

CASE REPORT

# Use of Multiwave Locked System (MLS®) as an Adjuvant Therapy for the Management of Skin Wound Healing in Birds: A Case Series

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## Abstract

Photobiomodulation (PBM) is the use of laser therapy to living tissues for therapeutic purposes. In avian medicine, very little scientific information is available on the effect of PBM in the management of wound healing. This case series describes the successful application of PBM using MLS® (Multiwave Locked System) as an adjuvant approach in the treatment of cutaneous wounds in a peregrine falcon, a barn owl, and a peach-faced lovebird. The results observed in this report indicate that MLS® laser therapy may be a promising non-invasive additional strategy for managing wound healing in birds.

**Keywords:** Photobiomodulation, Laser, Birds, Skin, Wounds.

## 1. Introduction

Photobiomodulation (PBM) is a recently-adopted consensus term to describe the application of laser therapy to living biological tissues for therapeutic purposes.[1,2] Despite the lack of a complete understanding of the exact mechanism of PBM, it has been demonstrated that the photonic absorption of light in the red/near-infrared (NIR) spectrum by mitochondrial cytochrome c oxidase has the potential to promote several positive effects at multiple levels. These include the upregulation of ATP synthesis and modulation of the production of reactive oxygen species, nitric oxide, growth factors, and transcription factors, thus allowing the creation of an anti-inflammatory environment and the proliferation and differentiation of keratinocytes, fibroblasts, and endothelial cells.[3] In veterinary medicine, the therapeutic use of PBM has been investigated in several conditions, with the management of skin wounds representing one of the main fields of application.[4,5] In the clinical setting of avian species, skin wounds are most frequently secondary to traumatic causes, self-mutilation, or bites, with very

little scientific information available on the effects of PBM on wound healing and management.[6-8]

This case series describes, for the first time, the application of PBM using Multiwave Locked System (MLS®), a class IV laser with high peak power characterized by synchronized emission of pulsed and continuous waveforms (M-VET®; Asa S.r.l.), in the treatment of cutaneous wounds in a peregrine falcon (*Falco peregrinus*), a barn owl (*Tyto alba*), and a peach-faced lovebird (*Agapornis roseicollis*). In all three cases the laser protocol was applied as follows: three sessions every 72 hours during the first week, two sessions every 72 hours during the second week, and a final session after 96 hours. Safety precautions were observed by covering the bird's eyes with a dark cloth. Informed owner consent was obtained and all procedures were based on respecting patient behavior and welfare.

## 2. Case 1

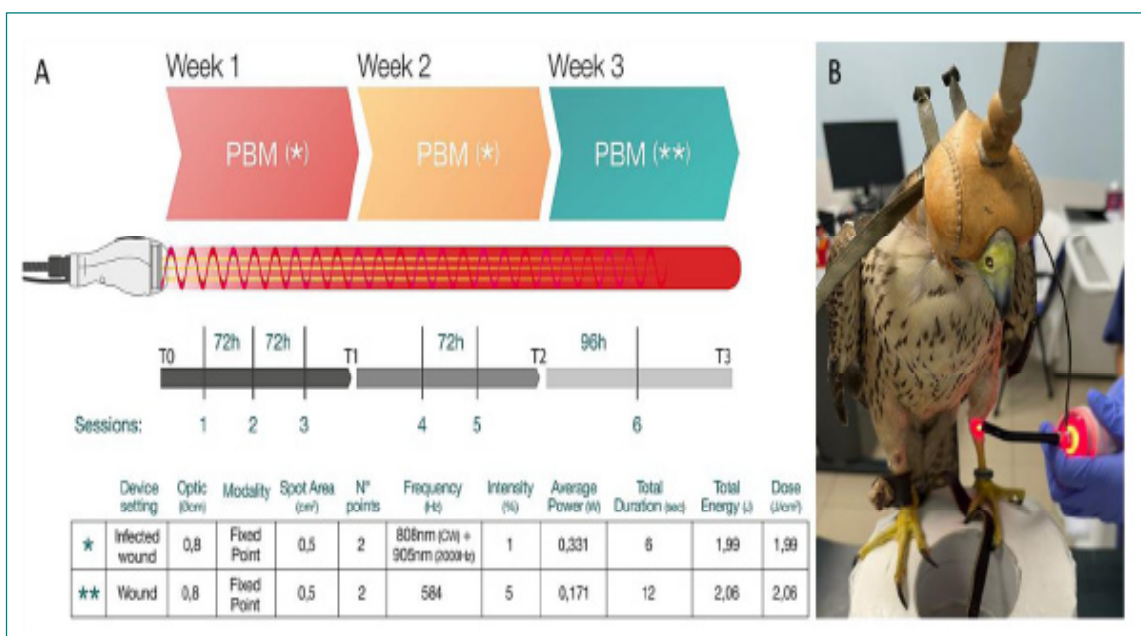
A one-year-old male peregrine falcon (*Falco peregrinus*) was presented with a two-month history

