

Introduction

Selecting the appropriate dressing for the individual is essential in promoting optimum healing, symptom management, comfort and overall quality of life for the patient. Reducing healing time and risk of complications also has a positive impact on healthcare resources and associated costs (Mudge and Orsted, 2010). Factors such as pain management, exudate levels, infection risk and wound type must be considered when selecting a dressing, in relation to dressing properties including adhesion, absorption capability and antimicrobial enhancement.

SMARTPORE Technology[®], utilised in the BETAp[®] dressing range (Mundipharma), represents a significant and unique advance in dressing selection, promoting tissue repair and reducing the risk of pain and complication. SMARTPORE Technology[®] also provides high absorption and retention of exudate, along with an optimal moisture vapour transmission rate (MVTR), creating an ideal option for wound healing.

What is SMARTPORE Technology[®]?

SMARTPORE Technology[®] is a unique micro pore technology used within the wound contact and absorptive layers of the three-layer BETAp[®] dressings. SMARTPORE Technology[®] supports easy dressing removal, with reduced pain and trauma to the wound bed (Lee et al, 2016; Park et al, 2002).

SMARTPORE Technology[®] consists of a smaller micro pore size compared to other dressings – i.e. a surface micro pore size of 25~75µm versus a range of 32~1000µm micro pore size in other dressings (Lee et al, 2016; Park et al, 2002). See Figure 1 for more information on how SMARTPORE Technology[®] size compares to other products.

Crucially, within the wound contact layer, this means that the micro pore size is smaller than fibroblasts, which measure 150µm after 24 hours (time of spreading; Levina et al, 2001). In practice, this means that tissue ingrowth is prevented, so there is minimal painful shearing of new tissue when the dressing is changed (Lee et al, 2016; Park et al, 2002).

Furthermore, a cross-section of each dressing found that other dressings have non-homogeneous micro pore sizes and morphologies, with micro pore sizes ranging from 169~1000µm. SMARTPORE Technology[®] has comparatively uniform micro pore size and homogenous morphology, ranging from 100~350µm within the absorptive layer of the dressing (Lee et al, 2016; Park et al, 2002).

What are the benefits?

In a study comparing BETAp[®] dressings utilising SMARTPORE Technology[®] with eleven other commercially available polyurethane foam dressings, SMARTPORE Technology[®] was found to provide significant benefits in practice that the other dressings did not (Lee et al, 2016).

The dressings were assessed using *in vivo* and *in vitro* testing, and using a field-emission scanning electron microscope (FE-SEM) to assess their physical properties, including:

- Thickness
- Density
- Tensile strength
- Elongation
- MVTR
- Absorption capability
- Retention capability

Table 1: SMARTPORE Technology[®] pore size compared to other dressing assessed by Lee et al (2016)

Dressing	Wound contact layer (µm)	Cross-section (µm)
BETAp [®]	25-75	100-350
A	52-154	169-455
B	53-158	241-366
A1	32-214	337-726
L	22-88	456-917
P	112-423	325-421
S	75-255	215-413
C	>1000	177-346
T	62-232	216-378
S1	88-453	348-716
M	55-343	346-645
P1	65-348	387-614

