions

Joint & Bone

- Osteoarthritis
- Heel Spurs
- TMJ Disorders

Soft Tissue

- Plantar Fasciitis
- Dupuytren's Contracture
- Tendonitis
- Ledderhose Disease
- Bursitis
- Peyronie's Disease

Skin Conditions

- Keloids
- Skin Cancer (NMSC)
- Warts
- Psoriasis

PARTNERS WE WORK WITH

We support your care plan with an additional treatment option for your patients

PT Physical Therapists

Osteoarthritis, Tendonitis, Plantar Fasciitis, Post-surgical rehabilitation

OS Orthopedic Surgeons

Osteoarthritis, Heel Spurs, Bursitis, Torn Meniscus

PO Podiatrists

Plantar Fasciitis, Heel Spurs, Ledderhose Disease

RH Rheumatologists

Osteoarthritis, Tendonitis, Bursitis, TMJ Disorders

PM Pain Management & Spine

Chronic joint pain, Spinal osteoarthritis, Dupuytren's Contracture

PC Primary Care Physicians

General referrals, Warts, Keloids, Skin Cancer (NMSC), Psoriasis

WHERE LDRT FITS IN

LDRT complements your current approach — another tool for patients who need more relief

NSAIDs

First Line

widely used

Effective short-term relief. LDRT helps patients needing longer results.

+ Addresses underlying immune imbalance

Cortisone & Bursa Injections

6–12 wks

typical relief window

Targeted relief for many patients. LDRT can extend benefit between cycles.

+ Calms the inflammatory cycle

Physical Therapy

Essential

proven approach

The foundation of MSK care. LDRT reduces pain so patients engage more in PT.

+ Less inflammation means better rehab

Joint Replacement

Definitive

for advanced cases

Gold standard for end-stage disease. LDRT helps patients not yet ready.

+ Non-invasive bridge to delay surgery

WHEN TO CONSIDER LDRT

LDRT is appropriate for patients who meet the following criteria

1

Chronic Pain > 3 Months

Persistent inflammatory pain in joints, tendons, or soft tissue that has not resolved with rest or initial conservative care

2

Conservative Treatments Exhausted

NSAIDs, cortisone injections, and/or physical therapy have provided insufficient or only temporary relief

3

Not Ready for Surgery

Patient prefers a non-invasive option, is not a surgical candidate, or wants to delay or avoid joint replacement

4

Age 40+ (Recommended)

DEGRO guidelines recommend LDRT for patients over 40 to minimize any theoretical long-term risk

Patients can be referred by their physician or contact the clinic directly for a consultation

YOUR PATIENT. YOUR CARE.

We work alongside you — not in place of you.

1 You Refer

Send your patient to Heelex with a referral or the patient can self-refer

2 We Treat

6 brief outpatient sessions over 2–3 weeks; ~5 minutes of treatment each

3 Patient Returns

Your patient comes back to you for ongoing management with reduced pain

Your Relationship

Patients continue all ongoing care with you — we never replace the referring provider

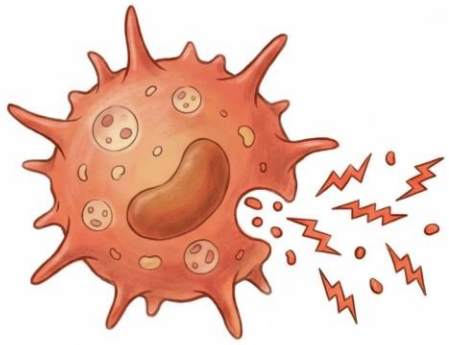
Collaborative Approach

We consult with you on the care plan and share treatment outcomes and progress

Expanded Options

LDRT gives your patients an additional non-invasive option alongside their current care plan

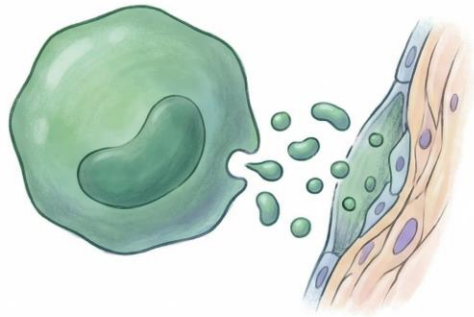
IMMUNE BALANCE: TWO FUNCTIONAL STATES



M1 — Pro-Inflammatory

"Attack mode" immune cells

- Produce inflammatory signals
- Drive pain and swelling
- Amplify and prolong inflammation