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of cutaneous wounds on the skin covering the ventral aspect of both tibiotarsus-tarsometatarsus joints. As in most cases of falcon dermatitis, very likely due to incorrect management as reported in the literature,[9] in the present case the jesses were too wide for the bird and the left leg, which was in fact the more seriously affected, bore a closed leg band that worsened the lesion. Previous treatment with amoxicillin-clavulanic acid (Synulox, palatable drops, 125 mg/kg, PO, BID; Zoetis S.r.l) and gentamycin-betamethasone cream (Gentalyn beta 0.1% + 0.1%; Essex Italia) had led to a partial improvement. Topical therapy was initiated with a 0.9% sodium chloride solution lavage, application of silver sulfadiazine cream (Sofargen 1%; Germavis) twice daily, and honey-based ointment (Vetramil; Bfactory) once daily with mild

improvement after several days of treatment. General physical examination yielded unremarkable results. Dermatological examination revealed an ulcerated, crusted area in the ventral aspect of the left tibiotarsus-tarsometatarsus joint and mild erythema with crusts on the skin covering the same region of the opposite leg. Topical therapy mentioned above was maintained during the laser protocol. A significant improvement was observed by the end of the protocol period on the right leg whereas the left one, which was clinically worse at first presentation, manifested a residual crust at the end of the treatment that healed totally after a few more days. Figure 1 shows the flowchart used for all three cases and how the procedure was performed during a laser session.



**Figure 1.** (A) Flowchart illustrating the device settings, optics, and parameters utilized during each session. (B) *Falco peregrinus* (case 1) undergoing a laser session

### 3. Case 2

A two-year-old female barn owl (*Tyto alba*) was presented with a seven-day-old wound on the skin covering the right tarsometatarsus that appeared after the recent application of a jess by the owner. Prior treatment with meloxicam (5 mg/kg PO BID, Metacam; Boehringer Ingelheim) once daily was unsuccessful and was suspended after the occurrence of gastrointestinal side effects. Topical treatment with the daily application of a solution of diluted povidone-iodine (Betadine 10%; Viatris), neem and hypericum oil spray (Hypermix; RI.MOS), and honey-based ointment (Vetramil; Bfactory) was initiated with a mild improvement of the skin lesion after several days

of treatment. General physical examination yielded no noteworthy findings. Dermatological examination revealed an alopecic area with erosions and ulcers in the right tarsometatarsus. A purulent discharge and hemorrhagic crusts were also observed in the dorsal proximal aspect of the same lesion. Topical treatment with products mentioned above were maintained during laser protocol. The evolution of the wound became evident by the end of the first week of treatment with a reduction in erosion, ulceration, and discharge. A moderate erythema and crusts were still evident. By the end of the second week a reduction in wound area and mild erythema were observed, and at the 6th session of laser therapy the integrity of the skin was restored (Figure 2).



