Repressive anti-epidemic measures; epidemiological investigation at the outbreak

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Chain of infections (epidemic proces)

THE CAUSATIVE AGENT OF INFECTION (bacteria, viruses, fungi, prions, protozoa)

1. the **presence of rezervoir (source)** of infection
   man, animal
   at the ende of incubation period
   acute stage
   cariers

2. the way **of transmission**
   A/ direct contact
   touching, kissing or sexual intercourse (Staphylococcus spp., Gonococcus spp.,HIV …),
   - **vertical transmission** – from mother to fetus (VHB, VHC, HIV, listeria, rubella, cytomegalovirus…)

   B/ indirect contact
   - inhalation of droplets containing the infectious agents (TBC, measles, influenza…)
   - ingestion of food or water that is contaminated (salmonella, Norwalk virus, VHA….)
   - biological transmission by insects (malaria, borellia….)

3. the **susceptibility** of the population or its individual members to the organism concerned
   Host factors : a g e , n u t r i t i o n, g e n e t i c s
   i m m u n i t y – natural (nonspecific),
   - acquired

THE INFECTION

= 1. **source of infection**

……

Chain of infections (epidemic proces)

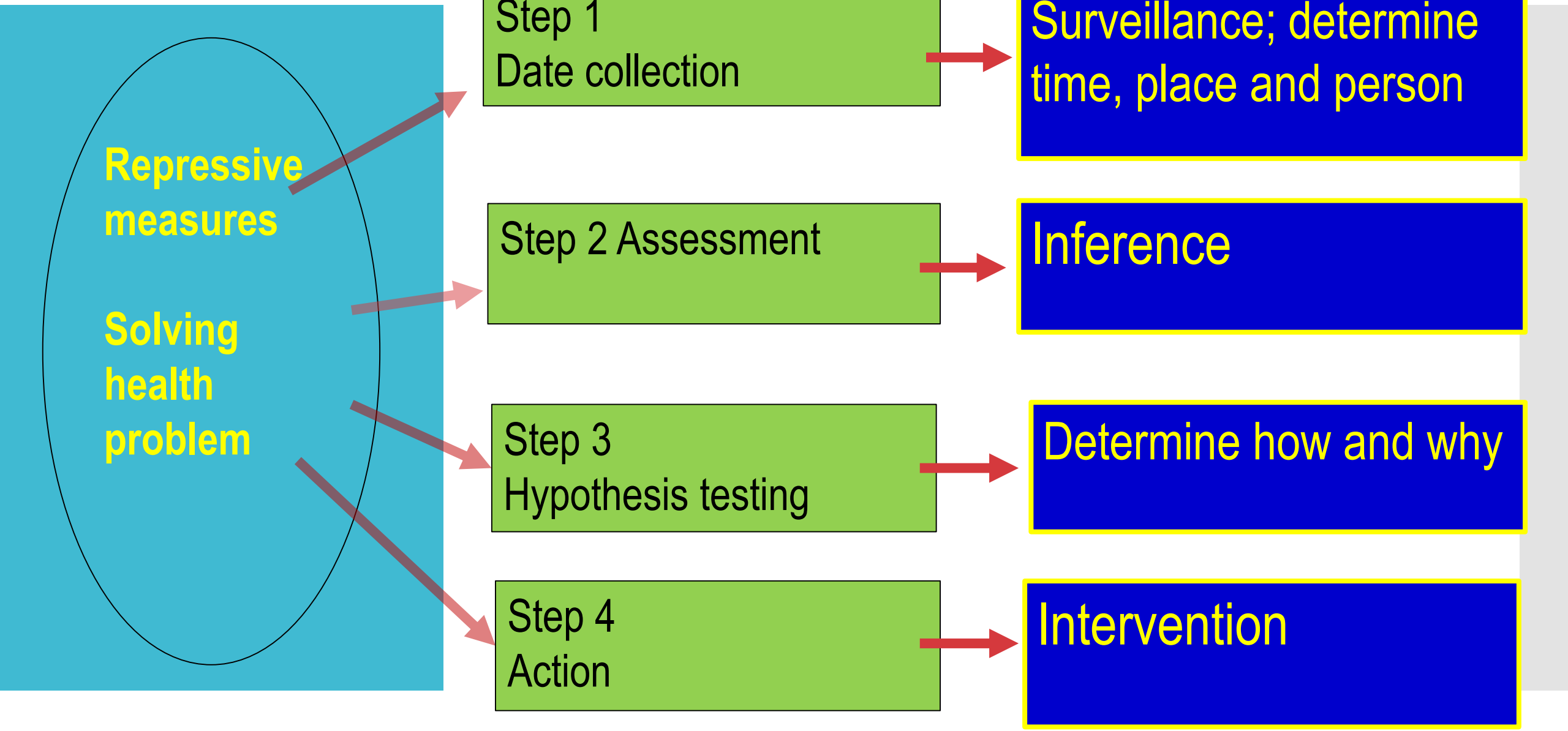
If the epidemiology is know, we can interfere with transmission:

„BREAKING THE CHAIN OF INFECTION“

Different infections have different epidemiologies and thus require different methods of control

Outbreak

- **Sporadics** diseases
- **An outbreak** is a sudden increase in occurrences of a disease in a particular time and place. It may affect a small and localized group or impact upon thousands of people across an entire continent.
- Two linked cases of a rare infectious disease may be sufficient to constitute an outbreak.
- Outbreaks include **epidemics**, which term is normally only used for infectious diseases, as well as diseases with an environmental origin, such as a water or foodborne disease. They may affect a region in a country or a group of countries.
- **Pandemics** are near-global disease outbreaks.


