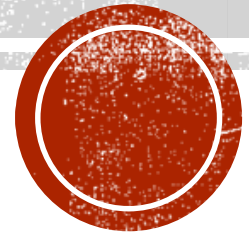


# WOUND CLEANSING

How are we doing? Do we need to re-think?



# WOUND BED PREPARATION

**“chance favors the prepared ~~mind~~  
wound”**

**Louis Pasteur**

- Wound Cleansing
- Wound Debridement
- Bacterial Control



# WOUND CLEANSING



# ADEQUATE WOUND CLEANSING



# CHALLENGES OF OBTAINING A CLEAN WOUND

- Historical vs modern threats to wound healing
- Availability of adequate solutions
  - Avoidance of toxicity
    - Risk / Benefit
    - Clean vs. Disinfect
  - Home vs facility vs clinic setting
- Pain and Trauma
  - History of need to avoid; avoidance of pain prevails



# INTERNATIONAL WOUND CARE SURVEY

- Conducted in eleven countries in Europe and North America
- Identify practitioners primary consideration in their approach to pain and tissue trauma at dressing changes
- 14, 657 questionnaires distributed
  - 3,918 responded (27%)



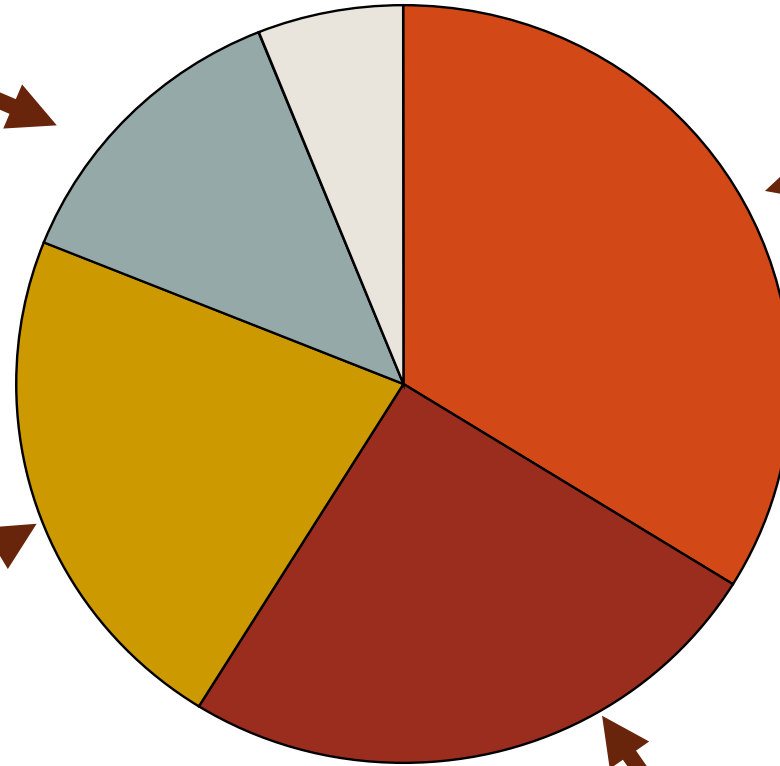
**13% Preventing surrounding skin damages**