**Figure 2.** *Tyto alba*. Case 2. (A) Alopecic area with erosions, ulcers, hemorrhagic crusts, and purulent discharge were observed in first presentation-first session. (B) Skin integrity was restored at the end of the protocol-sixth session.

#### 4. Case 3

A one-year-old female peach-faced lovebird (*Agapornis roseicollis*) was presented with a six-month history of feather plucking involving the dorsal aspect of the right shoulder and the lateral and medial aspects of the right wing. The main differential diagnosis was polyfolliculitis/polyfolliculosis, a particular skin presentation of unknown origin reported in budgerigars and lovebirds which results in pruritus and feather destructive behaviour.[10] Treatment with meloxicam (0.1 ml PO BID, Metacam; Boehringer Ingelheim), topical administration of gentamycin-betamethasone cream (Gentalyn beta 0.1% + 0.1%; Essex Italia) once daily, and a diet trial were prescribed, with a moderate response. Two months later, the lesions had worsened, and a new therapy was administered, comprising amoxicillin-

clavulanic acid (Synulox, palatable drops, 125 mg/kg, PO, BID; Zoetis S.r.l.), itraconazole (Itrafungol, 10 mg/kg PO, BID; Virbac), neem and hypericum oil spray (Hypermix spray; RI.MOS), biotin supplement (Biotin Gel Forte; Canina pharma gmbh) and topical disinfection with diluted povidone-iodine (Betadine 10%; Viatris), resulting in a partial remission. The bird was found to be systemically healthy. Dermatological examination revealed an alopecic, erythematous-ulcerated area with hemorrhagic crusts involving the skin in the dorsal aspect of the right shoulder and lateral and medial aspect of the right wing. Systemic and topical therapy mentioned above was maintained during laser protocol. By the end of the first week a significant improvement was observed in the dorsal-lateral aspect of the wing (Figure 3) while the medial aspect of the wing healed after a total of 6 sessions.



**Figure 3.** *Agapornis roseicollis*. Case 3. (A) Alopecic, erythematous-ulcerated area with hemorrhagic crusts was on the skin of the dorsal aspect of the right shoulder during first presentation-first session. (B) A significant improvement was evident by the end of the-sixth session.

#### 5. Discussion

To the best of the authors' knowledge, this is the first case series documenting successful application of PBM using MLS® laser therapy as an adjuvant approach in the management of cutaneous wounds in

three different avian species.

Due to the dynamic nature of flight and the reduced vascular supply of the distal extremities, cutaneous defects of the medial wings and legs frequently result in chronic non-healing wounds.[6] This was evident

in this case series, with two birds having cutaneous wounds localized on distal extremities and one patient having a chronic non-healing defect on the right wing, with a more delayed improvement of the medial aspect of the wing.

In veterinary medicine the effects of PBM on skin wound healing have been investigated, especially in dogs, with controversial results.[4] Integumentary disorders are mentioned as one of the main applications of PBM in avians too, but to date scientific information on its clinical effects in birds is limited.[7-10] First, one of the most significant limitations described in veterinary literature is the lack of standardization in PBM treatment protocols. [4,5] Moreover, while the general effects of PBM on the avian system will be the same as in other species, the anatomical and physiological differences of birds dictate certain adjustments, including lowering of power density and dose in order to preserve the relatively thinner skin of these patients as compared to mammals.[7]

In general, MLS® therapy has been shown to have anti-inflammatory effects stemming from increased NLRP10 protein which inhibits the pro-inflammatory cytokines IL-1 $\beta$  and IL-18, thus reducing inflammation and pain. Furthermore, MLS® therapy has been demonstrated to enhance cell energy metabolism, anabolic activity, and repair processes, and also to positively impact extracellular matrix turnover by influencing the collagen and metalloproteinase production that plays an essential role in tissue remodeling.[11]

