



NORSOCOM  
Marinejegerkommandoen



# RDCR – BLOOD PRODUCTS, BLOOD GROUP & TTD's





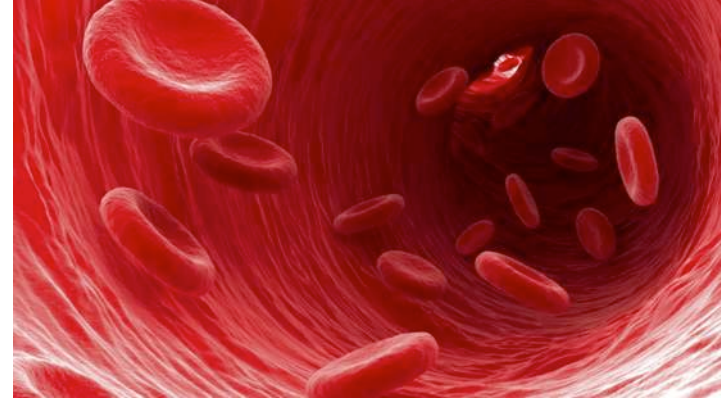
# Why transfuse blood products

- Lack of red cells
- Lack of platelets
- Lack of coagulation factors
- Lack of fibrinogen
- Bleeding





# Anemia: Lack of red blood cells



- Iron deficiency anemia.
- Vitamin deficiency anemia.
- Anemia of chronic disease.
- Aplastic anemia.
- Anemias associated with bone marrow disease.
- Hemolytic anemias.
- Sickle cell anemia.
- Other anemias.
  - Malaria



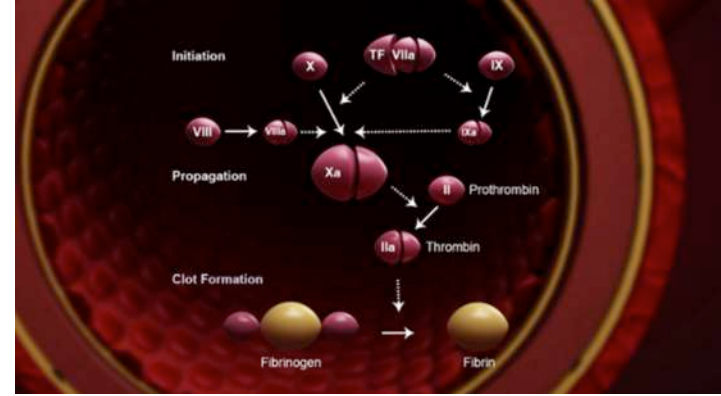


# Thrombocytopenia: Lack of platelets



- Thrombocytopenia of chronic disease
- Thrombocytopenia in infectious disease
- Thrombocytopenia due to bone marrow disease
- Thrombocytopenia due to autoimmune disease
- Thrombocytopenia in DIC
- Thrombocytopenia as a side effect of medication





# Lack of coagulation factors

- Vitamin K deficiency
- Liver disease
- DIC
- Medication
- Hemophilia
- Etc





# Lack of Fibrinogen

- Fibrinogen is a soluble plasma protein that is converted to fibrin in response to damage to the vascular system.
- The clotting process is initiated when platelets aggregate at the wound site.
- The cross-linked fibrin forms a mesh atop the platelet plug that completes the clot
- Fibrinolysis – dissolvment of fibrin – prevents clotting. – This is where TXA comes in to play.

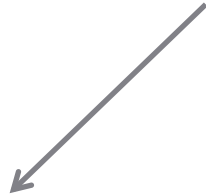




Component therapy:  
Transfusion requirements of  
isolated deficiencies!  
Makes sense!