**6% Other / missing**

**34% Preventing trauma to the wound bed**

**22% Preventing the spread of infection**

**25% Preventing pain to the patient**



# THE TOP TWO ISSUES IN WOUND HEALING

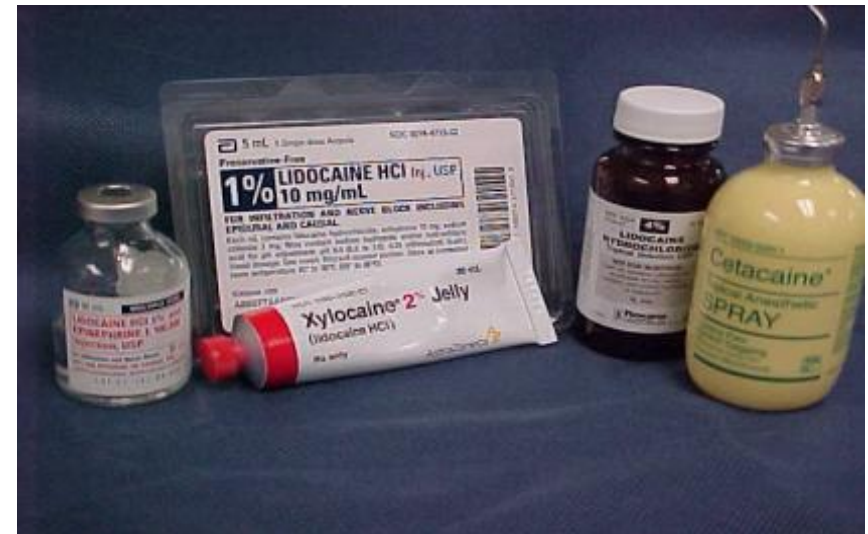
- Preventing trauma to the wound surface and surrounding skin
- Preventing pain to the patient during dressing change(s)





# PLAN FOR THE PAIN

- Inpatient pre-medicate patient
- Provide medication to patient
  - Take pain medication prior to leaving home if not driving
- Topical anesthetics can help
  - Know the mechanism of action
  - Prescriptions for patients and community care/long term care nurses



# WOUND CLEANSING



So.....

We have to decide.....



# OR BETTER....



# WOUND CLEANSING

- Wound cleansing is the use of fluids to gently remove loosely adherent contaminants and devitalized material from the wound surface.

Rodeheaver GT, Ratliff CR. Wound cleansing, wound irrigation, wound disinfection. In: Krasner DL, van Rijswijk L, eds. Chronic Wound Care: The Essentials e-Book. Malvern, PA: HMP; 2018:47–62. Available at <http://online.fliphtml5.com/zxoes/kzzg/> Accessed 5/19/2019.



# WOUND CLEANSING

- Integral part of wound bed preparation
  - Removes surface debris
  - Reduces bacterial load
  - Mitigates biofilm activity
- Challenge is finding the right balance
  - How to clean
  - What to clean with



# HOW TO CLEAN

- Debridement
  - Clearly a fail-safe way to get a wound clean
    - Clean again after debridement
- Cleansing
  - Irrigation
    - Streaming
    - Continuous pulsed irrigation
    - Pulsatile lavage
  - Monofilament/microfiber cleansing
  - Gauze cleansing



# HOW TO CLEAN

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# IRRIGATION - STREAMING

- Choice of solution: We'll get to that
- Method of Delivery – patient and setting dependent
  - Pouring
  - Syringes
  - Commercial devices
- Volume of Solution
  - 50-100 ml recommended



# PRESSURIZED CLEANSING



# WHAT ABOUT THE 35 ML SYRINGE, 19 GAUGE ANGIOCATH RECOMMENDATION?

- Stevenson TR, Thacker JG, Rodeheaver GT, Bacchetta C, Edgerton MT, Edlich RF. Cleansing the traumatic wound by high pressure syringe irrigation. JACEP 1976;5:17-21 (PDF) Syringe-based wound irrigating device. Available from:  
[https://www.researchgate.net/publication/235757692\\_Syringe-based\\_wound\\_irrigating\\_device](https://www.researchgate.net/publication/235757692_Syringe-based_wound_irrigating_device) [accessed Sep 09 2018].
  - Ideal pressures for irrigating trauma wounds



# ADJUSTING FOR THE PSI

Shetty R, Kingsly PM, Barreto E, Sreekar H, Dawre S. Wound Irrigation, Letter to the Editor. Indian Journal of Plastic Surgery September-December 2012 Vol 45 Issue 3.

- 35 ml and 19 G angiocath delivered 8 psi, 20 ml syringe and 18 gauge angiocath delivered 12 psi
- Larger syringe, lower pressures. Larger angiocath, higher pressures.

