

## The effect of the environment on modern wound dressings

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### **Objective**

To evaluate the performance of  
modern wound dressings in  
varying environmental conditions.

INTRODUCTION

METHODS

RESULTS

DISCUSSION

CONCLUSION

## Introduction

A key requirement for optimal healing of wounds is to maintain a moist wound environment. The presence of moisture beneath a wound dressing is acknowledged to increase the rate of epithelialisation and promote healing<sup>1</sup>.

Obtaining the right balance of moisture relies to a large extent on effectively managing wound exudate. Poor management of exudate can lead to deterioration of the wound, impeding healing<sup>2</sup>.

Modern wound management dressings rely on both Absorbency and Evaporation, (measured by MVTR - Moisture Vapour Transport Rate) to create a moist wound healing environment<sup>2</sup>.



## Introduction (continued)

Absorbency and MVTR are often quoted jointly as a dressing's total fluid handling (TFH) capacity, and are used as a performance benchmark to compare dressings and guide dressing selection.

Test methods have been developed to measure these properties and are accepted as standard methods<sup>3,4</sup>. A common feature of these standard methods is to incubate test samples at a set temperature and very low relative humidity.

It has been shown that changes in temperature and relative humidity will affect the MVTR of semi-permeable films<sup>5</sup>. This study sought to investigate how much the performance of a range of dressings could be affected by varying environmental conditions.



## Methods

Two foam dressings were evaluated for their fluid handling properties by a standard *in vitro* test methodology.

The chosen assays were as set out in the European Harmonized Standard BS: EN 13726, aspects of absorbency and MVTR.

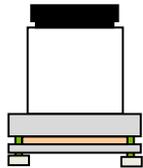
The assay involves fluid in contact with dressings in a closed system for 24 hours prior to calculating the absorbent capacity and MVTR of the dressing.

The assays were repeated incorporating variations to the standard test methodology, in order to observe the impact that temperature and humidity can have on a dressing's total fluid handling.

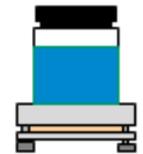


## Paddington Cup Method (BS:EN 13726)

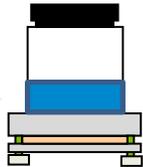
### Total Fluid Handling: MVTR and Absorbency



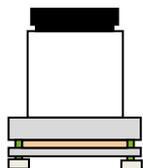
The dry cup with sample was weighed;  
*weight = a*



The cup with sample + water was weighed  
*weight = x*



After storage the cup was weighed again.  
*weight = y*



Water was drained and the cup weighed  
*weight = b*



### Method Description (performed in replicates of 5 samples)

- A round 55mm diameter sample was cut from the dressing
- Sample was placed on the flange of the cup and secured with the retaining ring
- Weight of the Paddington Cup and dressing was recorded
- 20ml deionised water was added to the Cup and the weight is recorded
- Cup was placed in 37°C incubator, containing trays of silica gel and the test began after a 30 minute period in order to condition the cup to temperature (humidity at less than 20% RH throughout the test).
- After 24 hours the cup was placed in an desiccator for 30 minutes and weight was recorded
- Excess water was then removed from the cup and the cup inverted to allow drainage
- Weight of the cup with sample was recorded