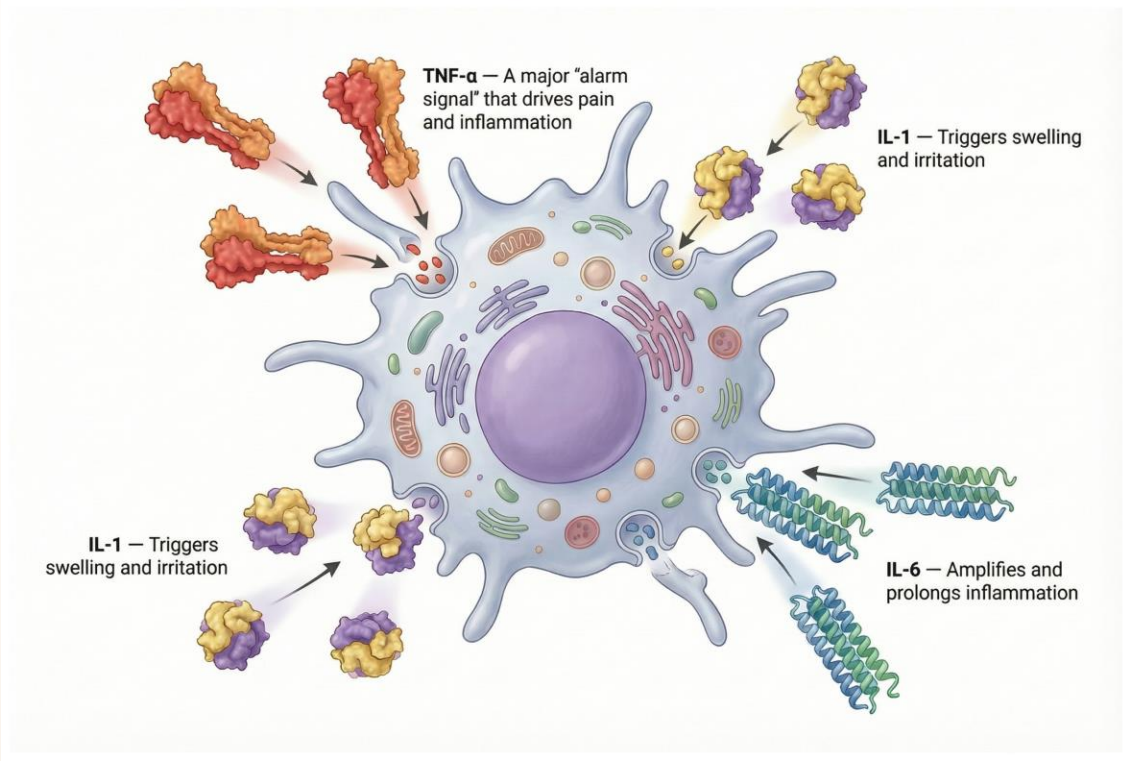


M2 — Anti-Inflammatory

"Healing mode" immune cells

- Produce calming signals
- Promote tissue repair
- Restore normal healing

M1: PRO-INFLAMMATORY ("ATTACK MODE")