**WHOLE  
BLOOD**



**PLATELETS**



**PLASMA**



**RED CELLS**



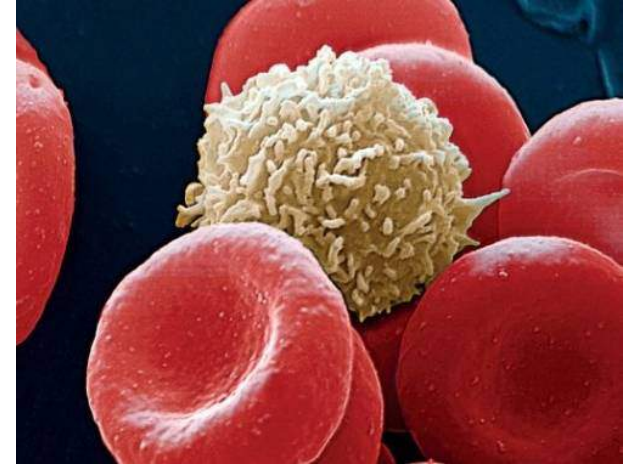


# Additives

- Packed red blood cells (eg . SAGMAN)
  - Saline / adenine /glucose/ mannitol
- Whole blood
  - CPD (21 days) – CPDA (28-35days)
  - Citrate – Binds to calcium – an important factor in coagulation system
  - Prevents clotting in the bag
  - Supports cells during storage
- Transfusion of more than 4 unit- administer calcium IV
  - Calciumchloride 5mmol IV
  - Calciumgluconate







# Leukocyte depletion

- Standard according to European regulations
- Not necessary in our world!





But what about bleeding?  
Not an isolated  
deficiency

Loss of red cells,  
plasma and  
platelets



PLATELETS



PLASMA



RED CELLS





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# Bleeding

- Reverse shock
- Supporting hemostasis





# TCCC guidelines:

- If in shock and blood products are available under an approved command or theater blood product administration protocol:
  1. Resuscitate with **whole blood**, or, if not available
  2. **Plasma, RBCs and platelets in a 1:1:1 ratio\***, or, if not available
  3. **Plasma and RBCs in 1:1 ratio**, or, if not available;
  4. **Reconstituted dried plasma, liquid plasma or thawed plasma alone or RBCs alone**;
  
- If in shock and blood products are not available under an approved command or theater blood product administration protocol due to tactical or logistical constraints:
  5. – **Resuscitate with Hextend**, or if not available;
  6. – **Lactated Ringers or Plasma-Lyte A**;





# Blood types

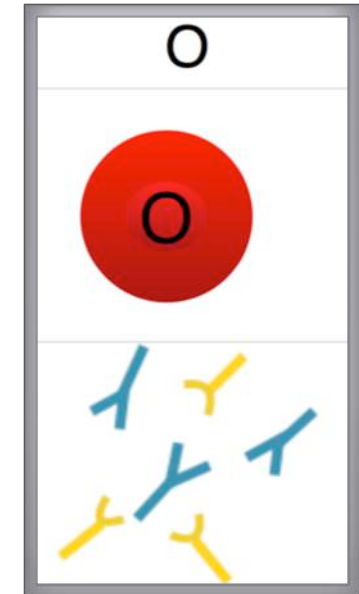
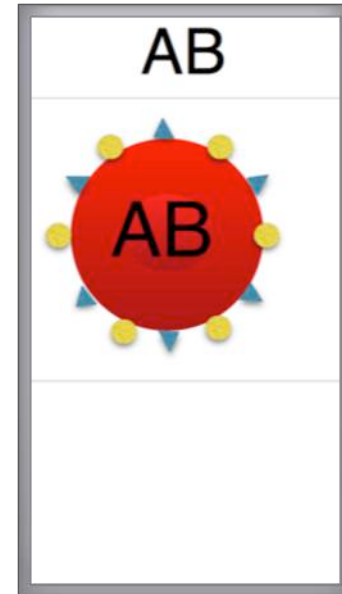
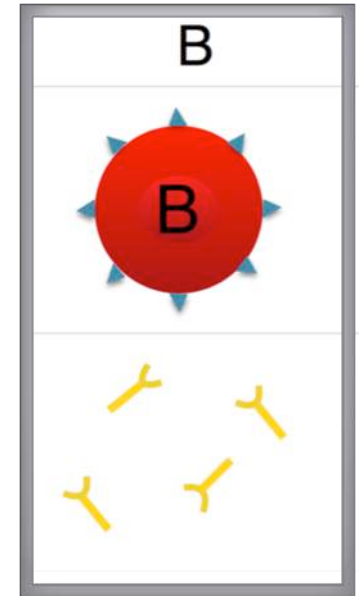
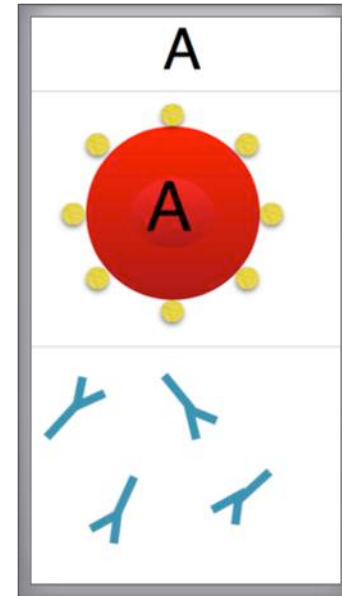
- All cells, including those that make up blood, have substances known as antigens on their surfaces.
- Antigens function to enable our immune system to distinguish the body's own cells from foreign invaders.
- When invaders are recognized, they are destroyed by antibodies, which are also produced by the immune system.
- One may think of antibodies as a homing missile that attacks specific antigens by triggering an immune response.
- Some immune responses are beneficial, but others may be very hazardous.





