

# WOUND EXUDATE: WHAT IT IS AND HOW TO MANAGE IT

Wound exudate plays an essential role in wound healing by providing a moist wound bed and a supply of necessary nutrients. Understanding what causes changes in its amount, colour, consistency and odour enables more effective wound management which promotes quicker healing, and minimises maceration, discomfort and embarrassment for the patient.

**Una Adderley is Tissue Viability Prescribing Specialist Nurse, North Yorkshire Primary Care Trust**

Open wounds produce a fluid that is known as exudate. Exudate has been described as 'wound fluid', 'wound drainage' or 'an excess of normal fluid' (WUWHS, 2007) (*Figure 1*). However, wound exudate is a complex phenomenon that requires careful nursing management if it is to assist healing.

## What is exudate?

In the acute wound healing process, the initial wounding (either through trauma or surgery) will trigger inflammation which is an early stage of the normal healing process. As part of the inflammatory process, the capillaries become more permeable and fluid leaks from them into the body tissue. This leaked fluid enters the open wound where it is known as exudate.

Exudate consists of water, nutrients, electrolytes, inflammatory mediators, white cells, protein-digesting enzymes and growth factors. Exudate plays an essential role in the normal healing process by maintaining a moist wound bed. This promotes healing through supplying the essential nutrients



*Figure 1. Highly viscous exudate in a cavity wound.*

that allow cells to metabolise, helping tissue-repairing cells to migrate to where they are needed, and allowing dead or damaged tissue to separate from good tissue (autolysis) (WUWHS, 2007). The amount of exudate produced will be related to the size of the wound, with larger wounds (i.e. wider and/or deeper) producing larger amounts of exudate.

In normal wound healing, exudate volume will decrease as healing occurs. However, exudate can cause problems if the quantity means that it is difficult to prevent dressing leakage or if there is swelling (oedema). Dressing leakage (known as strike-through) may increase the risk of infection since dressings that are moist or wet on the outside are more attractive to microbes and more easily penetrated. Dressing leakage may also be unpleasant for patients while oedema may lead to increased pain.

Chronic wound exudate has a different chemical composition which in itself may cause problems.

Although chronic wound exudate is rich in growth factor nutrients and leucocytes which assist in healing by stimulating epithelial and fibroblast cell production (Young, 2000), it is also likely to contain bacteria and dead white cells along with high levels of inflammatory mediators and protein-digesting enzymes which can be detrimental to healing (WUWHS, 2007). Chronic wound exudate appears to be more corrosive than acute wound exudate and can more readily cause skin irritation or allergic reactions of the skin around the wound (Cameron and Powell, 1997).

## Why do wounds produce excessive exudate?

Wounds healing by primary intention (in which the edges have been brought together by sutures or other materials such as adhesive strips or glue) may leak a small amount of exudate, especially if there is incomplete closure. The level of exudate usually reduces fairly quickly and such wounds usually heal without complication. However, the suture line of wounds healing by primary intention may break down (dehiscence) so that healing will have to occur by secondary intention (from the bottom up). Healing by secondary intention is also the usual mode of healing for most chronic wounds such as leg ulcers and pressure

ulcers. Wounds healing by secondary intention will usually leak exudate from the surface of the wound. This may be purely due to the normal wound healing process, and simple wound management using the principles of moist wound healing (Winter, 1962). Moist wound healing involves maintaining a balance between excessive moisture (which requires absorbent dressings such as alginates or foams) and the wound bed becoming too dry (which requires moisture donating dressings such as hydrogels or hydrocolloids). The ideal state is a moist wound bed which will enable normal healing to take place. However, some wounds will produce large amounts of exudate.

Copious exudate may be related to the large area or volume of a wound. A large surgical wound that is being deliberately left to heal by secondary intention or large pressure ulcers may produce large amounts of exudate. Some wound types, such as burns, rheumatoid ulcers, skin donor sites and inflammatory ulcers due to pyoderma gangrenosum, are also generally regarded as having higher rates of exudate (WUWHS, 2007). However, if the quantity of exudate that is being produced cannot be explained by these causes then additional reasons should be considered.

