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PRINCIPLES OF WOUND MANAGEMENT

- 1. DEFINE THE AETIOLOGY**
- 2. CONTROL FACTORS AFFECTING
WOUND HEALING**
- 3. SELECT APPROPRIATE WOUND
DRESSING & BANDAGE**
- 4. PLAN WOUND HEALING
MAINTENANCE**

Removal of non-functional tissue

**Wound
Bed
Preparation**





WOUND BED PREPARATION

- **Ebers Papyrus - Hot oils & Waxes**
- **Middle Ages - Membranes & Faeces**
- **15th Century - Cautery**
- **19th Century - Linteum & Oakum**
- **20th Century - Moist Wound Concept**

WOUND REPAIR

Healing Wounds

- ↑ Cell mitosis
- ↓ Pro-inflammatory cytokines
- ↓ MMPs
- ↑ Growth factors
- Cells capable of rapid response

Chronic Wounds

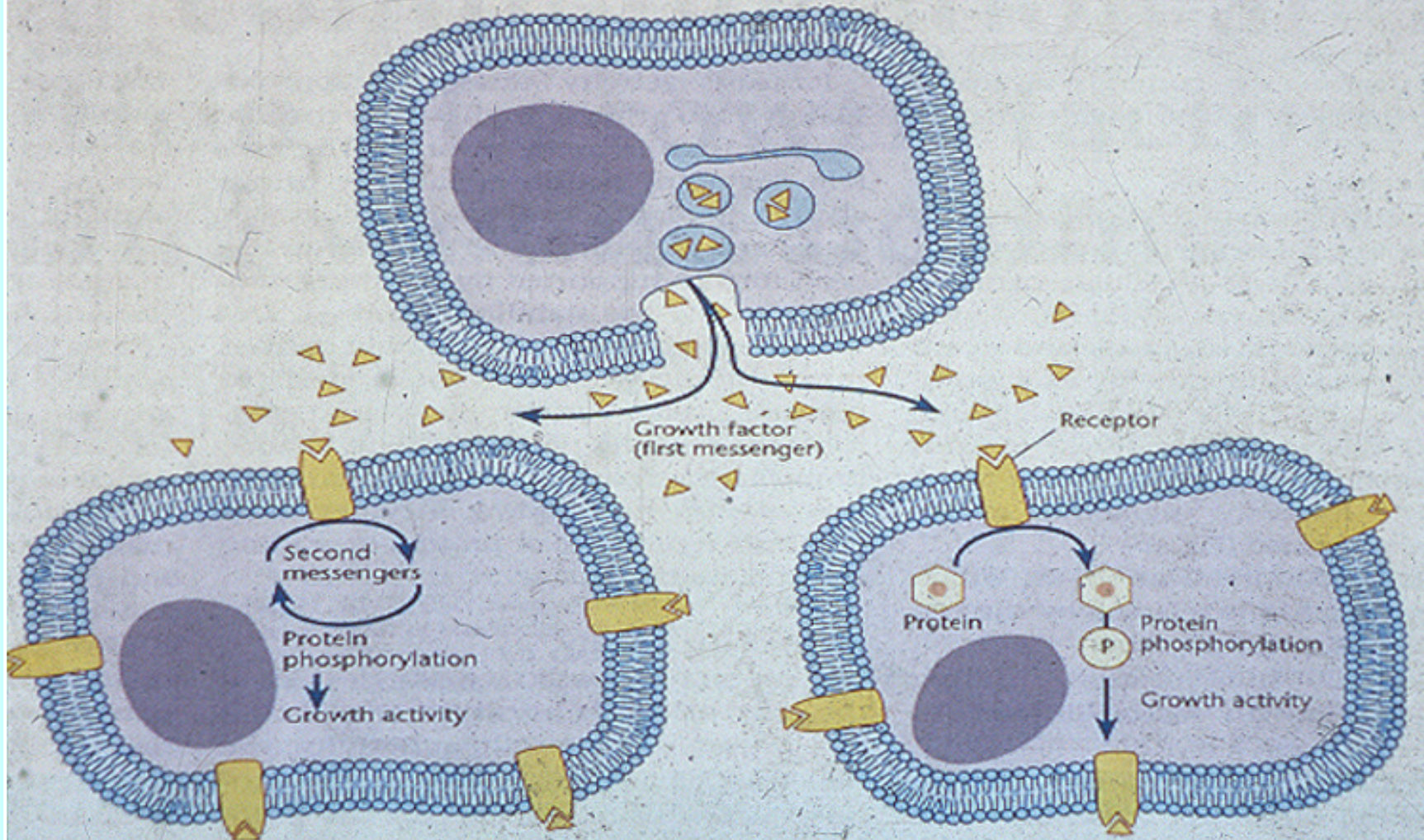
CHRONIC WOUND

DEFINITION:

“Chronic wounds have failed to proceed through an orderly and timely process to produce anatomic and functional integrity”

Lazarus GS et al. Arch Dermatol (1994)

GROWTH FACTOR RELEASE AND INTRACELLULAR ACTIVITY



Intracellular activity stimulation via a chemical pathway (left) or directly (right)

Removal of non-functional tissue

**Wound
Bed
Preparation**

WOUND BED PREPARATION

OPTIMUM PREPARATION

of a wound bed for tissue repair
in the absence of vascular disease
or medical contraindications is

DEBRIDEMENT

WOUND BED PREPARATION

DEBRIDEMENT

THE REMOVAL OF

+/- NON-VIABLE TISSUE

+/- NECROTIC TISSUE

+/- DEBRIS

+/- SENESCENT TISSUE

FROM A WOUND.

WOUND BED PREPARATION

DEBRIDEMENT

AUTOLYTIC

ENZYMATIC

MECHANICAL

CHEMICAL

BIOLOGICAL

SHARP

WOUND BED PREPARATION

**“EFFECT OF EXTENSIVE
DEBRIDEMENT AND TREATMENT
ON THE HEALING OF DIABETIC
FOOT ULCERS.”**

Steed,DL et al:

Journal of the American College of Surgeons

183: 61-64 (1996)