Syringe MLs	Needle/Angio Gauge	PSI
35	25	4
35	21	6
35	19	8
20	18	12
12	22	13
12	19	20
6	19	30

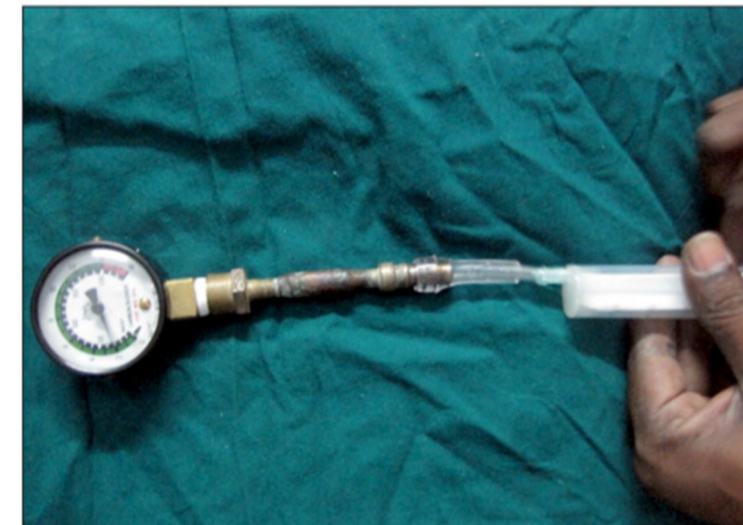


Figure 1: Experimental assessment of pressure generated



# IRRIGATION DEVICES



# POWERED DEVICES



Pulsatile lavage



Non-contact low frequency ultrasound

Contact low frequency ultrasound



# A WORD ABOUT PERSONAL PROTECTIVE EQUIPMENT

- Should be worn with any procedure which may result in aerosolization of bacteria



# GAUZE SCRUBBING

- Likely more painful
- Less effective on bacterial
- Less expensive
- Consider topical analgesia





# MICROFIBER DEBRIDEMENT PAD

- Debridement Pad consists of microfibres that debride and an absorbent backing layer
- Pad is moistened and used in a circular motion
- Debridement Pad frees the wound from coatings and dead cell residues (debris) and absorbs excess exudates. Intact tissue is spared.
- Works well with scaly and necrotic wound surfaces



Irving S, Ovens L, Collier M. Prontosan Debridement Pad Made Easy. Wounds International May 2018.