# ABO system

- People with type A blood have the antigen A on the surface of their RBCs
  - They have B antibodies in plasma
- People with type B blood have the B antigen
  - They have A antibodies in plasma
- Individuals with type AB blood have both A and B antigens
  - They have no antibodies in plasma
- Whereas people with type O blood have no antigens present
  - But both A and B antibodies in plasma





# The major principle of blood transfusion

- The donor red cells must survive in the recipient!







# ABO Mismatch

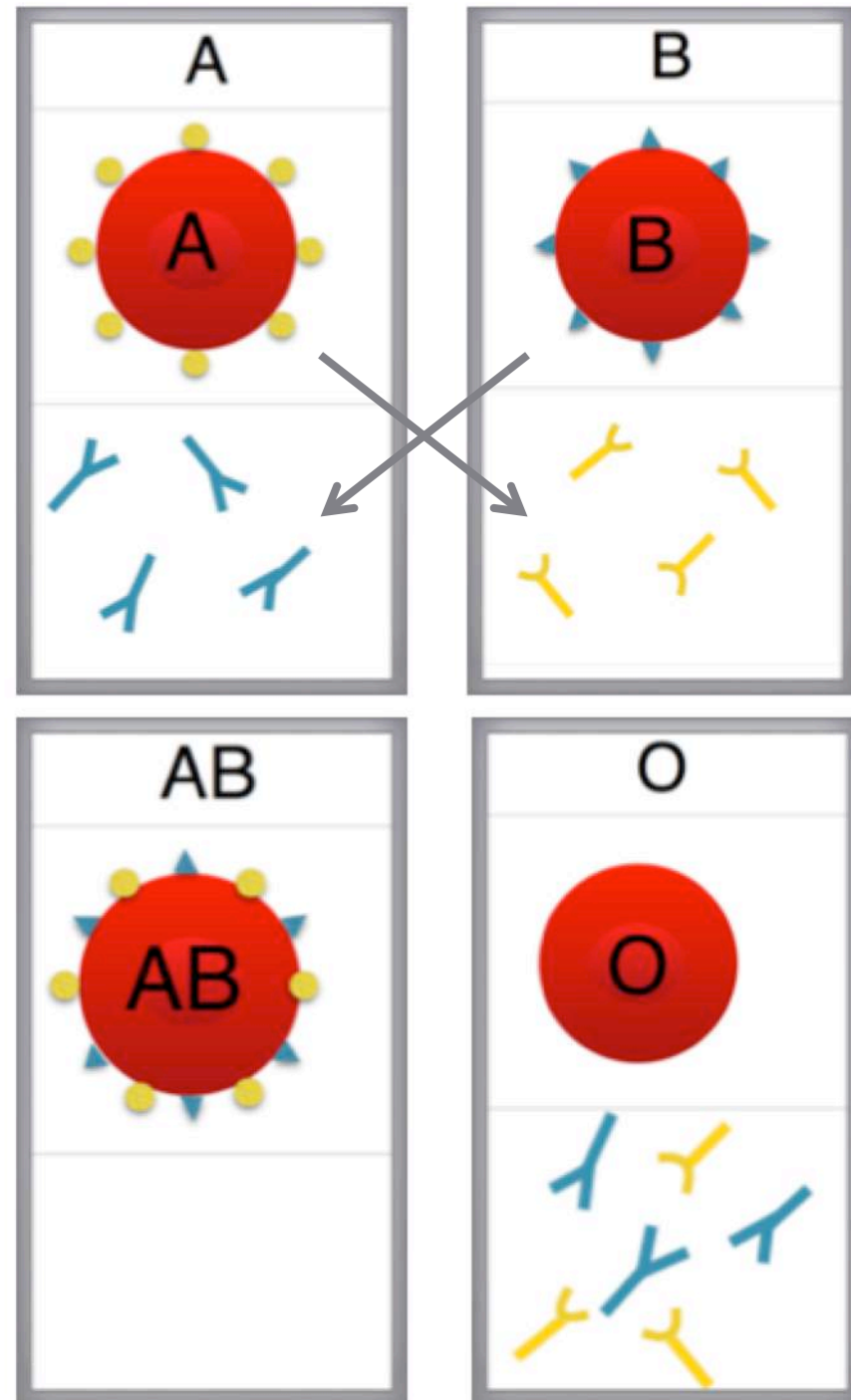
- An antibody can attach to several RBCs at once and bind them together.
- For example, if type B blood (with B antigens) were transfused into a type A recipient (with anti-B antibodies), the recipient's anti-B antibodies would immediately bind the donor's RBCs, causing a transfusion reaction where the binded RBCs block small vessels causing reduced bloodflow to vital organs.
- In addition the binded RBC's release their hemoglobin over the next few hours to days. This is called hemolysis.
- This free Hb can block the kidney tubules and cause rapid death from kidney failure.