WOUND BED PREPARATION

**HEALING of DIABETIC FOOT
ULCERS (non ischaemic)**

PDGF versus PLACEBO

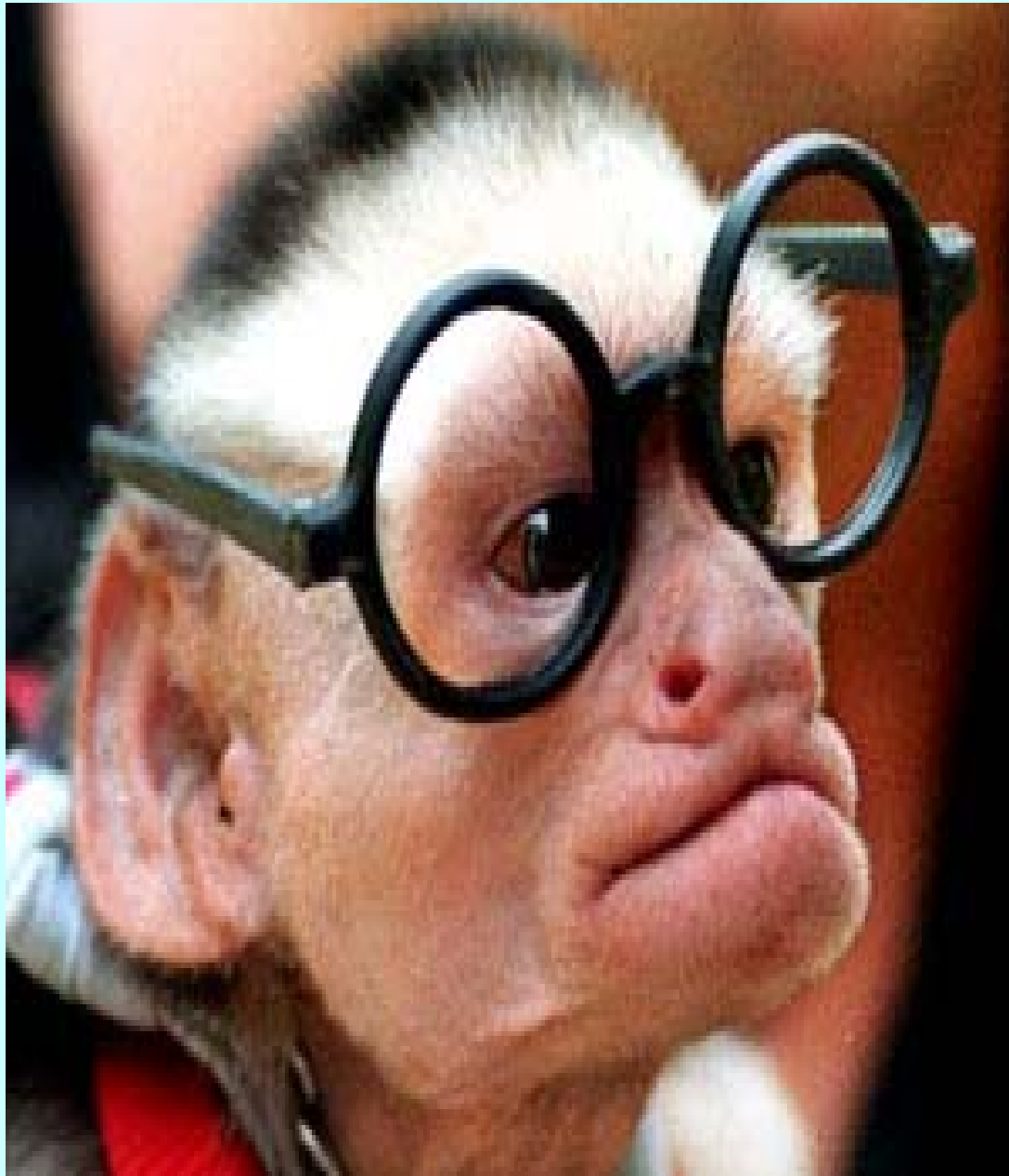
Steed,DL et al (1996)

WOUND BED PREPARATION

*“...a lower rate of healing was
observed
in those centres
which performed less frequent
debridement.”*

Steed, DL (1996)
J.Amer.Coll.Surg.183;61-64





**WHAT ON
EARTH IS
SENESCENCE?**

CELLULAR SENESCENCE

‘PROGRAMMED SENESCENCE THEORY’

(Hayflick, 1965)

