Kako bi definirali biosigurnost?

- Definiramo kao skup mjera koje će nas zaštiti od opasnih mikroorganizama
- Biozaštita usmjerena na smanjenje mogućnosti da se neki mikroorganizam namjerno koristi kao biološko oružje

Za što će nam koristit znanja iz područja biosigurnosti i biozaštite?

➢Očuvanje zdravlja

Što je biohazard?

Biološki rizik ili biološka opasnost

- Simbol stvorio Charles Baldwin 1966. god. : ukazuje na patogene koji mogu naštetit ljudima i živim organizmima

- Potencijalnu opasnost od kontaminacije ili zaraze elemenata koji dolaze u kontakt

BIO - MEDICAL WASTE

CYTOTOXIC WASTE
સાઇટોટોકસીક કચરો

Black Bag

- Cytotoxic Waste
- Expiry Date Medicine
- Radio Active Substance Waste

- સાઈટોટોકિસક વેસ્ટ
- એકસપાયરી ડેટની દવાઓ
- રેડિયો એકિટવ વેસ્ટ

INFECTIOUS WASTE (PLASTIC)
ચેપી પ્લાસ્ટીક કચરો

Red Bag

Used and Disposable plastic items like...
- Blood Bags
- Infectious I. V. Sets
- Infectious plastic tubings
- Rubber catheters
- Cut plastic / latex gloves

વપરાશ બાદ નિકાલ કરવા યોગ્ય વસ્તુઓ જેવીકે....
- બ્લડ બેગ
- વપરાયેલ આઇ. વી. સેટસ
- વપરાયેલ પ્લાસ્ટીકની નલીઓ
- રબરનાં કેથેટર્સ
- પ્લાસ્ટીક/ લેટેક્ષ ગ્લોવ્ઝ કાપીને નિકાલ કરવા માટે

INFECTIOUS SHARP WASTE
ચેપી તિક્ષ્ણ કચરો

Blue Bag

- Glass Bottels
- Glass Ampoules
- Injection Vials

- કાચની બાટલીઓ
- કાચની એમ્પ્યુલ્સ
- ઇન્જેકશન વાયલ્સ

RECYCLABLE WASTE
પરિવર્તનશીલ કચરો

Green Bag

- Office Stationery
- Disposable paper cups
- Tissue paper used for Domestic purpose
- Kitchen Waste

- ઓફિસમાં વપરાતી સ્ટેશનરી
- નિકાલ કરવા યોગ્ય પેપર કપ
- સામાન્ય વપરાશમાં લેવાયેલ ટીસ્યુ પેપર
- ખોરાકી કચરો

INFECTIOUS WASTE (NON PLASTIC)
પ્લાસ્ટીક સિવાયનો ચેપી કચરો

Yellow Bag

- Infectious dressing material like gauze, cotton etc
- Human organs, body parts and tissues
- Blood bags
- Discarded cytotoxic medicines
- Discarded / expired durgs
- personal protective Equipments - disposable gown, mask, cap
- Infectious dressing material like gauze, cotton etc.

- માનવ શરીર અંગો, પેશીઓ
- બ્લડ બેગ
- નિકાલ કરેલ / સમય બગોદા ગયેલ દવાઓ
- રક્ષણ કરણનાં સાધનો જેવાકે નિકાલ કરવા યોગ્ય ગાઉન, માસ્ક, કેપ
- ચેપી ડ્રેસીંગ મટીરીયલ દા.ત. પાટાપીંડી વગેરે