# ABO mismatch

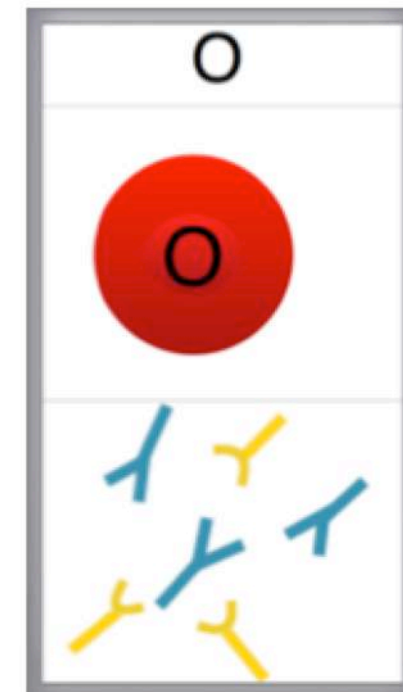
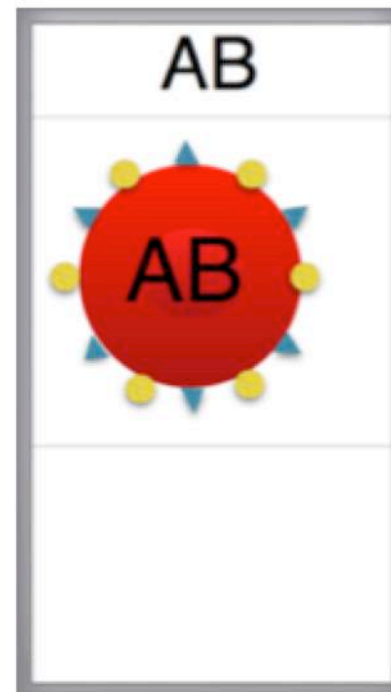
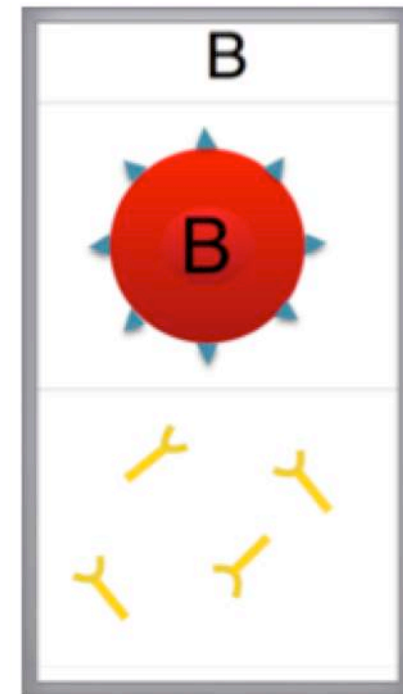
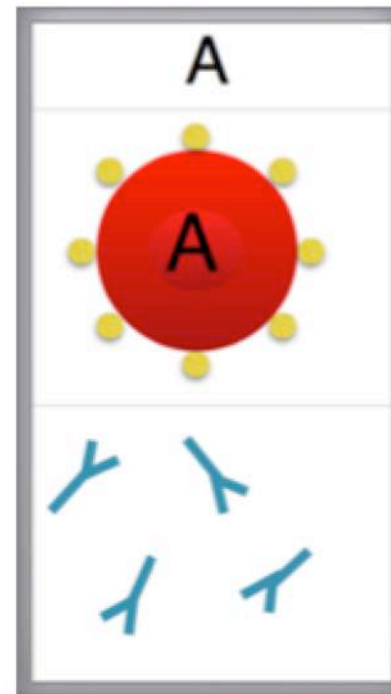
- In simple terms:
  - A antibodies (A - missile) attacks A antigens (A - targets)
  - B antibodies (B - missile) attacks B antigens (B - targets)

