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WHITE PAPER

HYDROHEAT ULTRA USB POWERED WARM COMPRESS

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INTRODUCTION

Warm compresses are a key element of the treatment of meibomian gland dysfunction, a very prevalent ocular surface disease [1].

While a flannel heated in hot water was originally recommended, these are known to rapidly lose their heat and the temperature is not regulated, leading to patient safety concerns [2]. A generation of microwave heated warm compresses followed, but these vary in their ability to reach the required meibum warming temperature ($\sim 40^{\circ}\text{C}$) [3, 4] and to maintain this temperature [5].

The effectiveness of a therapeutic warming device depends not only on the temperature achieved at the surface, but also on the amount of thermal energy transferred into underlying tissue. Published research from thermotherapy, rehabilitation medicine, and vascular physiology demonstrates that moist heat transfers thermal energy into tissue more efficiently than dry heat, resulting in faster tissue warming and greater increases in local blood flow [6-10].

“

**APPLICATION OF WATER
TO THE COMPRESS
SURFACE, USING AN
INCLUDED SPRAY
BOTTLE, ENHANCES HEAT
TRANSFER TO EYELID
TISSUES WHILE
MAINTAINING USER
COMFORT.**



Instant Therapeutic
Moist Heat

”

PURPOSE/ METHODS

TO ASSES:

- The eyelid warming temperature of the eyelids achieved and sustained by the HydroHeat Ultra USB mask.
- The symptomatic benefits of one month use of the HydroHeat Ultra.

The eyelid temperature under the mask was measured on 12 adult patients with a calibrated thermal camera (NEI Thermo Tracer TH7102MX) at baseline and every 5 minutes for 15 minutes on the mid-temperature HydroHeat Ultra setting.

The participants used the mask twice a day for one month and their change in symptoms (assessed with Ocular Surface Disease Index 6-item questionnaire) [11,12] was evaluated.



Twice a day

Participants used the mask twice a day for one month.



Eyelid temperature

Measured using calibrated thermal imaging



Outcomes assessed

OSDI-6 symptom questionnaire
Meibomian gland expression grading

MEIBOMIAN GLAND EXPRESSION SCALE:

GRADE 0 → NORMAL, CLEAR MEIBUM EASILY EXPRESSED

GRADE 1 → EASILY EXPRESSED, BUT MORE TURBID OIL

GRADE 2 → MORE VISCOUS / TURBID

GRADE 3 → “ROPY” TOOTHPASTE MEIBUM

GRADE 4 → NO EXPRESSION

RESULTS

The temperature rose from physically normal to virtually 40 degrees (in the therapeutic range) within 5 minutes ($p < 0.001$) and was well maintained in all participants (no significant change $p = 0.218$).

Symptoms as measured by the OSDI-6 decreased from 6.6 ± 0.9 [dry eye] to 3.2 ± 2.8 [no longer dry eye on average] at 1 month. Meibomian gland expression improved from 1.6 ± 1.3 to 0.8 ± 0.8 at 1 month.

50%

Reduction in symptoms

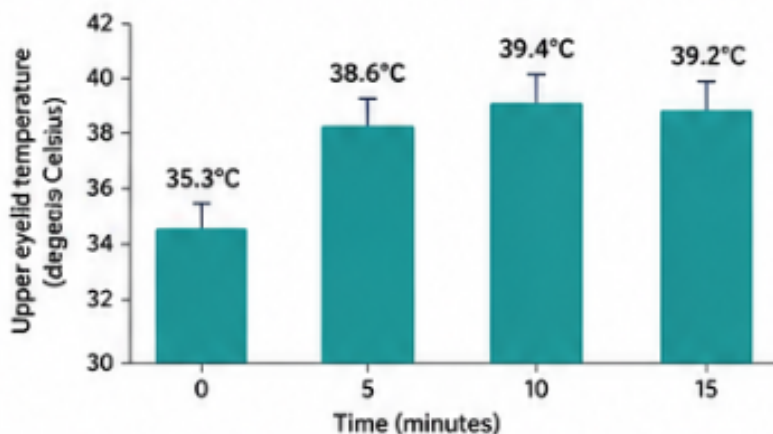
52%

Improvement in gland expression



RAPID THERAPEUTIC HEATING

Reaches Treatment Temperature Within 5 Minutes



Impact of Moisture

Moist heat has been shown to increase local blood flow by up to 500% [6].

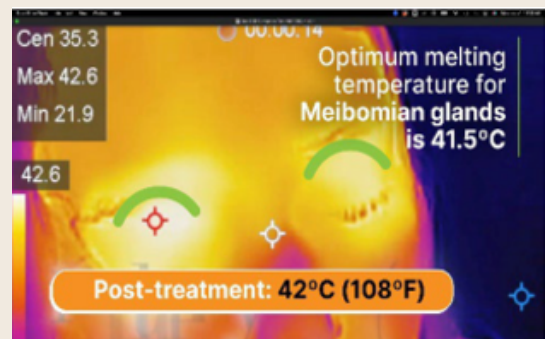
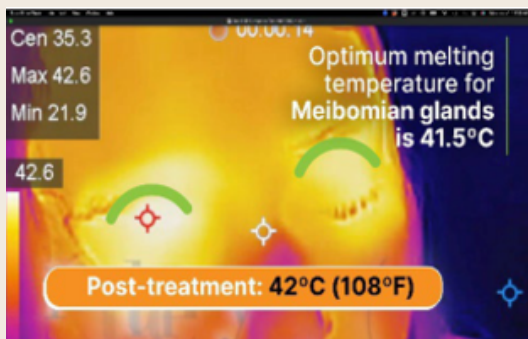
Water transfers thermal energy approximately 20-25 times more efficiently than air [8].

CONCLUSION

The HydroHeat Ultra compress is able to warm the eyelids rapidly to a therapeutically beneficial temperature and this is maintained for as long as the device is used.

Unlike a microwaved device, there is no drop in temperature and access to a microwave is not needed.

Further research on the high-setting shows a rapid increase in the temperature of the warm compress, reaching therapeutic levels in just 1 minute.



WHY MOIST HEAT MATTERS

- Improves thermal conductivity
- Reduces evaporative cooling
- Accelerates tissue warming
- Enhances blood-flow response



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