



Photobiomodulation (PBM) and Cancer Care: Clinical Overview and Applications

The following summary is helpful in understanding how photobiomodulation (PBM) may support recovery and quality of life during cancer treatment.

General Position

PBM Healing International does **not** recommend applying PBM **directly over an active tumor or known cancer site** until more clinical evidence confirms safety. However, there is **strong and growing evidence** that PBM can help **manage side effects from chemotherapy and radiation**, especially in head and neck cancer, breast cancer, and hematological cancers.

This overview includes safety, clinical mechanisms, and specific application areas based on current peer-reviewed evidence.

What Is PBM?

PBM (formerly known as low-level laser therapy or LLLT) uses non-ionizing red or near-infrared light (typically 600–1100 nm) to stimulate mitochondrial cytochrome c oxidase. This increases ATP production, reduces inflammation, modulates oxidative stress, and promotes cellular repair. In healthy or stressed tissues (but not tumor tissue), this improves healing outcomes and reduces fibrosis or scarring. PBM **does not cause DNA damage or carcinogenesis**, as its wavelengths are far above the ionizing radiation spectrum.

Key Applications of PBM for Cancer Treatment Side Effects

1. Oral Mucositis (OM)

- **Indication:** Chemoradiation for head and neck cancer or hematopoietic stem cell transplant
- **Effects:** PBM significantly reduces incidence, severity, and duration of OM, and lowers pain scores

2. Radiation Dermatitis

- **Indication:** Breast, head and neck, or pelvic RT
- **Effects:** Reduces inflammation, erythema, desquamation, and discomfort

3. Chemotherapy-Induced Peripheral Neuropathy (CIPN)

- **Indication:** Taxanes, platinum agents, bortezomib
- **Effects:** PBM improves sensory function and reduces neuropathic pain without affecting chemotherapy efficacy

4. Lymphedema

- **Indication:** Post-breast cancer or head and neck surgery
- **Effects:** PBM stimulates lymphangiogenesis, reduces edema, improves mobility

5. Xerostomia / Hyposalivation

- **Indication:** Radiation to salivary glands
- **Effects:** PBM enhances salivary gland regeneration and flow rates

6. Trismus & Voice Disorders

- **Indication:** Post-radiation fibrosis, oral SCC, or laryngeal involvement
- **Effects:** Improved jaw opening, pain relief, phonation quality

7. Dysphagia & Dysgeusia

- **Indication:** Radiotherapy to pharynx, tongue, palate
- **Effects:** May reduce fibrosis and neuromuscular dysfunction; early data suggest improved swallowing and taste recovery

Safety and Tumor Concerns

Despite early concerns from in vitro data showing cancer cell proliferation under certain PBM conditions, **clinical and animal studies show no increased recurrence or progression risk** when PBM is used appropriately.

Some evidence even suggests that PBM may:

- Enhance cytotoxicity of chemotherapy and radiotherapy when applied correctly
- Promote apoptosis in stressed tumor cells through excess ROS or mitochondrial overload
- Stimulate anti-tumor immune responses via improved vascular normalization and T-cell recruitment

However, **PBM over the tumor site remains investigational** and should only be attempted under clinical trial conditions.

Summary

-  **Recommended PBM use:** For **supportive care**, away from tumor sites, using established parameters.
-  **Avoid:** PBM **directly on known tumors** or where tumor activity is uncertain.
-  **Well-supported indications:** Oral mucositis, dermatitis, neuropathy, xerostomia, lymphedema
-  **Mechanisms:** Mitochondrial stimulation, ATP restoration, cytokine modulation, ROS balance

PBM Use in Pediatric Oncology

While most clinical data on photobiomodulation (PBM) in cancer has focused on adult populations, emerging evidence supports its use in children for managing treatment-related side effects. Pediatric oncology patients undergoing chemotherapy, radiation, or stem cell transplant often experience complications such as mucositis, dermatitis, pain, and fatigue—conditions for which PBM has shown consistent benefit in adult populations.

✔ **Safety:** PBM is non-invasive, painless, and free of systemic side effects. This makes it particularly suitable for pediatric patients, who may be more vulnerable to pharmacologic interventions. Studies in pediatric patients with leukemia and brain tumors have shown PBM can be safely applied for mucositis and pain relief without affecting overall treatment outcomes.

✔ **Applications in Children:**

- **Oral Mucositis:** Randomized controlled trials have demonstrated that PBM significantly reduces oral mucositis severity in children undergoing hematopoietic stem cell transplants and high-dose chemotherapy.
- **Peripheral Neuropathy:** PBM may help manage chemotherapy-induced peripheral neuropathy in children treated with vincristine or cisplatin, though more data is needed.
- **Skin Toxicities:** PBM can alleviate skin inflammation from radiation therapy or central line irritation.
- **Fatigue and Quality of Life:** Pilot studies suggest PBM may improve energy levels and mood in pediatric cancer patients by enhancing mitochondrial function.
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⚠ **Caution:** As in adults, PBM should not be applied directly over active tumor sites unless in a controlled research setting. Clinical use in children should follow published pediatric dosing parameters and safety guidelines.

Ongoing studies are investigating PBM for reducing long-term musculoskeletal and neurological side effects in pediatric cancer survivors. With further validation, PBM may become a valuable part of pediatric supportive oncology care.

Find enclosed selected publications from experts including Dr. Michael Hamblin and Dr. Praveen Arany, who advise caution but support PBM as a well-tolerated adjunct for cancer side-effect management.

References

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