# Medications for surgery department

# Wound treatment

The types of wounds, principles of treatment and preparations

# Wound types

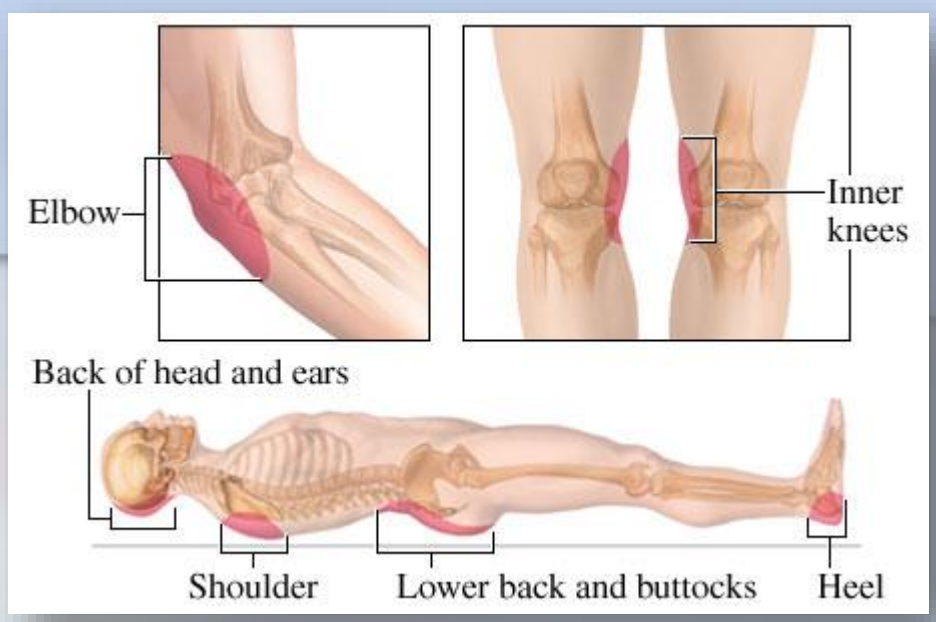
- Wounds
  - acute (trauma; surgery)
  - chronic (slower healing because of malnutrition, infection, immunodeficiency, diabetes
  - flesh wounds (skin tissue damage)
  - deep wounds (dermis tissue damage, subcutaneous tissues, muscles and bones)
  - laceration

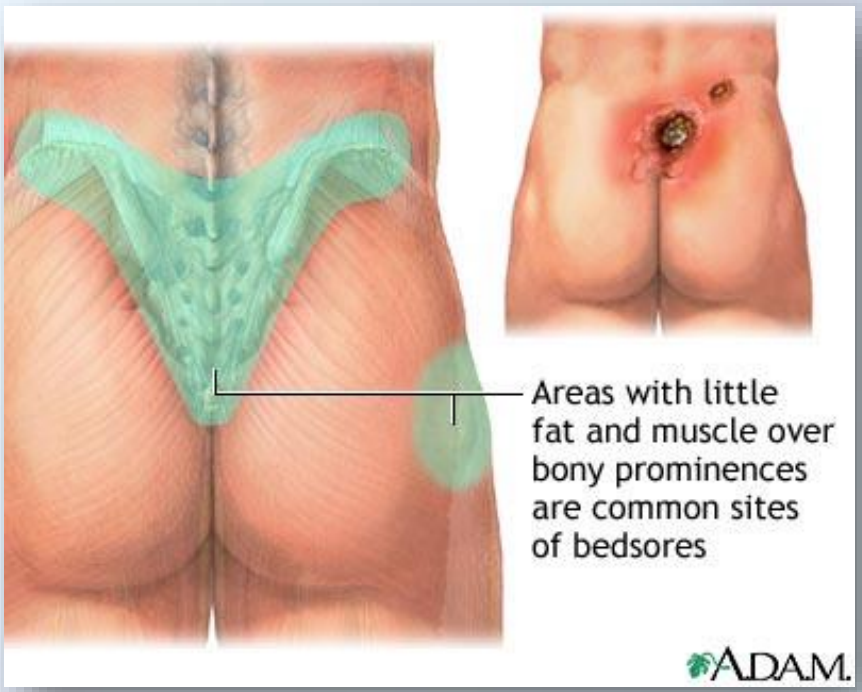
# Wound types

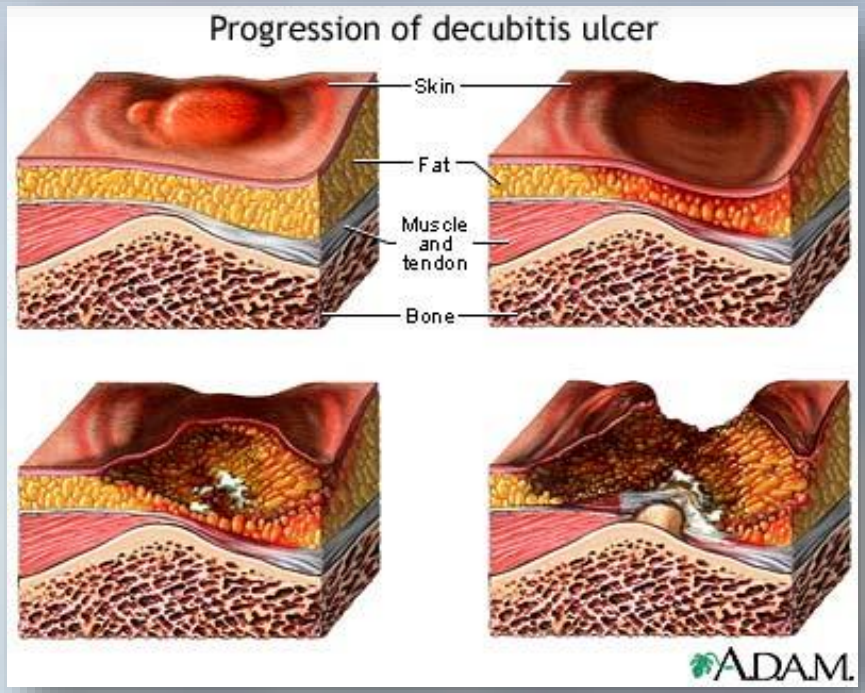
Ulcers

- Arterial (caused by poor blood circulation)
- Venous (induced edema or a weakened outflow of venous blood)
- Diabetic
- Bedsores - (caused by poor blood circulation due to pressure)

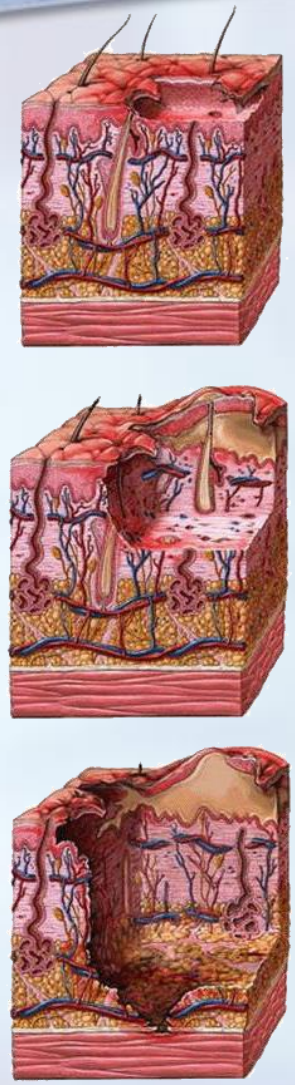
# Bedsores


Elbow
Inner knees
Back of head and ears
Shoulder
Lower back and buttocks
Heel


Areas with little fat and muscle over bony prominences are common sites of bedsores
A.D.A.M.


Progression of decubitis ulcer
Skin
Fat
Muscle and tendon
Bone
A.D.A.M.

# Wound types



- Burns
  - 1. degree (surface)
  - 2. degree (partial skin destruction)
  - 3. degree (subcutaneous tissue)
  - 4. degree (muscle, bone)

# Phases of Wound Healing

- Inflammatory - supply of blood cells in the wound, removing cellular waste, storage of hyaluronic acid
- Proliferation (growth phase), - input and division of connective cells, extracellular matrix formation
- Granulation – deposition of individual (random) fine collagen fibers
- Epithelization - splitting of fine collagen fibers and regular replacement of larger diameter fibers

# Classification (in terms of the setup)

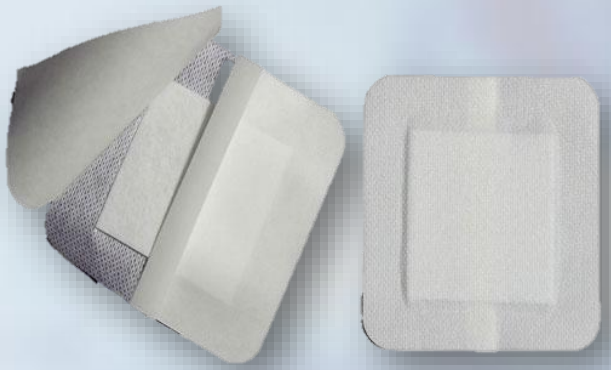
- Primary dressing - come into direct contact with the wound
- Secondary dressing - covering of the primary product
- Patches - consisting of a central part (generally containing absorbent) surrounded by an adhesive portion

# ABSORBING DRESSINGS

- Liquid absorption (exudate from the wound)
  - Conventional
  - Alginate and other natural or semisynth. polymers
  - Foam preparation
  - Superabsorbents
- Odor absorption
  - Active carbon preparation
  - others

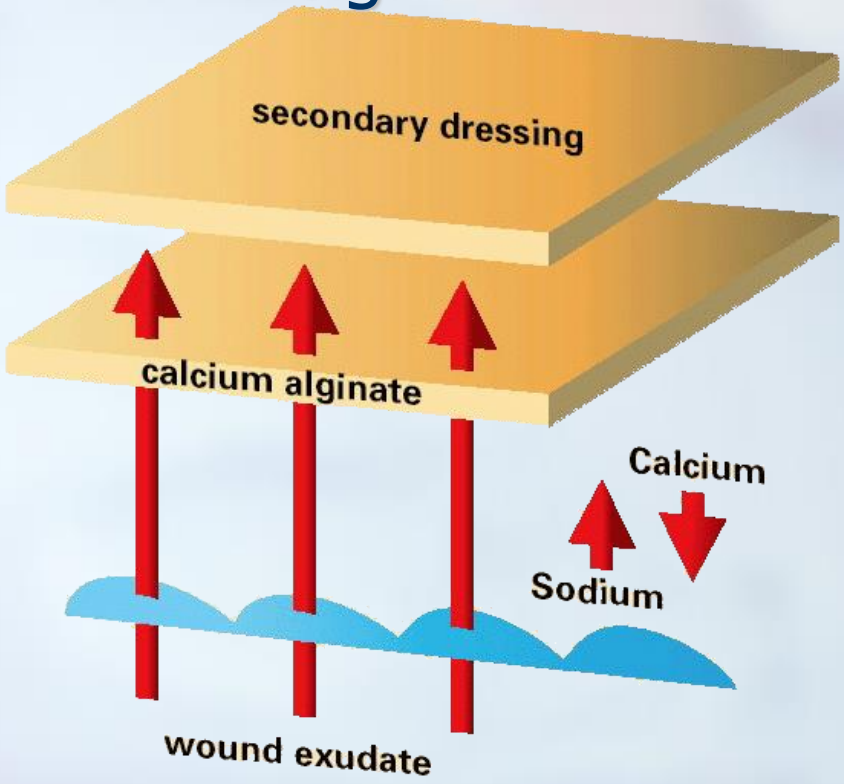
# Conventional preparations

- Gauze, wool, cellulose wadding
  - Natural and synthetic materials
  - They consist of two or more layers
  - used in case of a large amount of exudate
  - Both primary and secondary
  - Can have adhesive rim
  - Cheap



