A better understanding of the effects on Pressure Care and Temperature Management when using Symmetrisleep®

Issue 1: March 2017

Introduction

This booklet offers Individual Pressure Mapping details on a range of End Users with and without Symmetrisleep in place on a range of mattresses. It also shares information on Pressure Care, the importance Moisture and Temperature have upon the skin's performance and how Symmetrisleep systems can assist in reducing measured pressure and managing microclimate.

Contents

Pressure – how pressure mapping can help reduce the risk of skin damage

Pressure ulcers
Pressure ulcers are usually found over bony prominences and are caused as a result of pressure or pressure and shear causing damage to the skin. Where a person sits or sleeps with abnormal posture, their weight may not be distributed equally so increasing the risk of a pressure ulcer developing. Pressure mapping an individual can assist by highlighting potential areas of risk which enables appropriate interventions to be put in place.

A pressure ulcer, as defined by the European Pressure Ulcer Advisory Panel (EPUAP) falls into one of four main categories:

Category I
Intact skin with non-blanchable redness of a localized area usually over a bony prominence. The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category I may be difficult to detect in individuals with dark skin tones.[1]

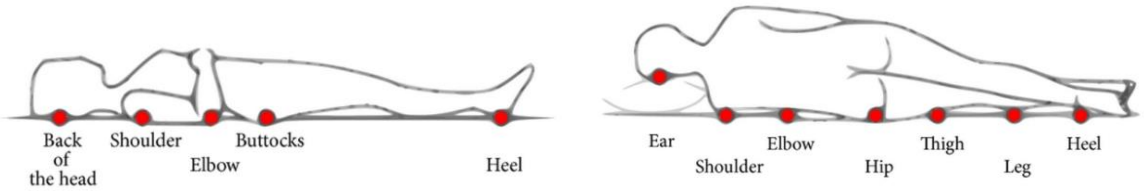
Category II
Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or sero-sanginous filled blister [1].

Category III
Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss [1].

Category IV
Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. Often includes undermining and tunnelling. Category/Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia, tendon or joint capsule) [1].

[1]. Copy taken from the 'Pressure Ulcer Prevention and Treatment EPUAP Review Guideline' written by the European Pressure Ulcer Advisory Panel (2009). This copy is a guide only.

Location of pressure ulcers
Pressure ulcers are more often found where skin touches the support surface for extended periods of time, a problem more frequently found when a client has restricted mobility. The most common locations are central on the body (hips, thighs and buttocks), followed by the ankles and heels. These areas account for nearly 75% of the identified risk areas.



Pressure mapping
Interface pressure mapping involves measuring pressure between two contact surfaces. The measurement in mmHg (millimetres of mercury is the manometric unit of pressure) provides a numerical value to help clinicians determine if any mapped areas have high pressure. Areas with high pressure can indicate increased risk of pressure ulcers and may require special attention.

It is acknowledged that the best way to reduce the occurrence of pressure ulcers is to improve the distribution of pressure whilst minimising the risk of shear and friction. Pressure mapping can help clinicians improve the distribution of pressure.

Pressure mapped clients
Pressure mapped studies produced on two different mattress types (foam and air). Pressure mapping data is created using the FSA Bodytrak system, calibrated to maximum reading of 150 mmHg across the sensing area of 185 x 76cm.

Pressure mapping examples

The results are presented to show the different pressure readings when on different mattress types without and with sleep systems using the CoolOver TR³ Airmantle. Postural support is provided using the contents of Symmetrikit starter pack (receptor sheet, pillows, horseshoe cushion, G-roll cushion, 2 med & 2 small brackets)

Samples 1-3
Pressure details were recorded in supine and side lying positions using two mattress types:
Foam mattress = Flexizone foam single mattress
Air mattress = Westmeria auto-adjust (auto setting)

Sample 1: RJ / Female
35-40yrs, 35-45kg

Sample 2: AE / Male
30-35yrs, 80kg

Sample 3: JP / Female
20-25yrs, 60-65kg

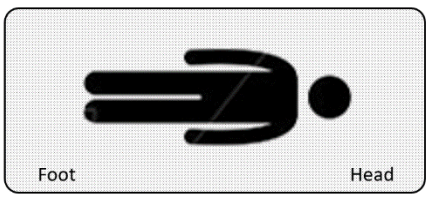
Samples 4-5
Residential home clients sampled during clinical testing.[1] Clients are using dynamic airflow mattresses. Pressure details were recorded in supine positions without then with CoolOver TR³ Airmantle and Symmetrisleep postural support in place.

Sample 4: TF / Male
85-90yrs, 60-65kg
Mattress: Essential Legato air mattress

Sample 5: AG / Female
85-90yrs, 45-50kg
Mattress: Reposa Flo air mattress

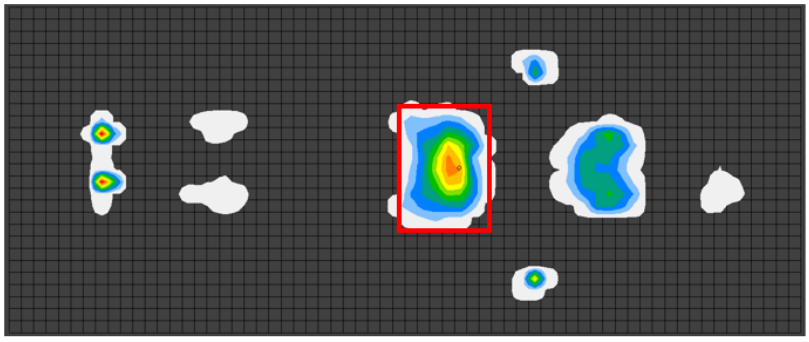
[1]. Postural care clinical trial conducted at The Gables Residential Home, Middlesbrough, North Yorks, TS4 2PE (Feb 2017)

Image layout
Client orientation during pressure mapping shows head at right side and foot to the left side of image.