Copious exudate related to a venous or mixed aetiology leg ulcer is likely to be due to venous hypertension. Venous hypertension can be reversed (and will consequently reduce exudate levels) through elevation of the leg or the application of graduated multi-layer compression bandaging, provided that there is

an adequate arterial supply. The arterial supply can be checked by Doppler assessment of Ankle Brachial Pressure Index (ABPI) (RCN, 2006). The ABPI is the ratio of the ankle blood pressure to the brachial blood pressure measured using Doppler ultrasound: an ABPI above 0.8 and below 1.2 is considered to be adequate for full graduated compression therapy (such as four layer bandaging or short stretch bandaging) to be applied (RCN, 2006).

Chronic heart failure can lead to grossly oedematous legs that leak vast amounts of exudate from the skin. Effective diuretic therapy is required to treat the heart failure. Bandaging and leg elevation may also be of benefit but great care must be taken to ensure that the cardiac system is not overloaded by a large quantity of fluid being suddenly pushed from the interstitial spaces of the skin into the circulation.

Failure of the lymphatic system due to occlusion associated with tumour or obesity, or damage following trauma or surgery can also lead to gross oedema of the limbs and exudate leakage. Again, compression bandaging and compression garments can greatly improve the quality of life for these patients but a full assessment by a clinician with special skills in the management of lymphoedema would be essential.

An increase in exudate levels can indicate increasing microbial contamination which may lead to wound infection. If the signs of infection are limited to the wound then a dressing that contains a topical antimicrobial, such as silver or iodine, may be effective

in reducing the levels of microbial contamination and thus reducing exudate levels to a normal level (Vowden and Cooper, 2006). If, however, the increase in exudate is accompanied by the symptoms of chronic wound infection (increased intensity and/or change in character of pain, discoloured or friable granulation tissue, odour, wound breakdown and delayed healing) (Gardner, 2001) then broad-spectrum systemic antibiotics may be required (Vowden and Cooper, 2006). It is important to remember that wound infection may exist alongside venous hypertension or lymphoedema and it may be necessary to address both aetiologies simultaneously.

Fungating wounds may also produce large quantities of exudate which may be related to impaired lymphatic drainage and/or heavy microbial colonisation. If the disease has significantly progressed, there may be little that can be done to address the underlying cause of the heavy exudate. Management is likely to be focused around palliative symptom management such as absorbent dressings and topical antimicrobials (Adderley and Smith, 2007).

### **What problems are associated with excessive exudate?**

Excessive exudate can bring misery to patients' lives. Uncontrolled, leaking exudate can lead to soiling of clothing and bedding and malodour which is distressing, socially embarrassing and inconvenient. Heavy exudate may contribute to malnutrition since any accompanying malodour may reduce appetite. Furthermore, since exudate is rich in protein, a large wound may lead



Figure 2. Haemoserous exudate which has collected around a suprapubic catheter.

to significant protein deficiency. A Grade 4 pressure ulcer may cause the patient to lose between 90–100g of protein per day due to exudate leakage (Breslow, 1991). Uncontrolled exudate can also macerate and excoriate the skin surrounding the wound which is painful and demoralising. Patients' quality of life may be impaired by the recommended wound care regimen. Leg elevation may reduce the level of exudate but also reduces mobility, increases discomfort and can limit the patient's social life. Dressings may absorb the exudate but be bulky and heavy. From the nurse's perspective, uncontrolled exudate makes heavy demands on nursing time and dressing costs. It can also be emotionally draining for both patients and nurses when management is particularly challenging.