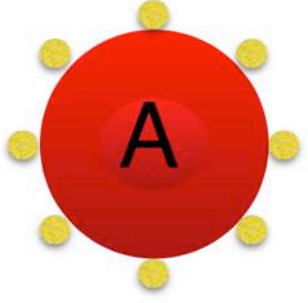
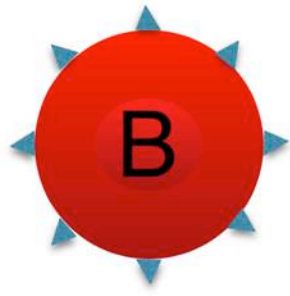
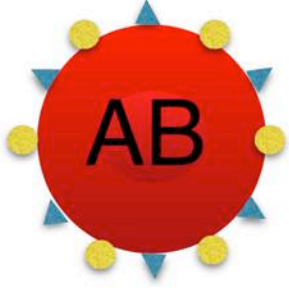
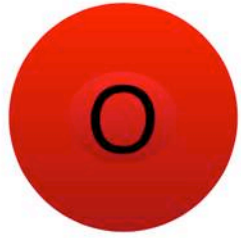
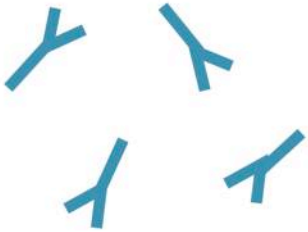
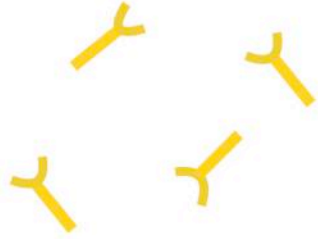







# ABO Mismatch

- Major ABO mismatch
  - Donor red cells hemolyse in the recipient due to a large amount of antibodies in the recipients plasma against the donor red cell
  - **MAJOR ABO MISMATCH KILLS!!**
- Minor ABO mismatch
  - The recipients red cells hemolyse due to antibodies in the donors plasma.
  - **YOU MAY SURVIVE MINOR ABO MISMATCH**



	A	B	AB	O
ANTIGEN (On RBC's)				
ANTIBODY (In Plasma)				
BLOOD TYPE	Cannot have B or AB blood  Can have A or O blood	Cannot have A or AB blood  Can have B or O blood	Can have any type of blood  Is the universal recipient	Can only have O blood  Is the universal donor
LOW TITER O				
HIGH TITER O				



# Tranfusionsreaksjoner

## ■ Definisjon:

- Akutte transfusionsreaksjoner kjem fram som uønskte teikn eller symptom under eller innanfor 24 timar av ein blodtransfusjon.
- Major ABO Mismatch:
  - Vanlegvis i 10-15 minutt eller etter 50cc av blod!





# Transfusion reactions

- Symptoms:
  - Pruritus
  - Urticaria
  - Fever
  - Chills
  - Shortness of breath
  - Back pain
  - Hypotension and tachykardia
  - Headache
  - Feeling of impending doom
- Action:
  - STOP Transfusion
  - Deliver volume
  - Consider epinephrine
  - Administer 250mg Solu cortef IV
  - Recheck patient and unit labeling
  - Bring blood bag with the patient to hospital

**Difficult to recognize, difficult to treat!**





# Transfusion reaction – How to avoid:

- Prehospital: Transfuse group 0 (preferably low titer) only.
- Double check, double check, double check!!
- Labeling
- Do not improvise , stick to the protocol
- Start transfusion slow
- Blood bags transfused must always follow the patient to the hospital!





# Transfusion transmitted disease

- Mainly three viral diseases to worry about:
  - HIV
  - Hepatitis B
  - Hepatitis C
  - Ps: there are many others!