Photo used with permission, B. Braun

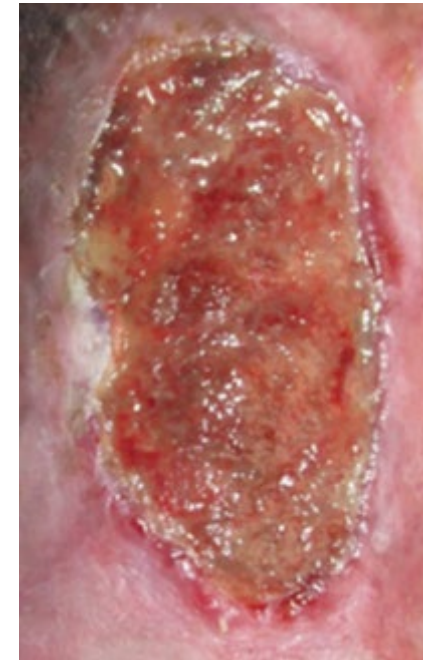


# MICROFIBER DEBRIDEMENT PAD

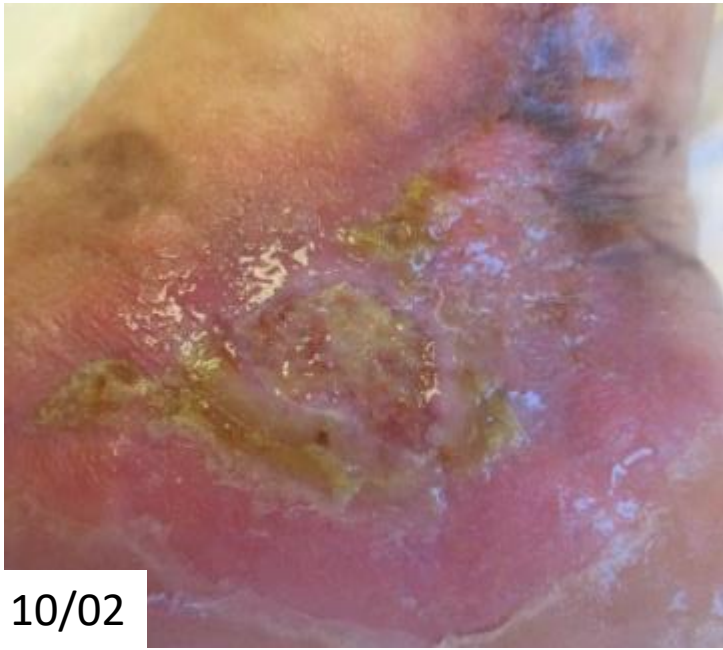


# MONOFILAMENT PAD

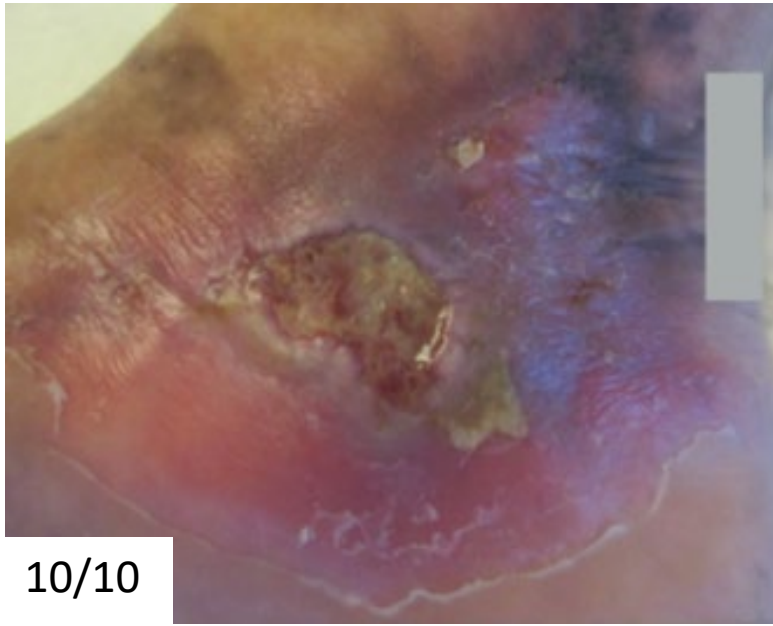
- Polyester monofilaments trap exudate and debris
- Thoroughly moisten and clean in circular motion
- Ideal for less experienced providers
- Necrosis, debris, bacteria, etc. is lifted from wound bed and trapped in fibers of device relatively painlessly