### Assessing exudate

An assessment of wound exudate should incorporate four main categories: colour, consistency, odour and amount (WUWHS, 2007). There will be some naturally occurring differences between individuals and external factors will lead to some variation. While some slight variation is normal, significant variation outside the 'normal' range should be noted since this may

identify any complications that may have an effect on healing.

### Colour

Healthy exudate is usually clear and amber-coloured. Variations from this may be due to a variety of factors as indicated in *Table 1*.

### Consistency

A change in the consistency of exudate can give significant clinical information. Increased protein content due to infection or inflammation may cause exudate to become thick and sticky. Alternatively, the exudate may appear sticky because it contains the residue of the previous dressing such as a hydrogel. By contrast, exudate that is thin or runny may be due to a low protein content that may be associated with venous or congestive cardiac disease or malnutrition (WUWHS, 2007).

### Odour

Measuring malodour objectively can be very difficult since odour is a subjective experience that is influenced by the frequency with which a person experiences the odour. Unpleasant odours may be related to bacterial growth, infection (Gardner, 2001), the presence of necrotic tissue or sinus or an enteric or urinary fistula (WUWHS, 2007). However, malodour may also be related to certain dressing types (such as hydrocolloids) or the presence of stale dressings, and need not indicate wound infection.

### Amount

It can be difficult to make accurate ongoing assessments of exudate since no standardised terminology currently exists and objective outcome measures

Table 1

#### Significance of exudate colour\* (WUWHS, 2007)

Clear, amber	Serous exudate is often considered 'normal' but may be associated with infection by fibrinolysin-producing bacteria such as <i>Staphylococcus aureus</i> ; may also be due to fluid from a urinary or lymphatic fistula
Cloudy, milky or creamy	May indicate the presence of fibrin strands (fibrinous exudate — a response to inflammation) or infection (purulent exudate containing white blood cells and bacteria)
Pink or red	The presence of red blood cells and indicating capillary damage (sanguinous or haemorrhagic exudate) ( <i>Figure 2</i> )
Green	May indicate bacterial infection e.g. <i>Pseudomonas aeruginosa</i>
Yellow or brown	May be due to the presence of wound slough or material from an enteric or urinary fistula
Grey or blue	May be related to the use of silver-containing dressings

\* Some medications are known to discolour urine and consideration could be given to drugs as a cause of exudate discolouration when all other causes have been excluded

(such as weight or volume of exudate over a certain time period) are difficult to achieve in real-life clinical practice (Nelson, 1997). Nurses have traditionally assessed exudate volume using the symbols +, ++ and +++ or the descriptors 'light', 'moderate' or 'heavy'. Such approaches are highly subjective and unreliable but more accurate approaches to assessing volume tend to be time-consuming and impractical. For example, dressings can be weighed following removal but a comparison can only be made if the same types of dressings are changed at equal intervals. Such

an approach may fail to meet the needs of the individual patient and be impractical in real-life practice. It is doubtful whether this degree of precision adds greatly to clinical care. A more pragmatic approach is to keep note of the type and number of dressings used over a certain time period and to note the presence of strike-through, maceration or leakage (Winter and Cutting 2006). It can be deduced that exudate volume is decreasing if less absorbent dressings are required and the interval between dressing changes is getting longer.

### Managing exudate

The reduction of exudate levels will depend on the successful management of the underlying cause. However, until the chosen therapy takes effect, the practitioner is responsible for managing the situation as effectively as possible through the use of appropriate dressings and topical agents.

### Dressing selection

The ideal dressing will remove excess exudate from the wound site and surrounding skin while maintaining high humidity at the wound bed (Bale, 1997). Dressings that rapidly absorb exudate and hold the moisture within the dressing thus holding harmful chronic wound exudate away from the surrounding skin are most effective at preventing maceration. Ideally they should also be easy to remove and cost-effective (White and Cutting, 2006).

Wound dressings are designed to handle fluid through various different mechanisms. Some dressings, such as foams, are designed to absorb exudate into the dressing matrix. Foam

dressings are available in a wide range of makes, shapes and absorbencies.