# What is HIV?

- **H**uman: Infecting human beings
- **I**mmunodeficiency: Decrease or weakness in the body's ability to fight off infections and illnesses
- **V**irus: A pathogen having the ability to replicate only inside a living cell





# HIV vs. AIDS

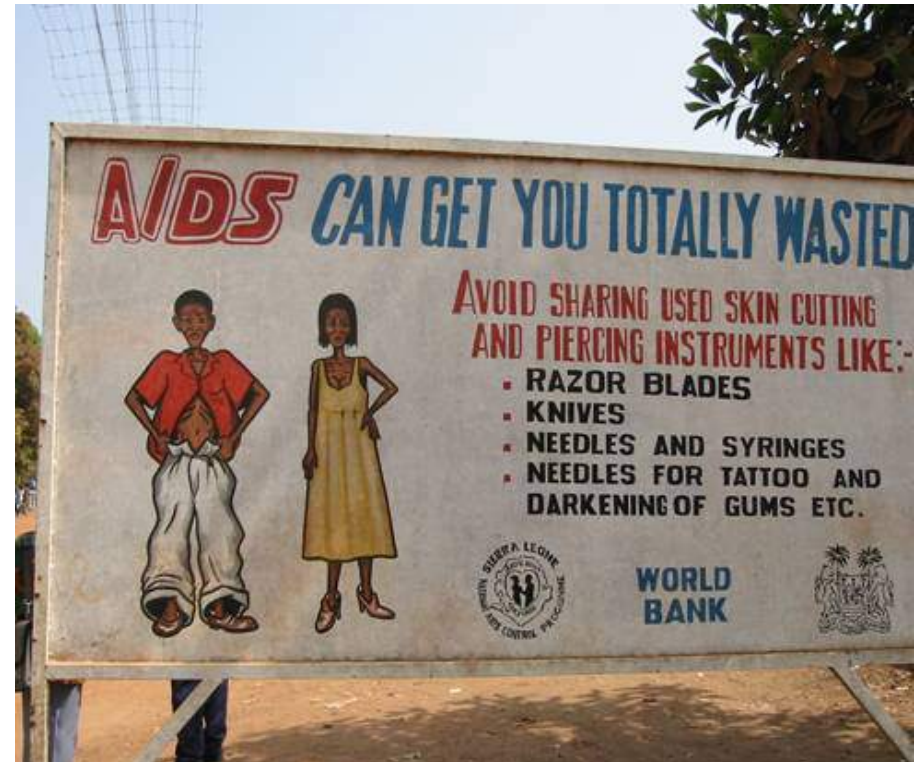
- HIV is the virus that causes AIDS
- Not everyone who is infected with HIV has AIDS
- Everyone with AIDS is infected with HIV
- AIDS is result of the progression of HIV Infection
- Anyone infected with HIV, although healthy, can still transmit the virus to another person





# How is HIV Transmitted?

- Unprotected sexual contact with an infected partner
- Exposure of broken skin or wound to infected blood or body fluids
- Transfusion with HIV-infected blood
- Injection with contaminated objects
- Mother to child during pregnancy, birth or breastfeeding





# HIV – Risk related to transfusion:

- Seroconversion is the period of time during which HIV antibodies develop and become detectable in HIV tests.
- Seroconversion generally takes place within a few weeks of initial infection.
- So, you can be infected even if a HIV test is negative...
- You survive HIV... Not necessary hemorrhagic shock...
- What is the actual risk?





# Hepatitis - inflammation of the liver

- Can have many causes
  - drugs
  - toxins
  - alcohol
  - viral infections (A, B, C, D, E)
  - other infections (parasites, bacteria)
  - physical damage

