Surgical
asepsis and antisepsis
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Development of Surgery
1. Discovery of the anesthesia
2. Development of antiseptic methods

Infection of the surgical wound
- complication even in modern medicine following principles of asepsis
complex and difficult surgeries + patients at risk

History
1. Introduction of antisepsis
   * Lister 1870 – destruction of pathogens in surgical site – carbolic acid
2. Conversion from antisepsis to asepsis
   * Terrillon 1883 – dry air sterilization
   * Schimmelbusch 1886 – sterilization of instruments using soda lye
   * Bloodgood 1886 – rubber gloves and surgical gowns
   * Trendelenburg 1888 – steam sterilization

Aseptic technique
in surgery
= prevention of contamination of surgical wound
includes:
1. Proper preparation and function of the facilities
   and environment
2. Preparation of the surgical site
3. Preparation of the surgeon and surgical team
4. Preparation of the instruments and surgical equipment

Antisepsis
= destruction of most pathogenic microorganisms
on living objects

➢ skin of the patient in surgical site
➢ hands of the surgeons

Sterilization
= destruction of all mikroorganisms on an item
➢ bacteria
➢ viruses
➢ spores

Goal of asepsis
= to prevent infection of SW during surgery
➢ „sterile surgery“ does not exist
➢ every SW is contaminated

! Infection still does not develop in every case !

Development of the infection depends on:
1. Resistance of organism to infection
2. Nature of bacterial contamination of SW
3. Interaction between the organism and bacteria (impairment/lack of immunity)

Risk of infection

Why?

- soft tissue trauma

- implants


- violation of aseptic principles

- overestimation of prophylactic antibiotic application

Factors influencing the risk of infection

● Immune system impairment

● Massive wound contamination

● Virulent bacteria

● Tissue trauma and ischemia

● Foreign material

Goal of asepsis

= to prevent infection of SW during surgery

▶ miniinvazivity - arthroscopy

▶ duration of surgical procedure

Structure and design of the surgical area

Clean surgical area

▶ clean operating rooms (ORs) air conditioning 21°C humidity 50%

▶ scrub sink areas

▶ sterile supply rooms

Mixed surgical area

▶ hallways between the ORs and nurses’ stations

▶ instrument and supply processing areas

▶ storage areas

▶ utility rooms

Contaminated surgical area

▶ anesthesia and surgical preparation rooms

▶ dressing rooms, lounges

Structure and design of the surgical area

● Surgical area is complemented by:

▶ central supply

▶ contaminated OR outside clean surgical area
● Surgical area should be close to:
  ➢ ICU
  ➢ diagnostic imaging

Instrument care and maintenance

*Physical removal of surface contaminants, otherwise sterilization is not effective!*

Cleaning of used instruments ASAP!

● rinsing with cold water immediately after sx  
  it removes blood and tissue detritus

● *If there is not immediate physical removal*

➢ rinse the instruments into warm water and detergent

Cleaning

⊙ Manual

➢ brushing, rinsing, sterilization

➢ slightly alcalic detergents

Do NOT use common soaps (deposits of insoluble alcalic residua)

after cleaning rinse with hot water + dry

⊙ Ultrasonic cleaning equipment  10-15 min.

principle of cavitation

Lubricating of the instruments

● Boxlocks, hinges and power equipment should be lubricated before autoclaving!

➢ special surgical lubricants

Corrosion, pitting and discoloration

Causes of stains and corrosion:

● Prevent blood, tissue, saline from drying on instruments

➢ contain chloride ions

➢ drying of the biologic material 1-4 hrs + autoclaving = „stewed“  
  corrosion = orange-brown discoloration + surface erosions

● Tap water contains minerals  
  use distilled or deionized water

● Enzymatic solutions  
  ultrasonic cleaners

use a soap with a neutral pH (between 7 and 8)

*Betadine, dish soap, hand scrubbing solutions, laundry soap

Sterilization

PHYSICAL

● Steam sterilization  
  steam sterilizers

● Ionizing radiation  
  cobalt 60

CHEMICAL (Gas)

● Ethylene oxide  
  EtO + CO₂

● Cold chemical sterilization  
  2% glutaraldehyde

● Plasma sterilization  
  H₂O₂

Sterilization

● Cold chemical sterilization  
  2% glutaraldehyde

immersion of items in the disinfectant/sterilant solution

delicate lensed instruments - bronchoscopes, endoscopes, cystoscopes

items should be clean and dry + disassembled

*Immersion times*

10 hrs at 20-25°C  sterilization
10 min. disinfection
thoroughly rinse in sterile water + dry with sterile towels
Monitoring of the effectiveness of sterilization

- **Chemical indicators**
  - *paper strips or impregnated tapes*
  - change color when a certain temperature, pressure, or humidity are reached
  - do not indicate sterility, only that certain conditions for sterility have been met

- **Biologic indicators**
  - once a week
  - Strains of highly resistant, nonpathogenic, spore-forming bacteria
  - *Bacillus stearothermophilus* steam
  - *Bacillus subtilis* gas

**Manipulation with sterile instrument packs**
  - after autoclaving

- **Storage**
  - items or packs wrapped
  - in closed racks
  - low humidity, minimal air turbulence, constant room temperature

**Recommended storage times**
- sterile packs in closed racks
  - two wraps, double-layer muslin 4 weeks
  - dtto + dust protective wrap 6 months
  - two wraps, paper wrap 6 months
  - plastic sterilization wrap 1 year

!!! Proper opening of the sterile pack !!!
**Damaged wrap packs are contaminated**

- moistened wrap
- storage in dusty environment or close to air ventilator
- perforation, compression and enfolding of plastic wrap

!!! Every use sooner sterilized packs !!!