SMARTPORE Technology[®] made easy

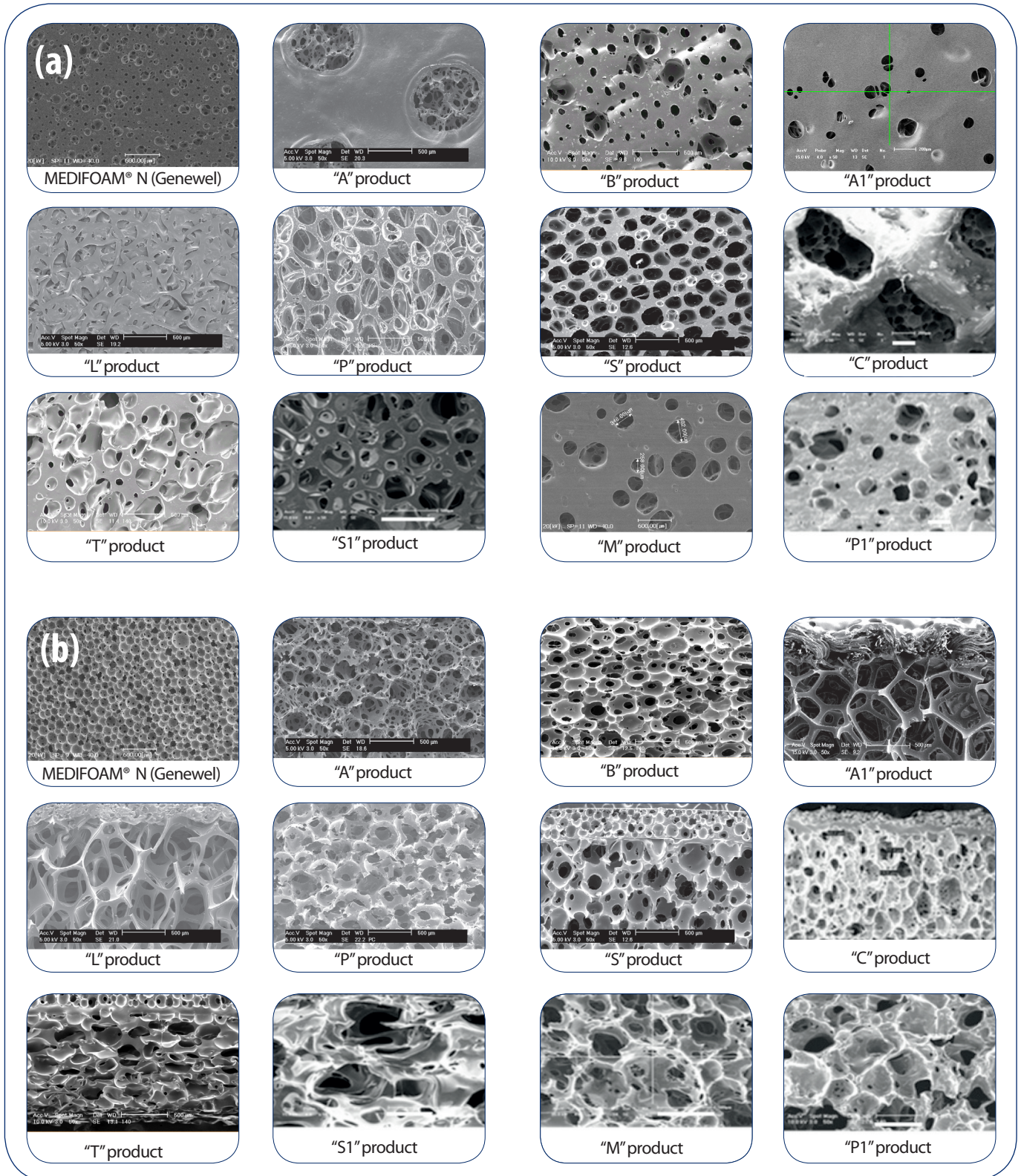


Figure 1: The micro pore size/uniformity of SMARTPORE Technology[®] compared to other dressings (Lee et al, 2016)