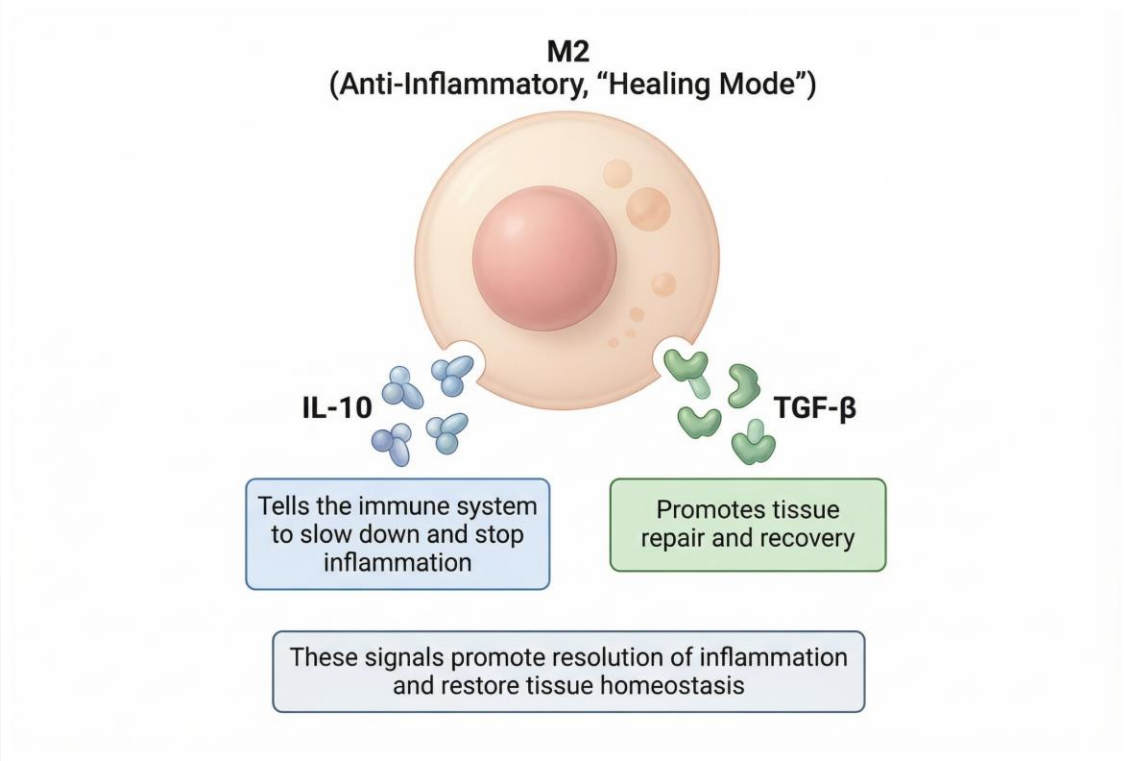


Key Functions of M1 Macrophages:

- First responders to infection or injury
- Release pro-inflammatory cytokines (TNF-α, IL-1, IL-6)
- Trigger pain, swelling, and heat to fight threats
- Essential for acute defense — but harmful when stuck "on"

In a healthy body, M1 activity is temporary — it should switch off once the threat is resolved

M2: ANTI-INFLAMMATORY ("HEALING MODE")