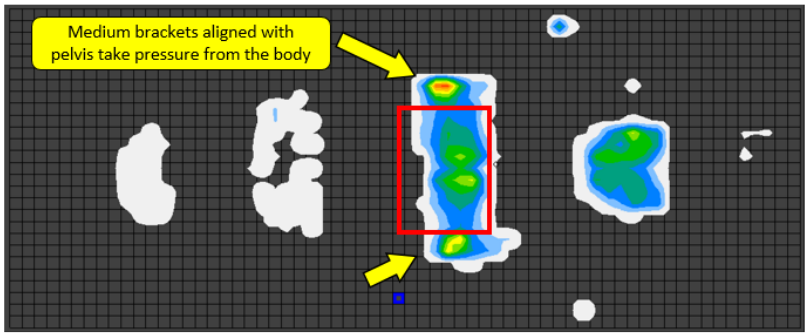
Sample 1: RJ / Female, 35-40 yrs, 35-45 kg

Foam mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	X
	Air	
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

No support. Pressure readings: Heels >150mmHg, Bottom= 119mmHg, Average= 30.4mmHg.

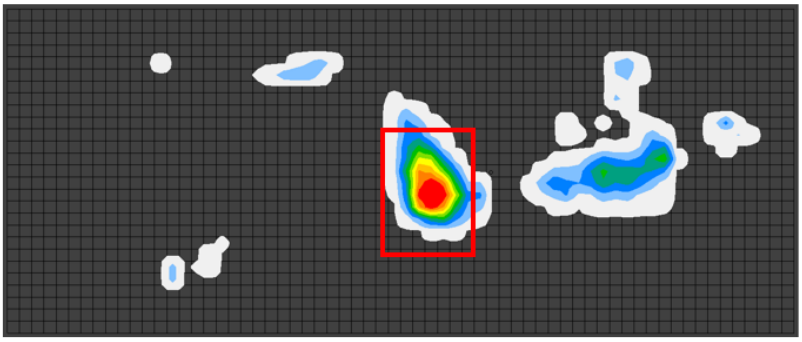


Position	Supine	X
	Side	
Mattress	Foam	X
	Air	
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Pressure readings: Off-loaded heels. Bottom= 75.6mmHg, Average= 23.2mmHg

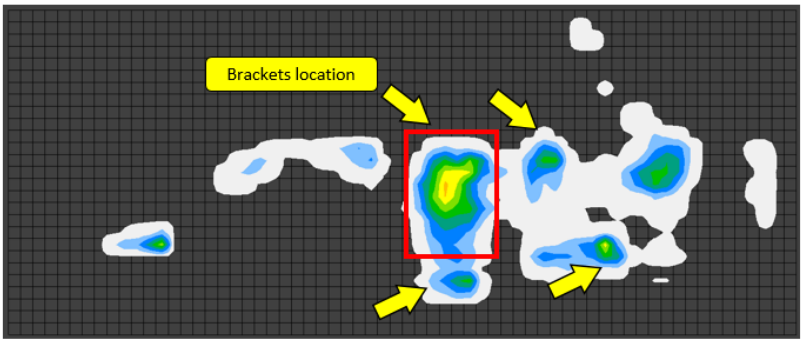
Pressure under the bony prominence area is reduced from 119 to 75.6mmHg average. Heels reduce from >150 mmHg to being fully off-loaded. It appears that the system compliments static mattresses.

Foam mattress. Side lying position.



Position	Supine	
	Side	X
Mattress	Foam	X
	Air	
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes		

No support. Pressure measurements: Hip= >150mmHg, Average= 29.8mmHg.



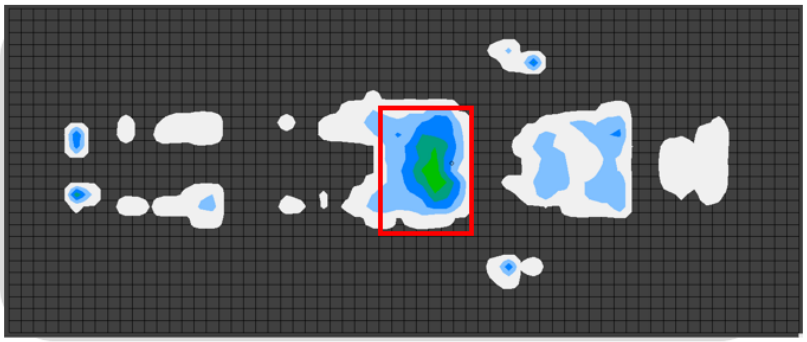
Position	Supine	
	Side	X
Mattress	Foam	X
	Air	
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Pressure readings: Hip= 110mmHg, Average= 21mmHg.

Peak pressure at the hip has reduced from 150mmHg (or greater) to 110mmHg. Average pressures have reduced from 29 to 21mmHg. It appears the Airmantle/Velcro combination does not contra indicate the alternating mattress.

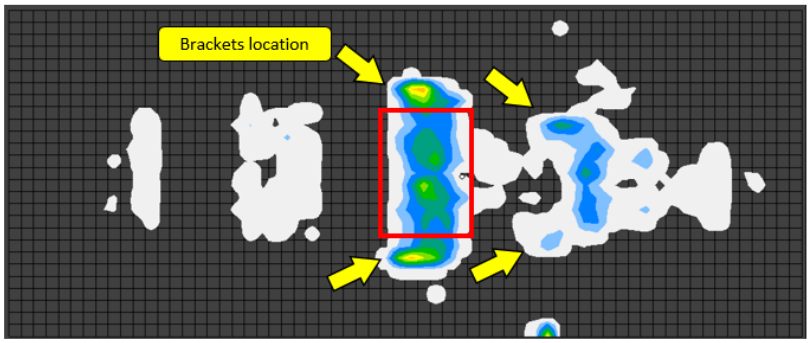
Sample 1: RJ / Female, 35-40 yrs, 35-45 kg