# Alginates

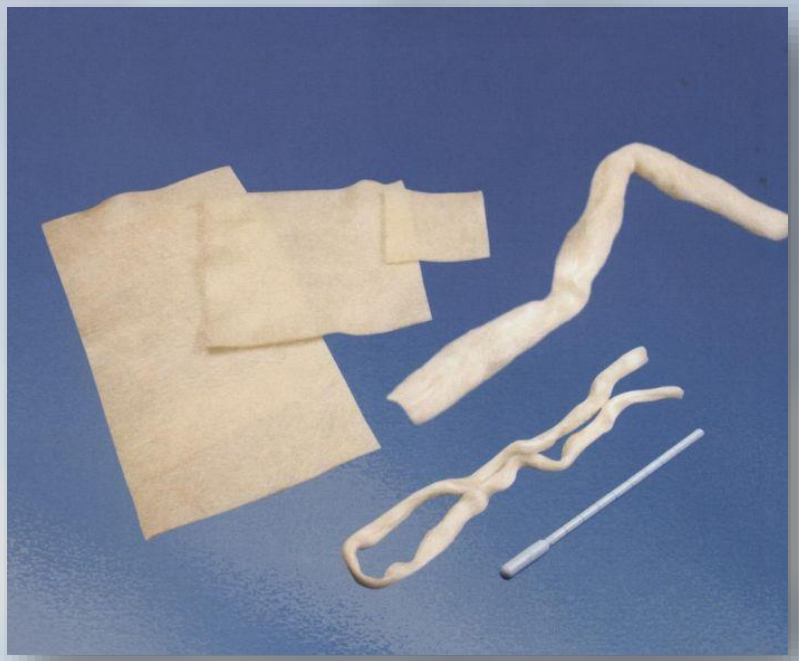
- They are made from brown seaweeds, they are capable of carrying up to 20-times their weight



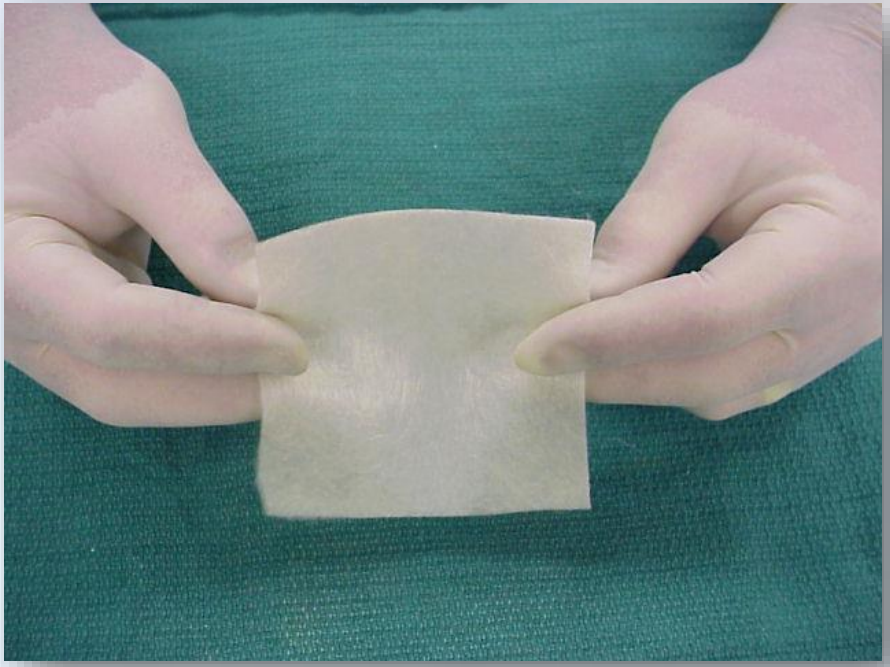

- supplied in the form of ropes, straps, pads, tampons and the like
- Mostly calcium alginate
- Changes exudate to gel
- the resulting gel forms a moist environment to facilitate healing
- Not suitable for dry wounds
- Needs secondary dressing

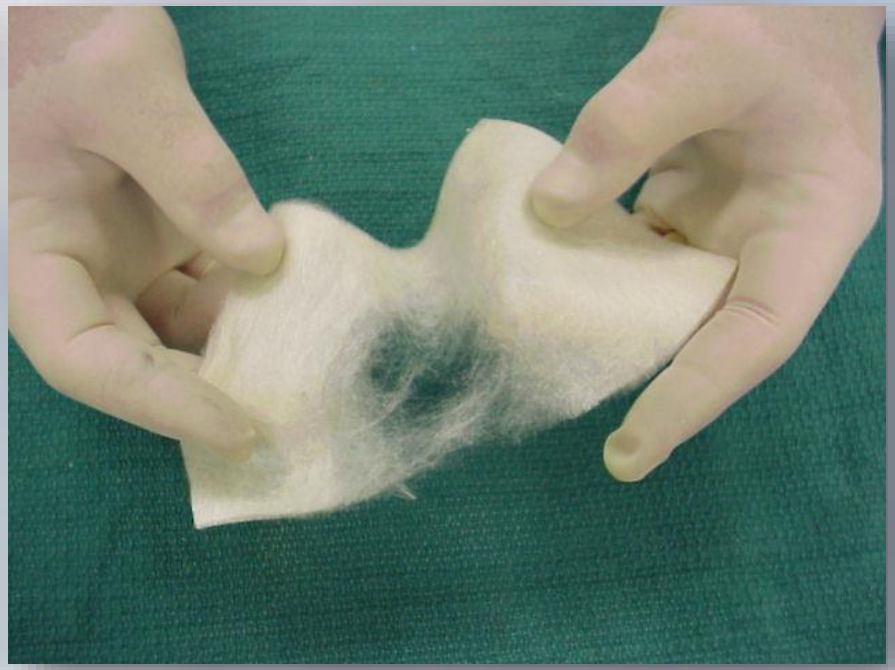
# Alginates


- SORBSAN with calcium alginate – various shapes and sizes
  - strings - into the cavernous wounds and cavities
  - pads, napkins- surface
  - biodegradable
  - after previous soaking (0.9% NaCl) the removal is easy and non-traumatic



# Alginates





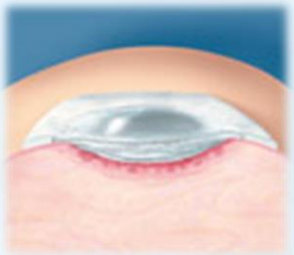
- Alginate preparation SORBSAN

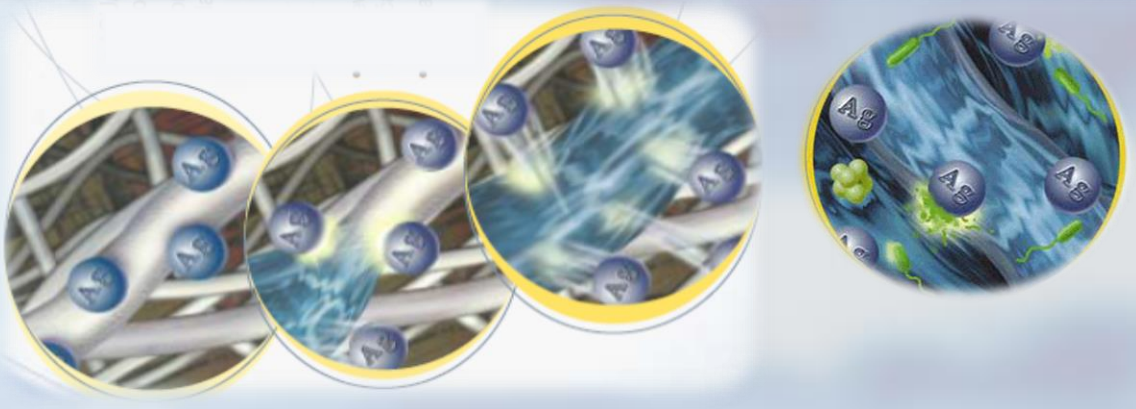
# Hydrocolloidal fibers (Hydrofiber)

- Aquacel – natrium carmelose
  - Changes exudate to gel
  - product keeps its shape even in gel form - easier removal
  - the resulting gel creates a moist environment to facilitate healing and immobilisation of microorganisms
  - Not suitable for dry wounds
  - Various shapes
  - Secondary dressing needed


# Hydrocolloidal fibers (Hydrofiber)

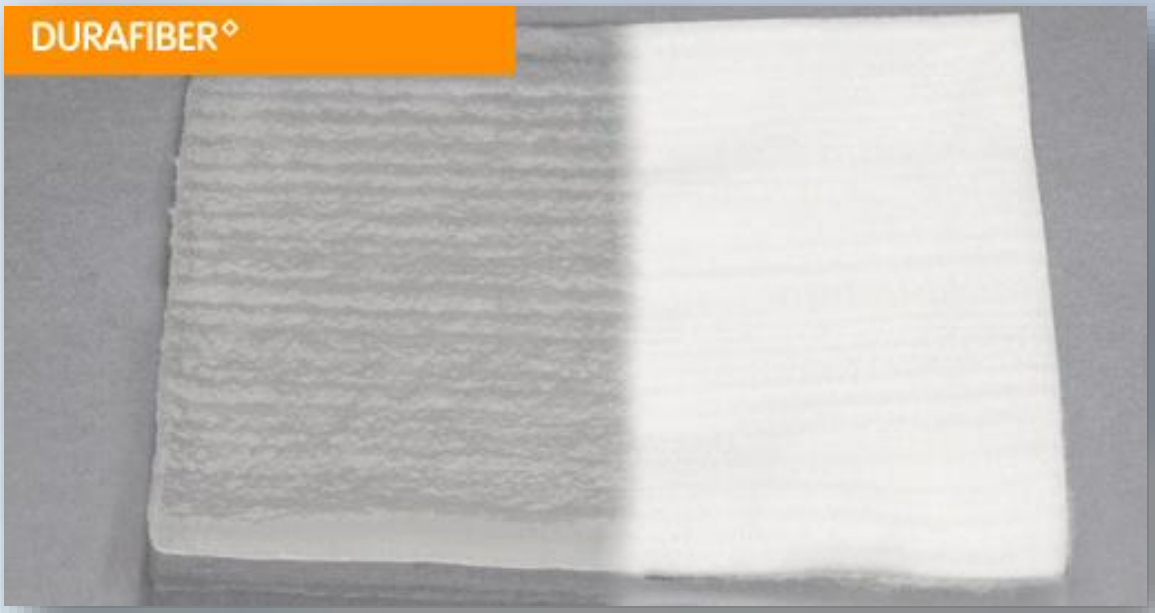
- Can be combined with antimicrobial agents (Aquacel Ag – silver ions, released after contact with exudate)





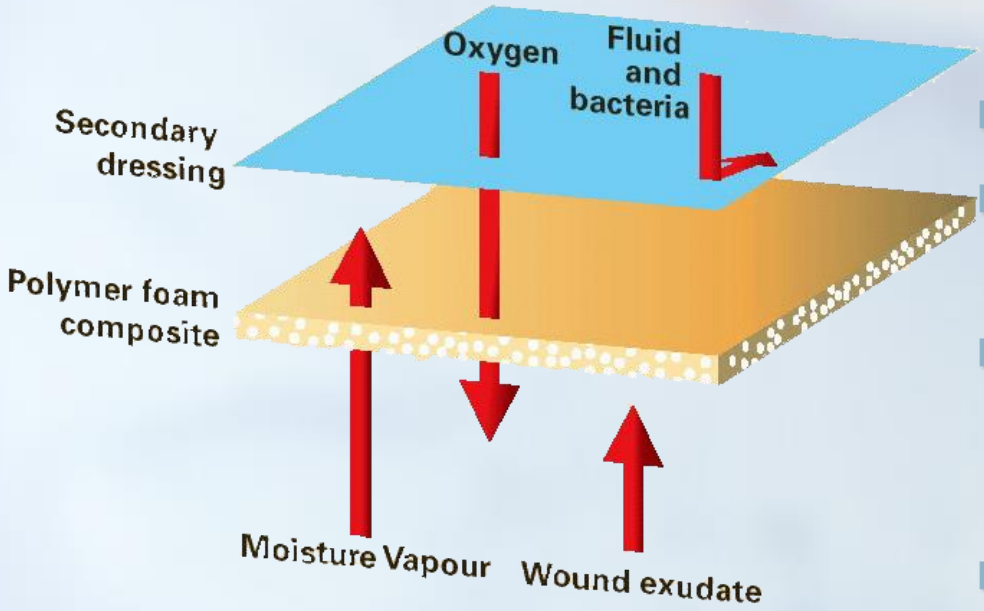
# Hydrocolloidal fibers (Hydrofiber)