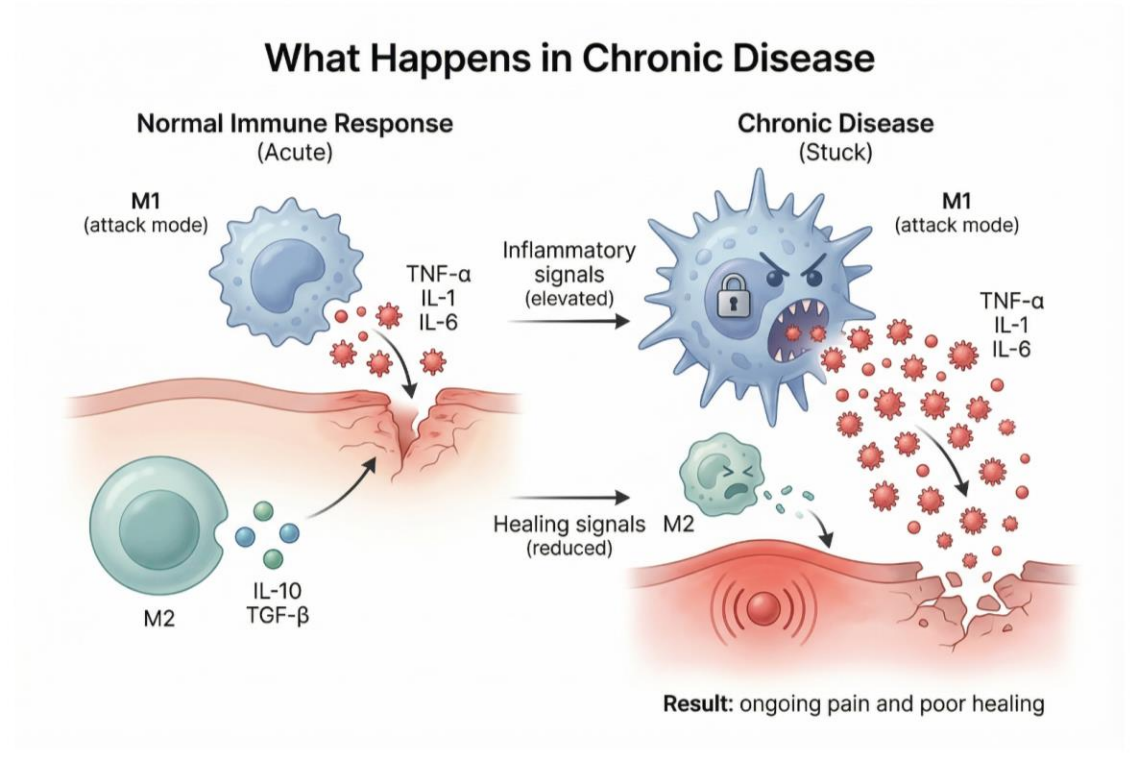


Key Functions of M2 Macrophages:

- Calm down overactive immune responses
- Promote tissue repair and regeneration
- Reduce pain and swelling
- Restore balance (homeostasis) to damaged areas

M2 macrophages are the body's natural "off switch" for inflammation — essential for healing