❖  $MVTR = x - y / \text{storage time} / \text{area}$

❖  $\text{Absorbent Capacity} = b - a / \text{storage time} / \text{area}$

❖  $\text{Total Fluid Handling} = MVTR + \text{Absorbent Capacity}$



## Deviation from Standard methodology

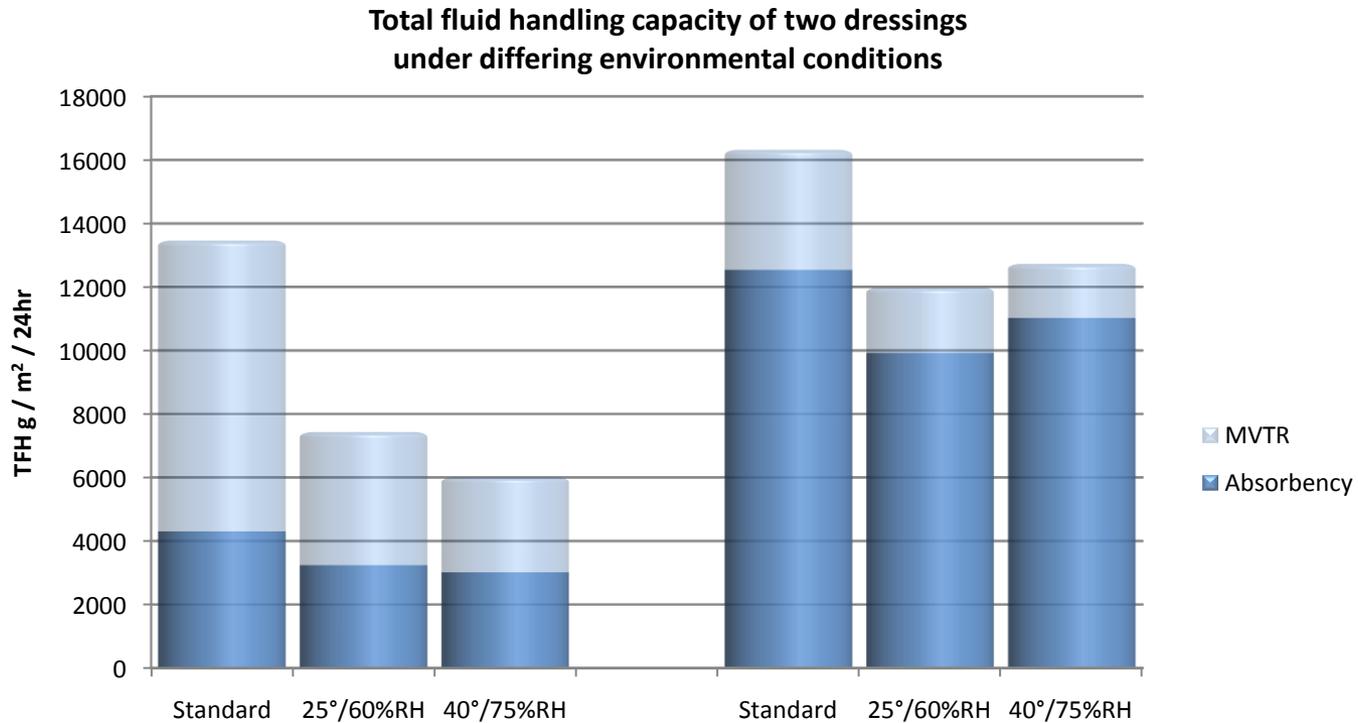
Stability cabinets are environmentally controlled chambers that provide standardised storage conditions. They are typically used to carry out studies to provide evidence supporting the shelf life of products. For this investigation stability cabinets were used to carry out the standard test described under different environmental conditions.

For the deviation from the standard test the conditions chosen were 25°C/ 65%RH and 40°C/ 75%RH, these 2 conditions are validated settings on our equipment.



## Results

Dressing B was shown to have the more consistent total fluid handling performance across a range of environmental conditions.