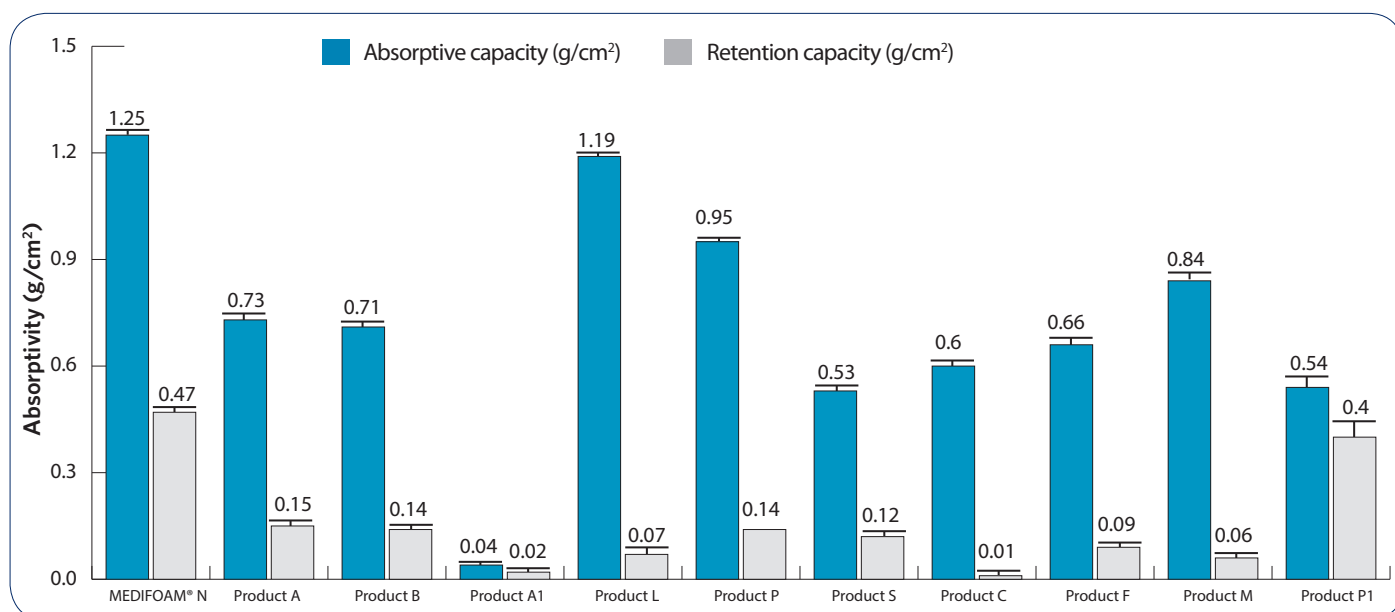


Figure 2: Mean absorption/retention capacities of dressings assessed by Lee et al (2016)

See Table 1 for more detailed information on how SMARTPORE Technology® micro pore size compares against the other dressings tested (Lee et al, 2016)

Reduced shearing and pain

It has been shown that the reduced micro pore size of SMARTPORE Technology® prevents the growth of new epithelial cells into the wound contact layer, leading to reduced risk of shearing and associated pain when dressings are changed (Park et al, 2002). SMARTPORE Technology® also reduces trauma to the wound bed and thus enhances wound healing (Jang & Min, 2002).

With traditional gauze dressings, Lee et al (2016) observed a wound dressing adhesion tendency. Whereas SMARTPORE Technology® demonstrated a substantial clinical significance in reducing wound dressing adhesion, particularly in the management of wounds when less frequent dressing changes were required.

The potential for ingrowth of newly formed tissue at the wound-dressing interface is thus a key consideration in wound-dressing selection – particularly when dressings that promote a moist wound environment are used with the intention of extending the period of time between dressing changes (Lee et al, 2016).

In a study by Kim et al (2002), pain was reported as less when using SMARTPORE Technology® compared to other dressings, in 93.8% cases (in a study of 80 patients).

Cases using SMARTPORE Technology® in burn wounds (Imran et al, 2016) demonstrated excellent treatment outcomes, successfully managing the patients' wounds and exceeding clinician expectations. The patients reported increased general comfort and 'minimal pain upon removal, facilitating a more pleasant experience during dressing changes, for both the patients and the attending nurses'.

A further case series (Tongson, 2017) assessed the use of SMARTPORE Technology® in diabetic patients with problematic chronic wounds. The patients experienced less pain and required less analgesic use during dressing changes with the SMARTPORE Technology® dressing compared with the other foam dressings used previously, and the wounds were successfully managed.

Reduced wound bed trauma and improved healing rates

The prevention of tissue ingrowth and shearing also results in improved healing rates due to reduced wound bed trauma (Li et al, 2013; Yoo et al, 2003). In Li et al (2013), the time of wound healing of skin graft donor sites was significantly shorter compared to the gauze group.

