Optimizing Wound Management at the Point of Care



Presenter: Amy A. Armstrong MSN, RN, CWOCN, CNL

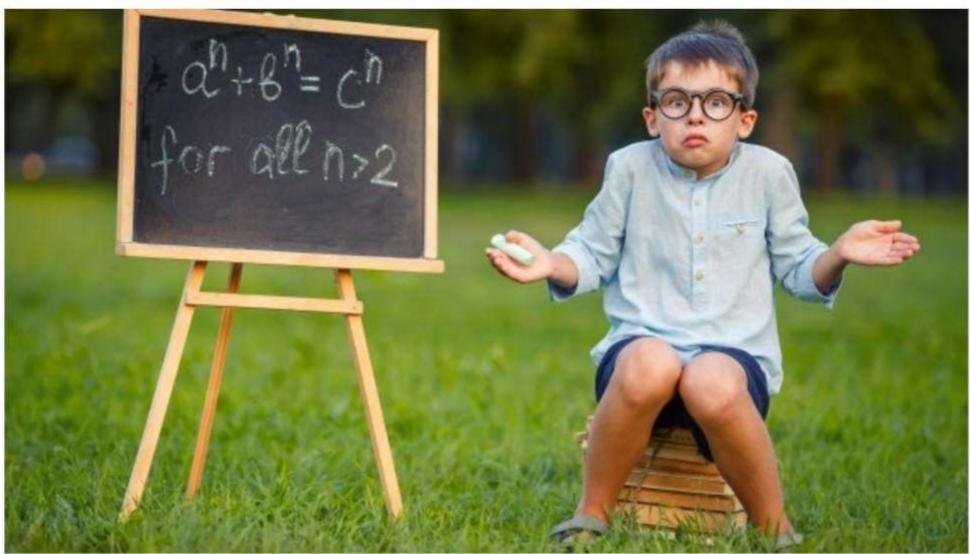
Disclosure

The presenter is an employee of Mölnlycke. The information presented herein is provided for educational and informational purposes. It is for the attendees' general knowledge and is not a substitute for medical advice. The material provided herein is not comprehensive for all medical developments and may contain errors or omissions. If you need advice regarding a specific medical situation, please consult a medical professional.

Upon completion of this educational offering attendees will be able to:



Why the M.O.I.S.T. Model?



Evolution of the M.O.I.S.T. Model

- Developed by Wund-D.A.CH
- Evolves T.I.M.E.
- Includes 2 important contributors
 - Oxygen balance
 - Supporting the wound bed



Direct Editions.

Wounds that have not besied after a period of eight needs: are independ by as "chronic records" [11]. Irrespective of this cone-based defection, wounds are classified as chromy from the mater, if they require transmiss for a passioner under being cause. This includes, for example, diabetic free ulture. would associated with peripheral artery disease (FAD), seeman log allows, or reseason places. The partiest of any two attent of cheerie, wounds binges on the diagnostic worksp (2) and the cased treatment of the anderlying, perhophysindicate allowers discussed Mr. including reference marchs. social factors [8]. At the name time, most parients distuld marine more record thirtagy based on the various phases of wound bealing [3]. Meta-analyses have shown that the use of such modern wound recovered promotes bealing to chronic records M.J. Given the broad therapeuts: armanumenturium analysis reday, many physicians strength to keep truck.

In reaper years, various acreages have been immediated that were meant to add structure to the topical treatment of cheeses wounds. First enblished in 2003, the T.I.M.E. concept has gained the widost acceptance incommissally. Over the past ten plan years, bowever, many new aspects and therapeutic options have energed. On behalf of "Wood-D.A.CH.*, the unfinite organisation of the various wound core societies in German speaking countries, an interdisciplinary and incorrectionismal export rapid therefore no our to ration the tried and true T.I.M.F. concept for the classification of ropical chronic wound missions in order to allow for the tackning of need that greats options.

The factors of the ELM.E. concept designated by "T", "I", and "M" still apply and remain important. They were the refere included, after sightly modeled, in the new MAXIAT. corange (Table 1). The letter "E" of the T.I.M.E. corange origisuffy stood for epidermix [7] and advangamily for edge (resend margino (9), and comprised very different concepts aloud at social bid preparation and presention of se-spitchidization such as alcheshouser, skip grafts, and biological wound there pies [4], he the M.O.I.S.T. concept, "E" has now here replaced by the letters "O" for orages fullance and "S" for support as this allows for the inclusion of new manners uptions for targeted therapy to a reach more differentiated fathion.