Air mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

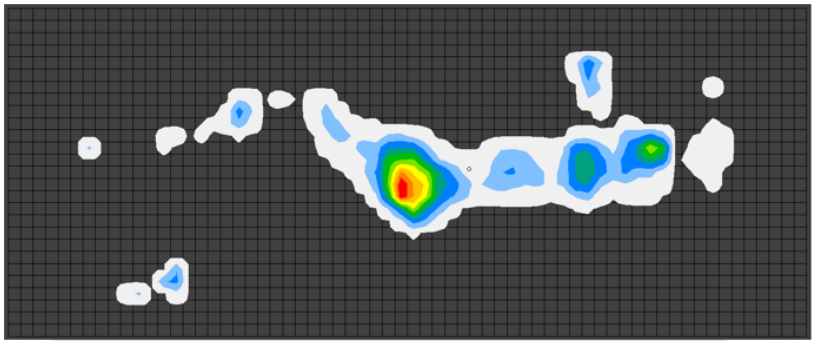
No support. Pressure readings: Heel= 55mmHg, Bottom= 69mmHg, Average= 33mmHg.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

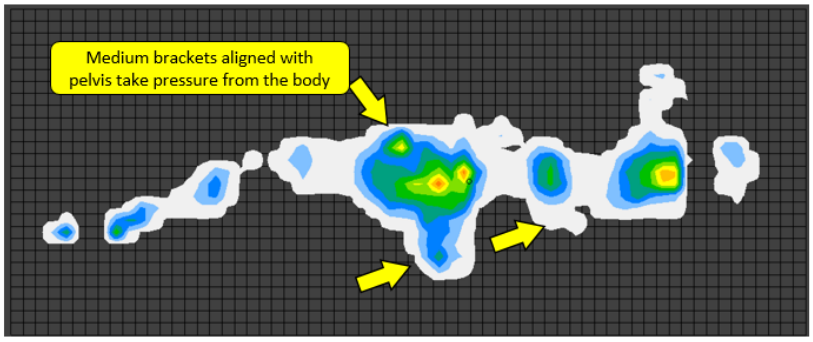
With support. Pressure readings: Heel offloaded, Bottom= 60mmHg, Average= 27mmHg.
Pressure under the bony prominence area is reduced from 66 to 60mmHg, the average falls from 33 to 27mmHg.
The heels are off-loaded to zero. It appears that the system compliments static mattresses.

Air mattress. Side lying position.



Position	Supine	
	Side	X
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes		

No support. Pressure readings: Hips= >150, Average= 24.

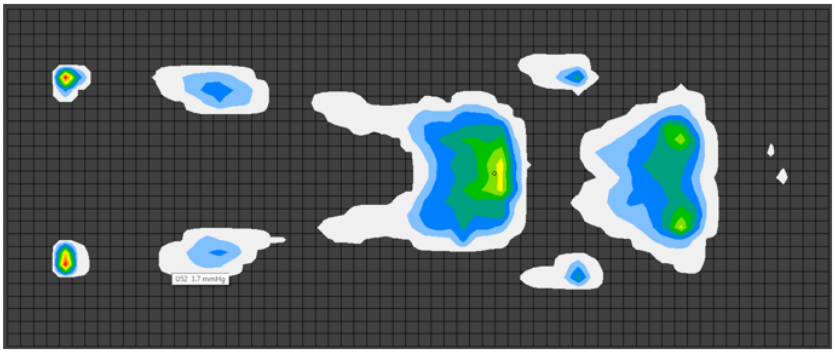


Position	Supine	
	Side	X
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Pressure readings: Hip= 87, Average reduces from 24 to 21.5.
Peak pressure at the hip has fallen from >150 to 87mmHg and the average from 24 to 21.5mmHg.
It appears that the Airmantle/Velcro combination does not contra-indicate the alternating mattress.

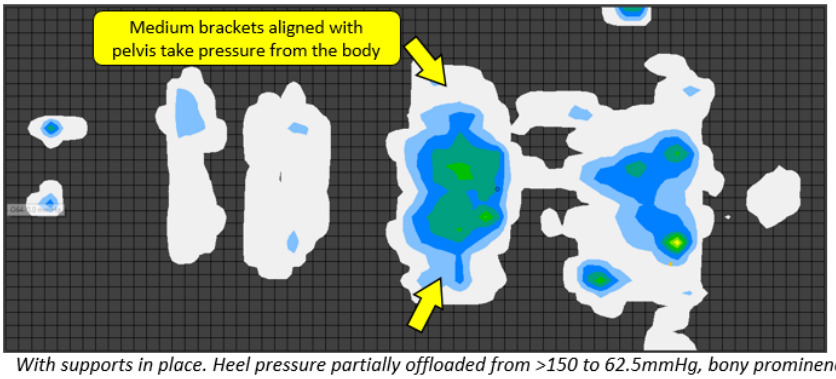
Sample 2: AE / Male, 30-35 yrs, 80kg

Foam mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	X
	Air	
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

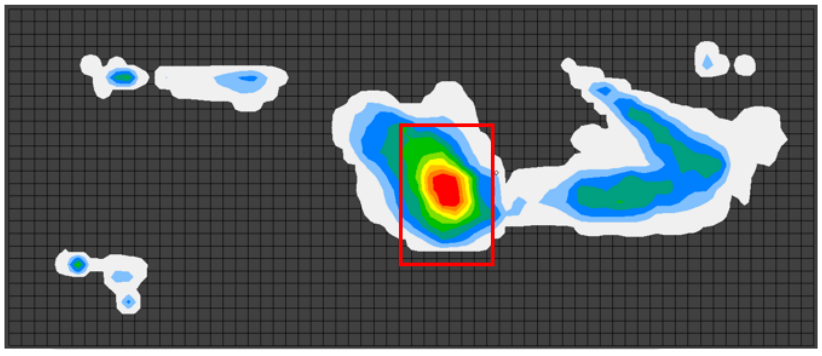
No support. Pressure measured: Heels= >150mmHg, bony prominence area= 99mmHg.



