

Moist Wound Healing and Advanced Wound Care

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Product - Quick Guide

Product	Necrotic	Sloughy	Contaminated/ Infected	Granulating	Epithelialising	Exuding	Delicate tissue
NU-GEL® Hydrogel	✓			✓	✓		✓
NU-GEL® wound sheet				✓	✓		✓
SILVERCEL® non adherent		✓	✓				
TIELLE® Hydropolymer adhesive dressing	✓		✓	✓	✓	✓	
TIELLE® packing	✓		✓	✓	✓	✓	✓
TIELLE® plus adhesive dressing	✓	✓	✓	✓	✓	✓	
TIELLE®extra		✓	✓	✓	✓	✓	✓

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Research by George Winter in 1962 changed the way that both acute and chronic wounds are managed in modern healthcare. He proved that wounds kept moist would heal up to 50% faster than those left dry and so the development of advanced dressings began. His research, and much that has followed not only confirms that a moist wound healing environment supports the healing process, but it actually reduces the risk of complications and scarring .

The drive for better wound care

As our care standards, medicine and resources have advanced then so has our lifespan as humans. With this comes an increase in the incidence of chronic non-healing wounds which include leg ulcers and pressure sores associated with compromised circulation and coexisting disease. There are now over 200,000 people affected in the UK at any one time and with cases being typically managed over months and years the drain on the resources of the NHS is enormous. Accruing annual costs in excess of £4 billion per year in management research has naturally been driven towards finding the fastest possible route to wound closure both through optimal healing and a reduction in the need for unnecessary, and costly dressing changes. Being that our animals heal similarly to us and may face similar challenges with problem wounds, the advances made to improve rates of healing in human wound care and the products developed to achieve a moist wound healing environment are equally applicable in veterinary medicine.

The healing process and the ideal wound healing environment

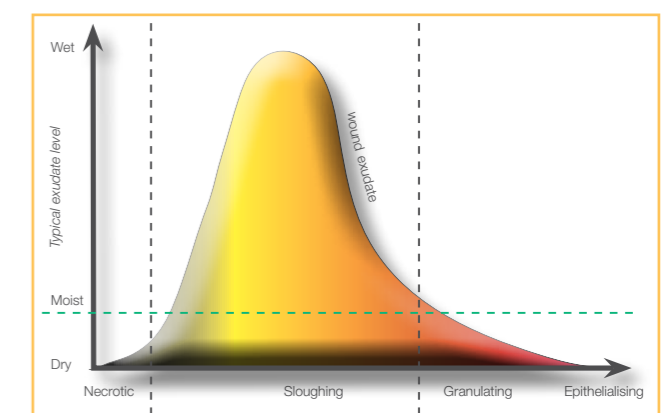
In the wild healing is achieved through a cascade of events which start at the moment of injury. Once haemostasis is achieved it immediately instigates the inflammatory response which builds over the next two days achieving debridement of devitalised tissue. The proteases responsible for debridement are part of a complex inflammatory response which is closely orchestrated through chemical messengers which need to be bathed in exudate and the moisture this provides to perform efficiently.

The dead tissue, contamination and foreign material is broken down by proteases that are secreted by macrophages which which peak around 24 to 48 hours after injury. A sloughy, exudative appearance is typical as devitalised proteins are ejected from the wound. As debridement progresses the macrophages begin to mediate the transition to the proliferative phase and the production of vascular granulation tissue at the base of the wound. This healthy vascular tissue will then provide the platform for the efficient cellular interaction that leads to

wound contraction, epithelial migration and provision of tensile strength to the healed wound. (Table 1.)

Table 1. The normal healing process	
Haemostasis (stemming of bleeding)	Bleeding stops and as clotting progresses platelets begin to adhere to the site of injury releasing chemical messengers to begin inflammation.
Inflammation (natural debridement)	Neutrophils and Macrophages begin clean up process. Slough and exudate produced as a by product. Inflammation most active during 2 nd to 3 rd days after injury. As the process dies down it triggers proliferation.
Proliferation (true healing)	Vascular tissue begins to proliferate at the base of the wound to provide a healthy bed for epithelialisation. Fibroblasts stimulate wound contraction and are essential for rapid closure. Surgery and reconstruction may be used to bypass this process by bringing wound edges together.
Maturation (scar maturity)	Collagen laid down during granulation and used as a structural matrix by epithelial cells is replaced with a more organised collagen. This provides the wound with greater tensile strength. This process will continue many months post injury and the wound may only be 80% its original strength after one year.

As a principle, moist wound healing is now readily accepted as the optimal environment for normal healing processes to occur once debridement has been achieved. The natural moisture in wounds is present in the form of wound exudate and provides an essential transport medium for cellular activity and chemical messengers. However, too little exudate will reduce the efficacy of natural processes while too much contributes to maceration and deterioration of the surrounding wound tissue causing healing delay.



