

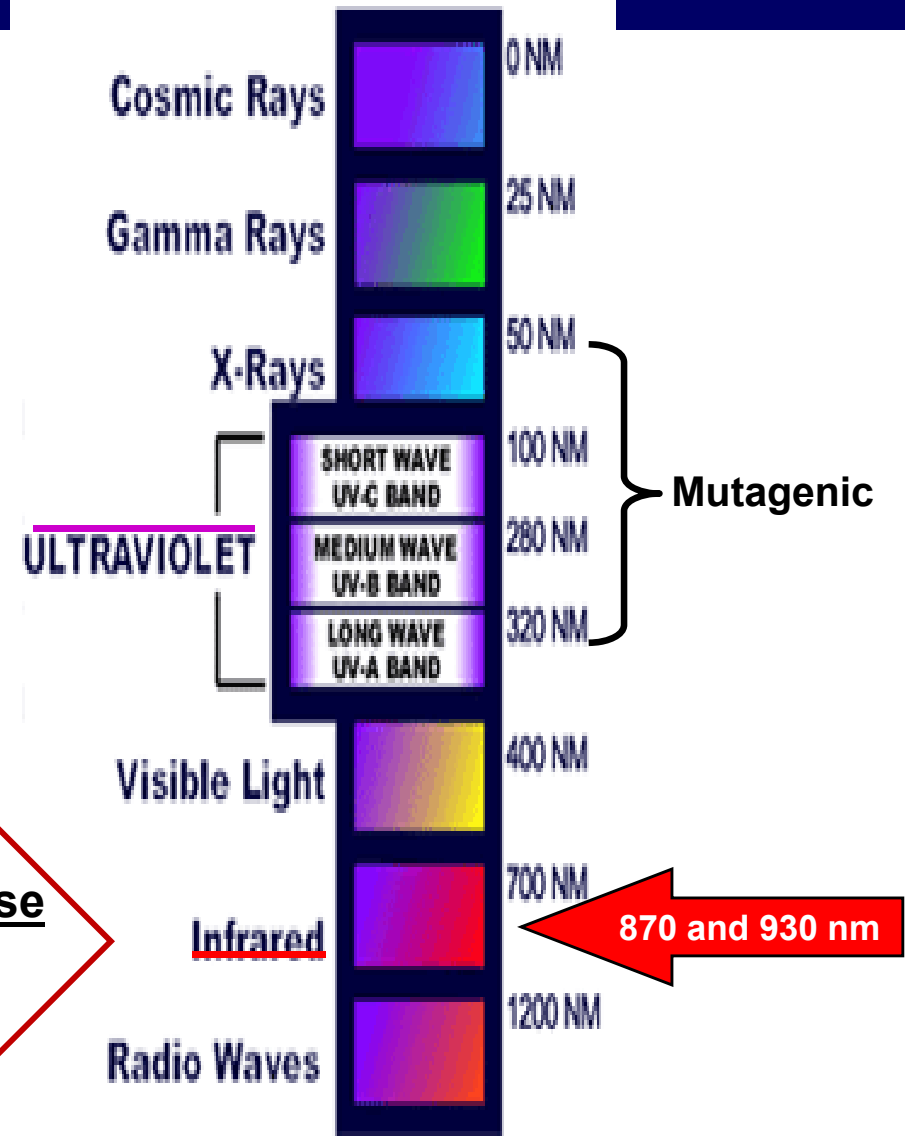
**An Overview
of a
Unique Dual Laser System for the Treatment of Infections**

Eric Bornstein, DMD

NOVEON: Background

*Neuman:
2 distinct wavelengths,
870nm and 930nm
should not be used
for optical traps because of
inherently lethal effect on E-coli
bacteria.

Non-mutagenic, could these
be clinically useful?



*Biophysical Journal, Vol. 77, November 1999

Confirmation of in vitro Effect

***In vitro Assessment for Possible Clinical Use**
Confirmation that 870nm and 930nm cause lethal photo-damage effects in microbes at physiologic temperatures.

In vitro tests

E. coli
S. aureus
T. rubrum
C. albicans

*

Bornstein ES and Michelon M: *Examining the Antibacterial Action Spectrum in vitro of the Noveon® Dual Wavelength Laser System through Photo-inactivation of E. coli at Physiologic Temperatures*. Abstract to be presented at ASLMS, National Harbor, Maryland, 2009.