Repressive measures
Solving health problem
Step 1
Date collection
Step 2 Assessment
Step 3
Hypothesis testing
Step 4
Action
Surveillance; determine time, place and person
Inference
Determine how and why
Intervention

Outbreak investigation

When investigating disease outbreaks, the epidemiology profession has developed a number of widely accepted steps:

- Identify the existence of the outbreak (Is the group of ill persons normal for the time of year, geographic area, etc.?)
- Verify the diagnosis related to the outbreak

Create a **case definition** to define who/what is included as a case

Case definition, in epidemiology, set of criteria used in making a decision as to whether an individual has a disease or health event of interest.

Establishing a case definition is an imperative step in quantifying the magnitude of disease in a population.

Case definitions are used in ongoing public health surveillance to track the occurrence and distribution of disease within a given area, as well as during outbreak investigations in field epidemiology.

Repressive anti-epidemic measures: isolation, case definition

Case definitions of communicable diseases:

- ✓ Clinical criteria
- ✓ Laboratory criteria
- ✓ Epidemiological criteria and epidemiological link

Case classification –

- ❖ Possible,
- ❖ Probable,
- ❖ Confirmed case.

Case definitions of communicable diseases:

Repressive anti-epidemic measures: isolation, case definition

Clinical criteria

Clinical criteria include common and relevant signs and symptoms of the disease which either individually or in combination constitutes a clear or indicative clinical picture of the disease. They give the general outline of the disease and do not necessarily indicate all the features needed for individual clinical diagnosis.

Viral hepatitis A (VHA) Case definition

Clinical Criteria

Any person with a discrete onset of symptoms (e.g. fatigue, abdominal pain, loss of appetite, intermittent nausea and vomiting)

- AND

At least one of the following three:

* — Fever
* — Jaundice
* — Elevated serum aminotransferase levels

Case definitions of communicable diseases:

Clinical criteria

Laboratory criteria

Repressive anti-epidemic measures: isolation, case definition

Laboratory criteria are a list of laboratory methods that are used to confirm a case.

Usually only one of the listed tests will be enough to confirm the case. If a combination of methods is needed to meet the laboratory confirmation, this is specified.

The type of specimen to be collected for the laboratory tests is only specified when only certain specimen types are considered relevant for the confirmation of a diagnosis.

Those laboratory criteria consist of a list of laboratory methods which can be used to support the diagnosis of a case but which are not confirmatory.

Viral hepatitis A (VHA)
Case definition

Laboratory Criteria

- At least one of the following three:

— Detection of hepatitis A virus nucleic acid in serum or stool

— Hepatitis A virus specific antibody response

— Detection of hepatitis A virus antigen in stool

Case definitions of communicable diseases:

- Clinical criteria
- Laboratory criteria
- Epidemiological criteria and epidemiological link

Repressive anti-epidemic measures: isolation, case definition

Epidemiological criteria are deemed to have been met when an epidemiological link can be established.

EU definitions – case definitions for reporting communicable diseases

Epidemiological link, during the incubation period, means one of the following six:

— 1. Human to human transmission: the fact that a person has had contact with a laboratory confirmed human case in such a way as to have had the opportunity to acquire the infection

— 2. Animal to human transmission: the fact that a person has had contact with an animal with a laboratory confirmed infection/colonisation in such a way as to have had the opportunity to acquire the infection

— 3. Exposure to a common source: the fact that a person has been exposed to the same common source or vehicle of infection, as a confirmed human case

— 4. Exposure to contaminated food/drinking water: the fact that a person has consumed food or drinking water with a laboratory confirmed contamination or has consumed potentially contaminated products from an animal with a laboratory confirmed infection/colonisation

— 5. Environmental exposure: the fact that a person has bathed in water or has had contact with a contaminated environmental source that has been laboratory confirmed

—6. Laboratory exposure: the fact that a person has worked in a laboratory where there is a potential for exposure

EU definitions – case definitions for reporting communicable diseases

Transmission may occur by one or more of the following routes:

— Airborne: by projection of aerosol from an infected person onto the mucous membranes while coughing, spitting, singing or talking, or when microbial aerosols dispersed into the atmosphere are inhaled by others

— Contact: direct contact with an infected person (faecal-oral, respiratory droplets, skin or sexual exposure) or animal (e.g. biting, touching) or indirect contact to infected materials or objects (infected fomites, body fluids, blood)

— Vertical: from mother to child, often in utero, or as a result of the incidental exchange of body fluids usually during the perinatal period

— Vector transmission: indirect transmission by infected mosquitoes, mites, flies and other insects which transmit disease to humans through their bites

— Food or water: consumption of potentially contaminated food or drinking water.