Position	Supine	X
	Side	
Mattress	Foam	X
	Air	
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

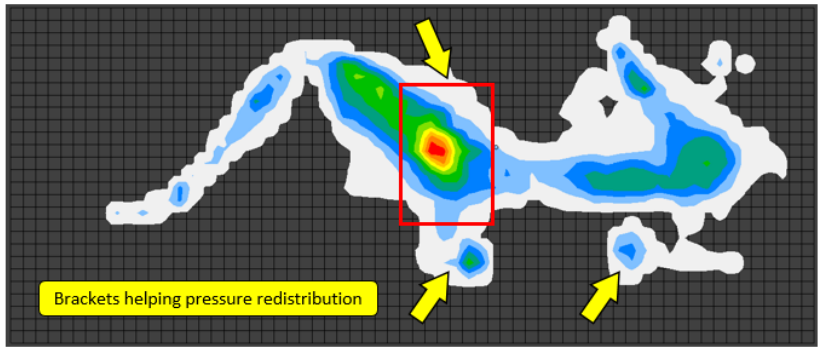
With supports in place. Heel pressure partially offloaded from >150 to 62.5mmHg, bony prominence area reduced from 99 to 77.8 mmHg. ***It appears that the system compliments static mattress.***

Foam mattress. Side lying position.



Position	Supine	
	Side	X
Mattress	Foam	X
	Air	
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes		

No support. Pressure reading at thigh >150mmHg, Heels = 77.9mmHg

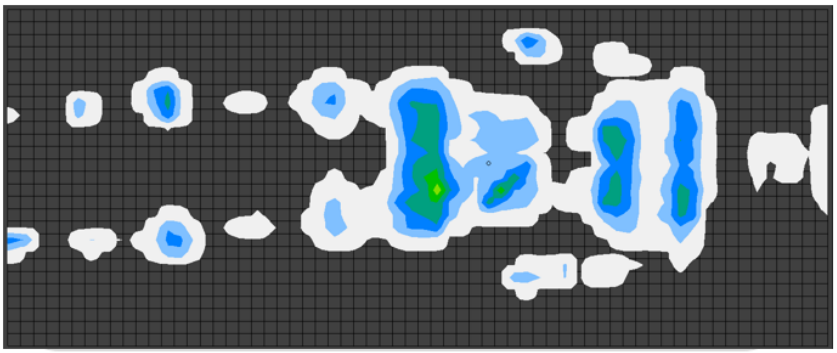


Position	Supine	
	Side	X
Mattress	Foam	X
	Air	
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Heel pressure reduced from 77.9 to 36.3mmHg. Peak pressure remains >150mmHg at the thigh, but the area is reduced . ***It appears that the Airmantle/Velcro combination does not contra-indicate the alternating mattress.***

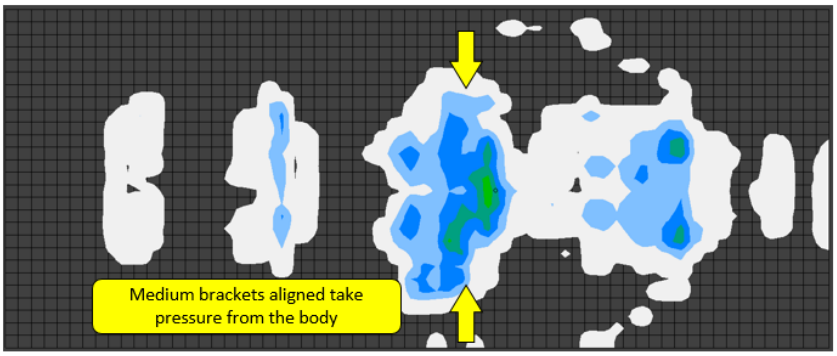
Sample 2: AE / Male, 30-35 yrs, 80kg

Air mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

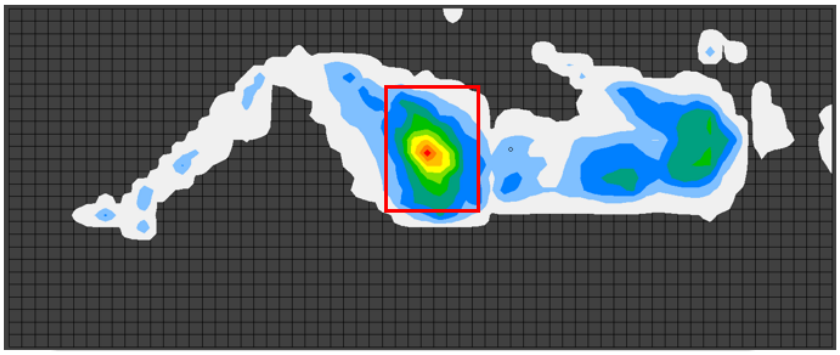
No support. Pressure readings: peak at bony prominences = 87mmHg.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

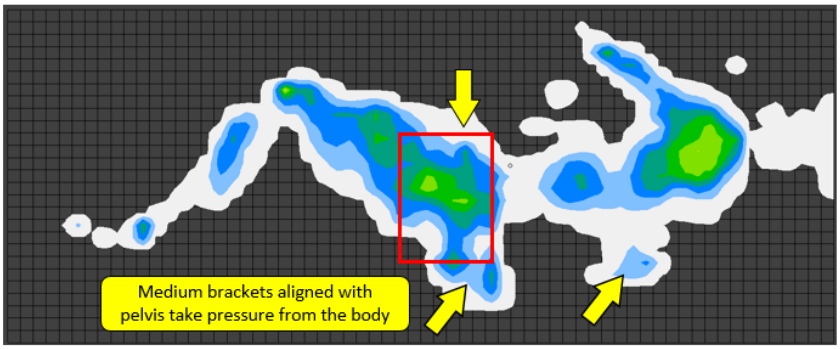
Including support. Peak pressure under bony prominence is reduced from 87 to 71mmHg.
The heels are also offloaded. ***It appears that the system complements air mattress.***

Air mattress. Side lying position.