- Durafiber – ethylsulfonate cellulose
  - gelation occurs only at locations where fluid is available (exudate)

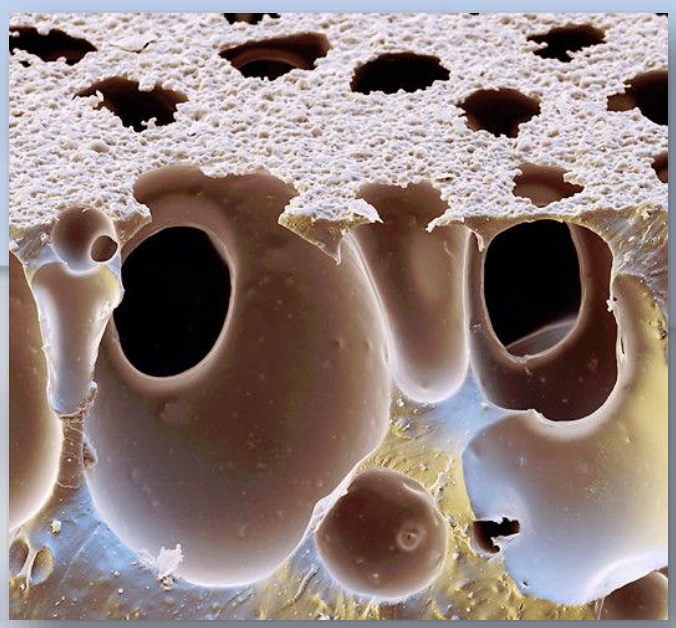
# Foam preparation

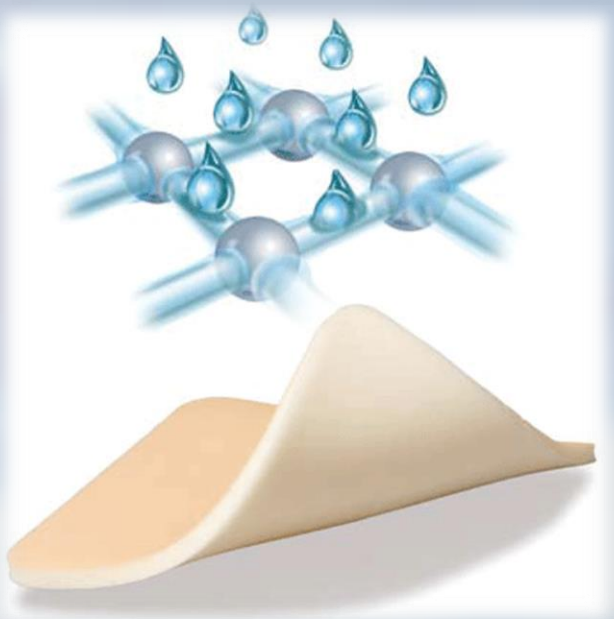
- Various polymers (very often polyurethan)



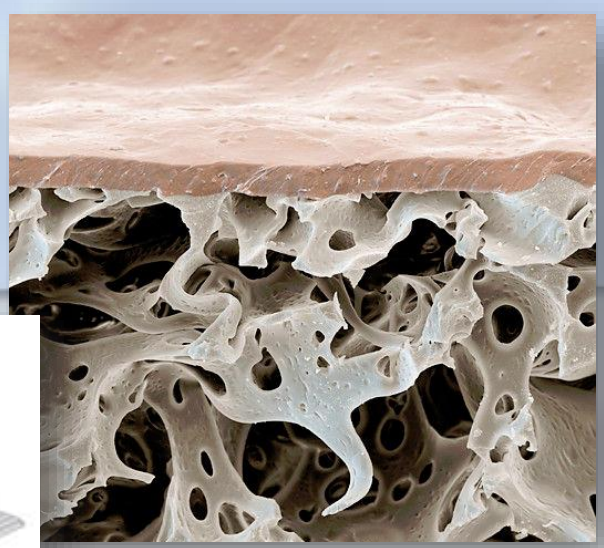

- Form: pads, tampons
- Permeable for oxygen, water vapour
- Not adhesive
- Isolating layer – keep constant temperature
- Absorbtion capabilities depend on material and pore size
- Suitable for surface wounds, tampons to cavities