The incubation periods for diseases are given in the additional information to facilitate the assessment of the epidemiological link.

Viral hepatitis A (VHA) Case definition

Epidemiological Criteria

At least one of the following four:

— Human to human transmission

— Exposure to a common source

— Exposure to contaminated food/drinking water

— Environmental exposure

EU definitions – case definitions for reporting communicable diseases

Case classification - Cases are classified as 'possible', 'probable' and 'confirmed'.
The incubation periods for diseases are given in the additional information to facilitate the assessment of the epidemiological link..

Possible case

A possible case means a case classified as possible for reporting purposes. It is usually a case meeting the clinical criteria as described in the case definition without epidemiological or laboratory evidence of the disease in question. The definition of a case as possible has high sensitivity and low specificity. It allows for detection of most cases but some false positives cases will be included into this category.

Probable case

A probable case means a case classified as probable for reporting purposes. It is usually a case with clinical criteria and an epidemiological link as described in the case definition. Laboratory tests for probable cases are specified only for some diseases

Confirmed case

A confirmed case means a case classified as confirmed for reporting purposes.
Confirmed cases fall in one of the three subcategories listed below.
They will be assigned to one of those subcategories during the analysis of data using the variables collected within the context of the case information.
Laboratory-confirmed case with clinical criteria The case meets the laboratory criteria for case confirmation and the clinical criteria included in the case definition.
Laboratory-confirmed case with unknown clinical criteria The case meets the laboratory criteria for case confirmation but there is no information available regarding the clinical criteria (e.g. only laboratory report).
Laboratory-confirmed case without clinical criteria The case meets the laboratory criteria for case confirmation but doesn't meet the clinical criteria in the case definition or is asymptomatic.

Viral hepatitis A (VHA)
Case definition

Case Classification

A. Possible case NA

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the clinical and the laboratory criteria

Outbreak investigation

- When investigating disease outbreaks, the epidemiology profession has developed a number of widely accepted steps:
- Identify the existence of the outbreak (Is the group of ill persons normal for the time of year, geographic area, etc.?)
- Verify the diagnosis related to the outbreak
- Create a case definition to define who/what is included as a case
- Map the spread of the outbreak using
- Develop a hypothesis (What appears to be causing the outbreak?)

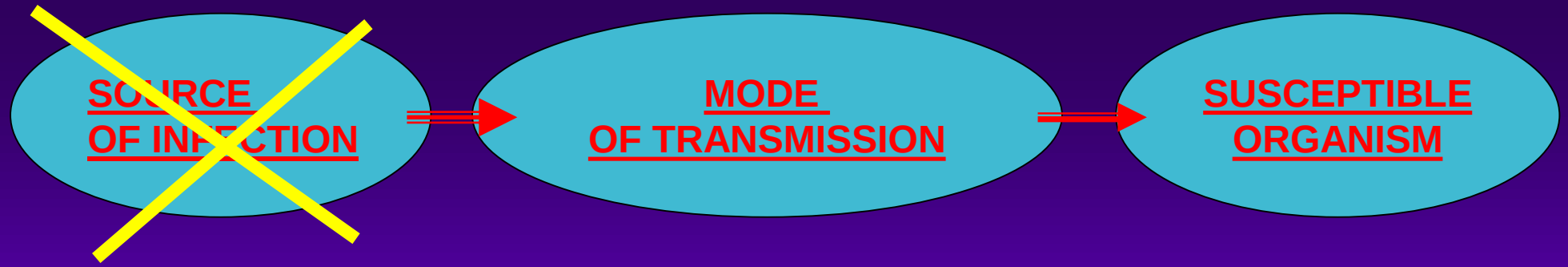
  Study hypotheses (collect data and perform analysis)
  Refine hypothesis and carry out further study

- Develop and implement control and prevention systems
- Release findings to greater communities

Focus of infection

- Anti-epidemic measures in the focus of infection are carried out at the occurrence of infection within the population.
- The focus of infection is represented by its source and its nearest neighborhood.
- The introduced measures have a repressive character.

Prevention of infectious diseases



Methods and possibilities of **patient and convalescent carriers isolation** are on so high level - as to prevent transmission of infection to susceptible individuals according to epidemiological severity of diseases.

Isolation of patients:

- **Dpt. of infectious diseases,**
- **„high degree of isolation“ (ebola)**
- **at home,**
- **barriers nursing technique**

Repressive anti-epidemic measures

Epidemiological investigation of the outbreak of the disease; date analysis (e.g., agent, transmission, and host) and active search for infected and suspected infections (possible sources)

Carried out immediately (preferably in an interview with the patient), defines the scope of an outbreak of place and time.