10/02



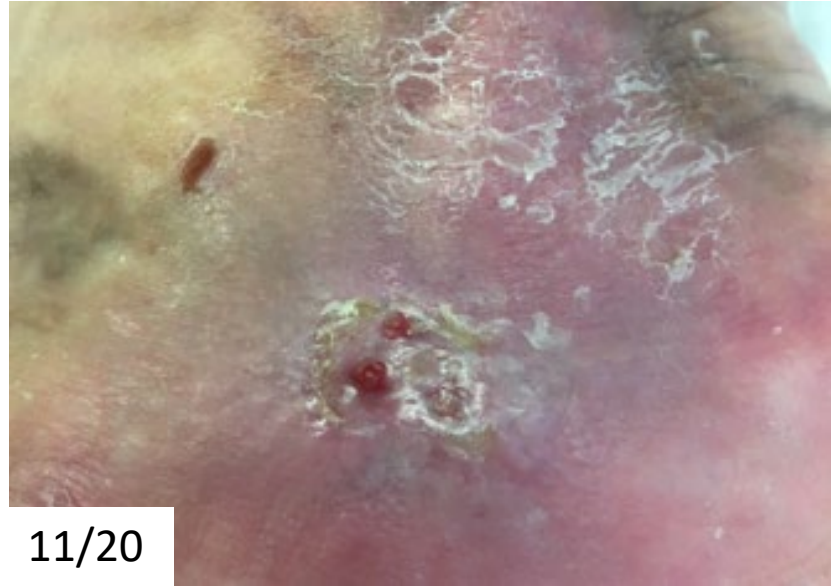
10/10



10/31



11/06



11/20



# WOUND CLEANSING – SOLUTIONS

- **Commercial cleansers**
  - Enhanced wound cleaning due to surface active agents, which break the bonds of foreign bodies on wound surface
  - Strength of their chemical reactivity directly proportional to their cleansing capacity and toxicity to cells
  - May be best suited for wounds with adherent cellular debris and biofilm
  - Typically contain preservatives to extend effective shelf life
  - Can be highly cytotoxic to healthy cells and granulating tissue (skin cleansers)



# WHAT TO CLEAN WITH?

- **Isotonic Saline (0.9%)**
  - On clean uncomplicated wound usually the right answer on test 😊
  - Must be used with enough psi to make a difference
  - No impact on microbes and biofilm
  - Best used with monofilament, microfiber or gauze
- **Potable water**
  - 2012 Cochrane Review concluded no difference in healing or infection rates in using saline vs tap water
  - Concern of water borne pathogens such as pseudomonas, and known growth of biofilm in pipes



# CLEANSING SOLUTIONS

Table 6: Cleansing solutions and gels				
Solution	Type	Cytotoxicity	Effect on biofilm	Comments
Sterile normal saline	Isotonic <sup>105</sup>	None	None	<ul style="list-style-type: none"> <li>■ Sterile, non-antiseptic solution<sup>103</sup></li> </ul>
Sterile water	Hypotonic	None	None	<ul style="list-style-type: none"> <li>■ Sterile, non-antiseptic solution<sup>103</sup></li> </ul>
Potable tap water	Varies in content	Unknown/variable	None	<ul style="list-style-type: none"> <li>■ Not sterile<sup>103</sup></li> </ul>
Polyhexa-methylene biguanide (PHMB)	Surfactant antimicrobial	Low to none <sup>23</sup>	Surfactant qualities disrupt biofilm attachments <sup>23,106</sup>	<ul style="list-style-type: none"> <li>■ Available in gel and irrigation preparations that can be used together or separately</li> <li>■ Lowers liquid surface tension, allowing greater spread and facilitating separation of non-viable tissue<sup>23</sup></li> <li>■ Does not promote bacterial resistance<sup>23</sup></li> </ul>
Octenidine dihydrochloride (OCT)	Surfactant antimicrobial	<ul style="list-style-type: none"> <li>■ <i>In vitro</i> tests show high toxicity<sup>107</sup></li> <li>■ Lack of absorption suggests no systemic effects<sup>107</sup></li> <li>■ Not shown to disrupt healing</li> </ul>	<ul style="list-style-type: none"> <li>■ Prevents formation of new biofilm for at least 3 hours<sup>108</sup></li> <li>■ Inhibits planktonic and bacterial biofilm growth for up to 72 hours<sup>108</sup></li> </ul>	<ul style="list-style-type: none"> <li>■ Available in gel and irrigation preparations that can be used together or separately<sup>107</sup></li> <li>■ Lowers liquid surface tension allowing greater spread and facilitating separation of non-viable tissue<sup>108</sup></li> </ul>
Super-oxidised with hypochlorous acid (HOCL) and sodium hypochlorite (NaOCL)	Antiseptic	May vary depending on concentrations	<ul style="list-style-type: none"> <li>■ Penetrates biofilm rapidly, killing formations from within<sup>103</sup></li> <li>■ Does not promote resistant bacteria strains<sup>103</sup></li> </ul>	<ul style="list-style-type: none"> <li>■ Purported to provide desloughing and antimicrobial activity</li> <li>■ Available in gel and irrigation preparations that can be used together or separately</li> </ul>
Povidone iodine	Antiseptic	Varies depending on concentrations <sup>108</sup>	<ul style="list-style-type: none"> <li>■ Inhibits development of new biofilm<sup>110</sup></li> <li>■ Eradicates young biofilm colonies<sup>110</sup></li> <li>■ Significantly reduces mature biofilm colonies<sup>110</sup></li> </ul>	<ul style="list-style-type: none"> <li>■ Modulates redox potentials and enhances angiogenesis, thereby promoting healing<sup>111</sup></li> <li>■ May inhibit excess protease levels in chronic wounds<sup>111</sup></li> </ul>