Position	Supine	
	Side	X
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes		

No support. Pressure readings: Max pressure at the hip= 145.7 mmHg. Average= 24.6 mmHg.

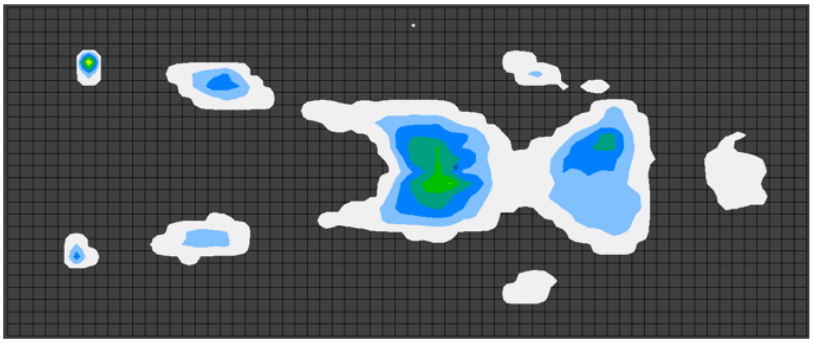


Position	Supine	
	Side	X
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Pressure at the hip falls from 146 to 75mmHg. The average falls from 24 to 20mmHg.
It appears that the Airmantle/Velcro combination does not contra-indicate the alternating mattress.

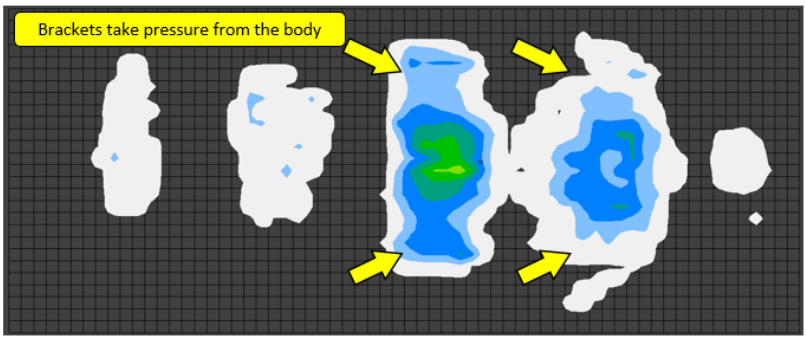
Sample 3: JP / Female, 20-25yrs, 60-65kg

Foam mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	X
	Air	
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

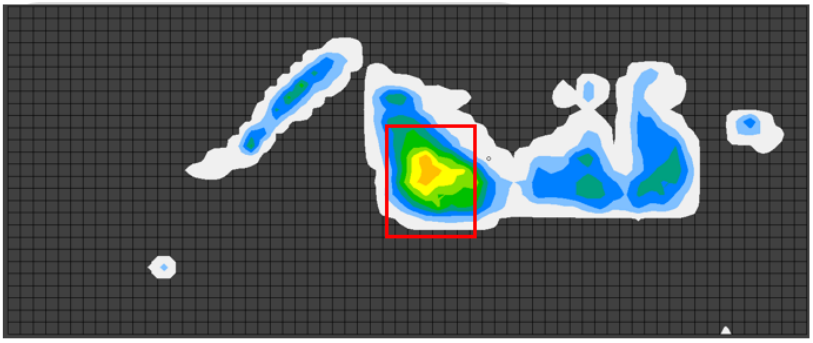
No support. Pressure readings: Peak at heel= 107.3mmHg, average= 19.2mmHg.



Position	Supine	X
	Side	
Mattress	Foam	X
	Air	
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

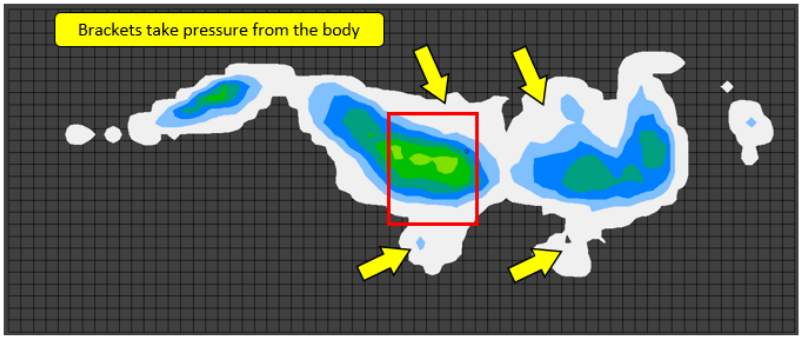
With support. Pressure readings: Max 87mmHg at bony prominences, Average= 17.78, Heel off-loaded.
It appears the system compliments static mattresses.

Foam mattress. Side lying position.



Position	Supine	
	Side	X
Mattress	Foam	X
	Air	
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes		

No support. Pressure readings: highest pressure zone at thigh= 120.5mmHG, average= 28.7mmHg.

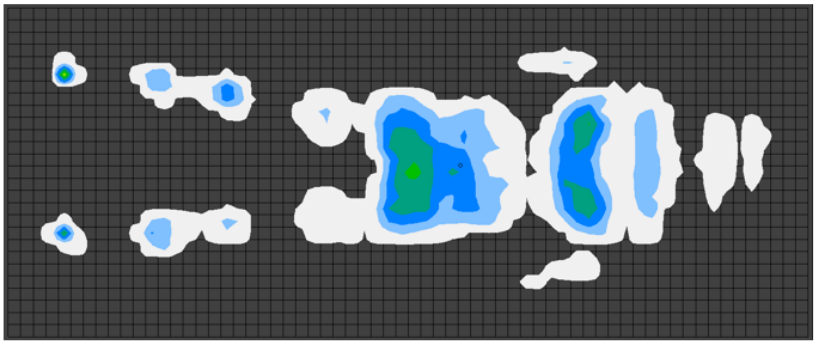


Position	Supine	
	Side	X
Mattress	Foam	X
	Air	
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Pressure readings: Max reading reduced from 120.5 to 85.4mmHg at the thigh.
Average readings have reduced from 28.7 to 23.1mmHg. ***It would seem the system compliments static mattresses.***