It is necessary to trace:

- the source of infection and
- other potentially infected people;
- collect basic data about patients and
- their contacts and
- data (age, gender, onset of disease, residence, profession etc.)
- to develop epidemic curves and
- expressing working hypotheses about the sources and routes of transmission.

Guarantine measures

Guarantine measures for suspected infection **in the form of medical supervision** (regular investigation and observation after incubation periods since the last case of the disease):

- ✓ **higher medical control of contacts,**
- ✓ **laboratory screening,**
- ✓ **focal disinfection** routine around the patient for elimination EA; final after transporting or death of the patient,
- ✓ **restrictions and prohibitions some profesional or private activities,**

Prevention of infectious diseases

HANDWASHING, DISINFECTION OF HANDS

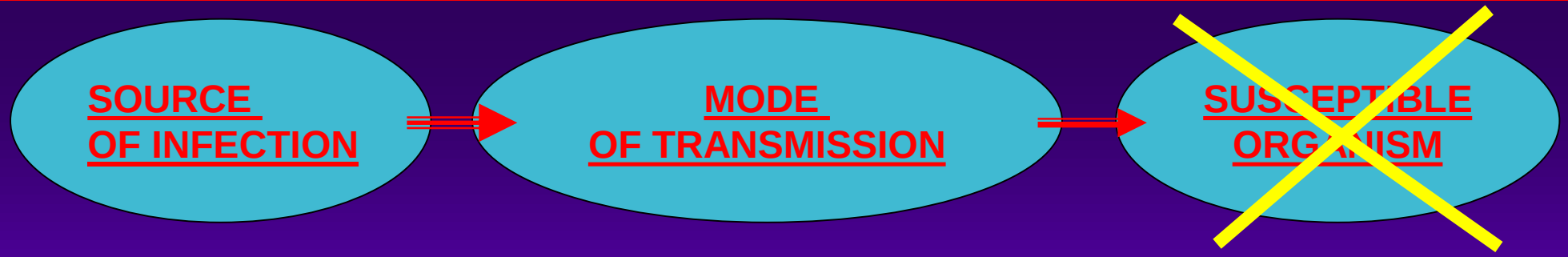
LINEN WASHING,

CLEANING
GOOD PREPARING OF FOOD, SAFE WATER……..,
……

DISINFECTION

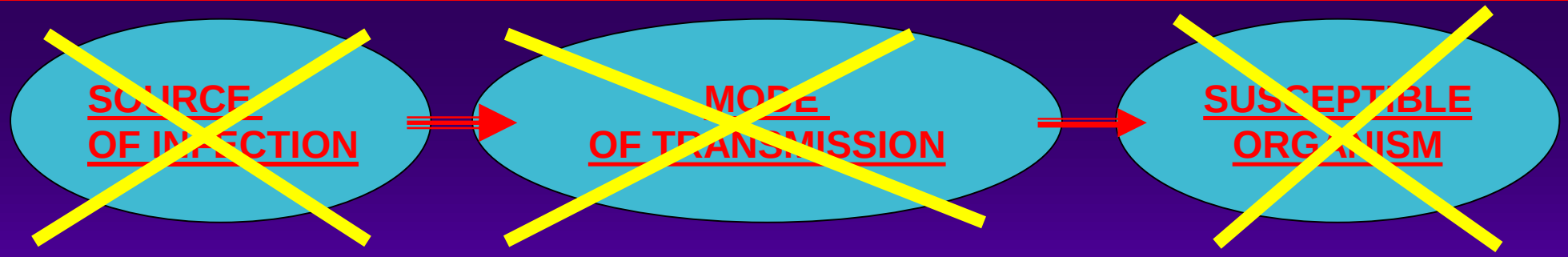
STERILIZATION

Prevention of infectious diseases



- ✓ **Immunoprophylaxis - active and passive immunization** according to the circumstances,
- ✓ **chemoprophylaxis** especially antibiotics or antimalarials,

Prevention of infectious diseases



- ✓ **Control of basic hygiene measures** , such as drinking water , food , removal of garbage , sewage disposal,
- ✓ **health and educational work** is the instruction of persons affected and threatened by means of appropriate behavior.
- ✓ **Monitoring and evaluation of anti-epidemic measures** - a day he **performs and evaluates epidemiologist** , if necessary, amend or adapt according to the situation. Efficiency measures are evaluated from a health and economic perspective.

Measures must be **viable** , **easily workable** , **understandable** and **effective** .