M - moisture balance

Correspondence Circultatur

For several decades, most second that pe has been the gold standard to the instance of chronic wounds (4), he that an ner, is in recorded to solvery an equilibrium between non-italis. and two mark measures to wounds. Autombaging day mounds require the addition of moneyer, for example, develop bydente. Usually, however, show a program of moreous, then requiring the our of mound products such as separaborohers.

O - axygen balance

With respect to the pulsephynology of alarma woulds. Reportis plays a key tole to mark: all reported wounds 2%. As manufactural measures, this more that a superially if menores such as reconstitutionism and compression damage have been resulficione - these are charge-size regions are lable to resour corgan belance. Here, adiovase meatments re-bally mayord diversings or opinion on mell as monombaric or Republic Langer through \$10, 53).

1 - infection control

by evenues anothers; represent to only indicated for green to the topical resonance of chemic remode (4).

5 - support

In case of recolumnst mounds dropte apparently subspace revantures, specific would therapies, may be used that acrossly alked the expansed second healing process. The promotion of round haring is advered, for example, through a decrease in moralism minimum (MMPs) [13], historing the pill [14], in the application of growth factors [UE, While first notice to manner die vusion augern have been devoloped, they are parametri mer sand sec a regular biase on dially chimcel practice

T - trisue management

Tono management describes all recorded about at second had proportions, and primarily turbales the natural turbals. of distributions and sound changing, he countries, such preserval polations such as hypochlorous and (14), Salveigners sound proposition may also comprise drug-free mound. (Q/Engris Consults, Carterion on, It-praise, Respects drawings or physical incounts such as negative pressure,

electricity, or electronical (4), followers are of chose therapies has beneficial effices on defendences, second channing, groexlates as well as to optibilization.

Distributed by an introduciple are and interpretational or part panel, the M.O.L.K.T. concept for the first time intodays a new agreeme that includes the ideas of the trial. and now TEME, corcept, and refers them by adding point supaces. Thus, the M.O.LS.T. concept is owner to feetsoftent, assist elevaniane to respectate ally placeme metaal. treatment of character would sorn, the most record account for

Conflict of interest

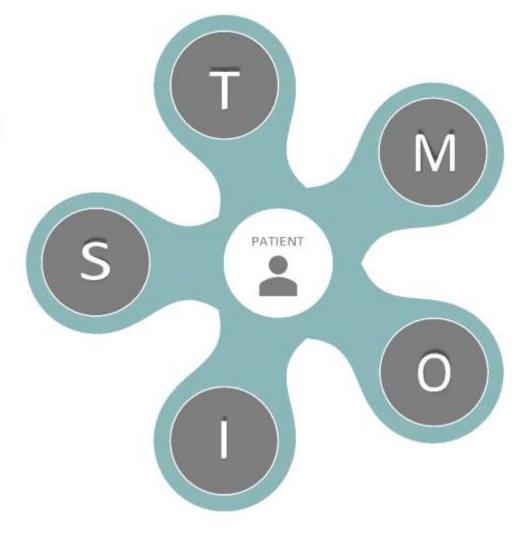
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The M.O.I.S.T. Model in Practice

- Applied following thorough wound assessment
- Does not need to be sequential



A Model for Optimizing Wound Management at the Point of Care



Optimal Wound Healing Environment



Moist but not wet



Stable temperature



Protection from cellular distortion



Moisture & Wound Healing

Autolytic debridement Faster & better quality of healing Pain reduction Reduced scarring Collagen synthesis Keratinocyte migration

^{1.} World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.

^{2.} Nuutila, K., & Eriksson, E. (2020). Moist wound healing with commonly available dressings. Advances In Wound Care, 10(12), 685-698. DOI: 10.1089/wound.2020.1232

Undisturbed Wound Healing

Allowing the wound to "rest" by alleviating unnecessary dressing changes, which protects and supports the normal processes of skin and wound healing, including a moist wound environment & catalyzes faster wound closure.



Optimal Wound Dressing



Fluid Handling By Product Category

Product Category	Indication	WVTR	Absorptive Capacity	Wear Time
Film	Superficial low exuding	Moderate	None	Several days
Foam	Moderate to high exuding	Moderate	Moderate to high	A few days
NPWT	Acute & chronic wounds	Moderate	Moderate to high	Several days
Hydrogel	Full and partial thickness	High	None to low	A few days
Hydrocolloid	Shallow low exuding	Low	Moderate	Several days
Alginate, Gelling Fiber	High exuding	High	Moderate to high	A few days

Key: NPWT = negative pressure wound therapy; WVTR = water vapor transmission rate.