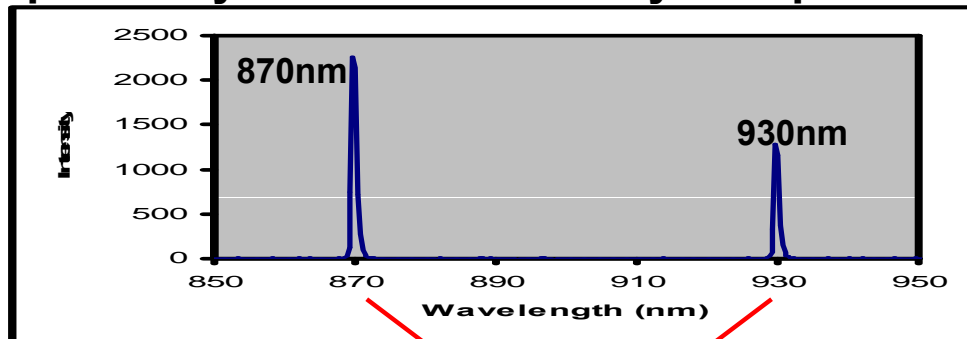
Mechanism of Action – What it is Not

Clearly not thermal

- With the exception of one patient, the highest temperatures observed was 101.5°F
- Average maximum observed temperature in all subjects of MRSA human resistance reversal pilot study was 99°F