**AGING IS AN ACTIVE, PREDETERMINED
PROCESS BASED ON A CELL DIVISION
COUNTER**

**ie BIOLOGICAL CLOCK – EROSION OF
CHROMOSOMAL TELOMERES**

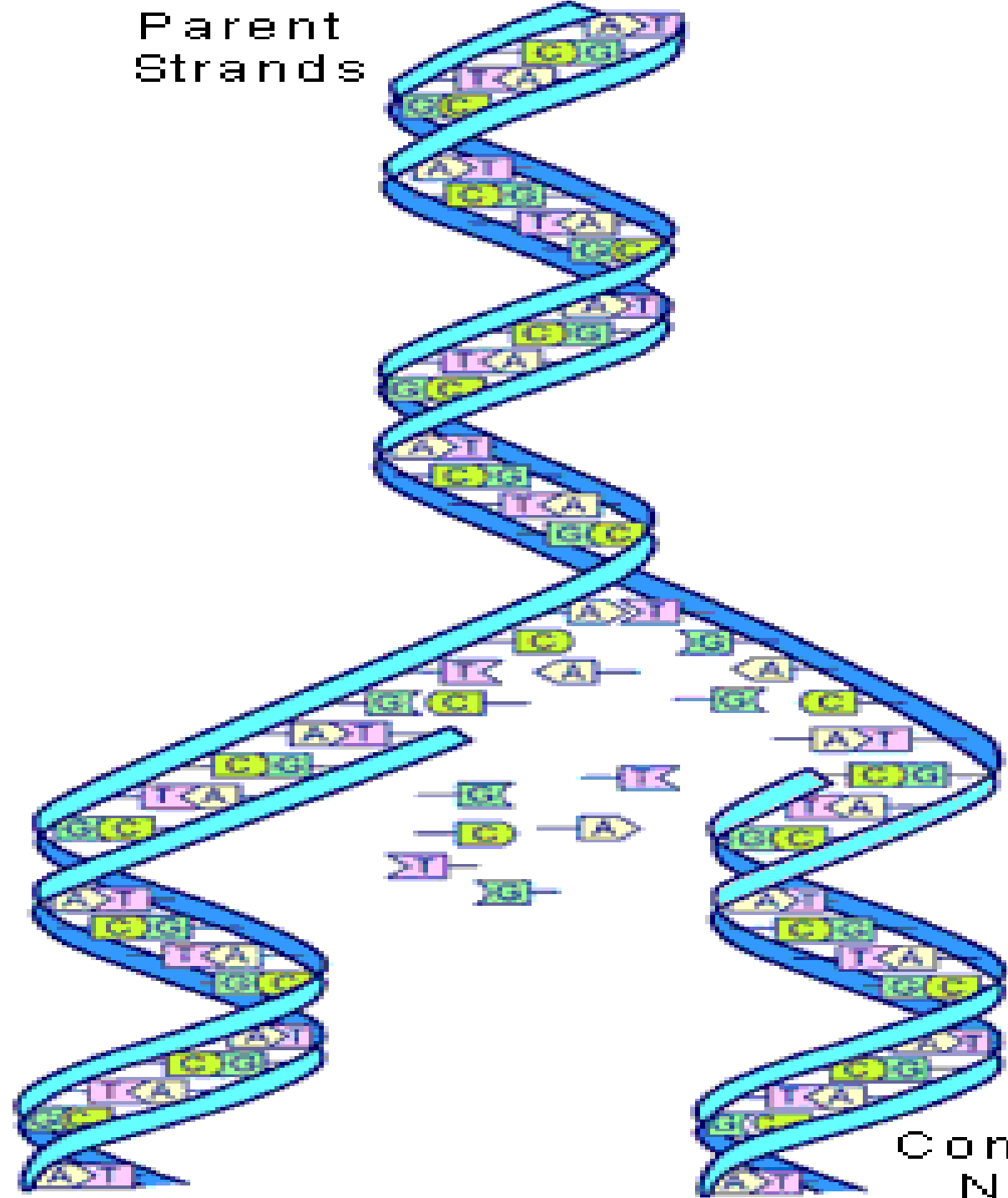
CELLULAR SENESCENCE

TELOMERES

Telomeres form specialised ends of chromosomes

With every round of replication there is progressive erosion of telomere sequence

Parent Strands



Complementary New Strands

SENESCENT TISSUE?