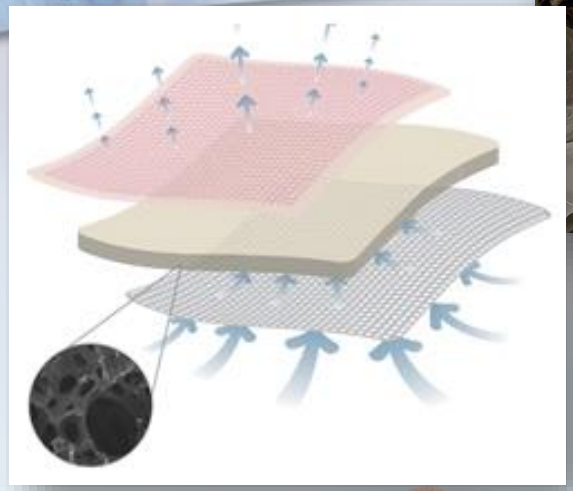
# Foam preparation

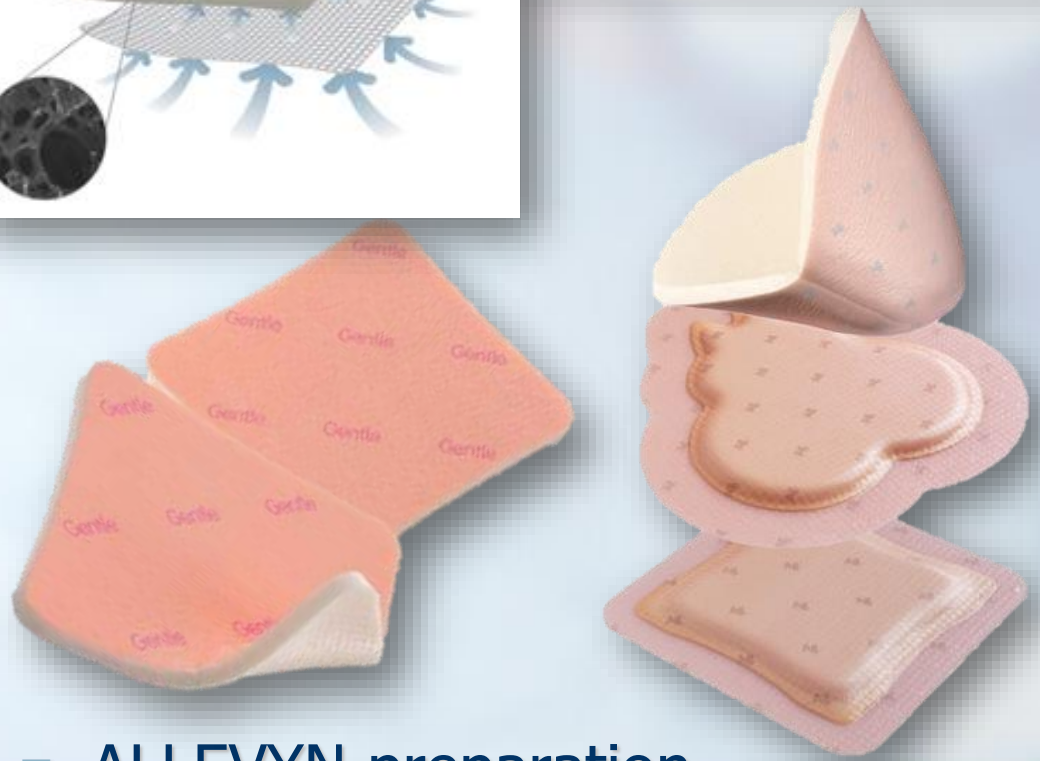




- structure







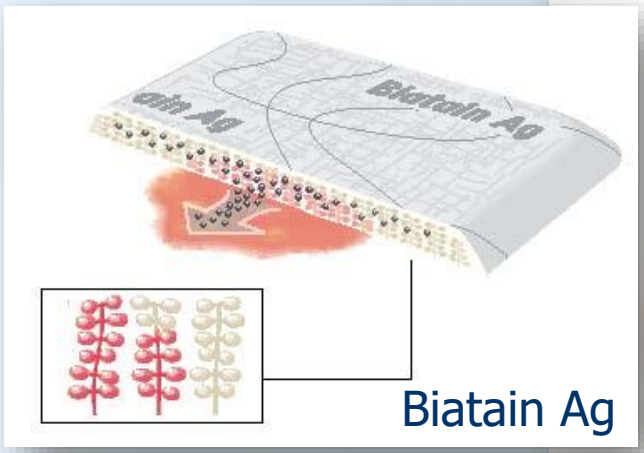
- ALLEVYN preparation

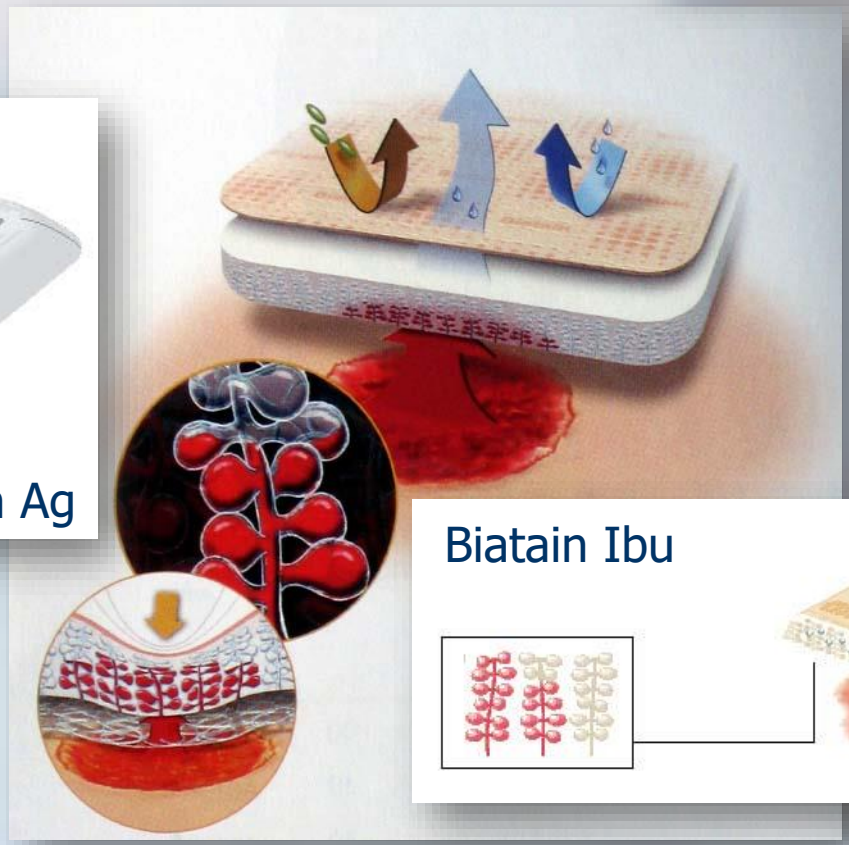
# Foam preparation

- ALLEVYN Cavity

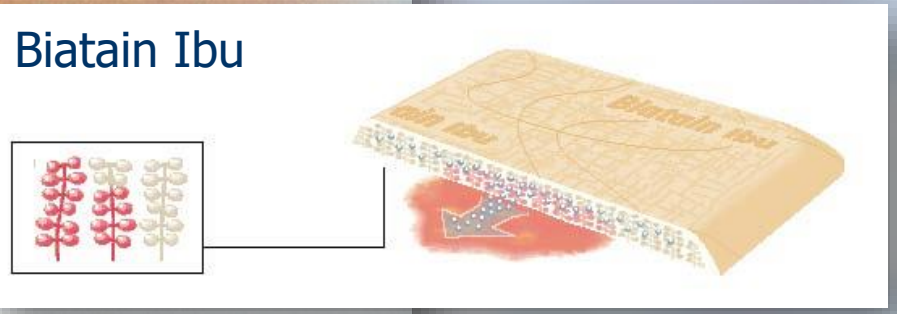
# Foam preparation

- Foam preparation BIATAIN



Biatain Ibu

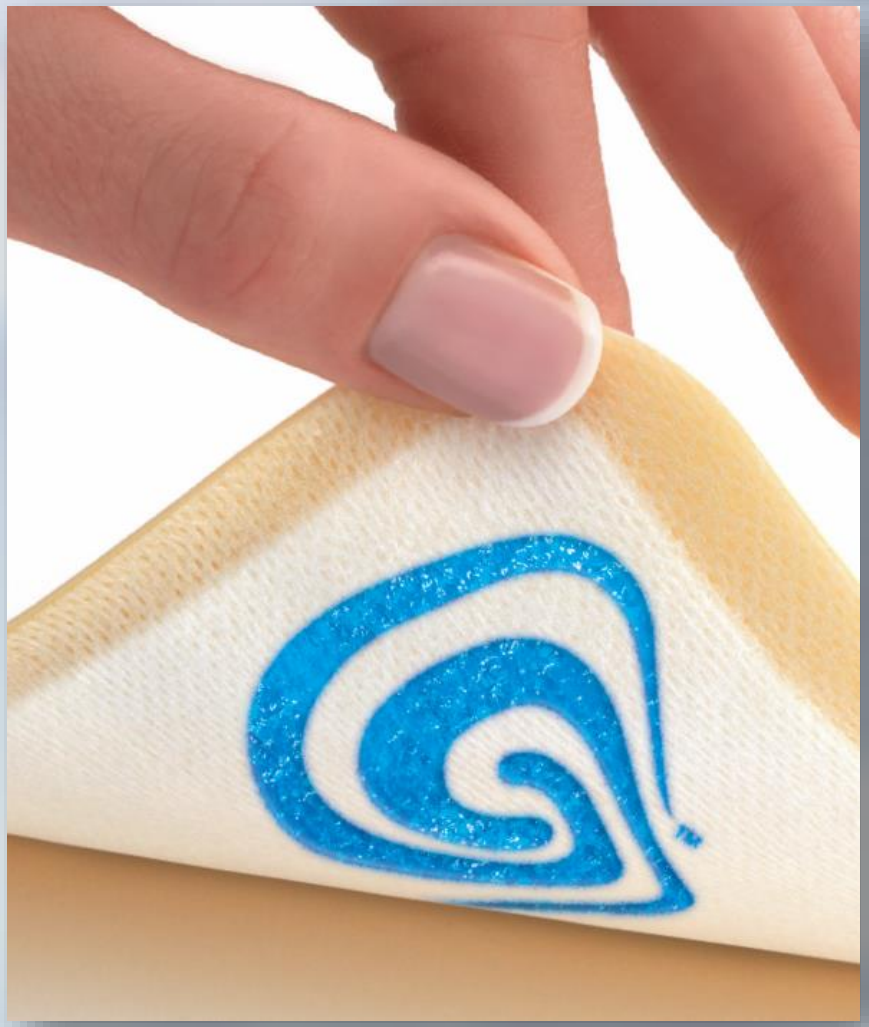


# Foam preparation

- Foam preparation application

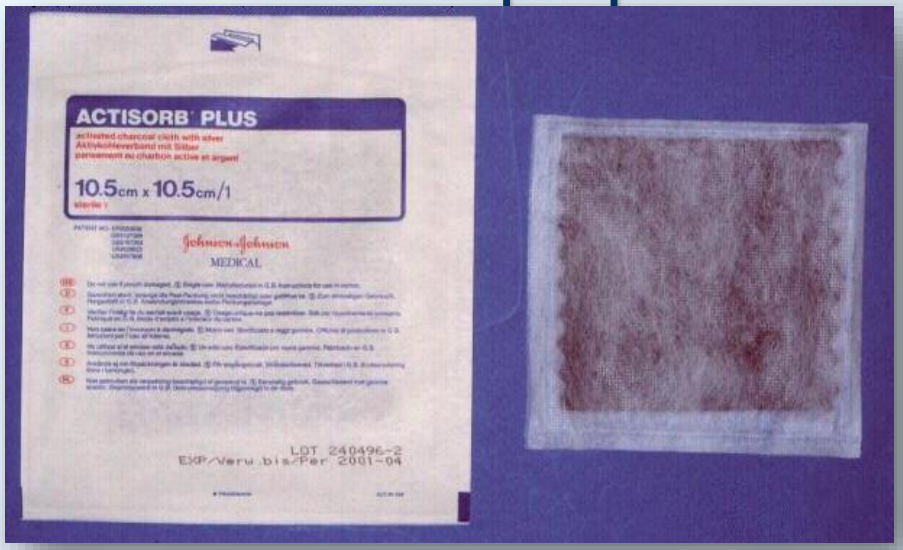
# Combined preparations

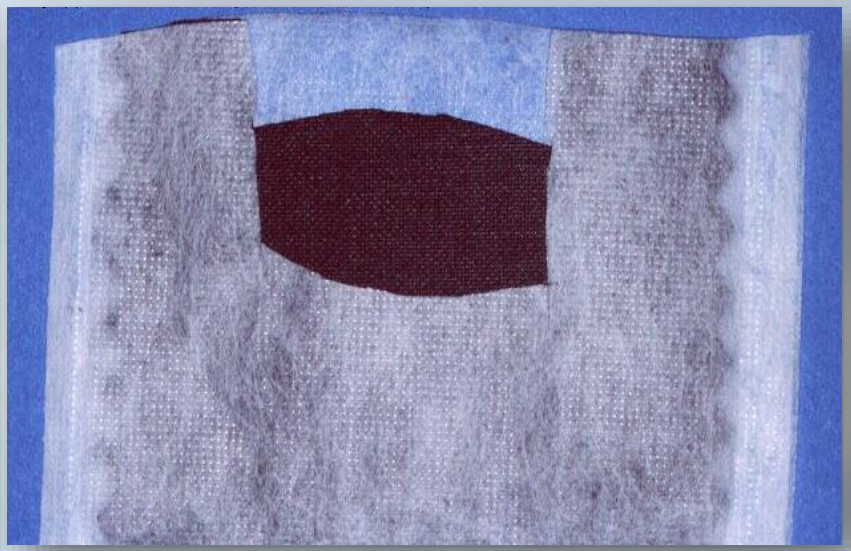
- Versiva XC – combination of NaCMC (hydrocolloidal fibres) a PU foams
  - Better fluid adhesion upon compression



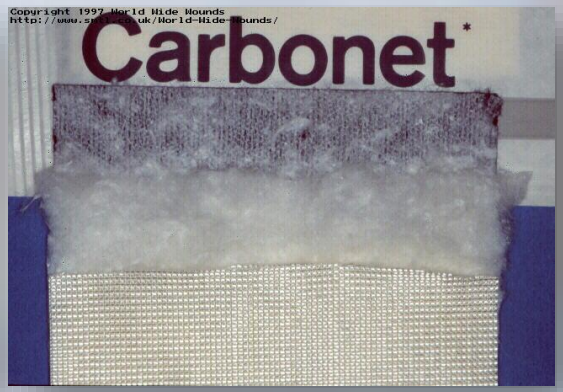
# Preparation with active carbon

- They have activated carbon, which after insertion into the wound absorbs toxins, degradation products, also volatile amines and fatty acids, responsible for the unpleasant odor
- form: fabric with bound carbon, powders, combined preparations

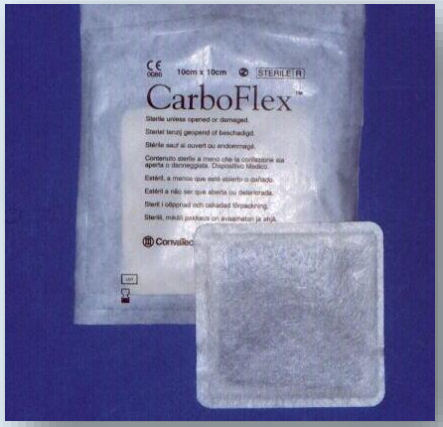


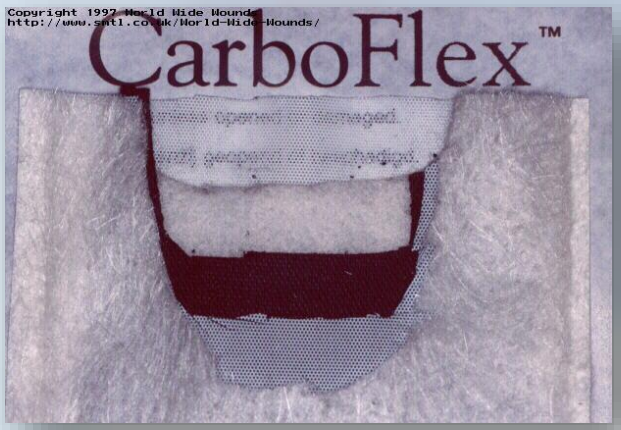



# Preparation with active carbon

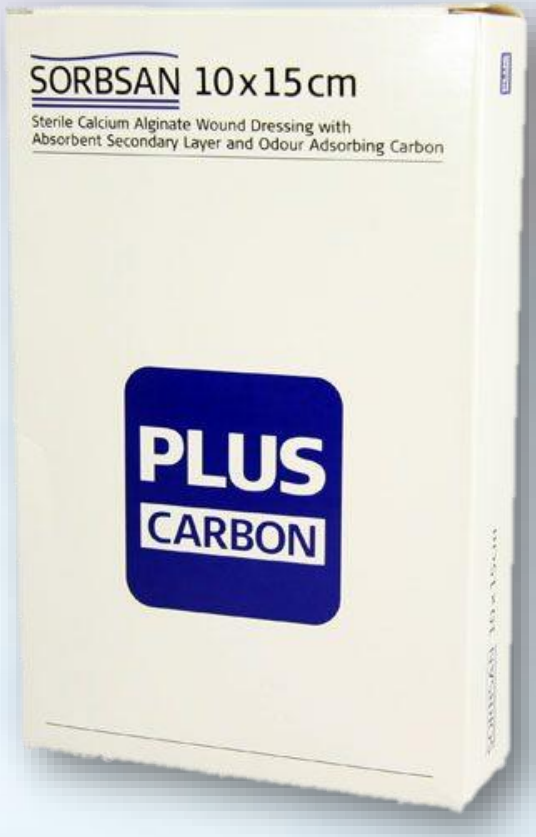

Combined preparation (coal, fibrous cellulose, PE - exudate and odor absorption)