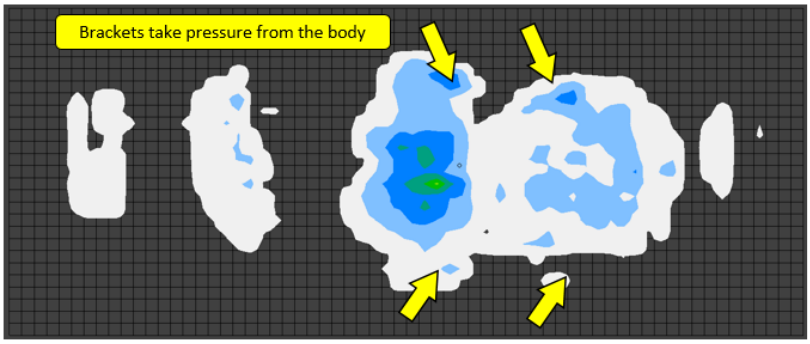
Sample 3: JP / Female, 20-25yrs, 60-65kg

Air mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

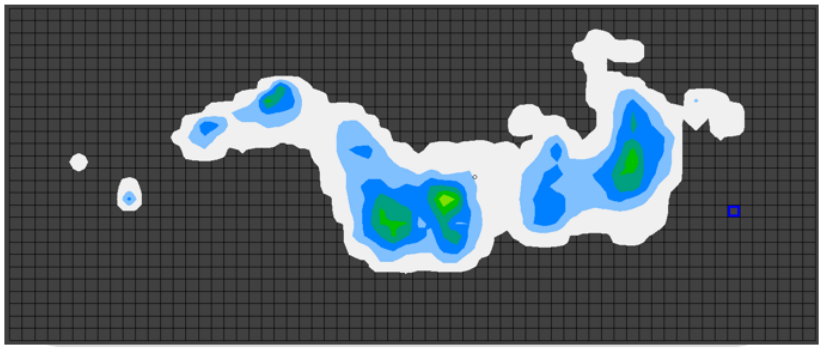
No support. Pressure readings: Peak pressure at heel= 90.6mmHg, average= 18.8mmHg.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

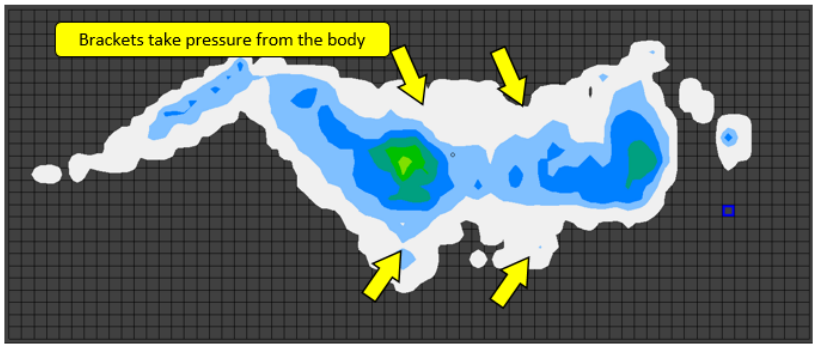
With support. Pressure readings: Heel pressure off-loaded. Average reduced from 18.8 to 14.9mmHg.
It appears that the Airmantle/Velcro combination does not contra-indicate the alternating mattress.

Air mattress. Side lying position.



Position	Supine	
	Side	X
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes		

No support. Pressure readings: Peak pressure at hip= 89.7mmHg, average= 20.4mmHg.

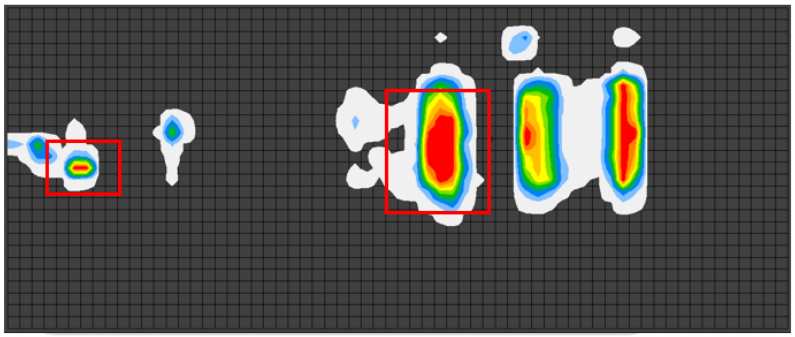


Position	Supine	
	Side	X
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets on trunk, cushions under legs	

With support. Pressure readings: Pressure at hip reduced from 89.7 to 86.4mmHg, average reduced from 20.4 to 19.4mmHg. ***At appears the Airmantle/Velcro does not contra-indicate the alternating mattress.***

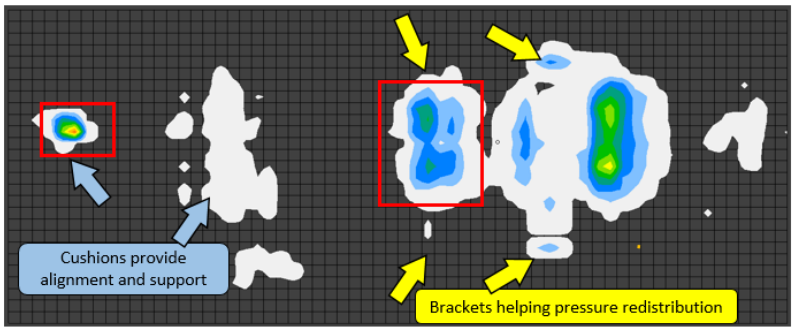
Sample 4: TF / Male, 85-90yrs, 60-65kg

Air mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

Before support. *Client has tendency to cross feet. Pressure measured at heels & bony prominences = >150mmHg*