**Surgical instruments**
- **Basic surgical instruments**
  - Scalpels
    - pencil grip
  - Scissors
  - Needle Holders
  - Tissue Forceps
  - Hemostatic Forceps
towel clamps
- Retractors
- Curettes

**Basic surgical instruments**
- Scalpels
- Scissors
- Needle Holders
- Tissue Forceps
- Haemostatic Forceps
towel clamps
● Retractors
● Curettes
Basic surgical instruments
● Scalpels
● Scissors
● Needle Holders
● Tissue Forceps
● Haemostatic Forceps
towel clamps
● Retractors
● Curettes
Holding
Basic surgical instruments
● Scalpels
● Scissors
● Needle Holders
● Tissue Forceps
● Haemostatic Forceps
towel clamps
● Retractors
● Curettes
Basic surgical instruments
● Haemostatic Forceps
towel clamps
Basic surgical instruments
● Retractors
Basic surgical instruments
● Scalpels
● Scissors
● Needle Holders
● Tissue Forceps
● Haemostatic Forceps
towel clamps
● Retractors
● Curettes
Orthopedic instrumentation
● Bone-holding Forceps
● Pin Cutters
● Periosteal Elevators
Preparation of the surgeon and surgical team
Surgical attire
Surgical scrub
one of cruciate conditions of asepsis
mechanical removal of dirt and oil
The surgical scrub physically separates microbes from skin and inactivates them through contact with the antimicrobial solution
reduction of the transient bacterial population
residual depression of the skin's resident bacterial population
● antimicrobial soaps
chlorhexidine gluconate
povidone-iodine
Surgical scrub
● remove watches and rings
● use scrub brushes, antibacterial soap, nail cleaners
● wet hands and forearms thoroughly
● apply 2-3 pumps of antimicrobial soap to hands and wash hands and forearms
● nail cleaner
● rinse arms and forearms
● apply 2-3 pumps of antimicrobial soap to hand and forearm
● apply 2-3 pumps of antimicrobial soap to the sterile scrub brush
● rinse the scrub brush well under running water, and transfer the brush to your scrubbed hand; do not rinse the scrubbed hand and arm at this time
● repeat the process on your other hand and arm
● drop the scrub brush in the sink
Surgical scrub
● starting with the fingertips of one hand, rinse under water by moving your fingertips up and out of the water stream and allowing the rest of your arm to be rinsed off on the way out of the stream
● allow the water to run from your fingertips to your elbows
● never shake your hands
● rinse off your other hand similarly
● hold your hands upright and in front of you so that they can be seen
● proceed to the gowning and gloving area
Surgical scrub can not be replaced by gloving
23.3% incidence of glove defects, in procedures lasting more than 60 mins
Traditional accepted methods of surgical scrubs
○ anatomic timed scrub 5-6 min
first surgery 5-7 min another 2-3 min
○ counted brush stroke scrub
Preparation of the surgical team
● Gowning
● Gloving
➢ closed gloving
➢ open gloving
is used when only the hands need to be covered (as for urinary catheterization, bone marrow biopsy, or sterile patient preparation) or during surgery when one glove becomes contaminated and must be changed
This method should not be used routinely for gowning and gloving
➢ assisted gloving
● Removing gloves aseptically
Gowning
Gloving
• Removing gloves aseptically

Selection of the patient to surgery
Patient assessment - risks
Every time!

priority = life-saving

Choroidal plexus papiloma
Preparation of the patient
Fasting 12 hrs
➢ + water
Prevention of vomiting and aspiration aspiration pneumonia

➢ 48 hrs large bowel procedures
sometimes enteral ATB application - kanamycin, neomycin, penicillin G

➢ 4-6 hrs in young animals hypoglycemia could occur
Preparation of the patient
● Evacuation of bowel and urinary bladder contents
➢ defecation, urination
➢ enema
➢ urinary bladder manually expressed, catheterization
in general anesthesia
Preparation of the operative site
in the skin's superficial cornified layers and outer hair follicles
● normal / rezident organisms
Staphylococcus epidermidis Corynebacterium spp.
Pityrosporum spp.
● transient pathogens
Staphylococcus aureus Staphylococcus intermedius
E. coli Streptococcus spp.
Enterobacter spp. Clostridium spp.

in some cases, bathing the animal the day before surgery to remove loose hair, debris, and
d external parasites may be warranted
Hair removal
every method traumatizes skin - dermatitis
Breakage of skin barrier bakterial colonisation
● shaving 10 times more infections
Small skin lacerations and erosions
● depilation nákladná

lymfocytar skin reaction in cats
paw area
● clipping limited trauma
Clipping
● Right before surgery
  clipper + vacuum
  ➢ Incision site + 20 cm around

Paw - glove + Vetrap
Clipping

● Open wounds
  covering – gel
Antibacterial agents
  Broad spectrum, bactericidal + fast action
  ● povidone-iodine
  ● chlorhexidine

Final OS preparation
● Patient prep room
Draping
● Disposable drapes
Draping for limb procedures
Aseptic surgical procedure