Problems with Inadequate Exudate

- Delayed autolytic debridement
- Delayed healing
- Dressing adherence
- Pain or tissue damage



[.] World Union of Wound Healing Societies (WUWHS). (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.

Moisture Balance Basics: Dry Wounds



Wound Condition	TOO DRY
Clinical Signs	Scab or fibrinNo drainagePain
Goal	Donate Moisture
Dressing Types	Hydrogels

^{1.} World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.

Problems with Excessive Exudate

- Discomfort/pain
- Protein loss and fluid/electrolyte imbalance
- Peri-wound skin damage
- Wound expansion
- Psychosocial effects



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Moisture Balance Basics: Wet Wounds

Wound Condition	TOO WET		
Clinical Signs	MacerationHypergranulation		
Goal	Absorb Moisture		
Dressing Types	AlginatesHydrofibersFoamsSuperabsorbers		

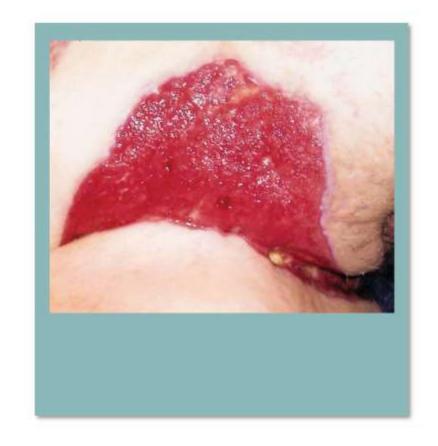




^{1.} World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.

Moisture Balance Basics: Moist Wounds

Wound Condition	MOIST WOUNDS
Goal	Maintain Moisture
Dressing Types	FoamsFilmsHydrocolloids



^{1.} World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.



Hypoxia & Wound Healing



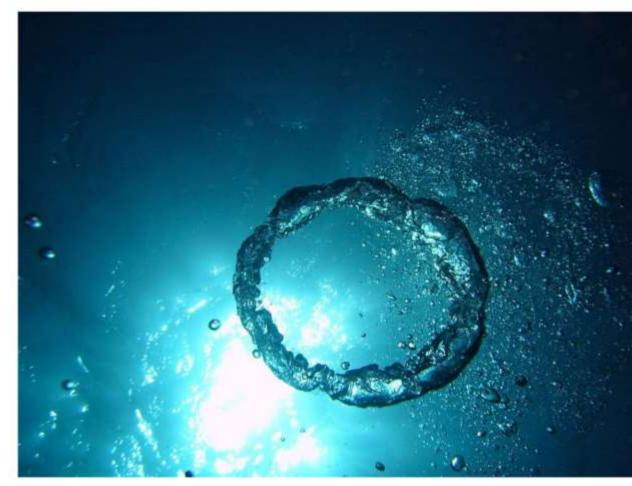
- Initial signal for wound healing¹⁻²
- Detrimental, if prolonged¹⁻²
 - Inhibits angiogenesis
 - Interrupts re-epithelialization
 - Slows extracellular matrix (ECM) synthesis

^{1.} Gottrup, F. (2017). Oxygen therapies for wound healing: EWMA findings and recommendations. Wounds International, 8(4), 18-22. Available on www.woundsinternational.com

Guan, Y. et al. (2021). Sustained oxygenation accelerates diabetic wound healing by promoting epithelialization and angiogenesis and decreasing inflammation. Science Advances. 7(35), 1-14. DOI: 10.1126/sciadv.abj0153

Tissue Oxygenation Delivery

- Local oxygen supply
- Supplemental oxygen
- Hemoglobin enhancement



Accessing Perfusion

- Capillary refill >3 seconds
- Palpation of peripheral pulses
- Ankle-brachial pressure index (ABPI)
- Toe-brachial index (TBI)
- Temperature difference between the feet
- Transcutaneous oxygen measurement



^{1.} Wound, Ostomy and Continence Nurses Society. (2017). Venous, arterial, and neuropathic lower-extremity wounds: Clinical resource guide. Mt. Laurel, NJ: Author

^{2.} Gottrup, F. (2017). Oxygen therapies for wound healing: EWMA findings and recommendations. Wounds International, 8(4), 18-22. Available on www.woundsinternational.com