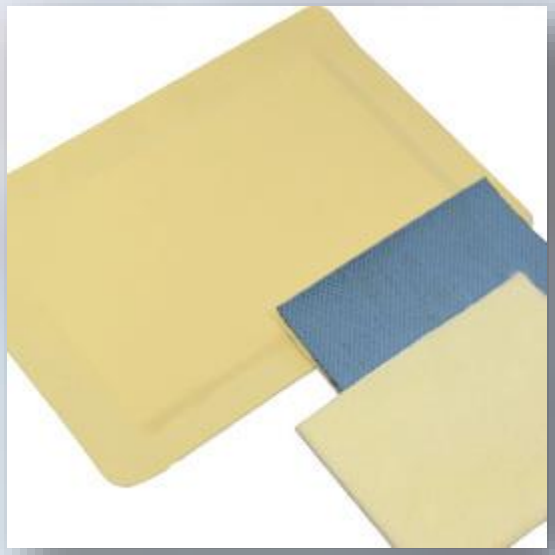


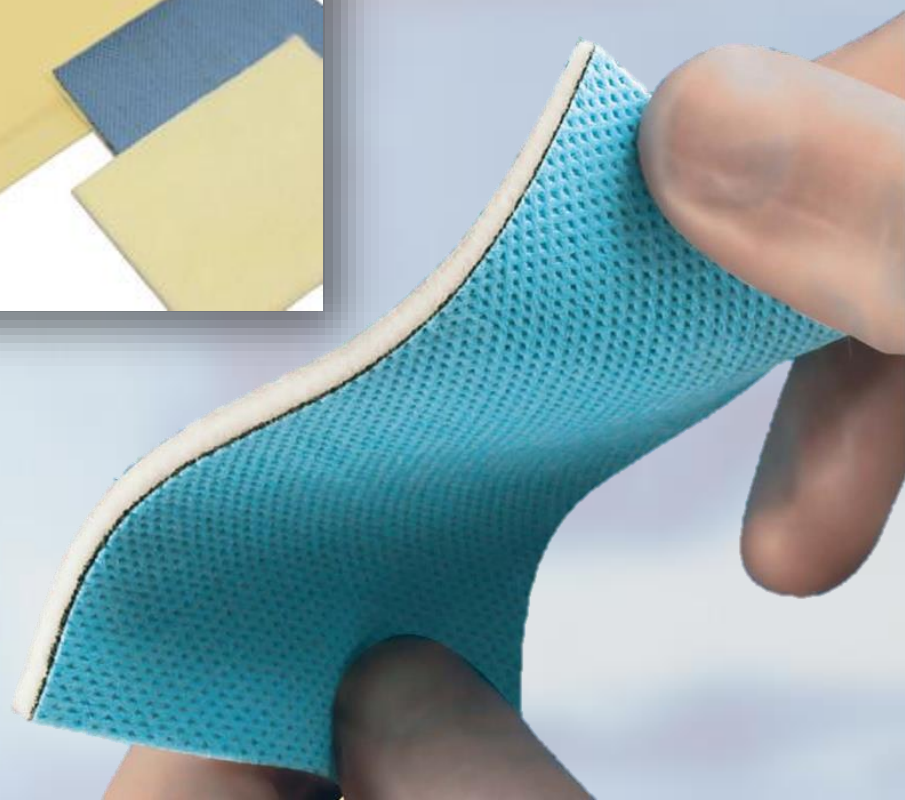




Combined preparation (coal, alginate, CMC - exudate and odor absorption)

# Preparation with active carbon



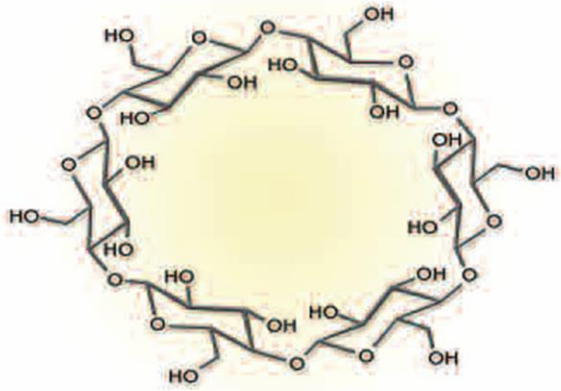





Combined preparation
Sorbsan Plus Carbon (alginate, carbon)

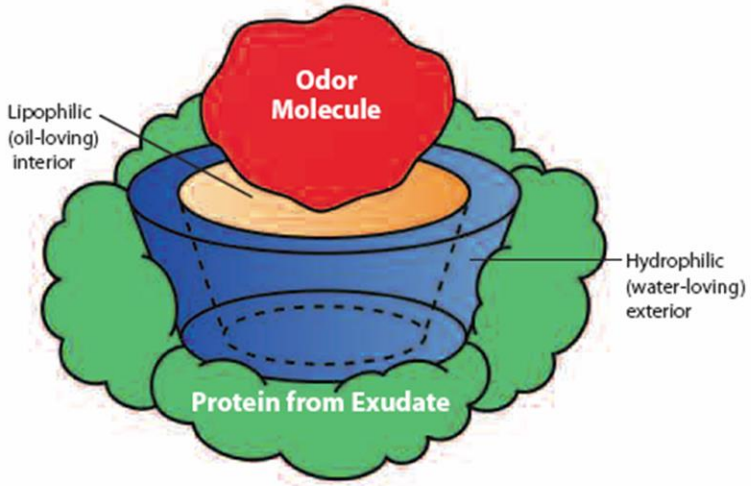
# Others

- Inactivation of odors using cyclodextrins
  - Exoderm Odor Shield - hydrocolloid (simultaneous absorption of exudate and odor)

Molecular structure: a ring composed of glucose units

3-D Shape: The lipophilic cavity attracts and traps odor-causing molecules. Serum protein binding to the outside wall stabilizes the cyclodextrin "bucket".



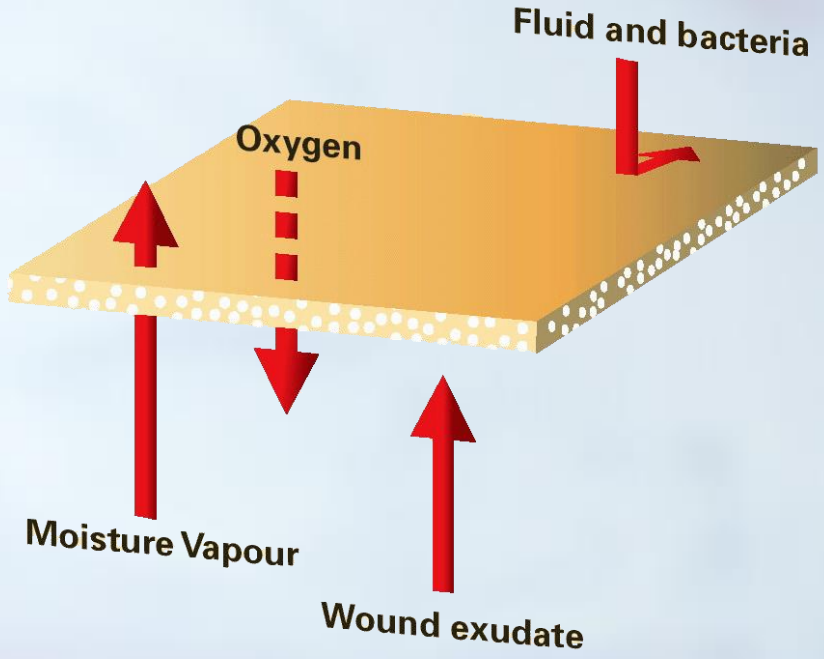

the absorption efficiency of unpleasant odor is not (unlike activated carbon) reduced by serum proteins

Creating a suitable microclimate in the wound; exudate absorption is not the primary purpose

# PREPARATIONS WITH ABSORBING PROPERTIES

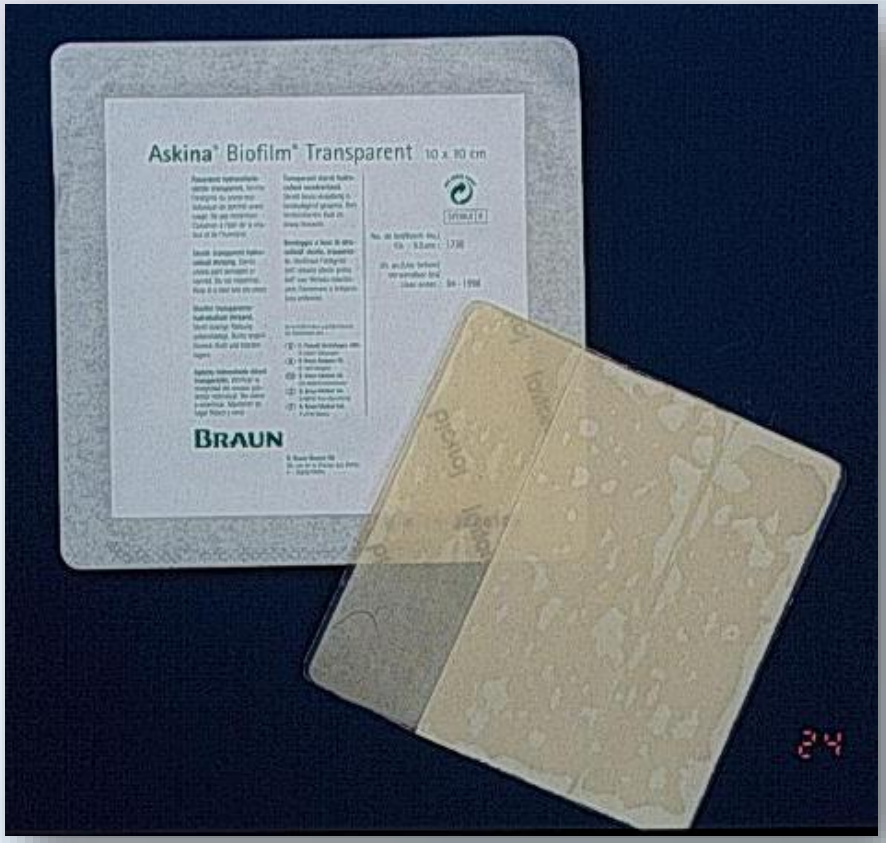
# Hydrocolloids

- They consist of hydrophilic polymers particles (CMC, gelatin), embedded into a carrier (another polymer, e.g. polyurethane); particles swell and absorb fluid slowly




- On wound surface non adhesive gel is created
- have mild occlusive properties, create conditions for moist wound recovery
- Form: pads, often with adhesive edge, may also exist in the form of pastes or powders