Mechanism of Action – What it is Not

Output Analysis of Noveon: Very Sharp Definition

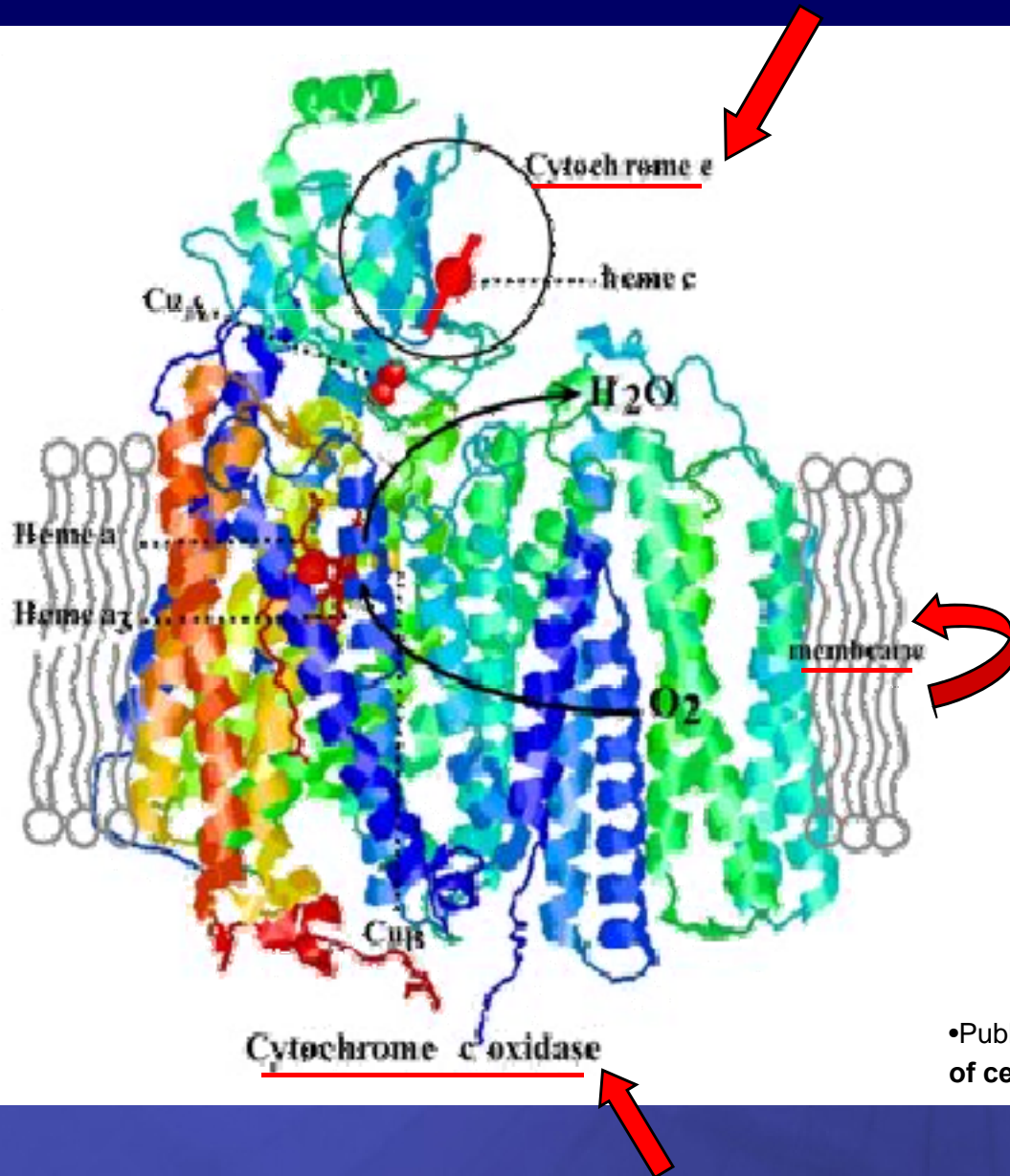


**Not due to any
ultraviolet light**



Mutagenic

870 and 930nm Mechanism of Action - What it Is



Alteration of
*Microbial Cellular
Metabolism*

Generation of
Radical Oxygen Species

•Published patent application Near-infrared electromagnetic modification of cellular steady-state membrane potentials – uspto.gov

*100% Kill of Onychomycosis Fungal Pathogens in vitro and in a Human Pilot

Pre-treatment

Post-treatment



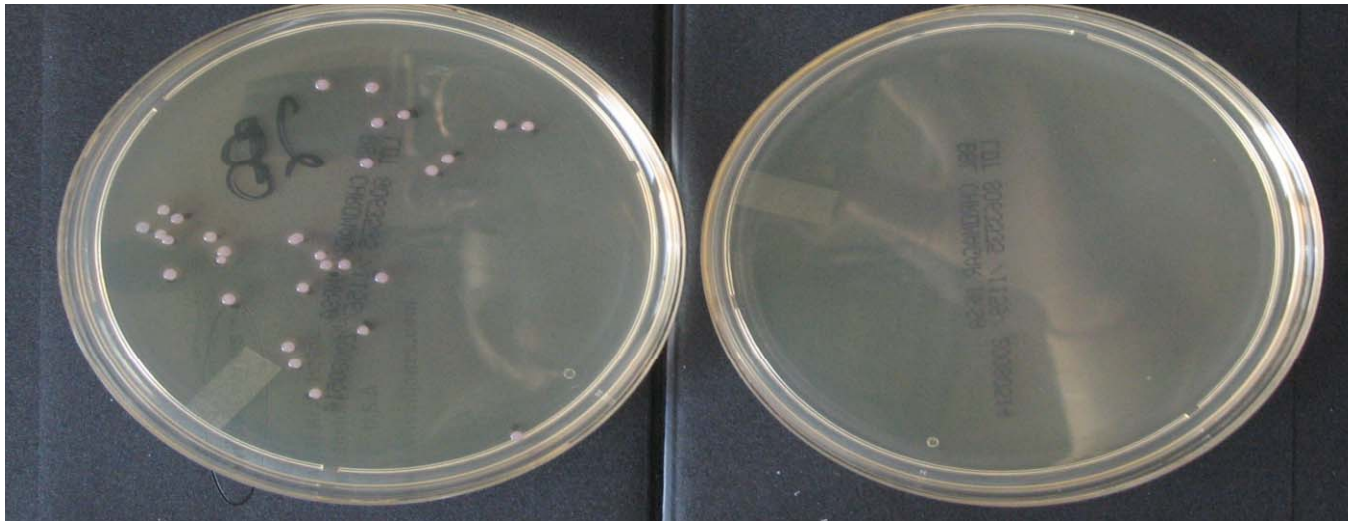
Efficacy Achieved without Thermal Damage

* Bornstein ES, Robbins AH, Michelon M: *Photo-Inactivation of Fungal Pathogens That Cause Onychomycosis In Vitro And In Vivo With The Noveon® Dual Wavelength Laser System*. Abstract presented at New Cardiovascular Horizons, New Orleans, LA, 2008.

Re-Sensitization In vitro and In vivo to Generic Antibiotics

MRSA (post Noveon and E-mycin 2%)