Oxygen Therapies

- Hyperbaric oxygen therapy (HBOT)
- Topical oxygen therapy (TOT)
- Other:
 - Vascular interventions
 - Skin transplantation
 - Fullerenes

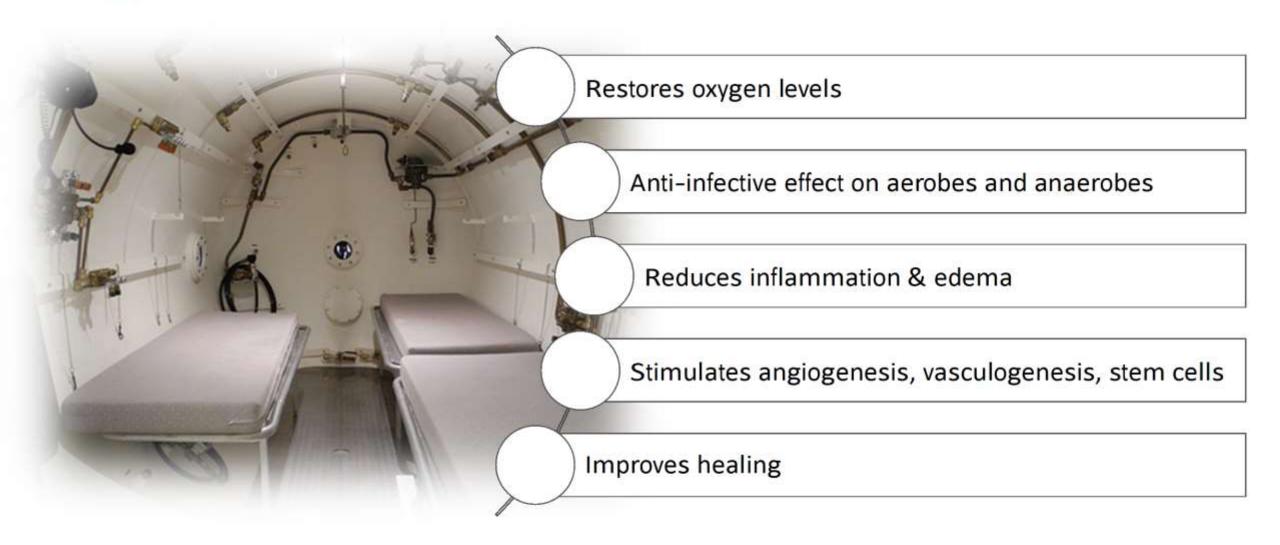


Oxygen Balance: TOT

Topical oxygen therapy (TOT)

- Continuous delivery of non-pressurized oxygen (CDO)
- Low constant pressure oxygen in a contained chamber
- Higher cyclical pressure oxygen
- Oxygen release through dressing or gel
- Oxygen transfer
- Application of oxygen species

Oxygen Balance: HBOT



HBOT Best Practice

- Part of a multidisciplinary treatment plan
- Ongoing wound care
- Wound care 4 weeks prior to HBOT
 - Debridement
 - Vascular screening
 - Offloading
 - Infection therapy

- Monitor efficacy with TCO2
- · Discontinue if HBOT not effective

Oxygen Balance: Vascular Interventions

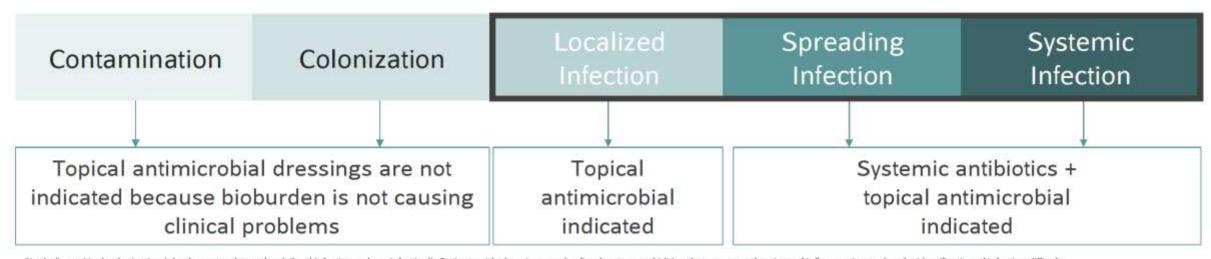
- Smoking cessation
- Cardiovascular exercise
- Medication management

- Reperfusion therapies
 - Coronary angioplasty
 - Coronary artery bypass surgery
 - Catheter-assisted thrombus removal.