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- **Clinical Criteria**

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* — Fever
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* — Elevated serum aminotransferase levels

- **Laboratory Criteria**
- At least one of the following three:
- — Detection of hepatitis A virus nucleic acid in serum or stool
- — Hepatitis A virus specific antibody response
- — Detection of hepatitis A virus antigen in stool

- **Epidemiological Criteria**
- At least one of the following four:
- — Human to human transmission
- — Exposure to a common source
- — Exposure to contaminated food/drinking water
- — Environmental exposure

- **Case Classification**
- A. **Possible case** NA
- B. **Probable case**
- Any person meeting the clinical criteria and with an epidemiological link
- C. **Confirmed case**
- Any person meeting the clinical and the laboratory criteria

Etiology:

- RNA Picornaviridae; Single serotype worldwide
- No chronic infection; protective antibodies develop in response to infection - confers lifelong immunity

VHA is durable; **survives in the external environment cca 10 days**

The source of infection

Incubation period (IP): 30 – max.50 days
Infectivity period: 2 weeks at the ende IP + 1 day after after the onset of illness

- the presence of high levels of virus in the faeces (10on 9 in 1 ml);
- around the onset is viremia

Route of transmission

Faecal-oral transmission - Close personal contact
(e.g., household contact, sex contact, child day-care centers)
Contaminated food, water (e.g., infected food handlers)
Blood exposure (rare), (e.g., injection drug use