WHAT HAPPENS IN CHRONIC DISEASE

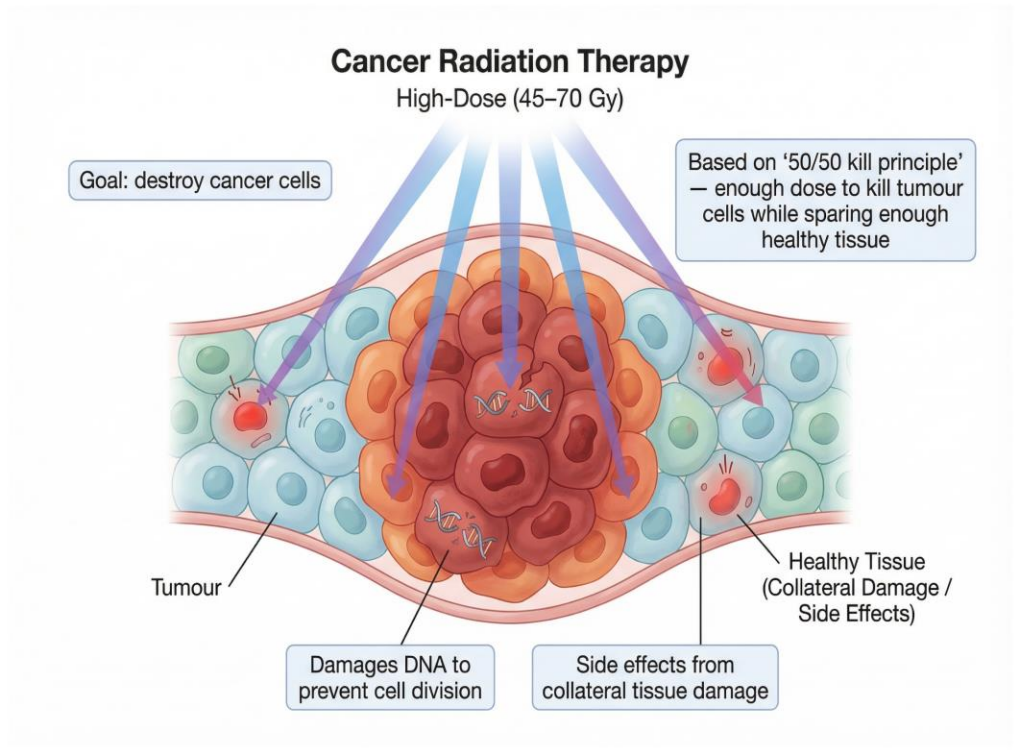


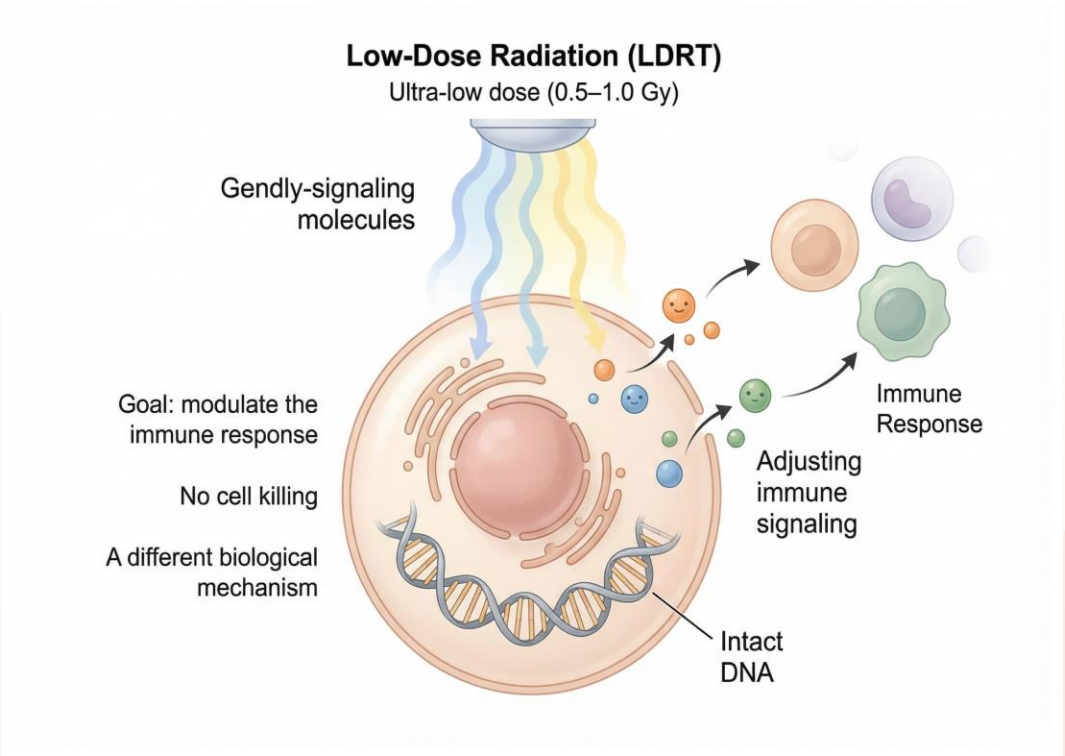
The Chronic Inflammation Cycle:

- Macrophages become **stuck in M1** (attack mode) — unable to switch to healing
- Inflammatory signals (TNF-α, IL-1, IL-6) remain **constantly elevated**
- Healing signals (IL-10, TGF-β) are **suppressed**
- Tissues suffer ongoing damage without repair

Result: persistent pain, swelling, and poor healing — the body attacks itself instead of recovering