Pre-
Treatment

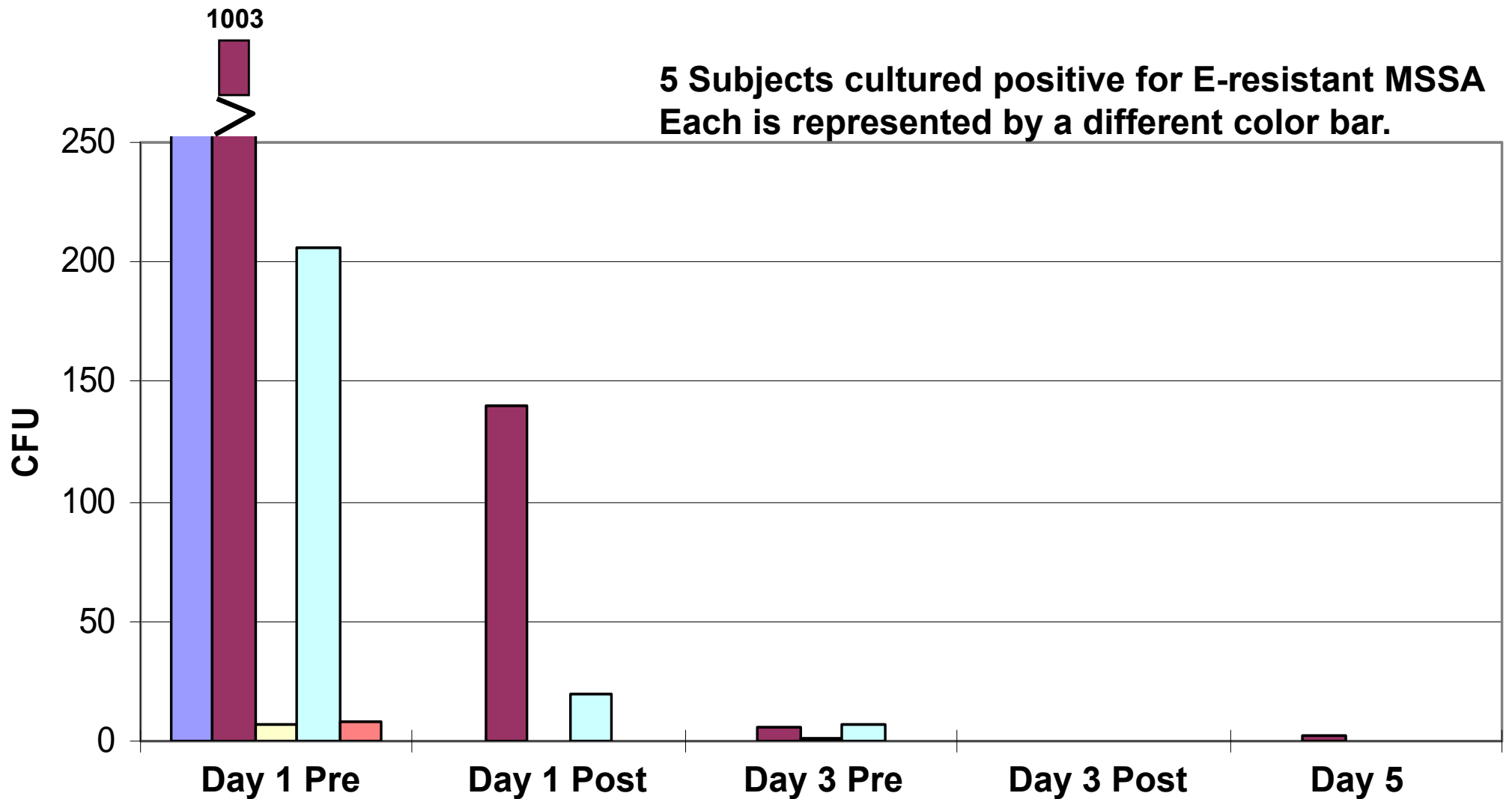


Post-
Treatment

In resistant microbes, **inhibit efflux pumps.**

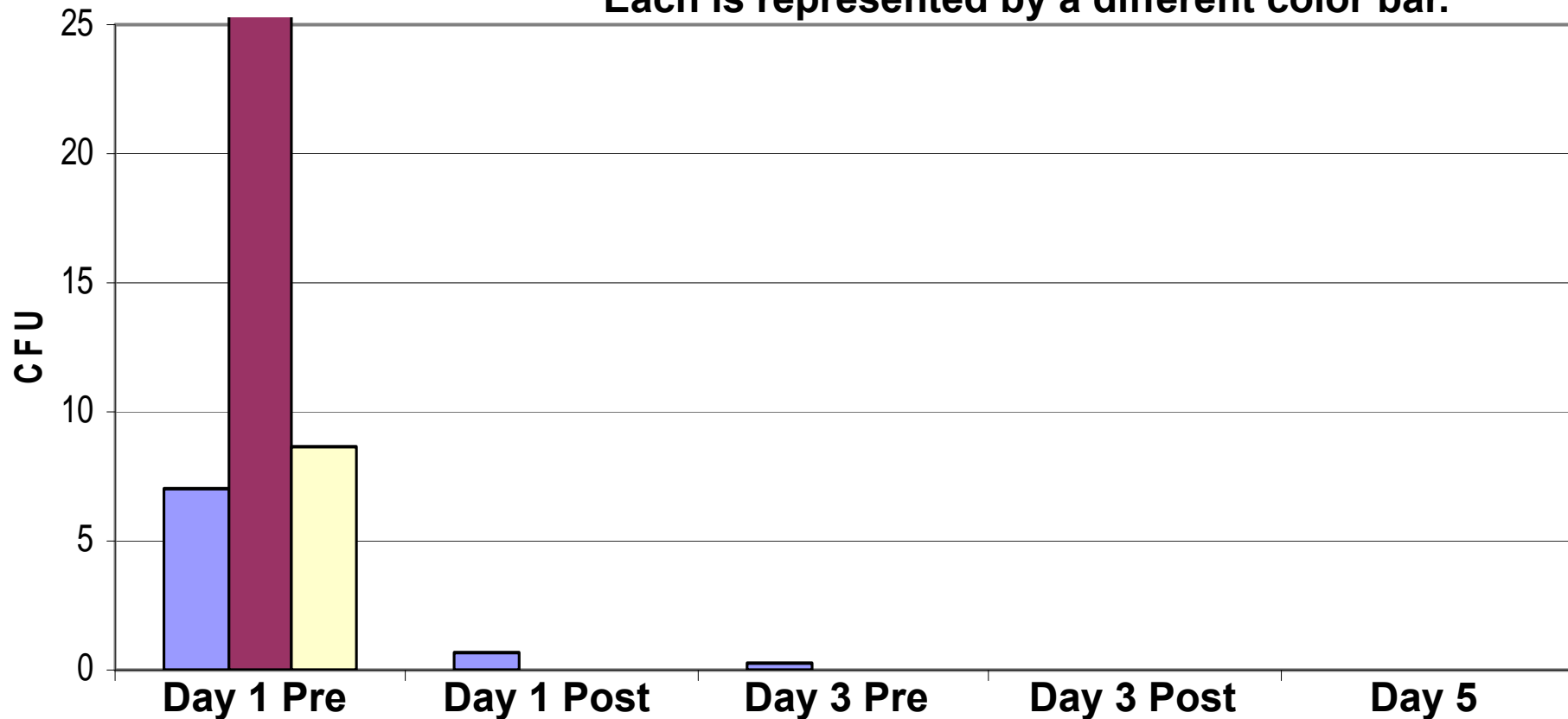
Bornstein, ES, Krespi, YP, Robbins, AH, et al. **Antimicrobial Resistance Reversal at physiologic temperatures in MRSA in the Nares with an 870 nm and 930 nm dual wavelength Noveon® laser.** Presented at the Termis North America Annual Conference and Exhibition in San Diego, December 7-10, 2008

Erythromycin-Resistant MSSA CFU Total Counts



Erythromycin-Resistant MRSA CFU Total Counts

3 Subjects cultured positive for E-resistant MRSA
Each is represented by a different color bar.*



Bornstein, ES, Krespi, YP, Robbins, AH, et al. **Antimicrobial Resistance Reversal at physiologic temperatures in MRSA in the Nares with an 870 nm and 930 nm dual wavelength Noveon® laser.**

Presented at the Termis North America Annual Conference and Exhibition in San Diego, December 7-10, 2008

Nomir Protocol 09-002 Onychomycosis

Description

- 32 Subjects – Randomized 2:1, Treated:Control
- 52 Toes – Treated: 38, Control: 11
- Blinded
- IRB Approved