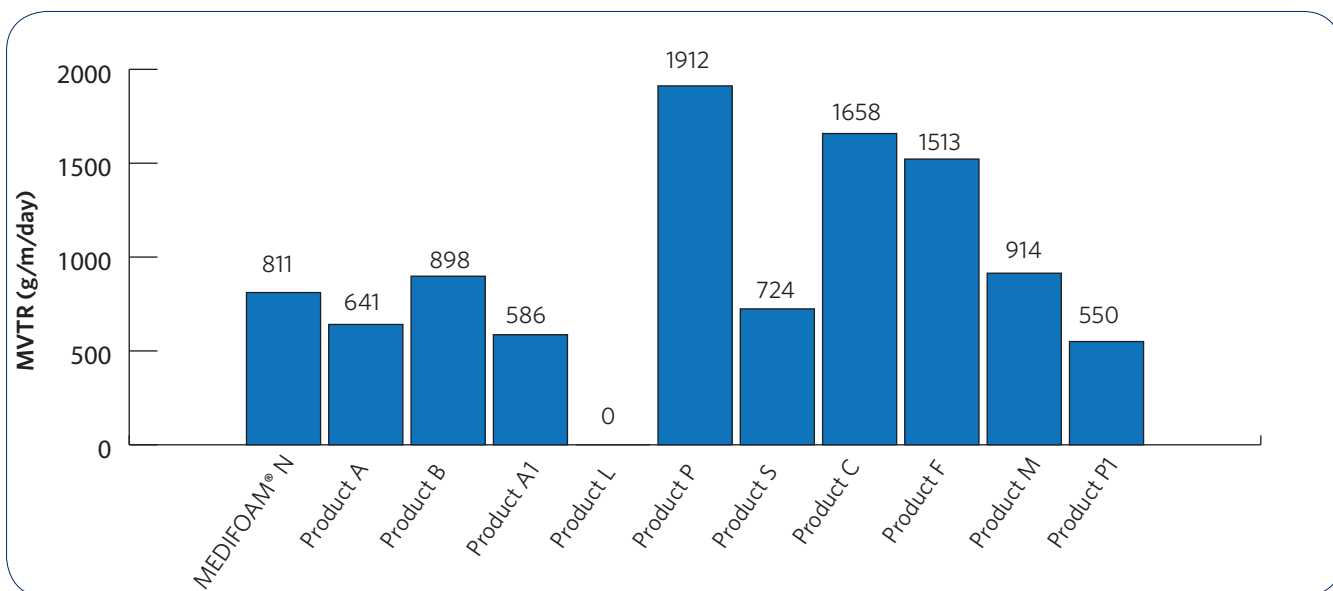


Figure 3: Mean MVTR of dressings assessed by Lee et al (2016)

Kim et al (2002) concluded that using dressings incorporating SMARTPORE Technology® ‘can shorten treatment period and patients can receive treatment more comfortably with the prevention of complications and relief of pain’. They also noted that the material may prove to be helpful in reducing scar formation.

High exudate absorption and retention capacity

SMARTPORE Technology® creates the densest dressing structure among all the products tested (Lee et al, 2016), and as such demonstrated a better absorption capacity (1.25 g/cm²) and retention capacity (0.47 g/cm²) compared to majority of dressings in studies conducted (Figure 2).

This greater absorption and retention capability is key in optimising healing, in order to avoid potential maceration/excoriation and damage to the periwound skin caused by unmanaged excess exudate (Wicks, 2012), as well as providing practical benefits that are found to improve patients’ quality of life (e.g. preventing leakage that may stain clothing or bedding).

Optimal MVTR

SMARTPORE Technology® has been proven to provide an optimal MVTR rate of 811g/m²/day, which is mid-range among the products compared (Lee et al, 2016) as seen in Figure 3. While the high absorption capacity of SMARTPORE Technology® reduces the risk of wound and periwound area maceration (Lee et al, 2016; Abdelrahman and Newton, 2011), study results regarding MVTR also suggest SMARTPORE Technology®’s ability to allow for optimised exudate drainage through evaporation (Lee et al, 2016).

MVTR is an important dressing characteristic to ensure a moist wound healing environment, which is generally proven to be optimal for healing. A lower value of MVTR may impede wound healing due to poor drainage of the absorbed exudate; accordingly, excessively high MVTR values may create a dry wound surface due to excessive loss of fluid as water vapour (Lee et al, 2016). Optimum moist conditions through MVTR have been proven to promote faster healing with better quality tissue formation (Junker et al, 2013).

Lee et al (2016) also noted that the moist wound healing environment created by SMARTPORE Technology® may also ‘help to reduce the frequency of dressing changes, mitigating not only healthcare costs but also patient pain and inconvenience’.

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 BETAplast® is marketed as MEDIFOAM® in Korea and China.