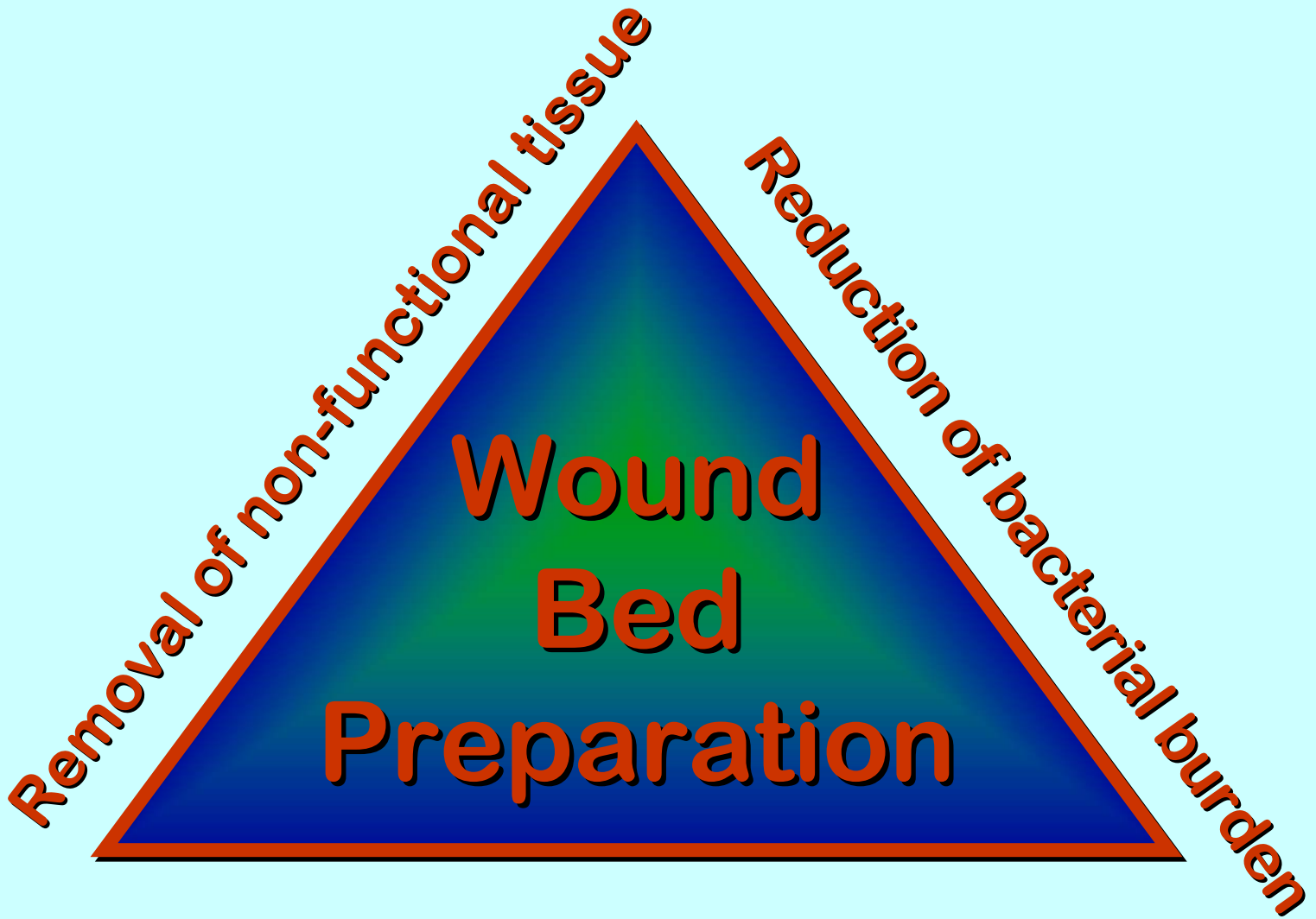
Senescent Wound Cells

- **Senescent** cells do not respond well to either endogenous or exogenous growth factors in the wound milieu
- Wounds open for extended periods of time are more likely to have **senescent** cells
- Sharp debridement removes **senescent** cells

WOUND BED PREPARATION

SUMMARY:

- Debride the wound bed
- Reduce levels of matrix metalloproteinases
- Remove necrotic & senescent cells
- Reduce bacterial contamination