^{1.} Gottrup, F. (2017). Oxygen therapies for wound healing: EWMA findings and recommendations. Wounds International, 8(4), 18-22. Available on www.woundsinternational.com



Implementing Topical Antimicrobial Dressings

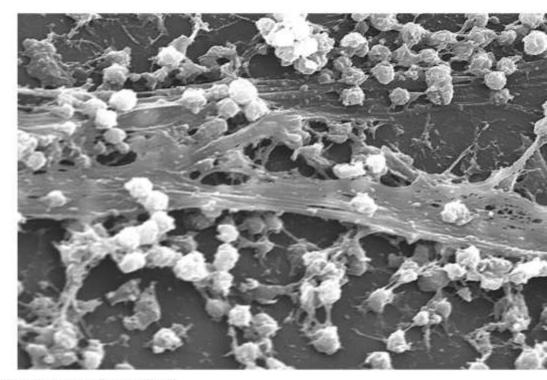


^{*}Including critical colonization (also known as 'covert' or 'silent' infection or 'pre-infection'). Patients with chronic wounds often have comorbidities that suppress the signs of inflammation and make identification of infection difficult.

Winnipeg Regional Health Authority. (2018). Silver-based dressings: Evidence informed practice tools. Accessed on https://professionals.wrha.mb.ca/oid/extranet/eipt/files/EIPT-013-016.pdf

Biofilm & Delayed Healing

- Break up biofilm
- Remove slough: house of biofilm, comprising 90% of biofilm
- Reduce reformation with antimicrobials
- Protect from contamination



[.] World Union of Wound Healing Societies (WUWHS), (2019), Consensus Document, Wound exudate: effective assessment and management. Wounds International,

Biofilm Assessment

- Not visible to the naked eye
- Indicated by other clinical signs
 - Increasing exudate & moisture
 - Inflammation & erythema
 - Poor granulation or friable hypergranulation
 - Recalcitrance to antimicrobial therapy



Care During the Wound Infection Continuum

Identify & address risks

- Prevent cross-contamination
- Facilitate wound drainage
- Antimicrobial dressings
- Optimize wound environment
- Optimize healing

Infection Control Strategies

Local and systemic options

- Antibiotics
- Antiseptics



- Antimicrobials
 - Silver
 - Copper
 - Honey
 - Dialkyl carbamoyl chloride.(DACC)

Undisturbed Wound Healing

Using a dressing that supports increased wear time

AND

Leaving the dressing uninterrupted

Benefits

- Reduced contamination & infection risk
- Optimized healing
- Cost savings for alleviation of waste and clinician time
- Decreased patient's apprehension
- Increased patient satisfaction



Address Underlying Cause



This approach may prevent an acute wound from progressing to a chronic state.

Wound Management Support Basics

Etiology	Presentation	Primary Support
All Wound Types		 Optimize nutrition Encourage exercise Promote smoking cessation
Pressure Injury		 Redistribute pressure & shear Interface friction Manage moisture
Diabetic Foot Ulcer	Contract of the second	Offload
Arterial Ulcer	St.	Address perfusion
Venous Leg Ulcer		• Compression
Other (Trauma, Surgical, Atypical, Unknown, etc.)	Approx.	Address underlying detriments

Stimulate Healing

Actively impact impaired wound healing processes

Decrease metalloproteinases (MMPs)

Regulate pH

Introduce growth factors

Control pro-inflammatory mediators

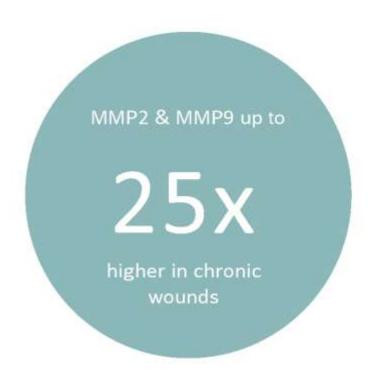
Donate collagen

^{1.} Dissemond, J et al. (2017). M.O.I.S.T. – a concept for the topical treatment of chronic wounds: Clinical Letter. Journal of the German Society of Dermatology. DOI: 10.1111/ddg.13215

^{2.} Jones, E. M., Cochrane, C. A., & Percival, S. L. (2015). The Effect of pH on the Extracellular Matrix and Biofilms. Advances in wound care, 4(7), 431–439. https://doi.org/10.1089/wound.2014.0538