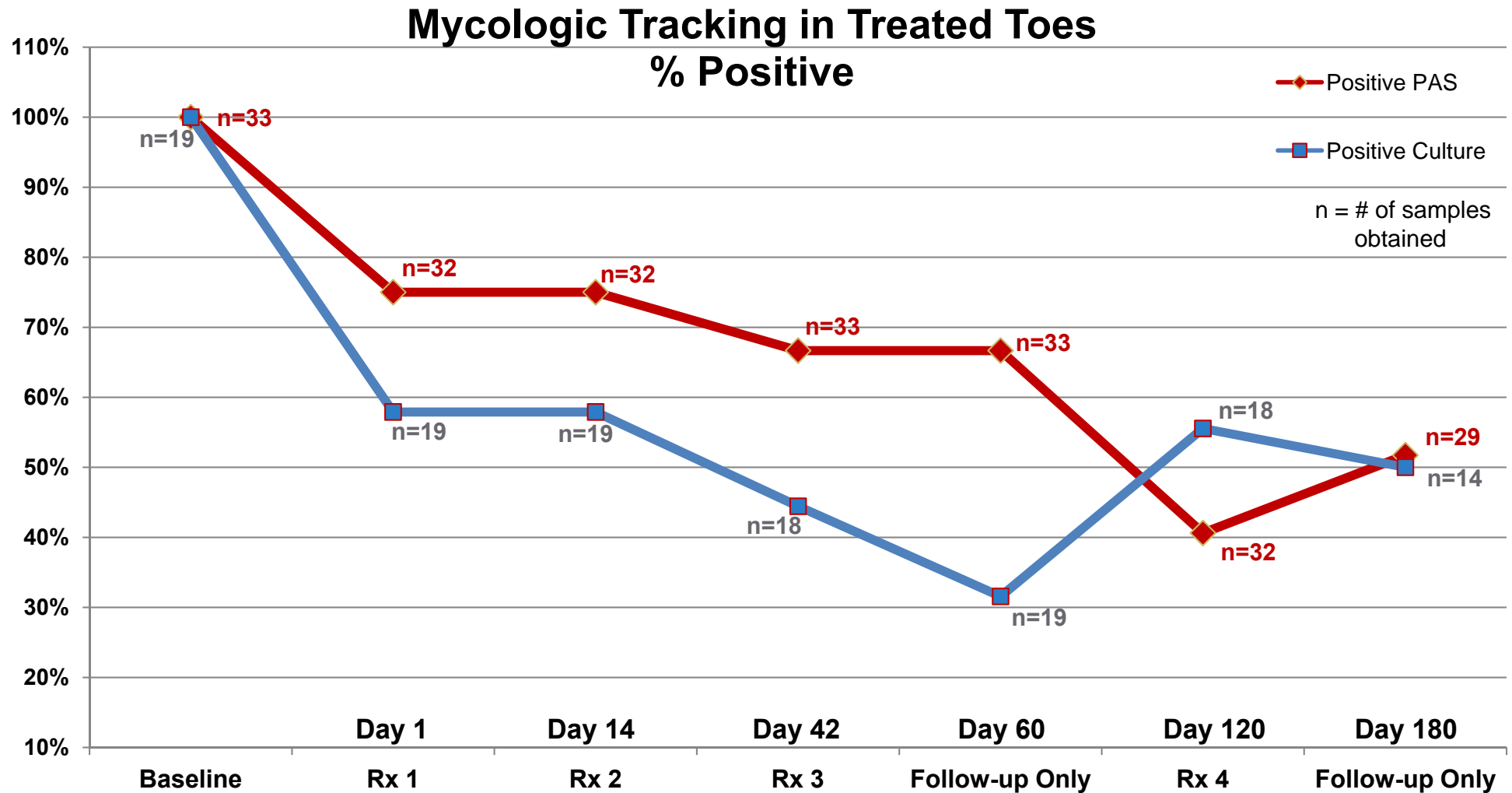
Treatment

- On Days 1, 14, 42, and 120

Nomir Protocol 09-002 Results - Mycology

Culture Results Post-Treatment			
Total With Positive Culture at Baseline		Negative Culture Attained with 2 Treatments or Less	
Treated Toes	19	14	74%
Control Toes	9	3	33%
		p = 0.0946	

Mycologic Tracking in Treated Toes



Nomir Protocol 09-002 Results - Clear Nail Growth

Maximum Linear Clear Nail Growth* (at 180 days)				
Group	< 1 mm*	1 to <3 mm*	≥3 mm*	Total Improved
Treated	11 (29%)	7 (18%)	20 (53%)	27 (71%) If clear area included (76%)
Control	7 (78%)	1 (11%)	1 (11%)	3 (33%)
* p-value <0.01 (Kruskal-Wallis exact test)				