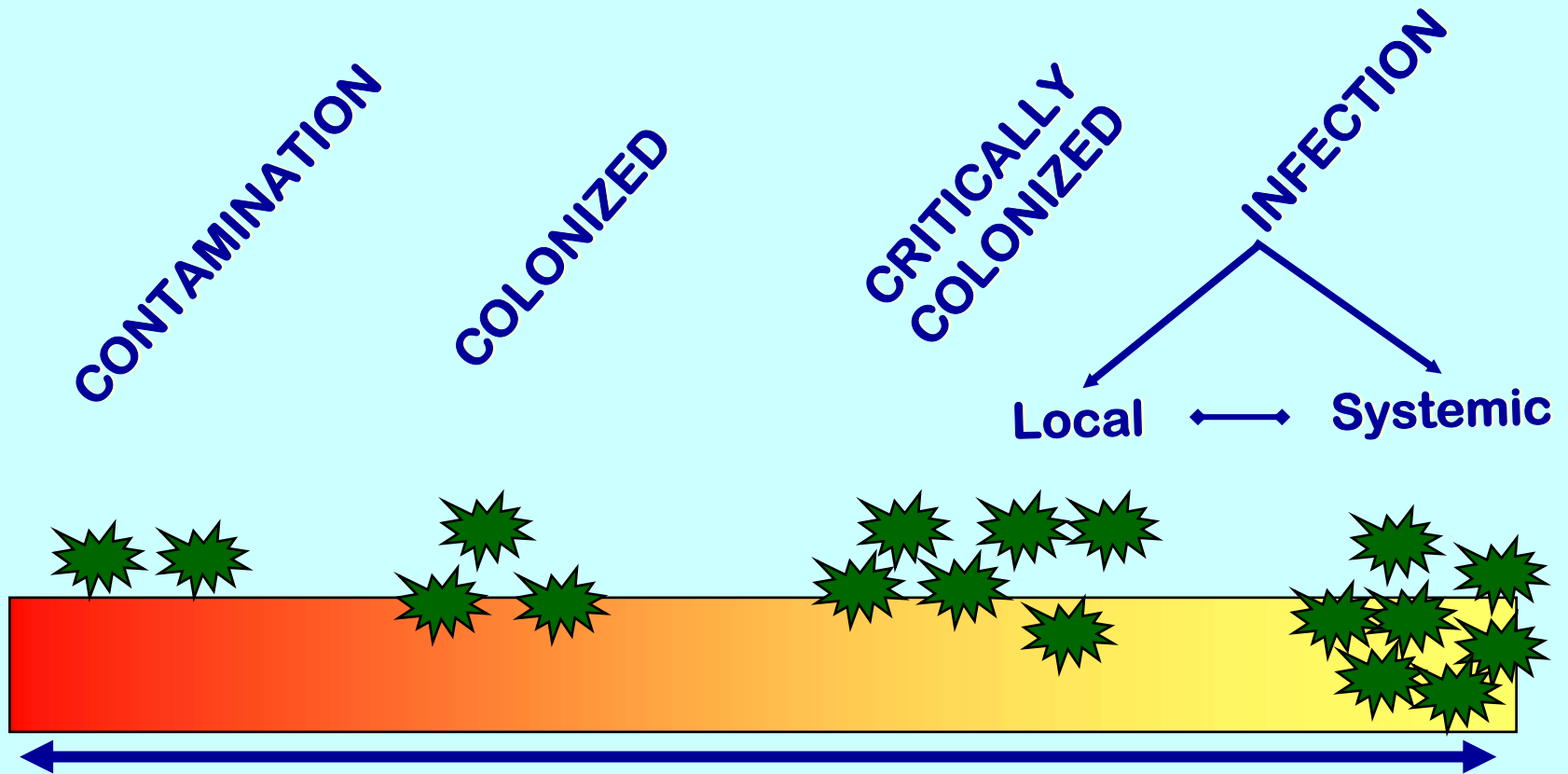


Factors Contributing to Increased MMP Levels & Prolonged Inflammatory Response

- **Ongoing bacterial contamination**
- **Repeated Trauma**
- **Ischemia**

BACTERIAL BURDEN

Contamination - Infection Continuum



BACTERIAL BURDEN

**“The dream of every Bacterium is
to
become two Bacteria”**

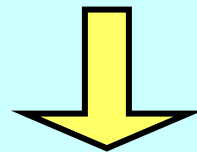
Francois Jacob (1960)