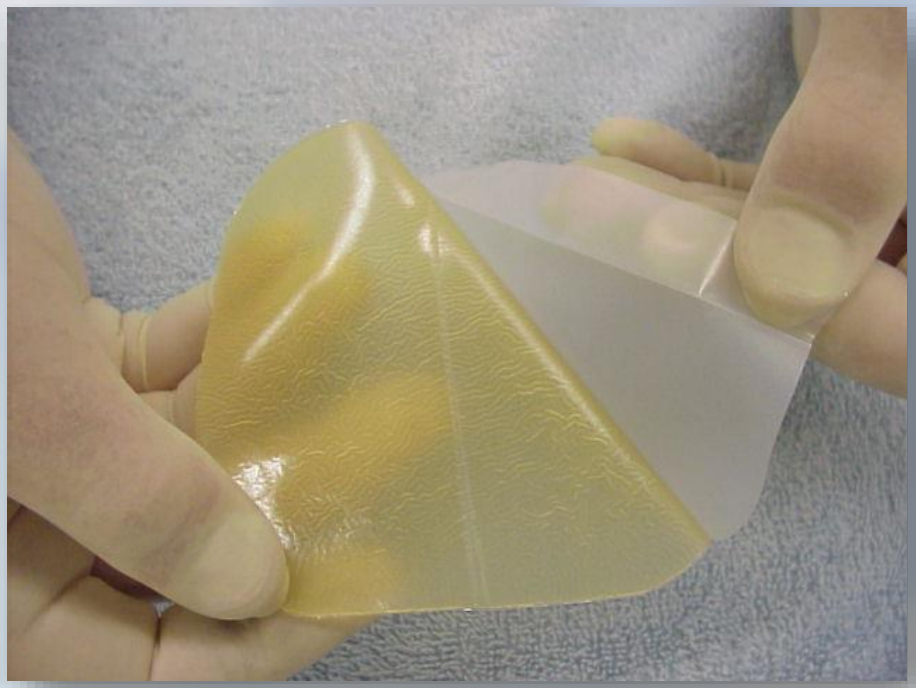
# Hydrocolloids




- Askina Biofilm Transparent


- Cutinova hydro

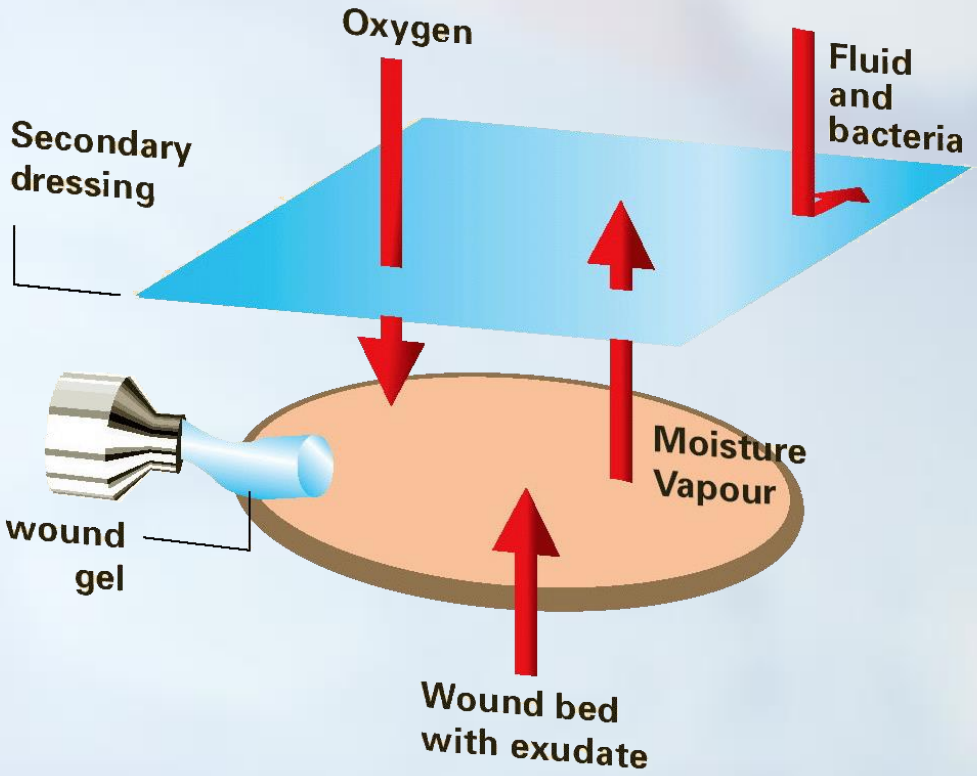
# Hydrocolloids



- DUODERM hydrocolloid

# Hydrogels

- Hydrofilic polymers containing some degree of water

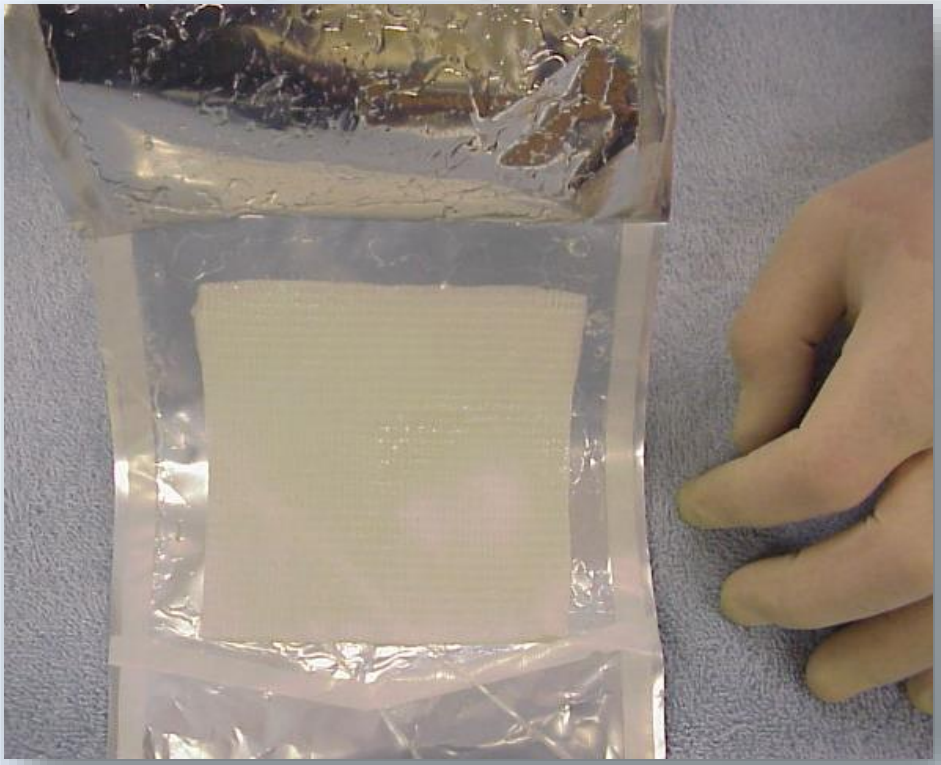



- Maintain moisture balance in the wound
- Exudate absorbed by gel
  - moisture is drained through a semipermeable film (secondary dressing)
  - May hydrate the wound
- allow easier removal of coatings
- Form: semi-solid preparations or various films and pads

# Hydrogels


- CURASOL

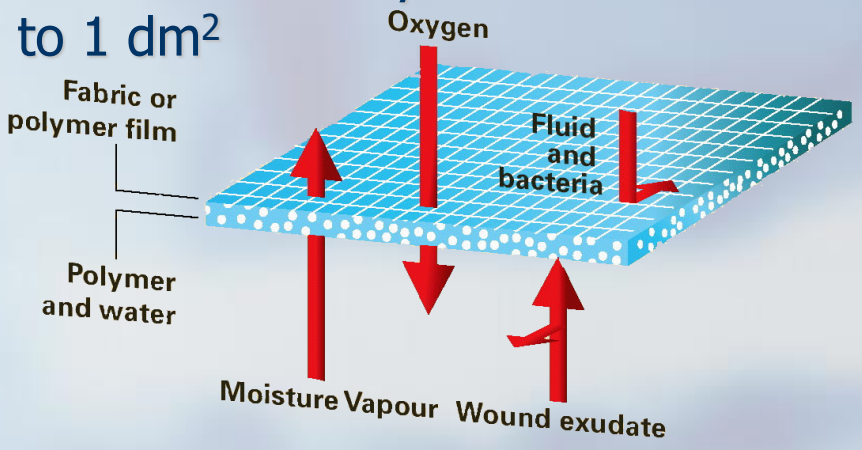
  Impregnated gauze



- CURASOL Gel, SoloSite, Intrasite Gel

# Hydrogels


- CICA-CARE – hydrogel dressing
  - composition of natural and synthetic polymers (PVP, PEG, agar) radiation crosslinked
  - thickness 3-4 mm
  - absorbtion ability 20 ml of secret to 1 $dm^2$

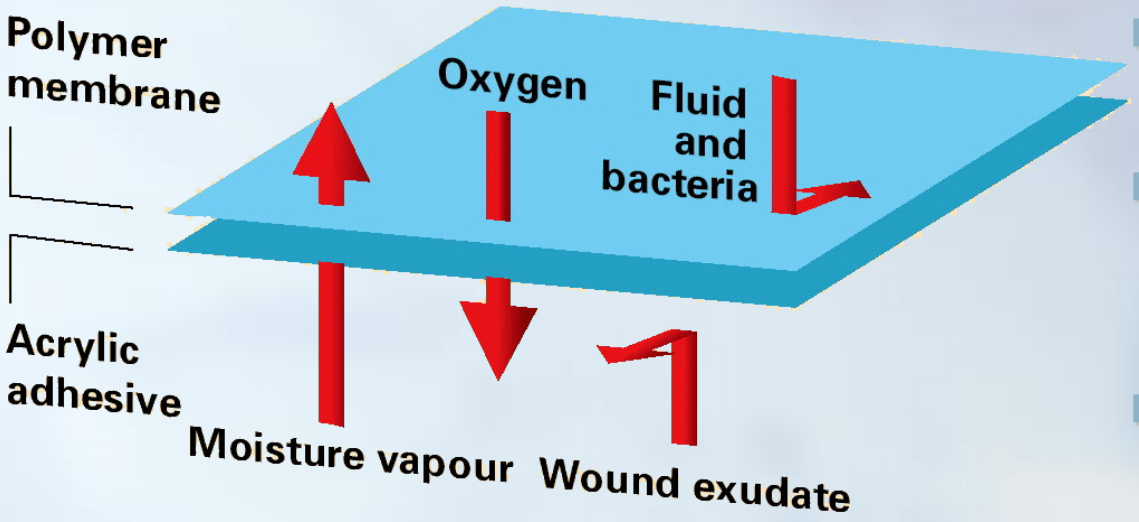


Film preparation

# COVERING DRESSING DEVICES

# Polymer films

- Semipermeable transparent products intended primarily for superficial wounds or to cover transplants



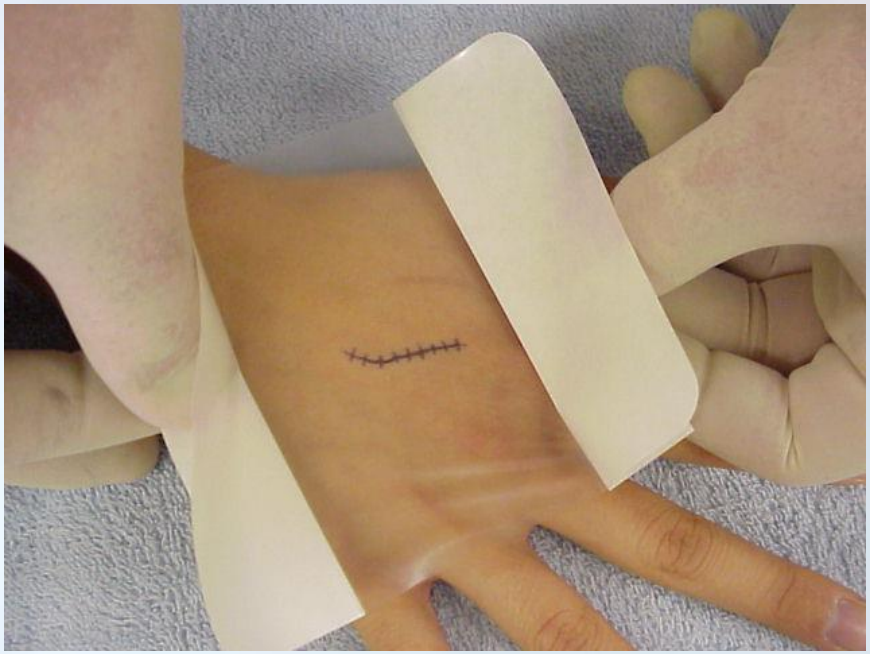

- Do not have absorbtion properties
- Permeable for water and oxygen
- Great protection against microorganisms
- Exchanged once per 4-5 days
- Relatively cheap

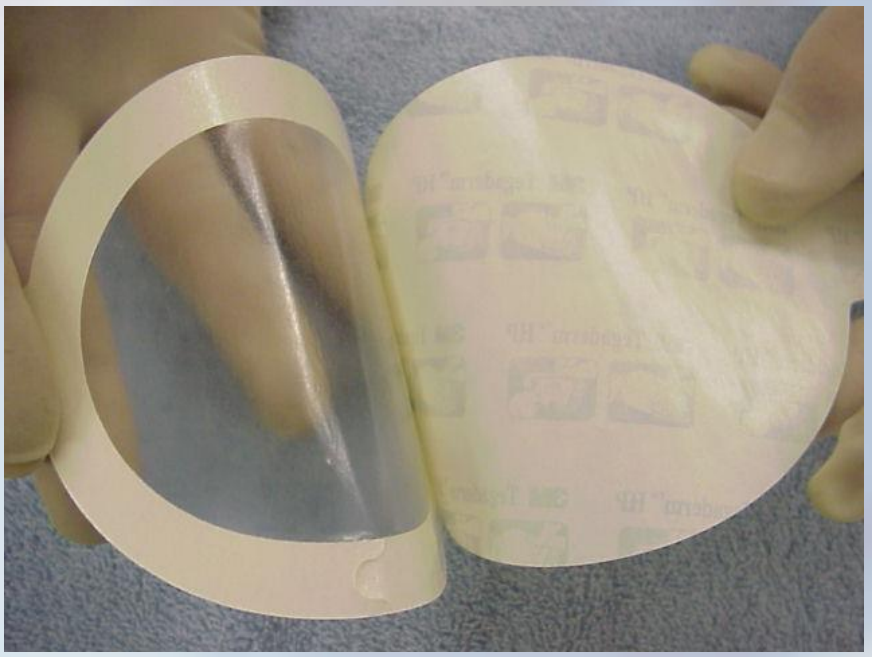
# Polymer films


- Tegaderm


- BLISTERFILM

# Polymer films





# NON ADHESIVE
# NON TRAUMATIC PREPARATIONS

# Non adhesive preparations

- Preparations non-adherent to the wound, but requiring additional coverage or adhesive edge, which can be harmful to the skin during removing
  - Vaseline preparations, w/o emulsion preparation
- Silicone preparation – non adhesive do dry surface, sticking to dry surface