Example Cases



Day 1



Day 120



Day 180

Example Cases



Day 1

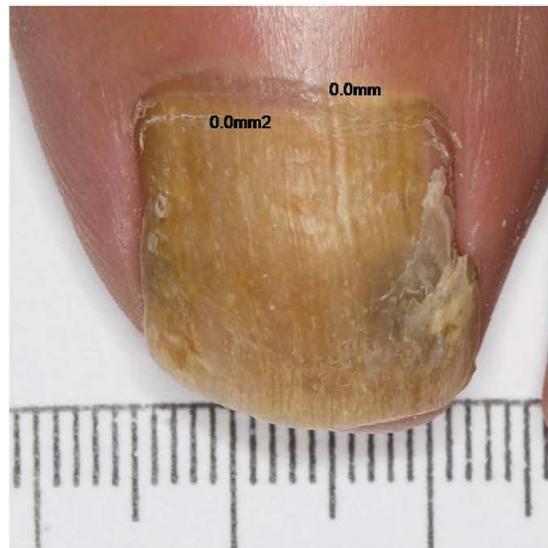


Day 120

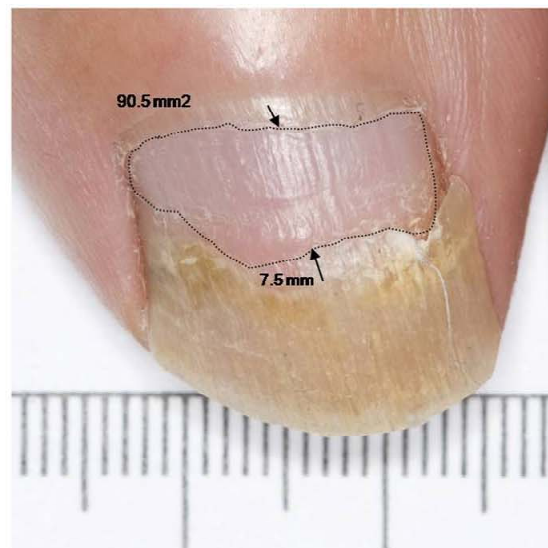


Day 180

Example Cases



Day 1



Day 120



Day 180

Lamisil[®], Penlac[®], and Noveon[®] Efficacy

Type of Treatment	Treatment Protocol	Elapsed Time Since Start of Study	Results
Noveon [®] Photobiology	Four 6-minute treatments	26 weeks	<ul style="list-style-type: none"> • 53% >3 mm clear nail growth (p<0.02) • 74% negative mycology at 2 weeks • 76% improvement (independent panel)
Lamisil [®] (terbinafine hydrochloride tablets) Oral	Daily tablet(s) for 12 weeks	48 Weeks	<ul style="list-style-type: none"> • 38% negative mycology + clear nails • 59% negative mycology + >5 mm clear growth • 70% negative mycology
Penlac [®] Nail Lacquer (ciclopirox) Topical Solution 8%	Daily topical application for 48 weeks	48 weeks	<ul style="list-style-type: none"> • <36% negative mycology • <12% clear or nearly clear nails

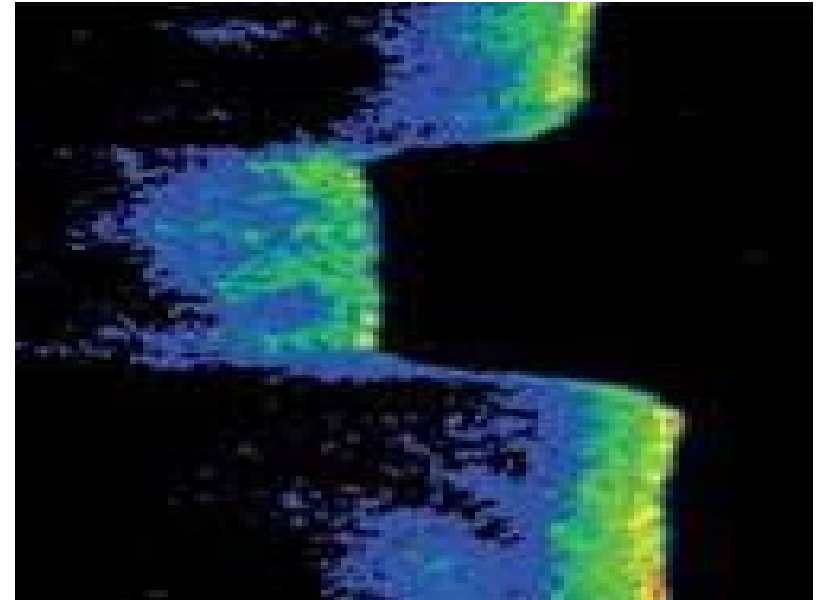
Noveon Summary

- A totally new type of laser, non significant risk.
- Does not use dangerous UV or ablation.
- Does use 2 very specific IR wavelengths that have the unique ability to cause photodamage to microbes at physiologic temperatures that can kill directly or sensitize to antibiotics.
- These effects have been used successfully in humans with both MRSA and fungi.