MMPs and Wound Healing

- Acute and chronic wounds
 - Regulate ECM degradation
 - Essential for re-epithelization
- Harmful in excess

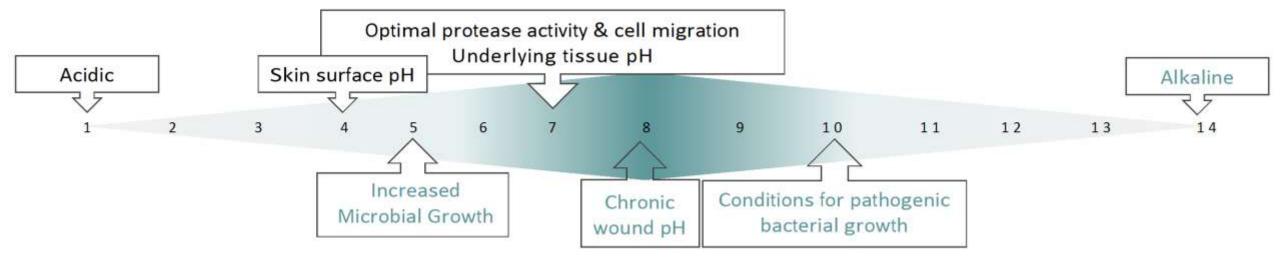


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^{3.} World Union of Wound Healing Societies (WUWHS). (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.

PH and Wound Healing



- 1. Dissemond, J et al. (2017). M.O.I.S.T. a concept for the topical treatment of chronic wounds: Clinical Letter. Journal of the German Society of Dermatology. DOI: 10.1111/ddg.13215
- 2. Jones, E. M., Cochrane, C. A., & Percival, S. L. (2015). The Effect of pH on the Extracellular Matrix and Biofilms. Advances in wound care, 4(7), 431–439. https://doi.org/10.1089/wound.2014.0538

PH and Bacterial Growth



Wound-associated microorganisms	Optimum pH for growth
Staphylococcus aureus	7.0-7.5
Enterococcus faecalis	7.0-9.0
Pseudomonas aeruginosa	6.6-7.0
Coagulase-negative staphylococci	7.0-7.5
Anaerobic bacteria	6.0-7.0
Escherichia coli	6.0-7.0
Klebsiella spp.	5.5-7.0
Candida spp.	7.0-8.0

^{1.} Dissemond, J et al. (2017). M.O.I.S.T. – a concept for the topical treatment of chronic wounds: Clinical Letter. Journal of the German Society of Dermatology. DOI: 10.1111/ddg.13215

Extracellular Matrix & Wound Healing

Highly complex noncellular component of all tissues within the body

- Essential support scaffold
- Initiates & directs tissue differentiation & homeostasis
- Disorganized in chronic wounds

ECM Proteins

- Collagen
- Elastin
- Fibronectin
- Glycosaminoglycans
- Tenascin-c
- Proteases

^{1.} Dissemond, J et al. (2017). M.O.I.S.T. – a concept for the topical treatment of chronic wounds: Clinical Letter. Journal of the German Society of Dermatology. DOI: 10.1111/ddg.13215

^{2.} Jones, E. M., Cochrane, C. A., & Percival, S. L. (2015). The Effect of pH on the Extracellular Matrix and Biofilms. Advances in wound care, 4(7), 431–439. https://doi.org/10.1089/wound.2014.0538

Growth Factors & Wound Healing



- New blood vessel formation
- Epithelization
- Wound contraction
- Deposition of ECM

^{1.} Xiao, T., Yan, Z., Xiao, S. et al. Proinflammatory cytokines regulate epidermal stem cells in wound epithelialization. Stem Cell Res Ther 11, 232 (2020). https://doi.org/10.1186/s13287-020-01755-y

Pro-Inflammatory Mediators & Wound Healing

- Produced during inflammatory phase after injury
 - Activates downstream cascade
 - Regulates epithelization
- Detrimental in excess
- Higher in non-healing wounds

^{1.} Xiao, T., Yan, Z., Xiao, S. et al. Proinflammatory cytokines regulate epidermal stem cells in wound epithelialization. Stem Cell Res Ther 11, 232 (2020). https://doi.org/10.1186/s13287-020-01755-y

^{2.} World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International,

Collagen & Wound Healing



- Granulation formation
- Remodeling
- Scar reduction

^{1.} Xiao, T., Yan, Z., Xiao, S. et al. Proinflammatory cytokines regulate epidermal stem cells in wound epithelialization. Stem Cell Res Ther 11, 232 (2020). https://doi.org/10.1186/s13287-020-01755-y

Tissue Management



Wound Cleansing

- During each dressing change
- Wound and peri-wound

What makes a good wound cleanser?