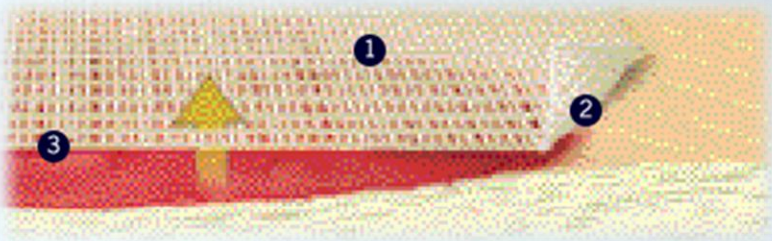
# Non adhesive preparations

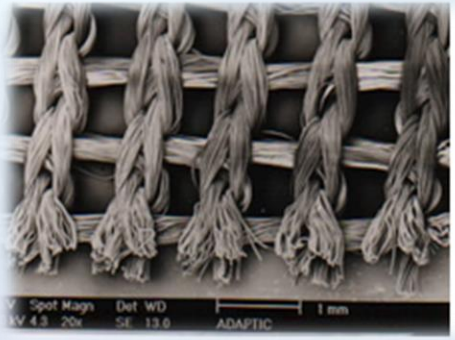


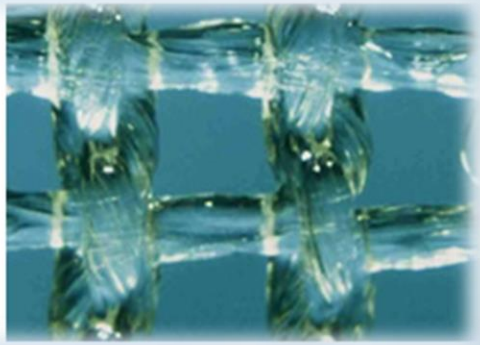
- JELONET - tulle fabric impregnated with white vaseline
- CURITY – cloth impregnated with a W/O emulsion

# Non adhesive preparations

- ADAPTIC ™ - cellulose acetate cloth impregnated with vaseline emulsion W/O
  - Minimal adhesion
  - Lint-free cloth



# Non adhesive preparations

**Tylexol (non adhering dressing)**

**English: Tulle Gras**

Vaselinum flavum 200,0

Et adde

Tulle 3,0 m

Sterilisetur!

Ad manus medici

D.S. Tulle Gras

# Non adhesive preparations

**Tulle gras with epithelization effect**

| | |
|---|---|
| Chamomil. Extr. Fluid. | 2,0 |
| Vitamin AD gtt. | 20 ml |
| Vaselinum flavum | ad 200,0 |
| Et adde | |
| Tulle | 3,0 m |
| Sterilisetur! | |
| Ad manus medici | |
| D.S. Tulle Gras | |

# Non adhesive preparations

- Silicone preparations
  - are non-adherent to moist surfaces (wound)
  - adhering to the dry surface (skin around the wound), but does not create the connection, therefore it is very easy to remove and non-traumatic
  - Repulsing water, protecting against maceration
  - Do not have absorbent properties, therefore, the silicone layer in contact with the wound is perforated and allows drainage of exudate into the absorbent layer above
  - Independent or combined dressing

# Non adhesive preparations

- Mepitel® - transparent perforated nylon fabric coated with a soft silicone

# Non adhesive preparations

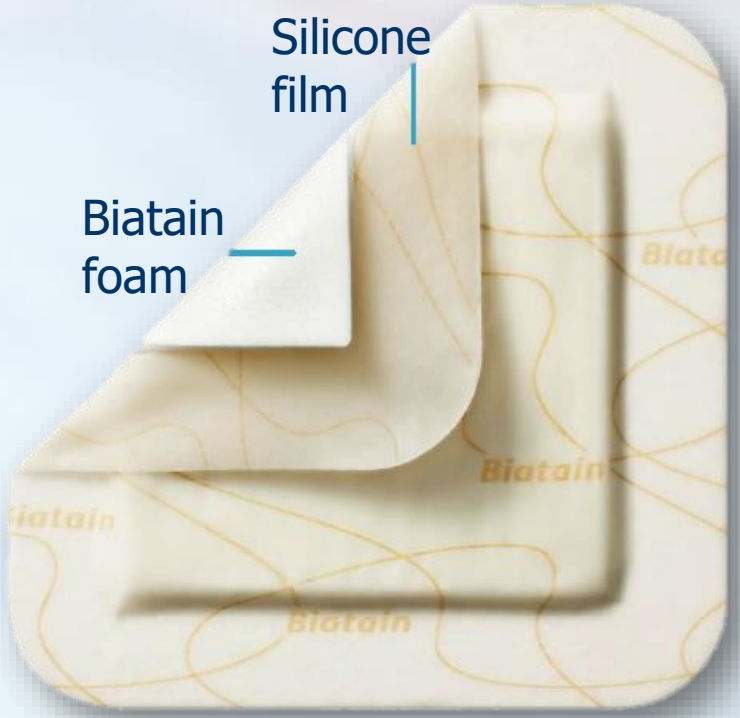
- Mepitac – soft silicone strip
  - Safetac technology

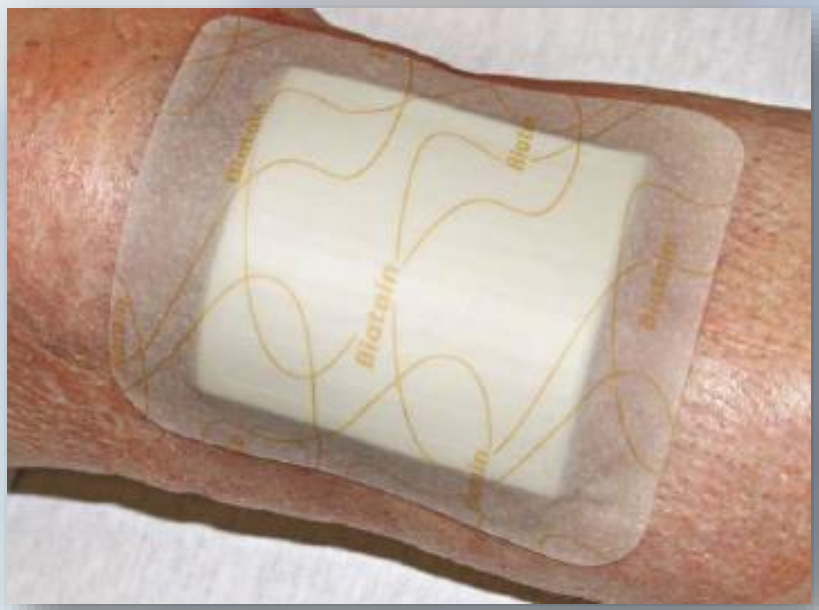


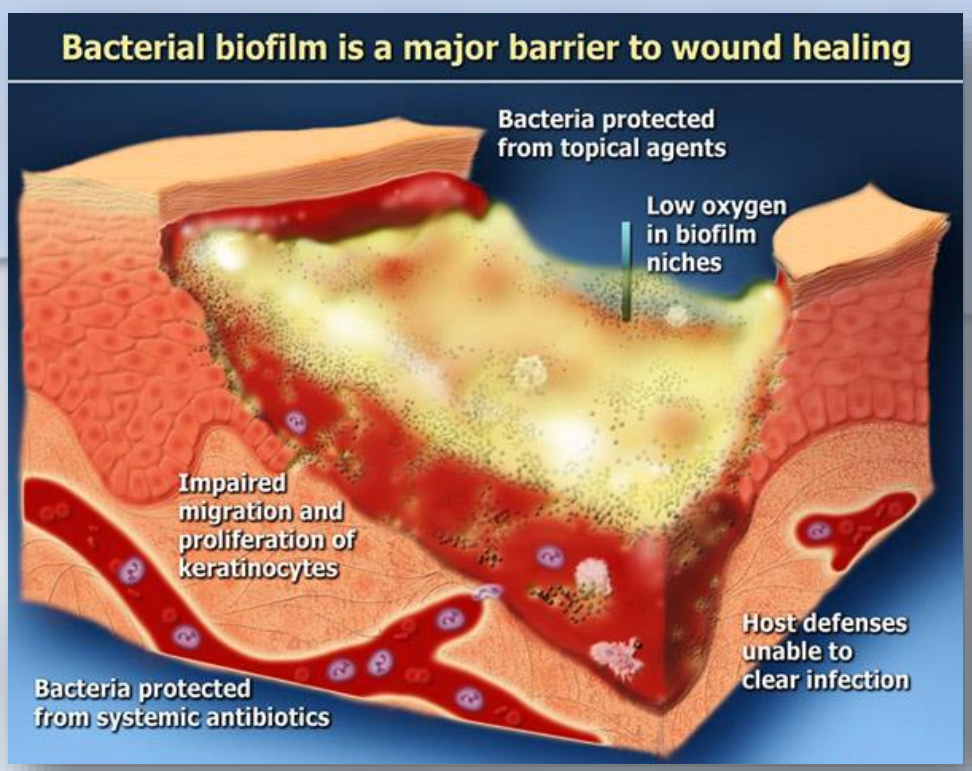
  - Dressing fixation or fixation of parts of devices (e.g. catheters)

# Non adhesive preparations

- Biatain Silicone






Antiseptic preparation, preparations blocking microorganisms

# PREPARATIONS FOR INFECTED WOUNDS

# Antiseptic preparation

- Products containing active silver (silver ions)
- Preparations containing antibiotics
- Other (iodine, chlorhexidine, hydrogen peroxide, honey etc.).

A very wide range of dosage forms

- classic (from liquid to solid)
- microforms (microparticles – wound filling)
- Dressing preparations (conventional and modern)

# Antiseptic preparation

- Active silver - silver metal is relatively inert, but in the presence of water releases silver ions, responsible for the biocidal activity
  - Form: fabric, foam products, hydrocolloids, powders
  - silver in preparation
    - in ionic form
    - metallic silver
      - in the form of nanocrystals