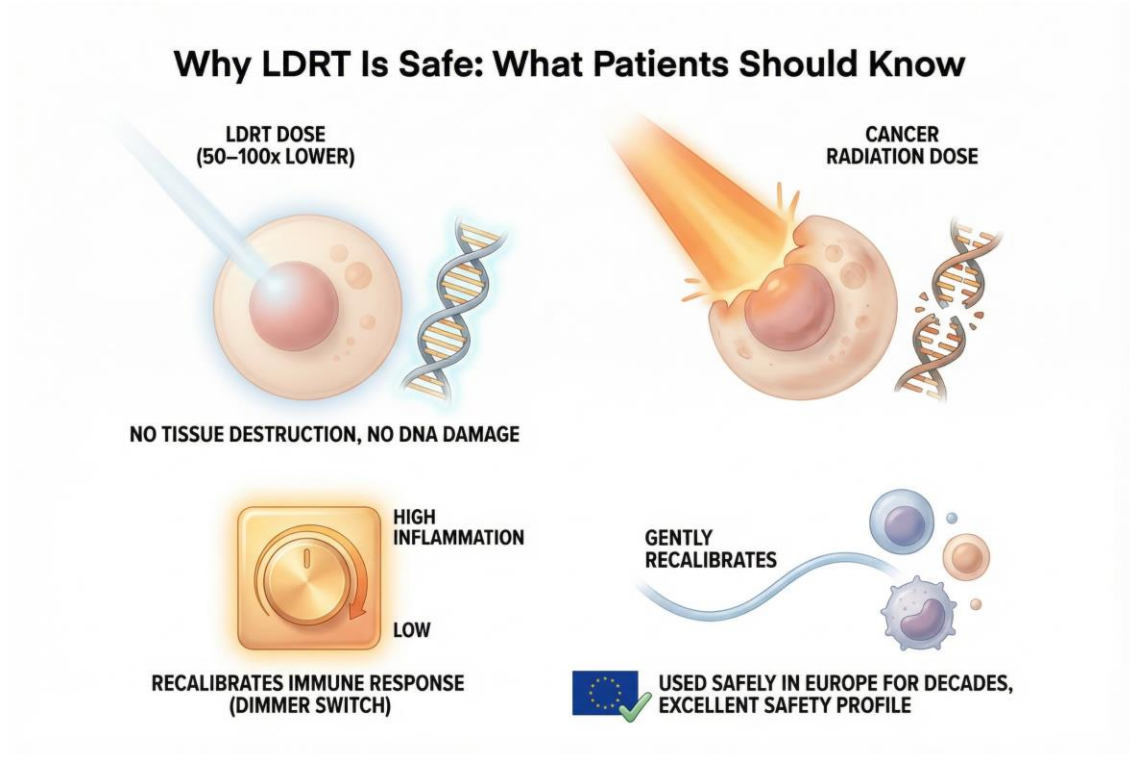
TWO VERY DIFFERENT USES OF RADIATION





WHY LDRT IS SAFE: WHAT PATIENTS SHOULD KNOW

- The dose used in LDRT is **50–100x lower** than cancer radiation therapy
- At these doses, there is **no tissue destruction** and **negligible DNA damage** — well within the body's natural repair capacity
- LDRT works **with your body** — it gently recalibrates the immune response rather than fighting against it
- Think of it as a ***dimmer switch*** that turns down inflammation, not a weapon that destroys cells
- Used safely in Europe for over a century with an **excellent safety profile** — no increase in cancer rates reported

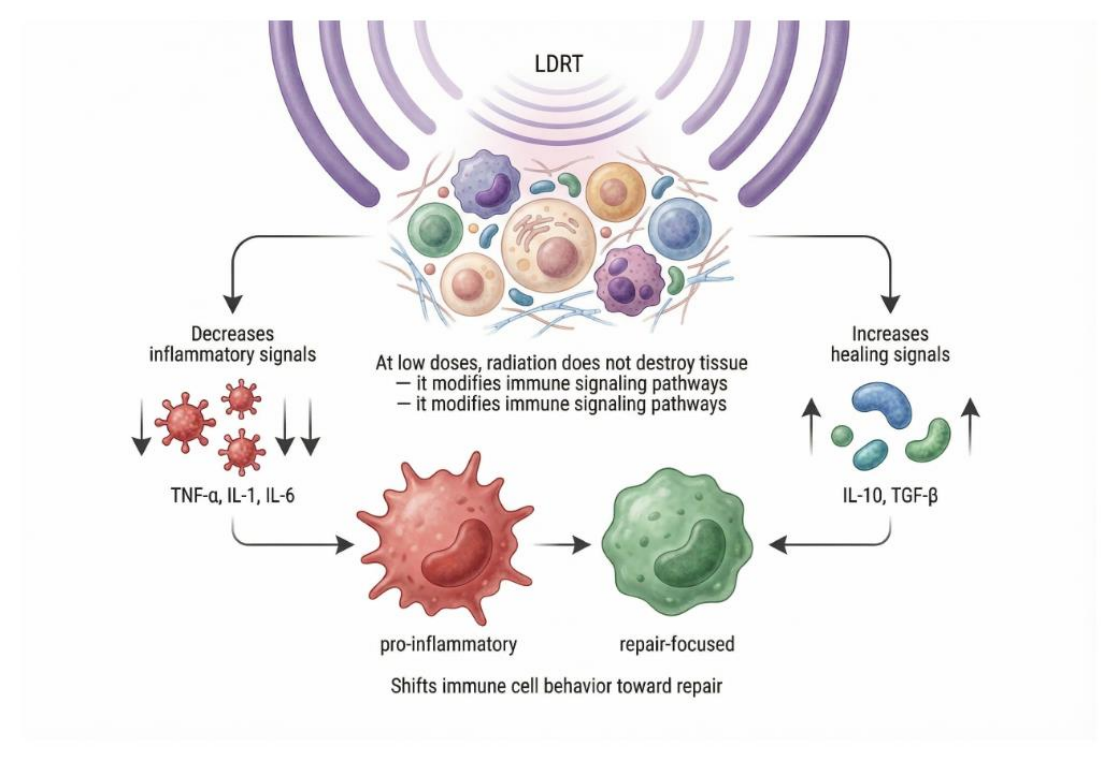


MECHANISM OF LDRT

At low doses, radiation does not destroy tissue — it modifies immune signaling pathways

Key effects:

- Decreases inflammatory signals (TNF-α, IL-1, IL-6)
- Increases healing signals (IL-10, TGF-β)
- Shifts immune cell behavior toward repair