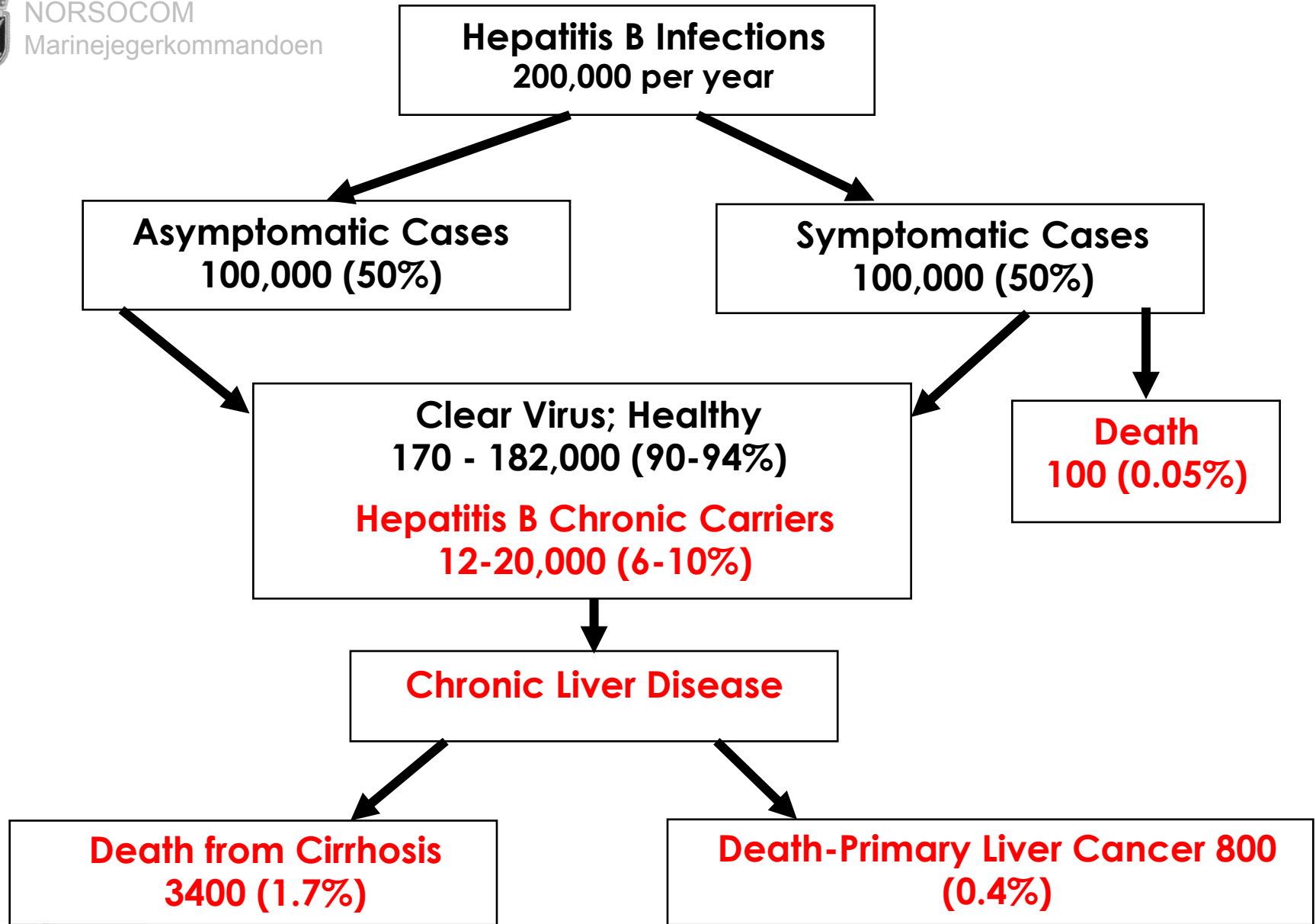




# Hepatitis B

- Who is at highest risk?
  - Injection drug users
  - Sex partners of those with Hep B
  - Sex with more than one partner
  - Men who have sex with men
  - Living with someone with chronic Hep B
  - Contact with blood
  - Transfusions, travel, dialysis







# Hepatitis C

- How do you get it?
  - Shared injection equipment (60% of new infections)
  - Blood transfusion before May, 1992 (now only 1 in 100,000 chance of transmission)
  - Blood transfer (tattoo, piercing ...)
  - Sex? (HCV in semen and vf but only 1.5% rate of transmission for long-term partners)
  - Mother to child (<5%)
  - 10-20% of infections have no identifiable risk factors







# Hepatitis C

- What happens when you have Hepatitis C ?
  - 85% of people develop chronic infection (infected for the rest of their life)
  - Rapid progression, slow progression, no progression





# Hepatitis C

- Long term pathogenesis
  - Over time progressive liver damage may occur
  - 20 -30 % of those infected will develop cirrhosis over 10 - 30 years
  - Many live without symptoms for decades
  - Others experience mild symptoms --intermittent fatigue, nausea, and muscle aches





# Documentation

- The transfusion must be registered according to unit specific procedures and it is advisable to keep the blood bag with the patient during transport to the surgical facility as documentation and also to follow up TTD testing post transfusion.