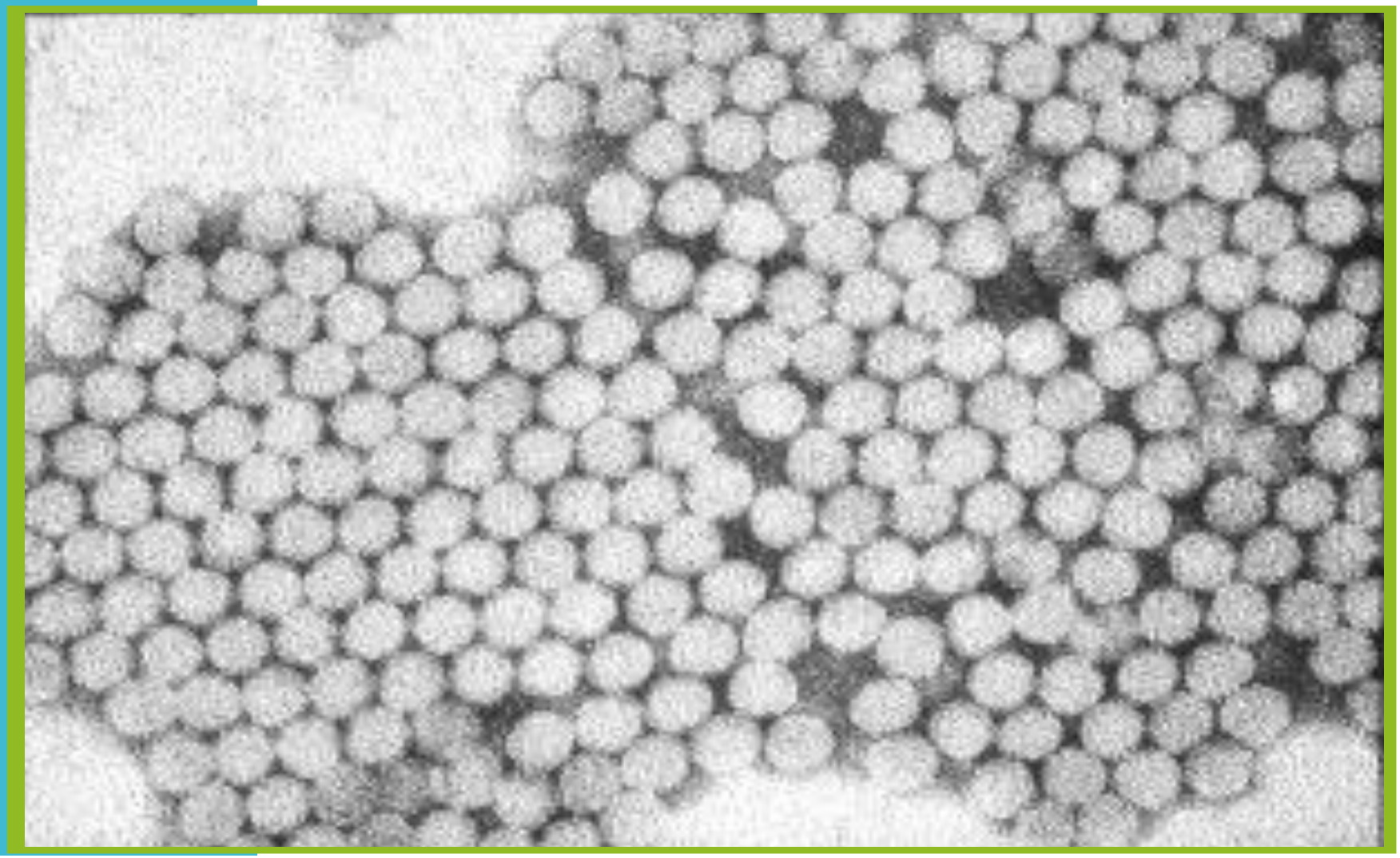
Susceptibility

General

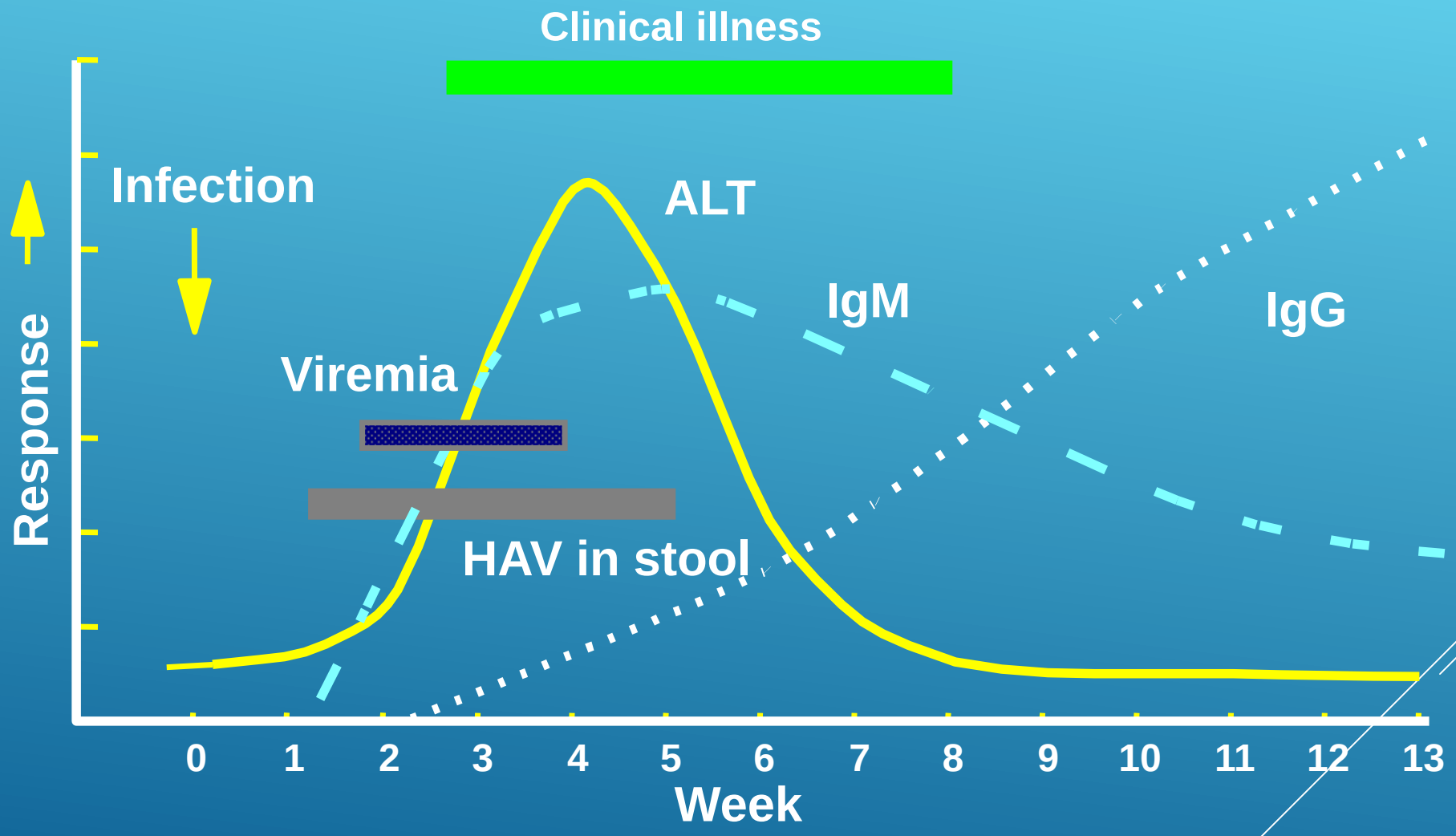
Preventive measures:

Hygiene (e.g., hand washing)
Sanitation (e.g., clean water sources)
Hepatitis A vaccine (pre-exposure)
Immune globulin (pre- and post-exposure)