# Antiseptic preparation

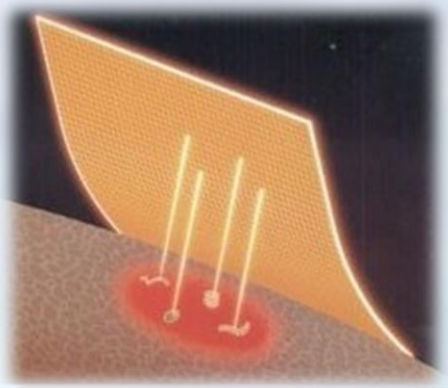
- SILVERON

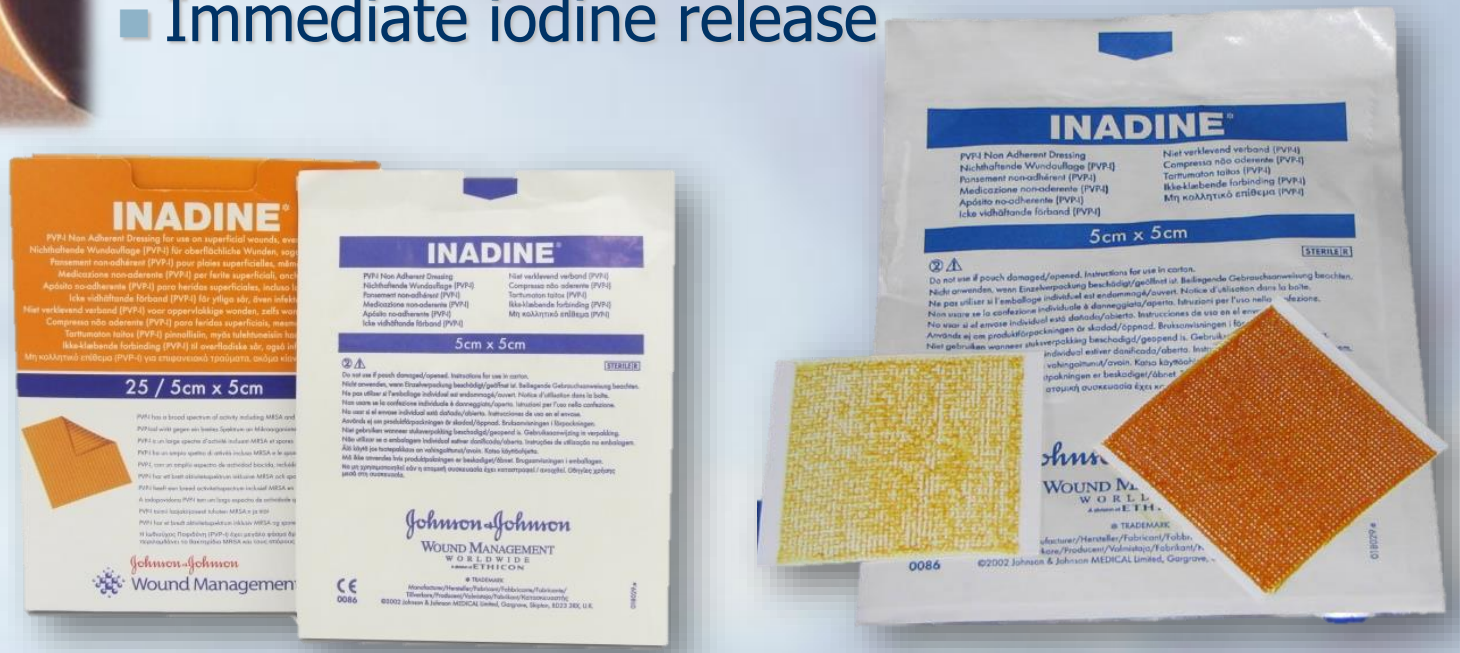

# Antiseptic preparation

- Iodine
  - destroys bacteria and pathogens
  - elemental iodine is irritating, it may be absorbed into the systemic circulation, it is not soluble in water
  - in the treatment of wounds two forms are currently used in industrial products:
    - iodinated povidone (iodophor - a complex of iodine and povidone, PVP-J, soluble in water)
    - cadexomer iodine - iodine incorporated into starch microparticles from which it is released

# Antiseptic preparation

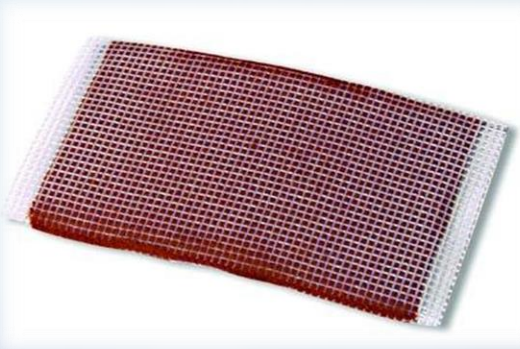
- Iodinated povidone
  - in the wound treatment an impregnated gauze is usually used, often in combination with a semi-solid base (Inadine)
  - Immediate iodine release





# Antiseptic preparation

- Cadexamer iodine
  - cadexamer – cross-linked starch in form of microparticles, particles have absorbing surface
  - Iodine conc. in particles 0.9 %, released gradually after contact with exudate (gel)
  - powder, fiber, gel, pad (Iodosorb, Iodoflex)

# Antiseptic preparation

**Iodinated povidone solution 10%**

| | |
|---|---|
| Povidoni iodinati | 10.0 |
| Natrii hydrogenoph. dodecahydrici | 3.2 |
| Acidi citrici monohydrici | 0.87 |
| Aquae purificatae | ad 100.0 |

M. f. sol.

*D. S. Antisepticum*

Ad manus medici

# Antiseptic preparation

**Tulle gras with iodine (antiseptic)**

| | |
|---|---|
| Iodi solutio glycerolica | 2.0 |
| Adepsa lanae cum aqua | 20 ml |
| Vaselinum flavum | ad 200.0 |
| M.f. Ung. Et adde | |
| Sanavel | 3.0 m |

Sterilisetur!

Ad manus medici

D.S. Antiseptic Tulle Gras

# Antiseptic preparation

- Chlorhexidine acetate
  - No resistency
  - Not inactivated by serum and blood
  - Bactigras – tulle impregnated by vaseline
    - Long acting
    - nonadhesive

# Antiseptic preparation

**Chlorhexidine ethanolic solution**

| | |
|---|---|
| Chlorhexidini digluconas | 2.0 |
| Ethanoli 70% | ad 100.0 |

M. f. sol.

*D. S. Desinfection*

Ad manus medici

# Antiseptic preparation

Honey

- hypertonic, hygroscopic – withdraws water from bacteria
- Absorbed water contains remnants of bacteria cells
- Honey enzyme glucose oxidaze cleaves glucose, forming $H_2O_2$, killing bacteria
- acidic pH, not suitable for majority al all bacteria

# Antiseptic preparation



# Antiseptic preparation

- Revamil


# Antiseptic preparation

- Medihoney, Activon, Mesitran aj.


# Antiseptic preparation

**Boric unguentum with argenti nitras**

| | |
|---|---|
| Argenti nitratis | 1.0 |
| Aquae purificatae | 1.0 |
| Acidi borici ung. 3% ad | 100.0 |

M. f. ung.

D. S. Ointment.

Sterilisetur!

# Antiseptic preparation

**Boric unguentum with argenti nitras**

Camphorae racemicae 5.0

Acidi borici unguenti 3% ad 100.0

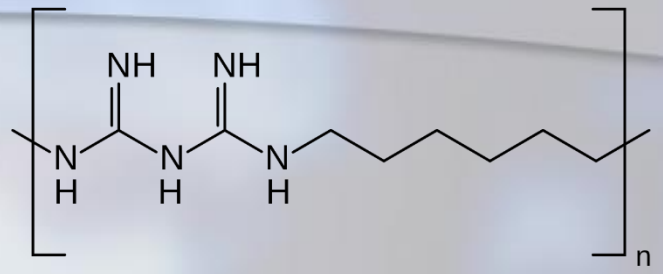
M. f. ung.

D. S. Ointment.

Sterilisetur!

# Antiseptic preparation

## Polyhexanide




- biguanide derivative
- microbicidal effect in 5-20 minutes
- therapeutic concentrations 0.02–0.1%
- positive effect on granulation and epithelialization
- not absorbed
- Adverse effects minimal (exanthema)
- available as a 20% solution (Polihexanidi solutio 20 per centum)

# Antiseptic preparation

**Polyhexanide solution 0.02%/0.04%**

| | |
|---|---|
| Polyhexanidi sol. 20% | 0.1/0.2 |
| Natrii chloridi | 0.86 |
| Kalii chloridi | 0.03 |
| Calcii chloridi dihydr. | 0.033 |
| Aquae pro inj. | ad 100.0 |

M. f. sol.

*D. S. for compresses or rinsing*

Ad manus medici

# Antiseptic preparation

**Polyhexanide ointment 0.02%/0.04%**

| | |
|---|---|
| Polyhexanidi sol. 20% | 0.2/0.5 |
| Macrogoli 4000 | 25.0 |
| Macrogoli 400 | 65.0 |
| Aquae pro inj. | ad 100.0 |

M. f. ung.

*D. S.* 1-3 times a day at the affected areas

Remove dirt, debris and dead plant tissues

# PREPARATIONS FOR WOUND CLEANING

# The immediate cleansing (fresh wound, dressing changes)

- Mostly liquid preparations
- solutions, sprays
- tenzides, antimicrobic agents
- Izotonic, adjusted pH



# The immediate cleansing (fresh wound, dressing changes)

IP solutions:

compresses 20 – 30 min.

- Solutio Acidi Borici 3%
- Jarisch solution
- Hypermangan solution (Potassium permanganate)
- Rivanol (1 ‰ solution; ethacridini lactas)

# The immediate cleansing (fresh wound, dressing changes)

IP semisolids:

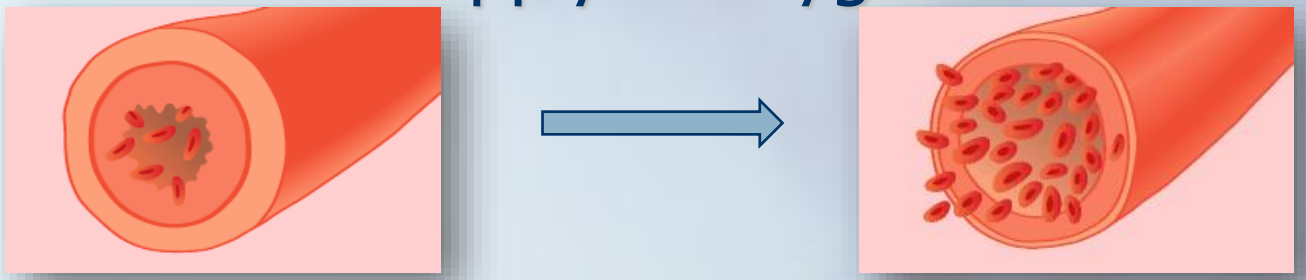
compresses 20 – 30 min.

- Acidi Borici unguentum 3 or 10%
- Boric unguentum with argenti nitras
- Camphora unguentum

# HEALING PROMOTION

# Healing promotion

- Peruvian balsam - IPL and HPL products in concentrations of 5-20%
  - improves blood supply to the wound site and better supply of oxygen and nutrients



  - Vishnevski balm
  - Sanavel with Peruvian balm
  - Optase, Xenaderm, Granulex Spray
  - Can cause allergies

# Healing promotion

## Vishnevski balsam

*Suspensio Vishnevski cum balsamo peruviano*

| | |
|---|---|
| Bismuthi tribromphenolas basicum | 5.0 g |
| Balsamum peruvianum | 20.0 g |
| Ricini oleum virginale | ad 100.0 g |

*Suspensio Vishnevski cum pice liquida*

| | |
|---|---|
| Bismuthi tribromphenolas basicum | 3.0 g |
| Pix fagi/pix lithanthracis | 5.0 g |
| Ricini oleum virginale | ad 100.0 g |

# Healing promotion

**Unguentum Mikulič (**Argenti nitratis unguentum compositum)

| | |
|---|---|
| Argenti nitras | 1,0 g |
| Aqua purificata | 1,0 g |
| Adeps lanae | 3,0 g |
| Balsamum peruvianum | 10,0 g |
| Vaselinum album | 85,0 g |

M. f. ung.

*D. S. Ointment*

# Healing promotion

**Jecoris aselli unguentum compositum**

| | |
|---|---|
| Zinci oxidi paste | 25,0 g |
| Jecoris aselli oleum (typus A) | 25,0 g |
| Adeps lanae | 25,0 g |
| Vaselinum album | 25,0 g |

M. f. ung.

*D. S. Ointment*

# Healing promotion

**Tulle gras with with Vishnevski balm**

Bismuthi tribromphenolas 10,0
Balsamum peruvianum 40,0
Ricini oleum ad 200,0
M.f. Susp. Et adde
Sanavel 3,0 m
Sterilisetur!
Ad manus medici
D.S. Vishnevski balm Tulle Gras

# Disinfectants

# Definition

- Chemicals that destroy the vegetative forms of microorganisms (usually destroys spores)
  - Must be effective against *Staphylococcus aureus, Pseudomonas aeruginosa* and *Salmonella choleraesuis*
  - effectiveness against viruses, mycobacteria, protozoan and spores resistant to high temperatures is not required

# Groups

- Alcohols and glycols
- Aldehydes
- Acids
- Oxidising substances
- Iodine and its compounds
- Phenols
- Surfactants (mostly quaternary nitrogen compound)
- Other (e.g. chlorhexidine)

# THANKS FOR ATTENTION