Management aim:	Debride devitalized tissue	Maintain a moist, clean environment	
Dressing type:	Debride	Absorb	Hydrate and protect

Table 2. Benefits of moist wound healing following initial lavage and debridement:	
During Inflammation	<ul style="list-style-type: none"> Enables efficient macrophage activity and chemotaxis Aids autolytic (natural) debridement through hydration of eschar Reduced pain at the wound site Reduced infection rates.
During Granulation	<ul style="list-style-type: none"> Rapid angiogenesis Supports chemotaxis and deposition of extra-cellular-matrix Prevention of cellular dehydration and death.
During Epithelialisation	<ul style="list-style-type: none"> Shorter, smoother pathway for faster epithelial migration leading to reduced scar tissue formation Reduced recurrence of inflammation due to cell dehydration Improved tissue integrity (improved elasticity and tolerance to trauma).

The ideal wound dressing:

The ideal wound dressing provides a sustained effect that provides an environment that is neither too wet nor too dry. As wound healing progresses through different stages the level of exudate produced varies, meaning different dressings are required as the wound heals. As a result many dressings offer different properties; either varied levels of absorption such as the hydrophilic foam dressings, or hydration in the form of a water based gel or hydrocolloid composite. All modern advanced dressings aim to facilitate the ideal moist wound healing environment by absorption of excess exudate or hydration where there is insufficient exudate.

Further benefits should also be incorporated into the dressing, to include reducing the need for frequent dressing changes and reduction of trauma on removal. This is especially true when using products during the proliferative phase of healing where new fragile epithelium and granulation tissue should be preserved by changing dressings as infrequently as possible. A comparison of ideals is shown in Table 3.

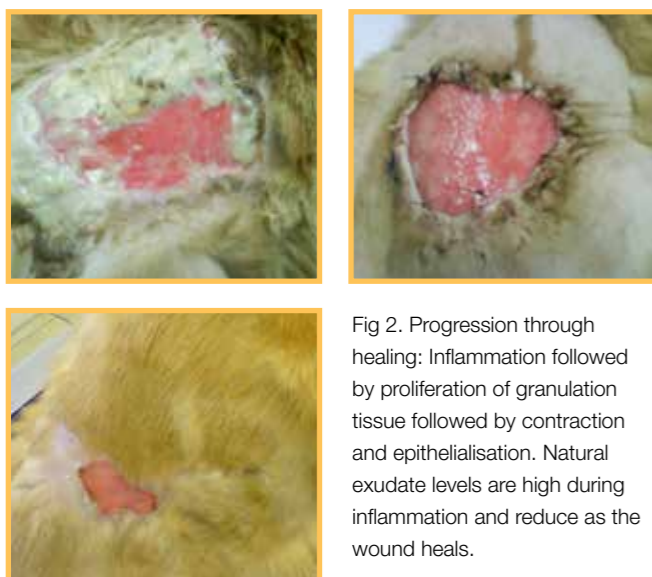


Fig 2. Progression through healing: Inflammation followed by proliferation of granulation tissue followed by contraction and epithelialisation. Natural exudate levels are high during inflammation and reduce as the wound heals.

Table 3. The ideal wound dressing:					
Dressing Ideals	Gauze	Dry dressings eg. Melolin/ Primapore	NU-GEL®	NU-GEL® Sheet	TIELLE® Range
Maintain a moist environment at wound interface	N	N	Y donates moisture	Y maintains moisture	Y absorbs excess exudate
Remove excess exudate without allowing 'strike through' to surface of dressing	N	N	-	Y able to absorb low exudate levels as well as donate	Y moderate to high exudate
Act as a barrier to micro-organisms	N	Y although not when wet	Y	Y	Y
Be non-toxic, non-allergenic and non-sensitising	Y	Y some inflammation to adhesives documented	Y	Y	Y
Be non-adherent and atraumatic on removal	N	N	Y	Y	Y
Leave no foreign particles in wound	N	Y	Y	Y	Y
Offer thermal insulation to the wound bed	N	N	-	Y	Y
Soothes nerve endings reducing pain at the wound site	N	N	Y	Y	-
Allow gaseous exchange	Y	Y	Y	Y	Y

Advanced dressings developed over the past 40 years simply help to normalise the status of the wound by preserving healthy wound exudate and fragile tissue. These dressings are designed to help by either adding or maintaining moisture in the form of hydrogels, or providing capacity for absorption and retention of excess exudate in dressings such as foams and alginates. Used to actively support the wound environment a range of dressings will be required during the life cycle of the wound. Each dressing change should include re-evaluation of exudate levels and consideration of the needs of the wound through the next stage of healing.

The Vygon Vet advanced wound care range

Dressings for hydration and moisture maintenance:

The principle reason to place a hydrogel in a wound is to donate fluid to the wound. The intention is to put water in a gel form that not only eases application but keeps the product where it is intended over several days without evaporation. Different brands vary in their water content ranging from 70-95% as well as the choice of hydrophilic polymer that is used to achieve the gel consistency. Sodium carboxymethylcellulose (CMC) or seaweed derived alginates are the most typical method of gelling and although both are non-cytotoxic, alginates are also shown to be beneficial healing in their own right.