# WHAT TO CLEAN WITH?

- **Dakin's Solution 0.125 %**
  - Dilute hypochlorite (bleach) solution that shows effectiveness against Gram-positive bacteria such as strep and staph, as well as a broad spectrum of anaerobic organisms and fungi.
  - Kills microorganisms, but also harms healthy cells in all concentrations
  - It can be sprayed on the wound, poured as a wound irrigant or used in a wet compress.
  
- **Acetic Acid (Vinegar Solution)**
  - Shown effectiveness against many Gram-positive and Gram-negative organisms, especially *Pseudomonas aeruginosa*.
  - Does not kill bacteria, creates an acidic environment unfavorable for bacterial growth.
  - Acetic acid in 1% and 5% concentrations has been widely used in an attempt to reduce pH.
  - Effective against odor



# WHAT TO CLEAN WITH?

- **Hydrogen peroxide**
  - One time cleansing for dirty acute injury may be appropriate
  - May be cytotoxic to healthy cells and granulating tissue
  - Ineffective in reducing bacterial counts in vivo; in vitro evidence of effectiveness
  - Effervescence visually changes wound surface



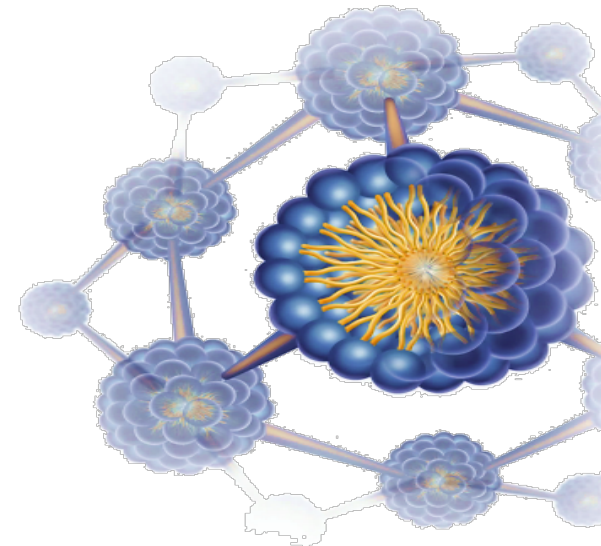
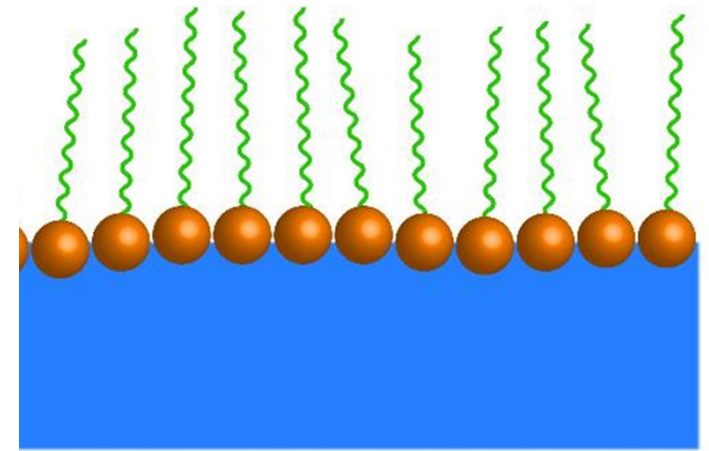
# Surfactant Dressings and Gels

- Dressings containing non-ionic surfactants that cleanse wound at microscopic level
- New evidence of anti-biofilm properties
- Local cleansing – “scrubbing bubbles”



# SURFACTANCY EFFECT

- Monomers line up along an aqueous environment with hydrophilic head / hydrophobic tail
- In higher concentrations form a micelle matrix which is surface active, constantly expanding and contracting creating a “rinsing” action on a molecular level.
- Disrupts non covalent bonds. Softens, loosens and traps the wound debris.
- Solubilizes debris at cellular level