The MLS® device used in this report involved the application of two different emissions that are combined and synchronized: one in continuous (peak power 6W $\pm$ 20%) or frequency (repetition rate 1–2000Hz, 50% duty cycle) mode emitting at 808 nm wavelength, and the other in a pulsed mode emitting at 905 nm wavelength with peak power from 140W $\pm$ 20% to 1kW $\pm$ 20% and pulse frequency varying in the range 1- 2000Hz.[12] In this respect, the energy dosages used in the three cases described in this report are in line with those proposed by Ness and Mayers[7] for skin lacerations, feather disorders, and self-mutilation in birds, while the protocols chosen were shown to be safe for all of the patients in the management of skin wounds regardless of their underlying causes.

In all three cases, various systemic and topical treatments were prescribed before laser therapy

and some of that were continued during the procol. Although it is not fully determinable whether PBM alone, other treatments, or their combination afforded the clinical improvement, by the end of the study, it was evident that a faster improvement of skin lesions was observed after the introduction of MLS® laser therapy in the treatment protocol for all patients. Moreover, PBM using MLS® therapy was well tolerated in all three cases.

## 6. Conclusion

Although additional in vivo studies should be conducted to determine if this non-invasive therapy benefits wound healing in avian species, the results observed in this report indicate that MLS® laser therapy is a promising adjuvant strategy for wound healing management in birds.

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## Conflict of Interest

There are no conflicts of interest.

## 7. References

1. Musstaf RA, Jenkins DFL, Jha AN. Assessing the impact of low level laser therapy (LLLT) on biological systems: a review. *Int J Radiat Biol.* 2019; 95:120-43.
2. Anders JJ, Lanzafame RJ, Arany PR. Low-level light/laser therapy versus photobiomodulation therapy. *Photomed Laser Surg.* 2015; 33:183-4.
3. Glass GE. Photobiomodulation: A review of the molecular evidence for low level light therapy. *J Plast Reconstr Aesthetic Surg.* 2021; 74:1050-60.
4. Millis DL, Bergh A. A Systematic Literature Review of Complementary and Alternative Veterinary Medicine: Laser Therapy. *Animals (Basel).* 2023; 13:667.
5. Bunch J. Photobiomodulation (Therapeutic Lasers): An Update and Review of Current Literature. *Vet Clin North Am Small Anim Pract.* 2023; 53:783-99.
6. Mickelson MA, Mans C, Colopy SA. Principles of Wound Management and Wound Healing in Exotic Pets. *Vet Clin North Am Exot Anim Pract.* 2016; 19:33-53.
7. Ness RD, Mayer J. Laser Therapy for Birds. In: *Laser Therapy in Veterinary Medicine: Photobiomodulation.* Edited by Riegel JR and Godbold JC. John Wiley & Sons, New York. 2017; 298-305.

8. Ritzman TK. Therapeutic Laser Treatment for Exotic Animal Patients. *J Avian Med Surg.* 2015; 29:69-73.
9. Samllur J, Wernick M.B. and Zsivanovits P. Therapeutic Management of Pododermatitis in Falcon Medicine: Historical and Modern Perspective. *Arch Vet. Anim Sci.* 2021; 3:11.
10. Abou-Zahr T. Avian Dermatology. *Vet Clin North Am Exot Anim Pract.* 2023; 26:327-346.
11. Genah S, Cialdai F, Ciccone V, Sereni E, Morbidelli L, Monici M. Effect of NIR Laser Therapy by MLS- MiS Source on Fibroblast Activation by Inflammatory Cytokines in Relation to Wound Healing. *Biomedicines.* 2021; 9:307.
12. Micheli L, Cialdai F, Pacini A, Branca JJV, Morbidelli L, Ciccone V, et al. Effect of NIR laser therapy by MLS-MiS source against neuropathic pain in rats: in vivo and ex vivo analysis. *Sci Rep.* 2019; 9:9297.