Being bound to a hydrophilic polymer there is also capacity for a small amount of absorption as well as donation. A hydrogel can therefore be used from dry to low exuding wounds as well as an aid to debridement for stubborn slough and necrotic tissue.

NU-GEL® Hydrogel is a transparent hydro-active amorphous gel containing sodium alginate that gently and effectively rehydrates necrotic tissue and fibrinous slough. NU-GEL® is bacteriostatic meaning it will not encourage wound infection while assisting natural, autolytic debridement between dressing changes. Designed to create the ideal moist wound healing environment it is particularly suited to granulating and epithelising wounds that would otherwise be risk of drying.

It is normal in veterinary practice to cover a hydrogel with a secondary dressing such as a light foam dressing such as TIELLE®. This helps to keep the gel in place, maintains humidity and protects the wound from further trauma. Thicker foams should be reserved for heavier exuding where the absorbent capacity does not negate the effect of the hydrogel.

Sheet hydrogels: Hydrogels have more recently been incorporated into sheet form with a film backing that negates the need for a secondary dressing while maintaining moisture levels at the wound bed. Able to stay in place for longer periods, with some absorbent capacity the NU-GEL® sheet incorporates polyvinyl pyrrolidone in water. This not only soothes exposed nerve endings but maintains moisture levels over prolonged periods and is ideally suited to low exuding granulating and epithelialising wounds.

Dressings for absorption and secondary layers:

TIELLE® and TIELLE® PLUS: Wounds with moderate to high exudate should be managed with a foam dressing that has the capacity to hold exudate for up to three days wear such as TIELLE® or TIELLE® PLUS. Wounds of this type include wounds where dressings are wet or saturated on removal after only a few days wear, as well as drain sites and draining sinus wounds. A gel should only be required if the wound contains stubborn sloughy material that requires softening for removal at the next dressing change.

How can you tell if the dressing is not the right one for your wound?

If the dressing has stuck to the wound during wear and is difficult to remove without pulling healthy tissue with it, then the wound environment has become too dry. Either the dressing type should be reviewed, more hydrogel should be used or a less absorbent secondary layer should be chosen.

If the dressing is sodden, strike through is visible, or the wound margins and surrounding tissue appears blanched and plump, then the wound environment is too wet. A dressing with greater capacity for absorption such as TIELLE® PLUS will be required.

Problem Wounds:

Both acute wounds and more chronic, challenging wounds will benefit from moist wound management techniques. But those considered chronic or 'non-healing' are likely to combine reasons for failure to heal that are beyond moisture management (Table 4).

Table 4. The ideal wound dressing:	
Movement at the wound site	Edges fail to unite and epithelium unable to adhere to wound bed.
Foreign body	We don't always find everything that entered the wound, an X-ray may reveal the culprit.
Necrotic tissue	Necrotic tendon and bone can provide a foreign body effect that will prolong inflammation preventing granulation and closure.
Poor blood or oxygen supply	Tissue damage during trauma may be extensive and perfusion may be too low for healing. Anaemia may also prevent oxygen supply to local tissue.
Poor nutrition or health	Hypoalbuminemia below 30g/L significantly retards healing. Coexisting diseases should be ruled out.
Local tissue issues: dead space tissue	Dead space will mean pocketing of exudate and potential healing delay. Wounds under excessive tension may repeatedly breakdown.
Iatrogenic factors	General interference and use of inappropriate products.
Cell transformation	Wounds failing to respond despite best efforts should be biopsied. Histological changes may be the problem.

Factors that are out of the control of the clinician may include those related to disease and medication, tissue deficit and owner non-compliance. Although moist wound management will help maintain a healthy wound bed, healing by second intention is not always the fastest route to closure. Dressings are no substitute for reconstruction where healing delay is as a result of considerable tissue deficit or tension across margins or bony prominences. In any wound that fails to heal as expected contributing factors need to be identified, and despite the temptation to resort to novel and expensive products that make dramatic healing claims, when faced with a problem wound the optimal wound environment is still the best route to healing.

Conclusion:

Not all traumatic wounds present with simple closure options and as such a period of open wound management is not unusual once debridement has been achieved. In an effort to encourage a healthy bed of granulation over a wound bed, either for surgical closure or closure by second intent, it is essential to appreciate the moist wound healing principle and the products that are required to achieve balance through absorption or hydration. Modern wound dressings including the Vygon range have been developed with this in mind.

Designed to help clinicians fine tune the wound environment dressings should not only maintain moisture at the wound bed, they should be painless to apply and remove, and should remain viable over an extended wear time when required. When used correctly advanced dressings not only encourage rapid healing, but have the potential to reduce not just pain, but the number of visits and anaesthetics required to get a wound healed. As clinicians this not only helps us heal wounds quicker, but lowers risk and significantly improves the overall patient experience.