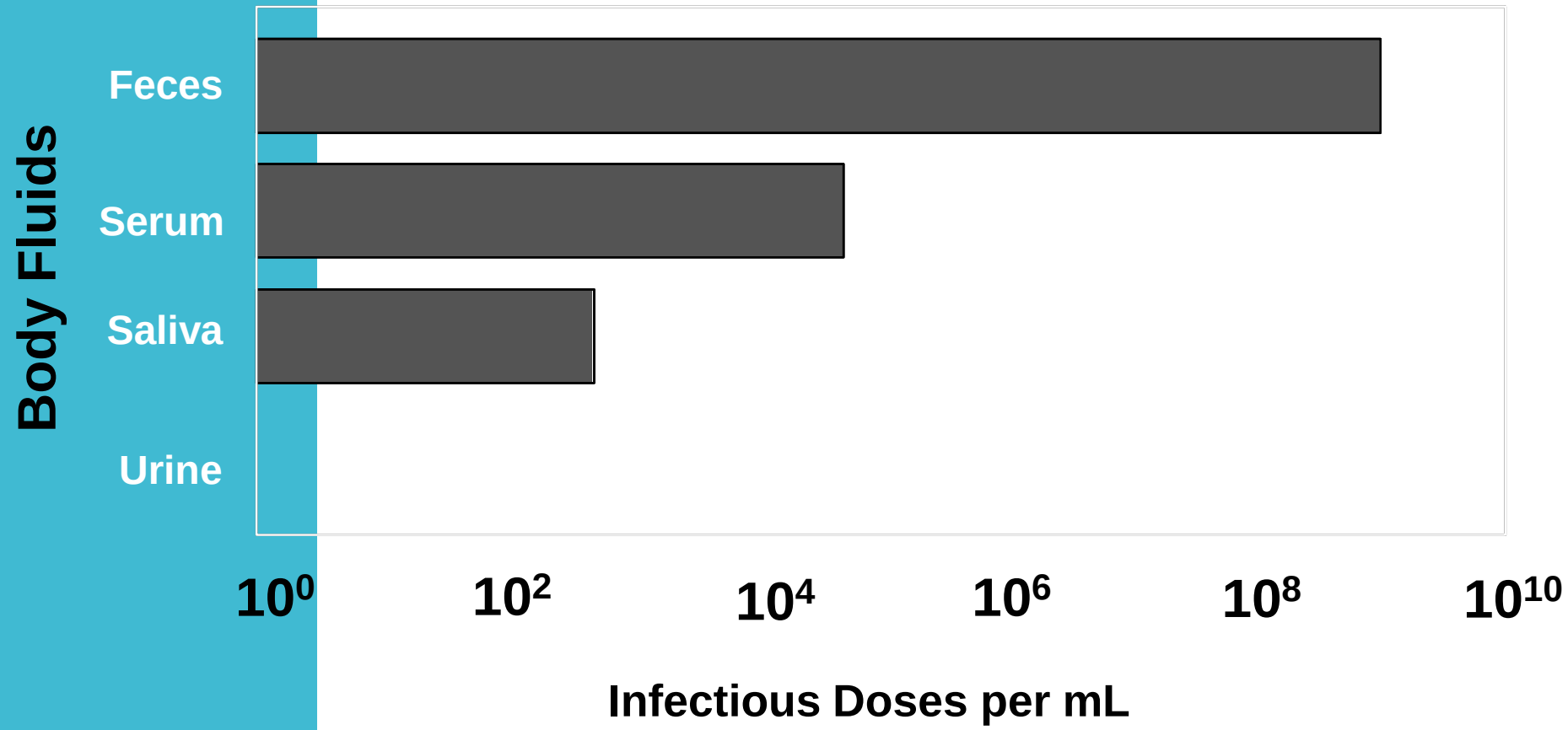
HEPATITIS A VIRUS



EVENTS IN HEPATITIS A VIRUS INFECTION

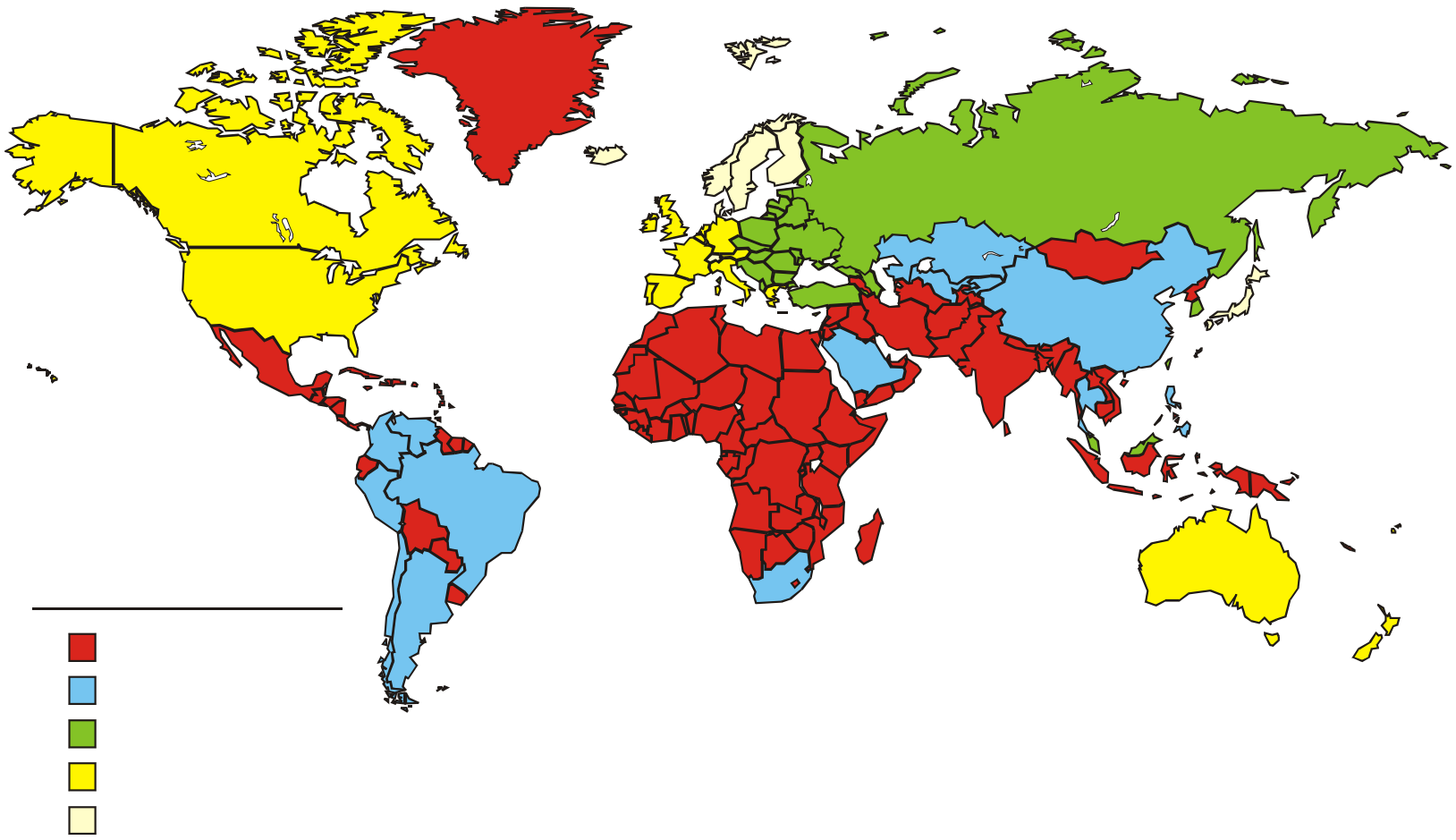


CONCENTRATION OF HEPATITIS A VIRUS IN VARIOUS BODY FLUIDS



Source: Viral Hepatitis and Liver Disease 1984;9-22
J Infect Dis 1989;160:887-890

GEOGRAPHIC DISTRIBUTION OF HEPATITIS A VIRUS INFECTION



Viral hepatitis A (VHA)
Repressive measures

Carried out immediately (preferably in an interview with the patient), defines the scope of an outbreak of place and time:

Guarantine measures for suspected infection **in the form of medical supervision under epidemiological characteristic:**

- **Incubation period (IP): 30 – max.50 days**
- **Infectivity period: 2 weeks at the ende IP + 1 day after** after the onset of illness
- the presence of high levels of virus in the faeces; around the onset is viremia

A list of other potentially infected people – contacts for **higher medical control**:

- clinical examination
- **laboratory screening: examination of antibodies IgG (**distinguish susceptible and non-susceptible persons)
- by the susceptible contacts – 3 times (during 50 days after last contact with source) examine serum aminotransferase levels.

Each increasing – reason for isolation of patient.

Viral hepatitis A (VHA)

Repressive measures

- **focal disinfection - substanties with virucidal efects**
- **active (passive ?) immunization**
- **prohibitions some profesional – cook**
- **control of basic hygiene measures** , such as hand-washing, hand- disinfection, water , food , removal of garbage , sewage disposal,
- **health and educational work** - the instruction of potentially infected people about of appropriate behavior.