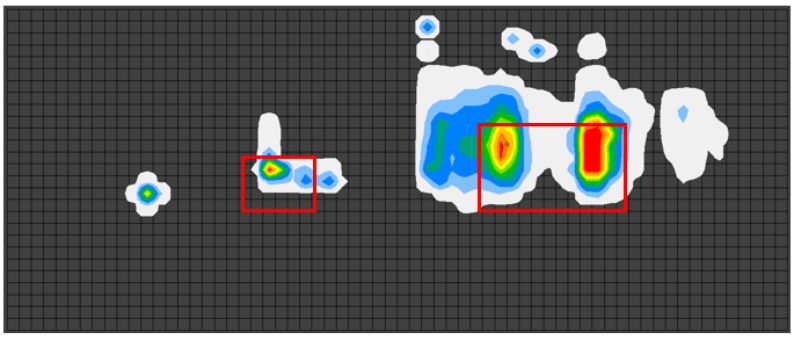


Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets. Cushions under & between legs	

After support. *Heel pressure partially offloaded from >150mmHg to 132,*
bony prominence area reduced from >150 to 63mmHg. Average reduced from 46.6 to 15.6mmHg.

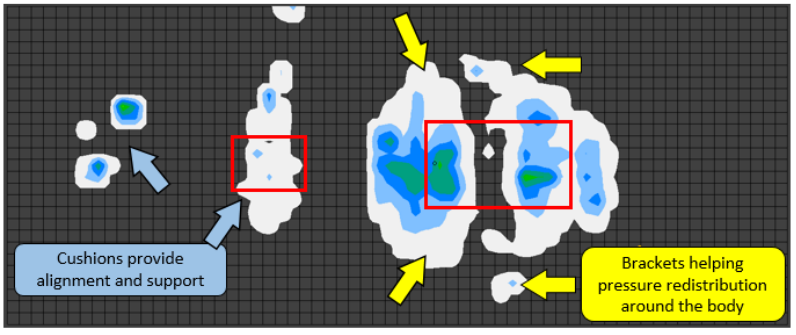
Sample 5: AG / Female, 85-90yrs, 45-50kg

Air mattress. Supine position.



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	X
	Yes	
Mantle	No	X
	Foam	
	Air	
Notes	Datum	

Before support. *Right foot positioned under left knee.*
Peak pressure recorded at right heel and torso = >150mmHg. Average pressure = 30.5mmHg



Position	Supine	X
	Side	
Mattress	Foam	
	Air	X
Velcro sheet	No	
	Yes	X
Mantle	No	
	Foam	
	Air	X
Notes	Support brackets. Cushions under & between legs	

After support. *Right leg re-aligned and pressure redistributed.*
Peak pressure reduced from >150 to 77mmHg. Average reading reduced from 30.5 to 16.6mmHg

Body & skin temperature – the importance of managing the skins temperature

Body temperature

The human body constantly produces energy (heat and moisture). This surplus energy is dissipated at a steady rate. For example, a normal adult will produce between 0.6 - 1 litre of moisture over 24 hours daily. This normally evaporates from the skin almost immediately and is never noticed.

A normal body core temperature is circa. 36.7°c with a skin temperature between 32-34°c. The body performs best when the ambient atmosphere temperature is approx. 21°c and when this balance changes the body takes action to preserve its normal operating temperature by a combination of radiation, convection and evaporation.

Skin temperature

The normal skin temperature is circa. 32-34°c. As skin temperature rises, its structure changes and its performance will alter. As skin warms or becomes very moist it starts to lose strength becoming more susceptible to damage. Risks such as tearing or damage from pressure become more real.

It is noted that the mechanical strength of skin reduces as it warms. For example, mechanical strength at 35°c is just 25% of the strength at a lower temperature of 30°c.

The clinical objective, where possible, is to maintain the clients 'normal' body and skin temperatures and prevent rising skin temperatures. Some clients may benefit from assistance evaporating moisture and heat away from the skins surface at the skins 'microclimate level'.

Microclimate – assisting the microclimate interface

The clinical practice guidelines on 'Prevention and Treatment of Pressure Ulcers: Quick Reference Guide' (2nd edition 2014) jointly issued by the NPUAP, EPUAP and PPPIA addresses new and emerging therapies including microclimate manipulation. The guide recommends consideration of microclimate manipulation to help prevent increased skin temperatures.

Microclimate manipulation[2]

Consider the need for additional features such as ability to control moisture and temperature when selecting a support surface.

> *The use of specialised surfaces that come into contact with skin may be able to alter the microclimate by changing the rate of evaporation or moisture and the rate at which heat dissipates from the skin.[3]*

Consider the need for moisture and temperature control when selecting a support surface cover.

> *Any surface that is in contact with the skin will have the potential to affect the microclimate. The overall effect is dependent on the nature of the support surface and its type of cover. [3]*

The guide also notes that increased heat increases the body's metabolic rate, inducing sweating and decreases the tolerance of skin for pressure.

[2]. Copy taken from clinical practice guidelines on 'Prevention and Treatment of Pressure Ulcers: Quick Reference Guide' (2nd edition 2014) NPUAP, EPUAP, PPPIA
[3]. Wounds International. International Review. Pressure ulcer prevention: pressure, shear, friction and microclimate in context. London Wounds International 2010.

Microclimate
The skins microclimate exists at the local interface between the support surface and an individual's skin, which differs to the climate in the surrounding region. It is a dynamic relationship, influenced by temperature, humidity and air flow.
When the body's core is too warm (Hyperthermic) the body will try to shed energy quickly by producing moisture (sweating). Conversely, when the body's core temperature is too cold (Hypothermic) the body will try to stimulate heat by shivering. Both these processes take place in the microclimate – the space where air touches the skins surface.

Managing the skins microclimate
Using 'active' and 'technological' fabrics, it is possible to influence (1) the skins general condition and (2) the bodys thermo-regulation process. This positive influence can assist users to manage their thermo-regulation function, helping the skin retain its structure and performance whilst keeping the client feeling cool and comfortable.