Dressings that fit closely to the contours of the body perform more effectively by being in close contact with the wound bed which enables more effective exudate absorption and thus decreases the risk of leakage. Some types of dressing are specifically designed to retain the fluid within the dressing material, even when pressure is applied. Some foams are also designed to transmit moisture vapour away from the wound towards the dressing backing where it can evaporate. These dressings are said to have a high moisture vapour transmission rate. However, such performance will be sub-optimal if the back of the dressings is covered by occlusive materials or if exudate levels are so high that the dressing has become sodden. Product information sheets should be carefully read to understand the exact properties of the dressings being considered for clinical use.

In dressings that use gelling technology, such as alginates and hydrofibres, exudate reacts with the dressing material to form a gel that maintains high humidity at the wound bed while preventing or reducing maceration. Alginates come in a variety of shapes including flat sheets and fillers which can be used within cavities.

There is no robust evidence to suggest that one particular type of dressing is better than another at managing exudate or promoting healing. Furthermore, assessing the clinical differences in terms of exudate management between different products can be difficult

as there is currently no standard approach in use (White and Cutting, 2006). Clinicians should develop a working knowledge of the different types and properties of dressings available to them in their clinical workspace.

### Alternative approaches

Sometimes the level of exudate or the position of the wound requires alternative approaches to managing exudate.

Wound care bag systems, which are similar to stoma bags, can be useful for managing exudate from fistulae or large open wounds. Such products are available on prescription.

Topical negative pressure (TNP) therapy is becoming more widely used to manage copious exudate and probably increase healing rates. In TNP a foam or gauze dressing (depending on the type of system) is placed within the wound cavity along with a catheter which is covered by an adhesive drape which provides a continuous airtight seal around the dressing. The catheter is attached to a vacuum pump unit which removes the air from the wound contact layer and gently sucks exudate away from the wound surface into a collection canister. It is thought that this process reduces oedema, improves blood flow and improves oxygenation and tissue nutrition thus accelerating healing (Benbow, 2006). There is not yet robust evidence to support these claims in terms of accelerated healing but TNP can provide a very effective way of managing uncontrolled exudate in certain types of wounds such as dehisced post-surgical wounds. This can lead to

significant cost savings in terms of nursing time, particularly in community nursing where patients who previously required daily or twice-daily dressing changes may only require visiting two or three times a week.

### Peri-wound care

Effective skin protection is vital for any patient with significant wound exudate. Rigorous cleansing of the wound bed is usually unnecessary and may be counter-productive since it increases the risk of damaging the newly-formed tissues. However, gentle cleansing of the surrounding skin will reduce the risk of excoriation from chronic wound exudate. Barrier products may be required to give additional protection from maceration and excoriation. Various creams and lotions are manufactured as skin protectants but it is important to ensure that they will do more good than harm. For example, a skin protectant that is incompatible with continence pads may reduce the absorbency of the pad leading to maceration and excoriation. Similarly, patients with venous leg ulcers have a high risk of allergy and may react to skin protectants that contain allergens.

### Conclusion

Wound exudate is a natural phenomenon that contributes to healing. Understanding what causes changes in the amount, colour, consistency and odour of exudate enables more effective wound care. If such issues are ignored, exudate levels may increase to a level where wound management becomes quite complex and wound healing more difficult to achieve. Wounds will heal more quickly and more comfortably if wound

exudate is managed effectively. Clinicians are responsible for accurately assessing the cause of the excessive exudate and for planning care. This should include agreeing a care plan that addresses the underlying aetiology of heavily exuding wounds and the selection of appropriate dressing materials and appropriate dressing change intervals so as to minimise the risk of maceration and compromised healing. Patient preferences must also be incorporated into care planning.

Finally, the effectiveness of care should be reassessed at regular intervals and amended as appropriate. With careful management, exudate can assist with the wound healing process rather than hindering it. **WE**

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