Clinical Presentation

Acute Wound
Infection
or
Acute on
Chronic Wound
Infection



Advancing erythema
Fever
Warmth
Oedema/Swelling
Pain
Purulence



“Classic” Signs & Symptoms

Clinical Presentation

Critically Colonized

-

↑ Bacterial Burden

-

Local

Wound Infection

Delayed healing

Change in color of wound bed

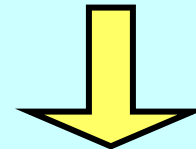
Friable granulation tissue

Absent or abnormal granulation tissue

↑ or abnormal odor

↑ serous drainage

↑ pain at wound site



“Secondary” Signs & Symptoms

Cutting & Harding (1994)

Gardner, Frantz & Doebbeling (2001)

“THE VALIDITY OF THE CLINICAL SIGNS AND SYMPTOMS USED TO IDENTIFY LOCALIZED WOUND INFECTION”

- “Traditional” signs & symptoms need not be present for local wound infection to be present in chronic wounds.
- Quantitative tissue biopsy demonstrated that “secondary” signs & symptoms occurred more often than “classic” in chronic wound infections.
- No single sign or symptom is 100% sensitive suggesting that none should be considered crucial or necessary to identify a chronic wound infection.
- **Increasing pain and wound breakdown considered sufficient to identify a chronic wound infection.**

WOUND BED PREPARATION

DEBRIDEMENT

AUTOLYTIC

ENZYMATIC

MECHANICAL

CHEMICAL

BIOLOGICAL

SHARP

SHARP DEBRIDEMENT

removes **biofilm** created by bacteria.

Biofilm created by bacteria make organisms resistant to most topical treatments.

WOUND BED PREPARATION

“There is still a large school of thought which says that one of the essentials in chronic ulcer care is to sterilise the ulcer surface.

There is no evidence to support this concept.”

David Leaper FRCS

Role of Sharp Debridement

- Removes senescent cells, necrotic tissue and foreign bodies ^{1,2}
- Decreases bacterial burden ^{1,3}
- Stimulates normal healing cascade¹

1. Steed DL, et al. J Am Col Surg, 1966

2. Consensus Development Conference on Diabetic Foot Wound Care:ADA 1999

3. Robson MC et al, Clin Past Surg 1990

Recalcitrant Sacral Pressure Ulcer





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WOUND BED PREPARATION

**Don't wait for a light to appear at
the end of the tunnel,**

Stride down there....

And light the bloody thing yourself!”

Sara Henderson

WOUND BED PREPARATION

HEALING TIME:

- **Initial healing rates (at 4 wks) predict overall healing rates at 12 weeks for diabetic foot ulcers^{1,2}**
- **No reduction in size in diabetic foot ulcers after one month of good care predicts non healing**

1. Kanto J, Margolis DJ. Arch Dermatol 1998.

2. Falanga V, Saboliniski M. Wounds 2000.

Bioengineered Tissue

- **Epidermal grafts**
 - autographs
 - allografts
- **Dermal Replacements**
 - acellular (Alloderm®), Integra®)
 - cellular (Dermagraft®)
- **Composite grafts**
 - bilayered skin equivalents (Apligraf®)

Wound Bed Preparation – Bioengineered Tissue

- **Sharp debride** the wound bed (wound bed excision)
- Reduce levels of matrix metalloproteinases
- Remove senescent cells
- Reduce bacterial contamination

WOUND BED PREPARATION

QUESTION?????

**IF YOU ARE A WOUND MANAGEMENT
CLINICIAN....**

HOW OFTEN DO YOU DEBRIDE WOUNDS?

**DO YOU HAVE HIGH LEVEL DEBRIDING
SKILLS?**