When working close to skin, the ideal fabrics and materials keep the clients temperature neutral and feeling comfortable. In general, materials with low insulation values are best, materials with high insulation values are not recommended.

CoolOver TR³ - how CoolOver can help restrict increases in skin temperature

CoolOver TR³ fabric
CoolOver™ is an advanced fabric, specially woven to provide the most comfortable fabric for skin. The fabric uses special yarn containing two additional ingredients which can both relate directly with the skin working at microclimate level.

(1) Bamboo is a natural fibre which provides:
- Moisture wicking properties
- A soft comfortable surface texture
- Anti-bacterial elements helping keep material fresher for longer

(2) Omnitherm™ uses patented technology from NASA and provides:
- Temperature regulation between 33.3 & 33.6°c
- Active heat transfer, by storing excess heat from the skin then returning the heat to the skin when required.

CoolOver TR³ fabric has active characteristics. When close to the skin, it operates at microclimate level actively wicking away excess moisture and heat from the skins surface. In doing so, it helps:

- maintain a neutral skin temperature
- the skins condition & performance
- the client remain comfortable

The CoolOver fabric enables good airflow within its structure, it also encourages the evaporation of moisture away from the skins surface. Typically, wicking fabrics (like CoolOver) retain less than 1% of moisture. By contrast, natural fabrics (like cotton) retain larger volumes of moisture which eventually cool in contact with the skin, causing irritation and discomfort.

'Intelligent' and breathable materials, working at microclimate level can positively influence the skins microclimate helping keep neutral skin temperatures and optimising skin performance.

Product testing – thermal insulation & breathability

CoolOver TR³ performance tests
Helping prevent the user from becoming too warm and even sweating can be achieved using materials with low thermal values (tog) combined with high wicking and breathability rates.
Materials with high insulation values encourage a user's body temperature to rise, the user may become too warm and uncomfortable. Skin may sweat, increasing moisture and humidity around the skins surface. If possible, the excess moisture should be actively removed from the skin surface to maintain a comfortable skin micro-climate.

Product testing / Thermal insulation
Independent tests performed to BS.4745 compared Coolover TR³ material samples and a commonly used mattress overlay using a spun polyester core. Foam mattress overlays were not tested, since they are more effective insulation materials which retain moisture and allow heat to build-up rapidly.
BS.4745 measures insulative properties of each test sample with the results quoted in tog values. The lower the tog rating, the lower the insulative value and the greater the ability to dissipate heat. For information, a standard light summer duvet has a value between 3 – 4 tog.

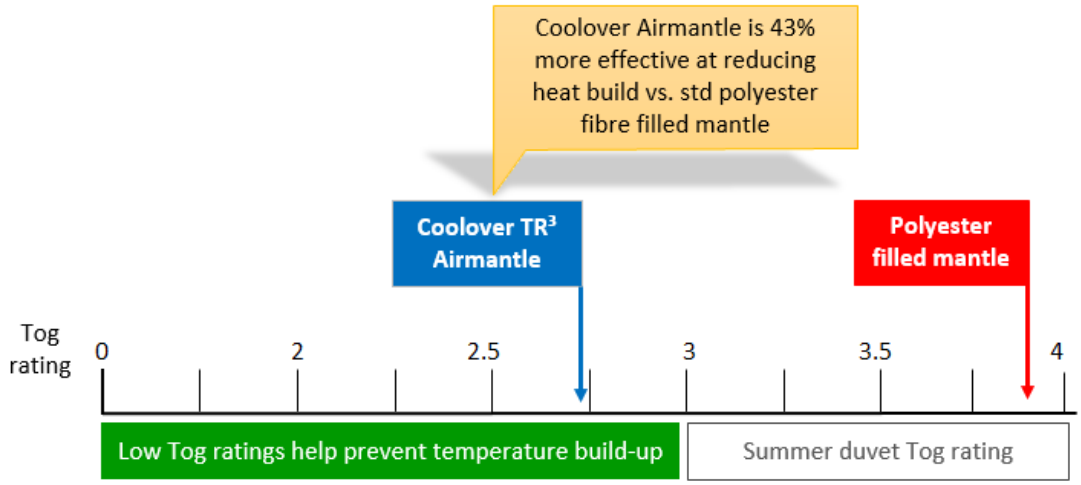
Test results
Materials with a lower tog rating are better at preventing temperature build-up, so helping clients body temperature remain neutral.

	Tog rating	Comments
CoolOver TR³ Airmantle	2.73	CoolOver airmantle is 43% more effective at reducing heat build up than polyester filled topper
Polyester filled topper	3.91	

Summary

The test results indicate that Coolover TR³ Airmantle is 43% better at preventing heat build-up than regular polyester fibre filled toppers. When using sleep systems, it is recommended to use materials with lower tog values around the skin.

Graphic illustration



Product testing / Breathability

Independent tests performed to BS.EN.31092 compared CoolOver TR³ samples and a commonly used mattress overlay using a spun polyester core. The test incorporates the effects of wicking and absorption in a combined test providing a measure of resistance to water vapour and uses a sweating hotplate to mimic human skin.

Tests results

Materials with a result less than 20m².Pa/W are considered fully breathable and 40m².Pa/W is considered non-breathable.

	Water vapour resistance (m^2.Pa/W)	Breathability	Comments
CoolOver TR³ Airmantle	15.2	Excellent	CoolOver Airmantle has excellent breathability with 59% less resitance to moisture transfer than polyester topper
Polyester filled topper	37.6	Very poor. Almost non-breathable	

Summary

The test results indicate excellent wicking and absorption rates for the CoolOver TR³ Airmantle. The results indicate that CoolOver TR³ Airmantle has 59% better performance transferring moisture and heat away from the skin when compared to regular polyester filled mantles.

The result shows that materials like CoolOver TR³ can provide significant help to clients who would benefit from assistance controlling their skin temperature and microclimate.

Graphic illustration