

Footnotes

Monthly Newsletter of Podiatric Innovations

ISSUE 5: Using Photo Sensitizing Agent in the Treatment of Onychomycosis



MEDICAL *foot* SOLUTIONS INNOVATIVE HEALING



Treatment of Onychomycosis

Photodynamic Properties of Methylene Blue

The earliest recorded treatments that exploited a photosensitizer with a light source, in this case sunlight, for a medical, therapeutic effect, can be found in ancient Egyptian and Indian sources. Annals over 3000 years old report the use of topically applied vegetable and plant substances to produce photoreactions in skin. These reactions caused a “re-pigmentation” of the skin and was used to treat vitiligo and leukoderma. The photosensitizing agents used in these ancient therapies have been categorised, using modern science, as belonging to the psoralen family of chemicals. Interestingly, Psoralens are still in use today in photodynamic therapy (PDT) to treat a variety of skin conditions, including vitiligo, psoriasis, eczema, cutaneous T-cell lymphoma and lichen rubour planus.

Unfortunately, it was not until the turn of the 20th century that detailed, scientific evidence demonstrated that certain photosensitive dyes, in combination with a light source and oxygen, could have therapeutic value. Interest in PDT was re-energized in 1978 when a cancer institute in Buffalo, NY began clinically testing PDT in patients with cutaneous and subcutaneous malignant tumors. Their research reported that of the 113 patients who underwent the PDT trial, 111 had partial or complete resolution and were relapse free for 12 months. Since then, Russia and China have become the leading research centers for PDT.

Typical Patient Presentation

- White and superficial colour confined to the toenails and manifests as small, white, speckled or powdery patches
- subungual hyperkeratosis and onycholysis, which is usually yellow-white in colour.

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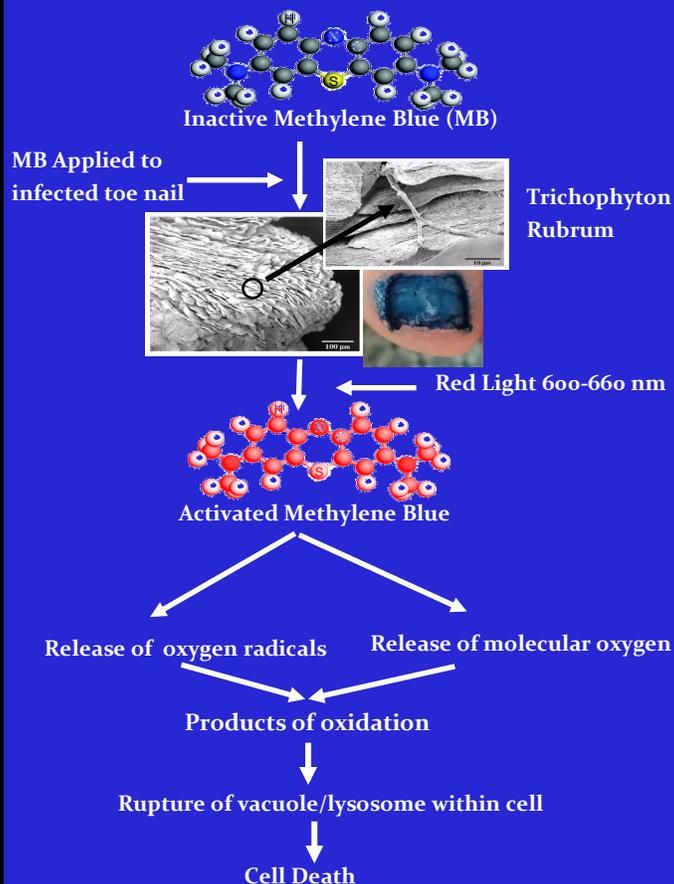
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Upcoming Issues

- Warts

Methylene Blue and Onychomycosis



Photodynamic Therapy

Modern Photodynamic Therapy (PDT) involves three key components: a photosensitizer (which is a chemical compound that can be promoted to an excited state when it is exposed to a specific wavelength of light), a light source, and oxygen.

A wide array of photosensitizer exist, but they are generally classified into three categories: porphyrins, chlorophylls and dyes. Each type of photosensitizer has an affinity for a specific part of the cell. In the case of Methylene blue, a dye, it tends to accumulate in acidic vesicles such as lysosomes. (Other photosensitizers will accumulate in other parts of the cell such as the mitochondria)

When a photosensitizer is exposed to a specific wavelength of light (each photosensitizer is different), it produces a charged oxygen atom. This high energy atom "attacks" any organic tissue it encounters, thus making it highly cytotoxic. In case of MB, the lysosome is destroyed, spilling its contents into the cell. This will result in the death of the cell. The charged particle is quickly eliminated from the tissue, with an average life of $3 \mu\text{s}$ (1×10^{-6} sec), thus causing no further damage to healthy tissue.

Treatment Protocol:

The infected toe nails are mechanically debrided to remove the protective top layer of the toe nail, as well as to remove as much of the fungus as possible. The methylene blue is applied to the toe nail, generally 1 drop is sufficient. Care must be taken not to allow the MB to drip down the digit due to its staining properties. The MB is then subjected to light in the 640-660 nm (red), and a brightness of 4,000-6,000 lm for 5-7 minutes. (No further benefit is achieved if the nail exposed longer to the light.) Typically, 3 treatments are required, with a 2-3 week interval between appointments. A topical antifungal is also prescribed or a YAG 1064 nm LASER can be used to augment the MB.

To date, science has been unable to find a monotherapy that is consistently able to eradicate fungus. As a result, clinicians are faced with combining multiple modalities to achieve a cure....or giving up all together. The use of methylene blue in combination with Jublia™, 1064 nm YAG LASER, debridement and/or oral Lamisil™ shows some promising results.

CLINICS

In 1999, Medical Foot Solutions opened its first clinic in Burlington, Ontario. In 2010 we expanded our operations and opened our second clinic in Milton, Ontario. We currently have three provincially registered Chiropodists on staff. The clinic assesses and treats approximately 7200 patient visits per year. We are able to provide a variety of services ranging from: Bio-mechanical assessments, diabetic wound debridement, soft tissue surgery, as well as general podiatric care. We are committed to providing the absolute best podiatric services in Burlington and Milton, and therefore we offer all patients a full refund if they are not completely satisfied.