# SURFACTANT ENHANCED AUTOLYTIC DEBRIDEMENT

12/04/18

Concentrated surfactant + ABX

12/14/18



# AND LASTLY... SCALES



# WHO THINKS THAT THERE IS BACTERIA UNDER THESE DRIED SCALES?



# REMOVE SCALES, REDUCE BACTERIA



Photos courtesy Kevin Woo, RN, PhD



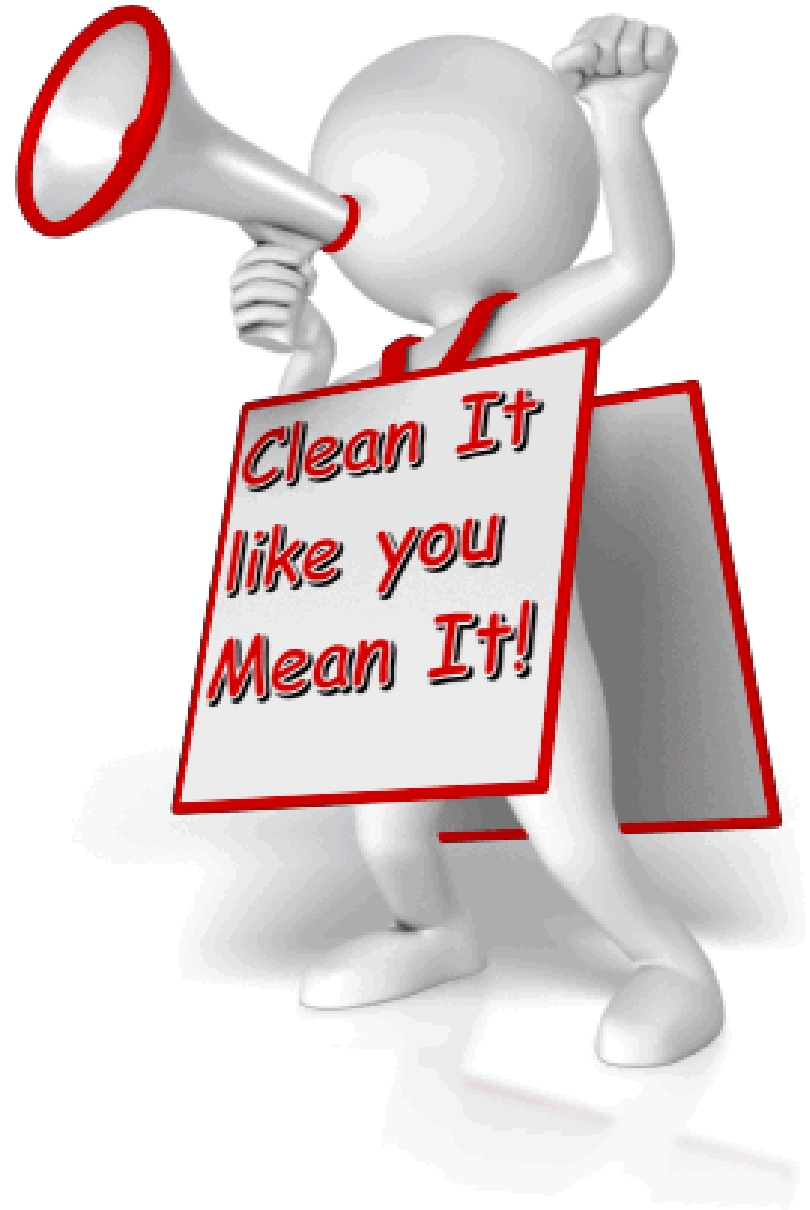


# Descaling Hyperkeratotic Skin



# CLOSING OUT ON CLEANSING.....

- Begin with the end in mind (Covey)
- Base cleansing on wound appearance and presumption of bioburden – Clean or disinfect?
- Base decisions on risk-benefit analysis



# THANK YOU!