Appendix

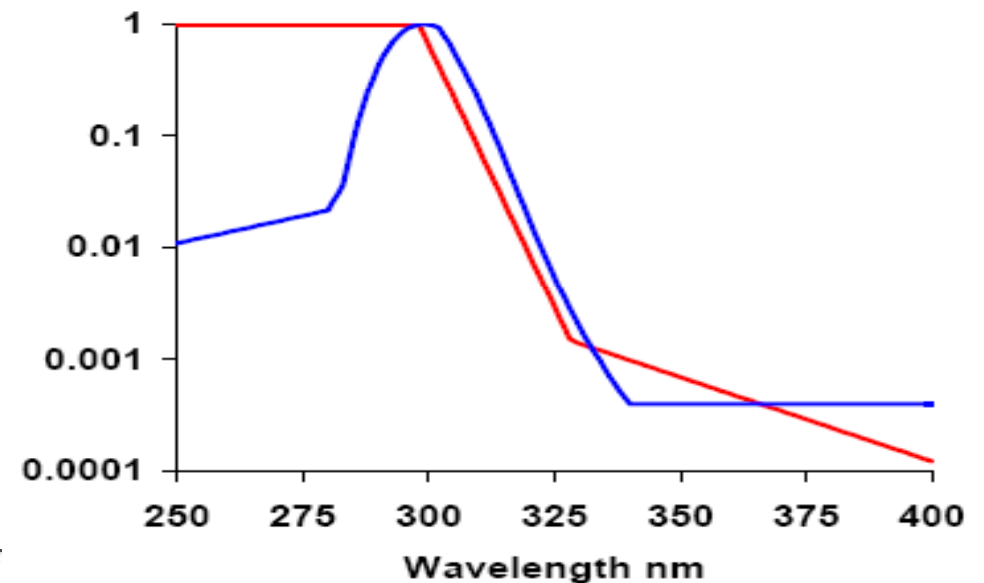
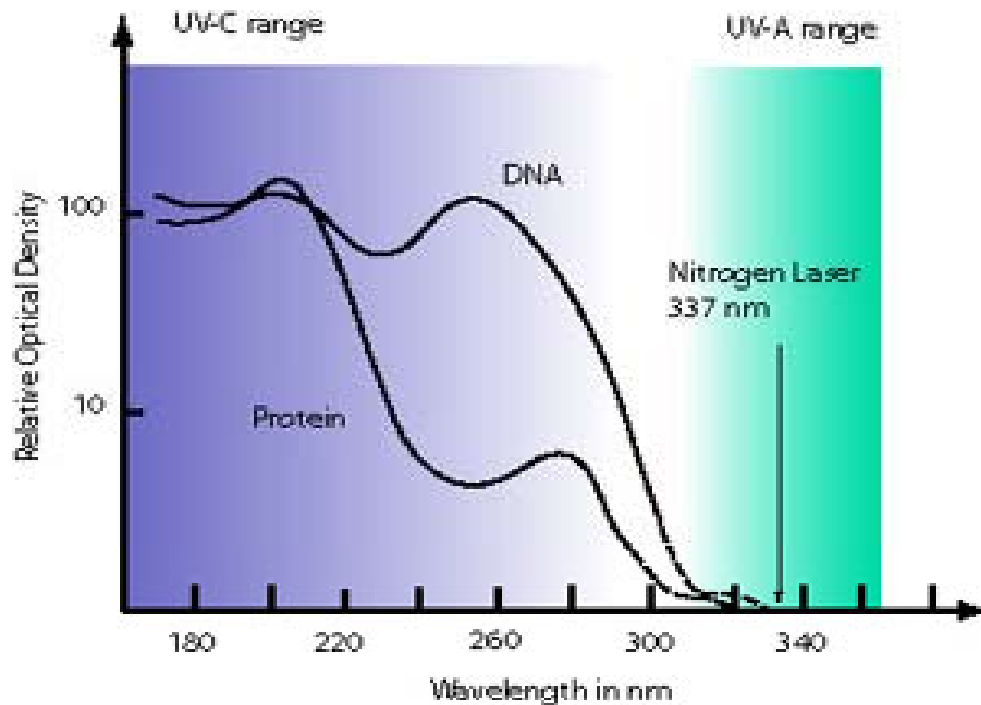
Other Experimental Mechanisms of Action

Photo-Thermal Ablation



Other experimental mechanisms of Action

Germicidal Uv Light



The CIE (1987) reference action spectrum for erythema in human skin (red) and the estimated CIE (2000) action spectrum for human squamous cell carcinoma (blue) based on mouse studies (1)

(1) Scientific Committee on Consumer Products of the European Commission on 20 June 2006

Penetration Ability of Noveon®

879nm/930nm