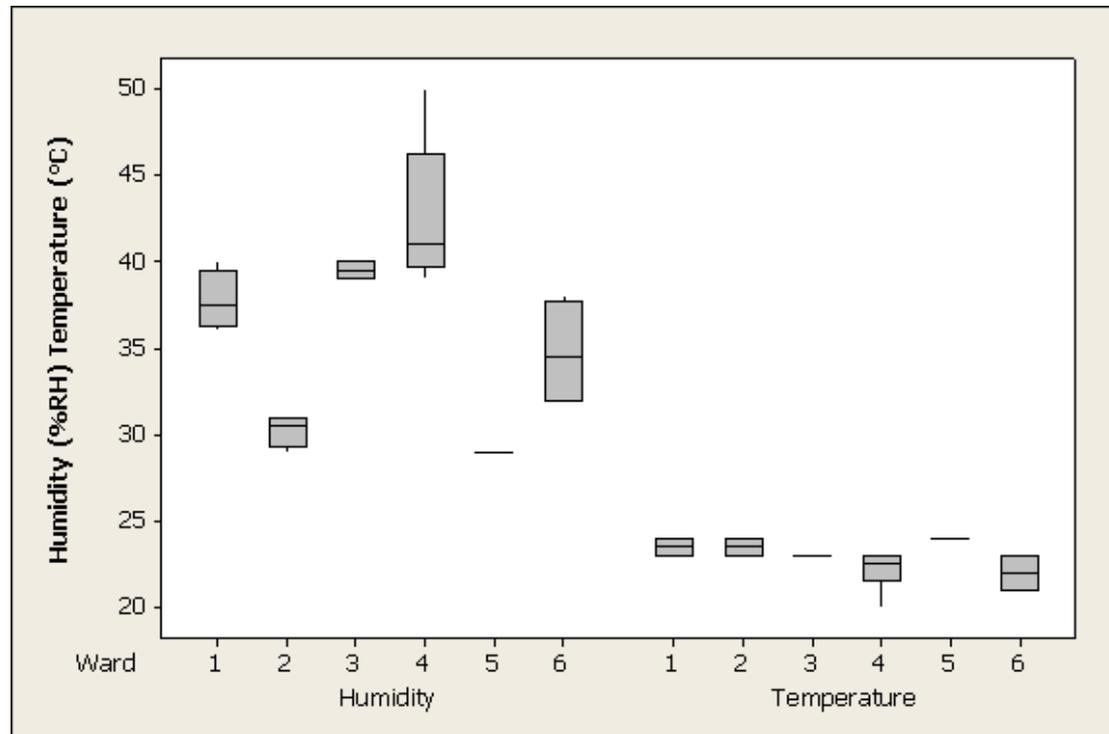
Dressing A  
Market leading  
foam dressing

Dressing B  
Hydropolymer  
dressing



## Temperature and humidity in a clinical setting

In order to see how temperature and humidity may vary in a clinical setting, a series of measurements was taken at Glasgow Royal Infirmary. Having established that no ethics committee approval was needed as there was no direct patient contact, a temperature and humidity probe was used to take readings in different locations in different wards.



## Discussion

This study has shown that when carrying out a standard test but at different environmental conditions the Total Fluid Handling of modern dressings may be very different. Dressings that have a relatively high MVTR in comparison to their absorbency are most adversely affected. As the relative humidity rises then MVTR plays a much lower contribution to the overall performance of the dressing.

Differences in temperature and relative humidity can have a profound effect on how the dressings perform. This study has also measured a range of conditions that were typically encountered in a clinical environment in Glasgow, in January 2012. Although this provides a useful snapshot of conditions, modern wound dressings are sold globally and climatic conditions vary hugely from region to region. By drawing parallels from the *in-vitro* data to clinically relevant conditions it can be surmised that dressings will differ in their performance according to the situation particularly where MVTR will be significantly lessened by warmer humid environments.



## Conclusion

The relationship between relative humidity and temperature is a complex one and both values will vary day to day due to normal atmospheric conditions. It is difficult to make direct comparisons between the laboratory data and how dressings will perform in a clinical setting. What may be concluded from this study, however is that dressings will not necessarily perform in the exact way a manufacturer states from conducting standardised testing.

This knowledge should be an important consideration when making dressing choices.

### References:

- 1 Winter G., Formation of the Scab and the Rate of Epithelisation of Superficial Wounds in the Skin of the Young Domestic Pig. Nature 193, 293 – 294
- 2 Thomas S., The role of dressings in the treatment of moisture-related skin damage. World Wide Wounds 2008.
- 3 BS EN13726-2:2002 Test methods for Primary Wound Dressings Parts 1,2.
- 4 ASTM E 96/E M-05
- 5 S. Thomas et al., The effect of temperature and humidity on the permeability of film dressings. JJWC 2011, volume 20

Additional note: All dressings selected for similar indication