- Hypoallergenic
- Nontoxic To Viable Tissue
- Readily Available
- Cost-effective
- Stable

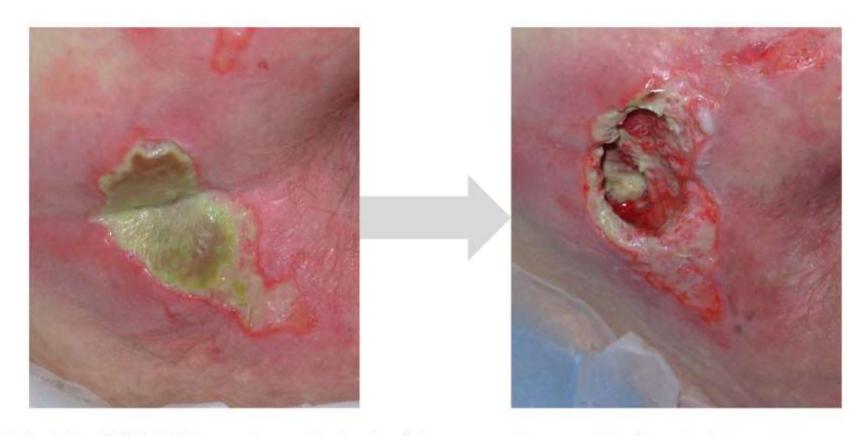
Common Wound Cleansers

- Normal Saline optimal
- Commercial cleansers
- Skin cleansers
- Lactated Ringers
- Potable (drinkable) tap water



Wound Debridement

The removal of necrotic (dead) or infected tissue to activate the healing process.



- 1. World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document, Wound exudate: effective assessment and management, Wounds International,
- 2. Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.



Wound Debridement Types

- Autolytic
- Bio-surgical
- Surgical
- Enzymatic
- Mechanical
- Medicinal or topical therapies

- World Union of Wound Healing Societies (WUWHS), (2019). Consensus Document, Wound exudate: effective assessment and management. Wounds International,
- Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.

Autolytic



- Uses the body's enzymes and natural fluids
- Softens necrosis
- Moisture retaining dressing once daily

Ideal Patient:

- Non-infected wounds
- Pressure injuries

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Biological Debridement

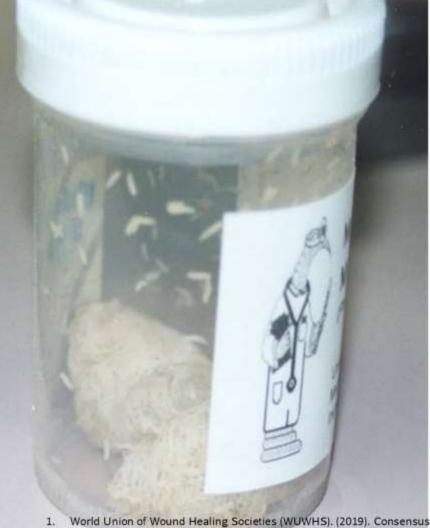
- Also known as larval therapy
 - Consume necrosis
 - Release antibacterial substances
 - Eat harmful bacteria
- Applied 24-72 hours & replaced twice weekly



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^{2.} Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.

Biological Debridement



Ideal Patient:

- Large, infected wounds
- Wounds with antibiotic resistant bacteria
- Poor surgical candidates

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- 2. Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.

Surgical

Removal of necrosis or infected tissue by cutting



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- 2. Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.

Enzymatic

- Uses enzymes in the topical ointment or gel to soften necrosis
- Applied 1-2 times per day

Ideal Patient:

- Bleeding problems
- High risk for surgical complications

Not Recommended for large or severely infected wounds

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^{2.} Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.