M1 → M2 TRANSITION

Inflammation

- TNF-α, IL-1, IL-6 elevated
- Chronic pain and swelling
- Tissue damage continues
- Immune system stuck "on"

LDRT

Healing

- IL-10, TGF-β increased
- Pain and swelling reduced
- Tissue repair begins
- Immune balance restored

LDRT promotes a shift from inflammation to healing, restoring immune balance

ADDITIONAL BIOLOGICAL EFFECTS (1/2)

Reduced Leukocyte Adhesion

Leukocytes = white blood cells
Adhesion = sticking to blood vessels

Fewer inflammatory cells attach to blood vessel walls and enter the tissue

Reduced Tissue Infiltration

Infiltration = immune cells moving into tissue

Less buildup of inflammatory cells in the affected area

ADDITIONAL BIOLOGICAL EFFECTS (2/2)

Endothelial Modulation

Endothelium = inner lining of blood vessels

Blood vessels send fewer signals to recruit inflammatory cells

Cytokine Shift

Cytokines = communication signals between immune cells

Balance shifts from inflammation to healing

HOW CYTOKINES WORK

1. Release
Immune cells send cytokine messengers

2. Bind
Cytokines lock onto receptors (lock & key)

3. Respond
Target cell changes behavior (gene activation)

Cytokines are small signaling proteins — the immune system's messenger molecules

Pro-Inflammatory Cytokines

Amplify immune response & recruit fighters

- **TNF-α** — Master alarm signal
- **IL-1β** — Triggers fever & inflammation
- **IL-6** — Activates acute phase response

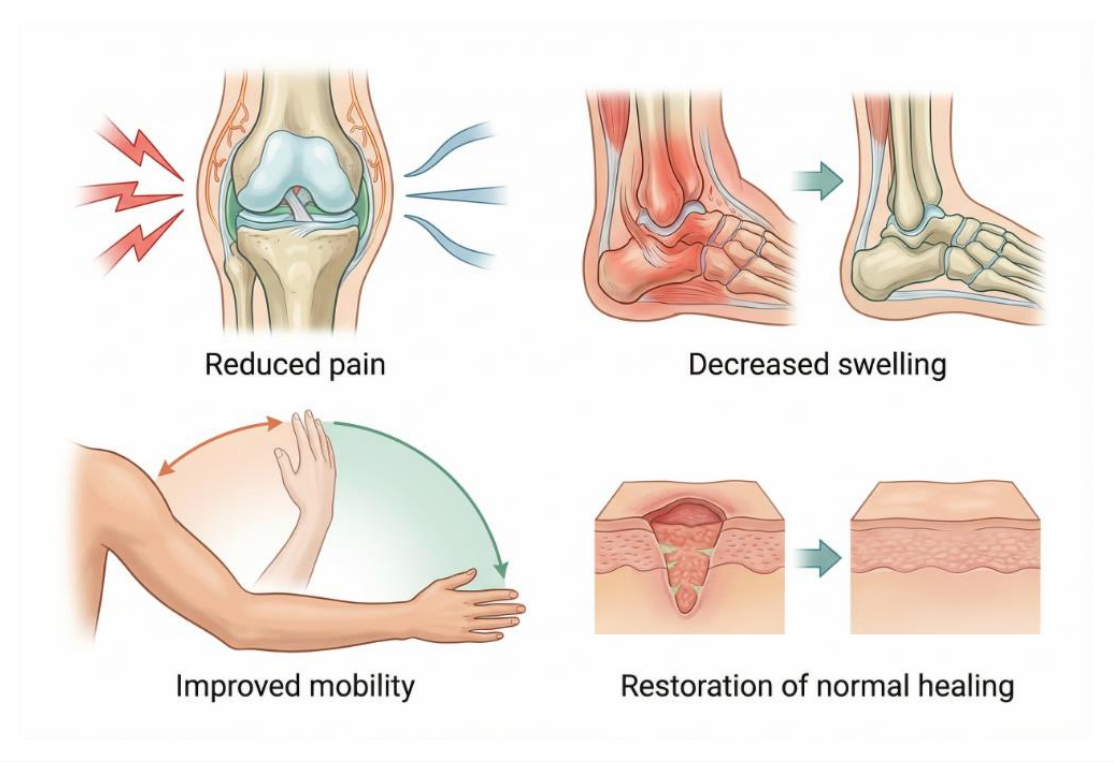
Anti-Inflammatory Cytokines

Calm down immune response & promote healing

- **IL-10** — Suppresses inflammation
- **TGF-β** — Promotes tissue repair & healing
- **IL-4** — Shifts immune balance to M2