Key characteristics of HAV, HBV, HCV, HDV, HEV

	A	B	C	D	E
Causative agent	Picornaviridae RNA	Hepadnaviridae DNA	Raviviridae RNA	Deltaviridae RNA	Hepeviridae RNA
Incubation period	2 – 6 weeks	2 - 6 months	2 - 6 months	3-7 weeks	2 - 10 weks
Characteristic of acute hepatitis	Case fatality increases with age	Acute hepatitis more common in adults	Acute hepatitis uncommon, almost never fulminant	Superinfection with HDV in chronic heptitis B may lead to fulminnat disease	High case fatality in pregnant women -10-20 %; other 1 -2 %
Biomarker of recent infection	IgM anti-HAV	IgM anti-HBc	None	IgM anti-HDV	IgM anti-HEV
Chronic infection	none	Chronic infection leading to sequelae	Chronic infection leading to sequelae	Chronic hepatitis that copmlicated chronic hepatitis B	Very rare
Cirrhosis and hepatocelular Ca	No	Yes; 0,1 -1,0 % are fulminant	Yes; 50 % can be fulminant	Yes; 5 - 20 % can be fulminant	NO
The period of infectivity	last 2 weeks of incubation period first day of acute stage	last 2 months of incubation period entire period of acute stage chronic disease, carriers	last 2 months of incubation period entire period of acute stage chronic disease, carriers	??	??
Infectious biological material	faeces viremia - 1. day of illnes	blood genital secretions	blood genital secretions	blood	faeces meat of animals
Mode of transmission	Person-to person Foodborne Waterborne	Perinatal Bloodborne Sexual	Blodborne Perinatal Sexual	Blodborne	Waterborne Foodborne Person-to person
Imunization	Inactivated hepatitis A vaccines are safe and effective for both pre- and post-exposure prophylaxis	Active (recombinant vaccine) and passive imunization	no	no	Vaccine licensed in China; not widely available