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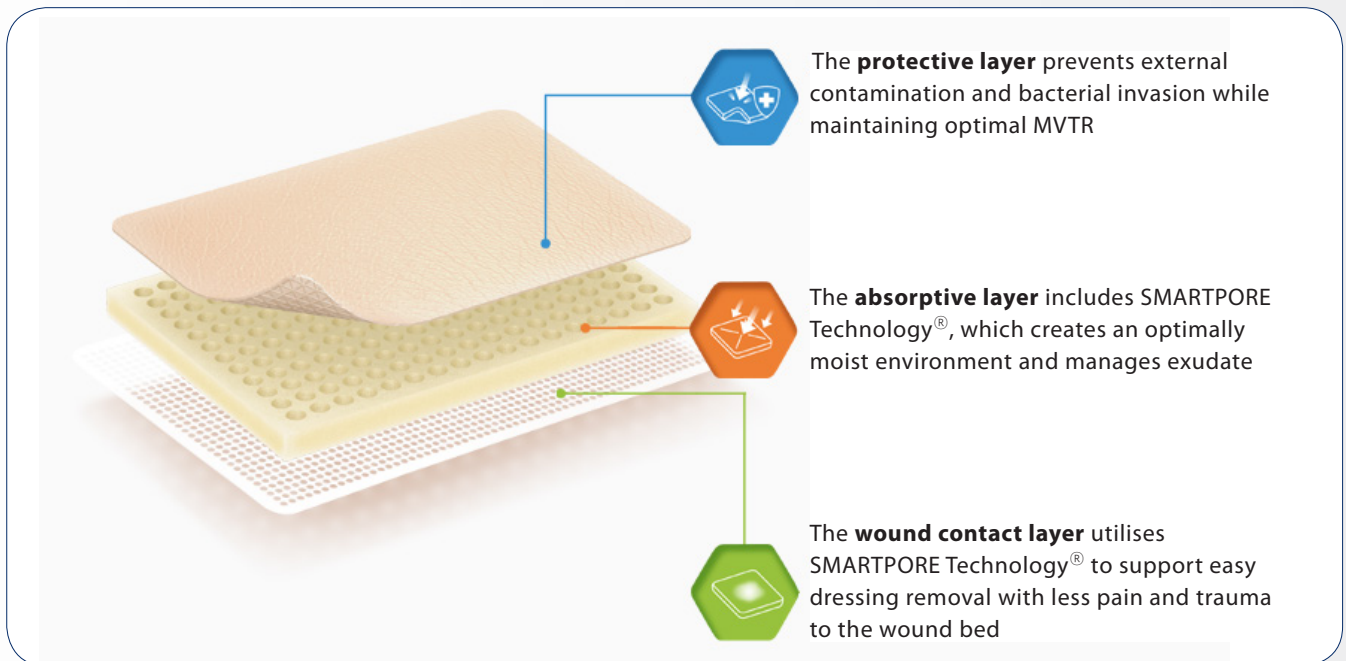


Figure 4: BETAplast® polyurethane foam layer design

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The views expressed in this 'Made Easy' do not necessarily reflect those of Mundipharma.

Use in practice

SMARTPORE Technology® is utilised in the range of BETApplast® polyurethane foam dressings, which are suitable for use in managing a range of chronic and acute wound types. BETApplast® polyurethane foam dressings provide an optimal moist environment to support effective wound healing with minimal pain and trauma. The range of moisture retentive dressings caters for both highly exuding and infected wounds and includes adhesive and non-adhesive products for maximum choice.

BETApplast® moisture retentive dressings are made up of three layers (Figure 4):

- The protective layer prevents external contamination and bacterial invasion while maintaining optimal MVTR
- The absorptive layer includes SMARTPORE Technology®, which creates an optimally moist environment and manages exudate
- The wound contact layer utilises SMARTPORE Technology® to support easy dressing removal with less pain and trauma to the wound bed.

See Table 2 for more information on the dressings available in the BETApplast® range.

Table 2: The dressings in the BETApplast® product range

BETApplast® dressing	Dressing properties
BETApplast® N	<ul style="list-style-type: none">▪ three-layer dressing▪ provides an optimal, moist wound healing environment▪ non-adhesive▪ with the SMARTPORE Technology® wound contact layer, there is minimal pain and trauma during wear and dressing change
BETApplast® B	<ul style="list-style-type: none">▪ provides additional absorptive layer▪ can be used in conjunction with BETApplast® N for optimal absorption and retention in heavily exuding wounds▪ non-adhesive
BETApplast® F	<ul style="list-style-type: none">▪ waterproof island dressings with translucent top adhesive film layer and padded with polyurethane foam
BETApplast® Silver	<ul style="list-style-type: none">▪ impregnated with silver sulfadiazine, effective in managing contaminated wounds by suppressing bacterial growth

Summary

SMARTPORE Technology®, with its smaller and more uniform micro pore size, represents a significant advance in dressing selection. SMARTPORE Technology® in the wound contact layer provides a range of clinical and practical benefits, including:

- Accelerated healing times and reduced tissue shearing
- High exudate absorption and retention capacity
- Optimal MVTR, promoting moist healing environment
- Reduced pain at dressing change
- Reduced frequency of dressing change, clinician time and related costs
- Promotes wound healing

These facilitate improvements in patient comfort and quality of life.

BETApplast® polyurethane foam dressings with its SMARTPORE Technology® can be used in the management of acute and chronic wounds.