LDRT shifts the cytokine balance from pro-inflammatory to anti-inflammatory — calming the immune system

CLINICAL OUTCOME

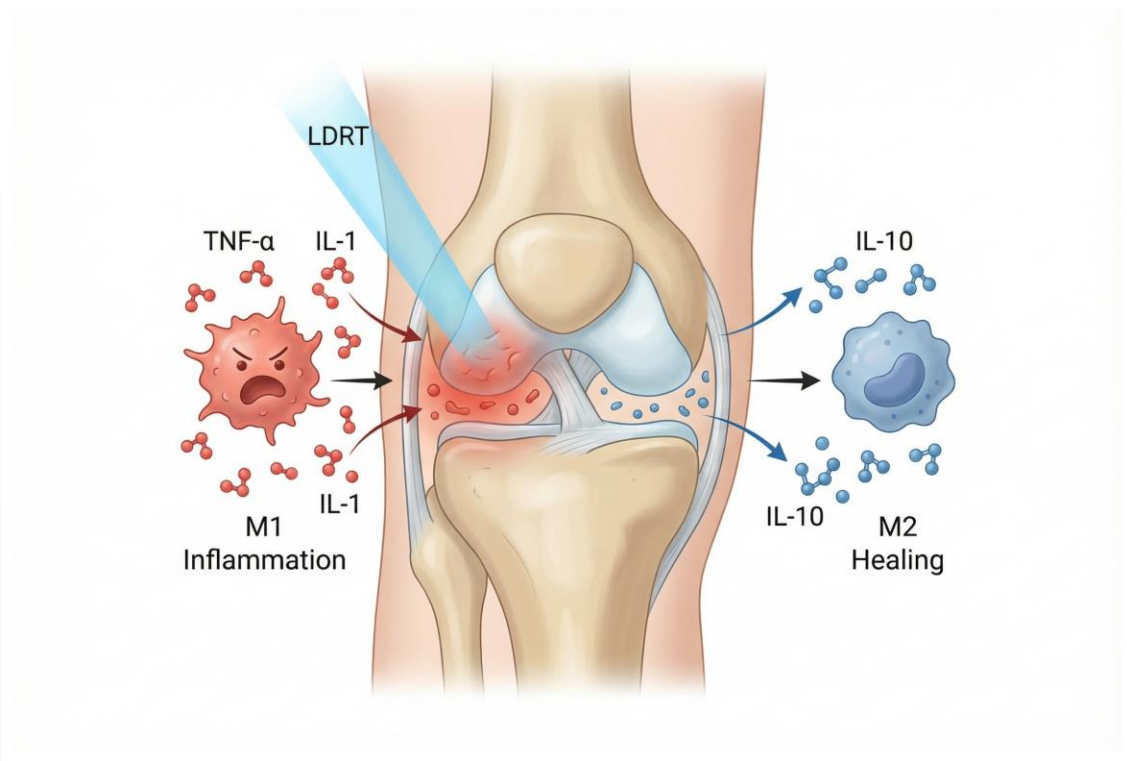


What Patients Experience:

- **Reduced pain** — Inflammatory cytokines decrease, relieving chronic pain signals
- **Decreased swelling** — M2 macrophages calm the overactive immune response
- **Improved mobility** — Less inflammation allows joints and tissues to function normally
- **Restored healing** — The body's natural repair mechanisms re-engage

These outcomes result from restoring the M1→M2 balance, not from destroying tissue

SIMPLE CLINICAL INTERPRETATION



In Plain Terms:

- LDRT turns down the **"attack" signals** (TNF-α, IL-1)
- It turns up the **"healing" signals** (IL-10)
- Macrophages shift from **M1** (inflammation) → **M2** (healing)
- The immune system **rebalances itself** — naturally

Think of it as recalibrating the immune system's thermostat — not replacing it

KEY TAKEAWAY

Not Destructive

LDRT is not destructive at low doses — it works with the body, not against it

Targeted Modulation

It is a targeted immune modulation therapy — precisely adjusting the immune response

Restore Balance

The goal is to restore balance and allow the body's natural healing to take over

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