Mechanical

- Most common type of debridement
- Removes unhealthy tissue by force

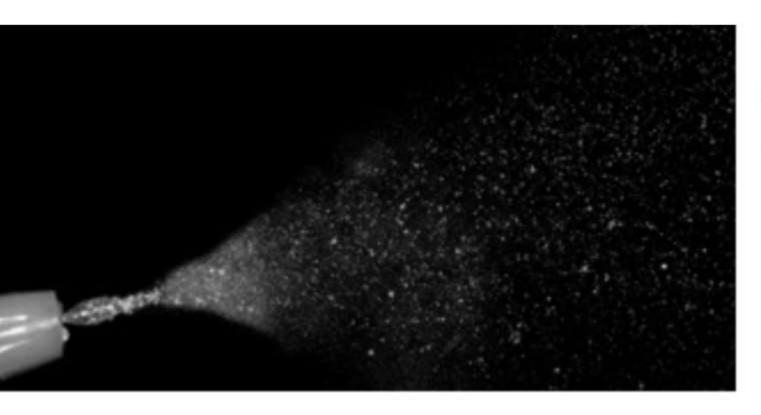
Types

- Hydrotherapy
- Wet-to-dry
- Monofilament debridement pads

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^{2.} Nunez, K. (2019). What Is Wound Debridement and When Is It Necessary? Medically reviewed by Shilpa Amin, MD, CAQ, FAAFP. Accessed on Healthline Media.

Ultrasonic Debridement



- Breaks up devitalized tissue
- Quick
- Requires specialized training

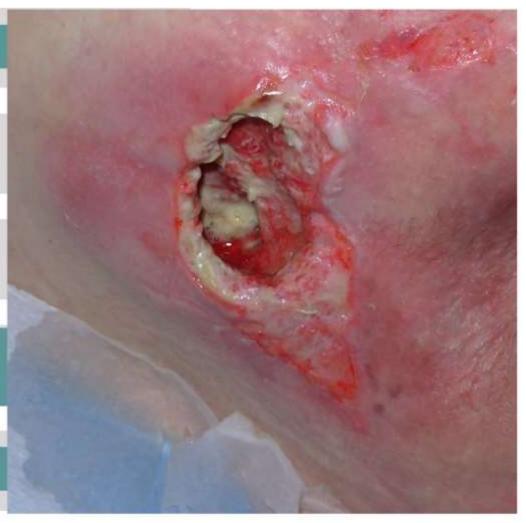
^{1.} World Union of Wound Healing Societies (WUWHS). (2019). Consensus Document. Wound exudate: effective assessment and management. Wounds International.

Check Yourself

Taking the M.O.I.S.T. Model to the Point of Care



Wet: Absorb Moisture Balance Oxygen Balance Infection Control Pressure/Shear Support Wound Redistribution Tissue Management Necrotic: Debride



Moisture Balance

Oxygen Balance

Infection Control

Infected: Antimicrobial

Support Wound

Pressure/Shear Redistribution

Tissue Management Necrotic: Debride



Moisture Balance

Moist: Keep Moist

- Oxygen Balance
- Infection Control
- Support Wound

Pressure & Shear Redistribution

Tissue Management



Moisture Balance High Exudate: Absorb Oxygen Balance Infection Control Infected: Antimicrobial Support Wound Edema: Compression Tissue Management Necrotic: Debride



Moisture Balance

Oxygen Balance Ischemic: Oxygen Therapy

Infection Control Infection: Antiseptic

Support Wound ABI 0.4: Vascular Intervention

Tissue Management



- Moisture Balance Moist: Keep Moist
- Oxygen Balance
- Infection Control
- Support Wound
- Tissue Management

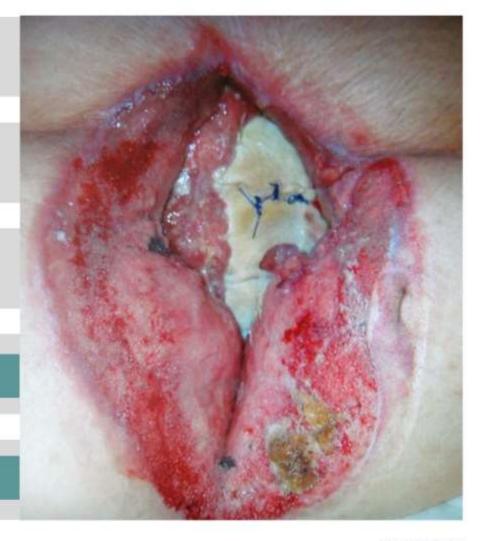


- Moisture Balance
- Oxygen Balance
- Infection Control
- Support Wound

Tissue Management

Stagnant: NPWT

Necrosis: Debride



Key Take-Aways

The M.O.I.S.T. Model:

Clinical-decision making tool

Guide product/intervention along the wound healing continuum

Individualize care through bundled best practices

Wounds speak...Are you listening?

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Thank you!