INFECTIOUS & INJURIOUS SHARP WASTE
ચેપી અને ઈજા પહોંચાડી શકે તેવો તિક્ષ્ણ કચરો

Puncture Proof Can

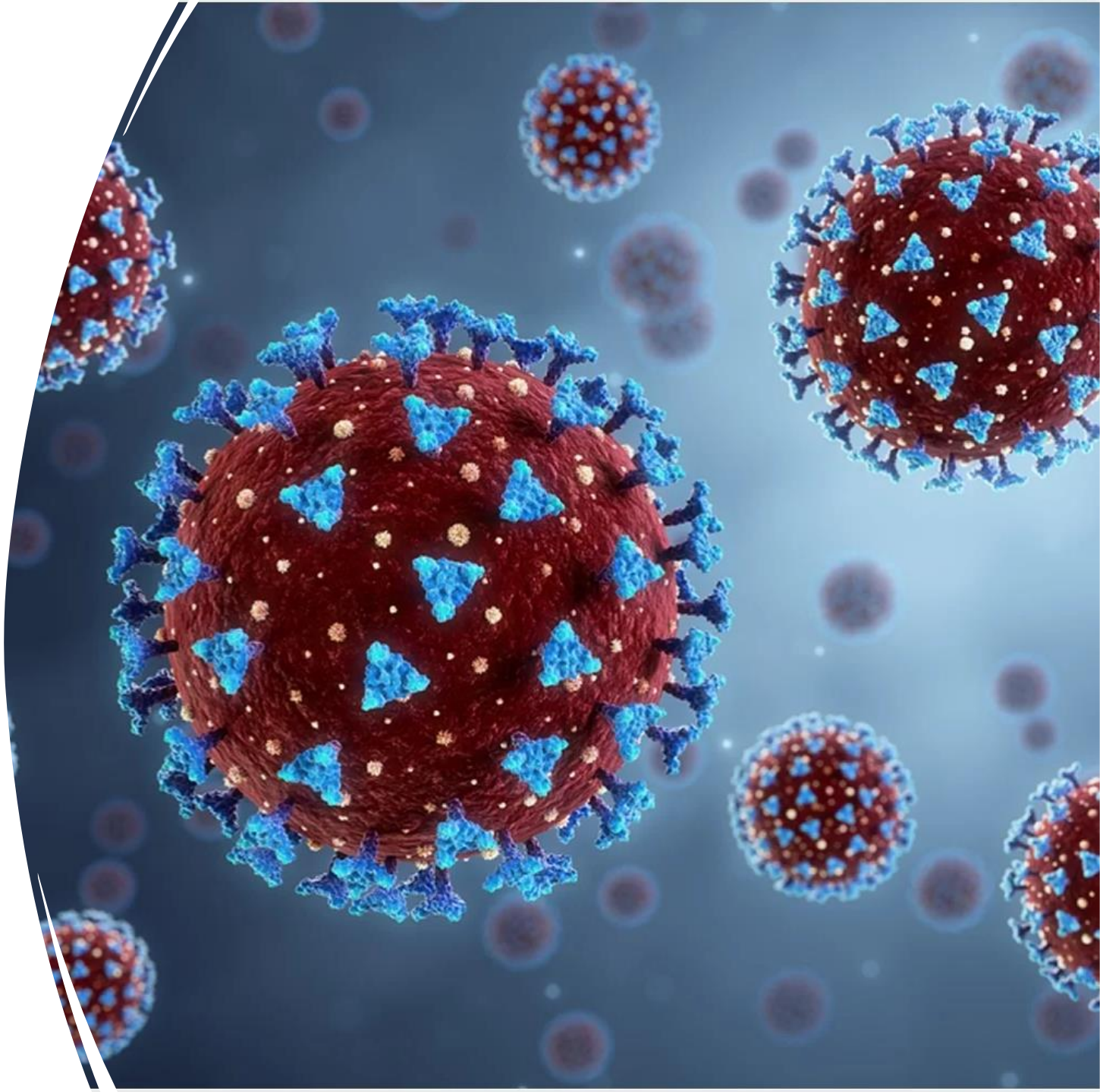
- Used Needles
- Used Scalpel blades Blades
- Cannula Stylet
- Lancets
- Broken glass slides & cover slip

- વપરાયેલ સોય
- વપરાયેલ સ્કાલપેલ બ્લેડ
- બ્લેડ
- કેન્યુલાનું સ્ટીલેટ
- લેન્સેટ
- તુટેલી કાચની સ્લાઈડ અને કવર સ્લીપ

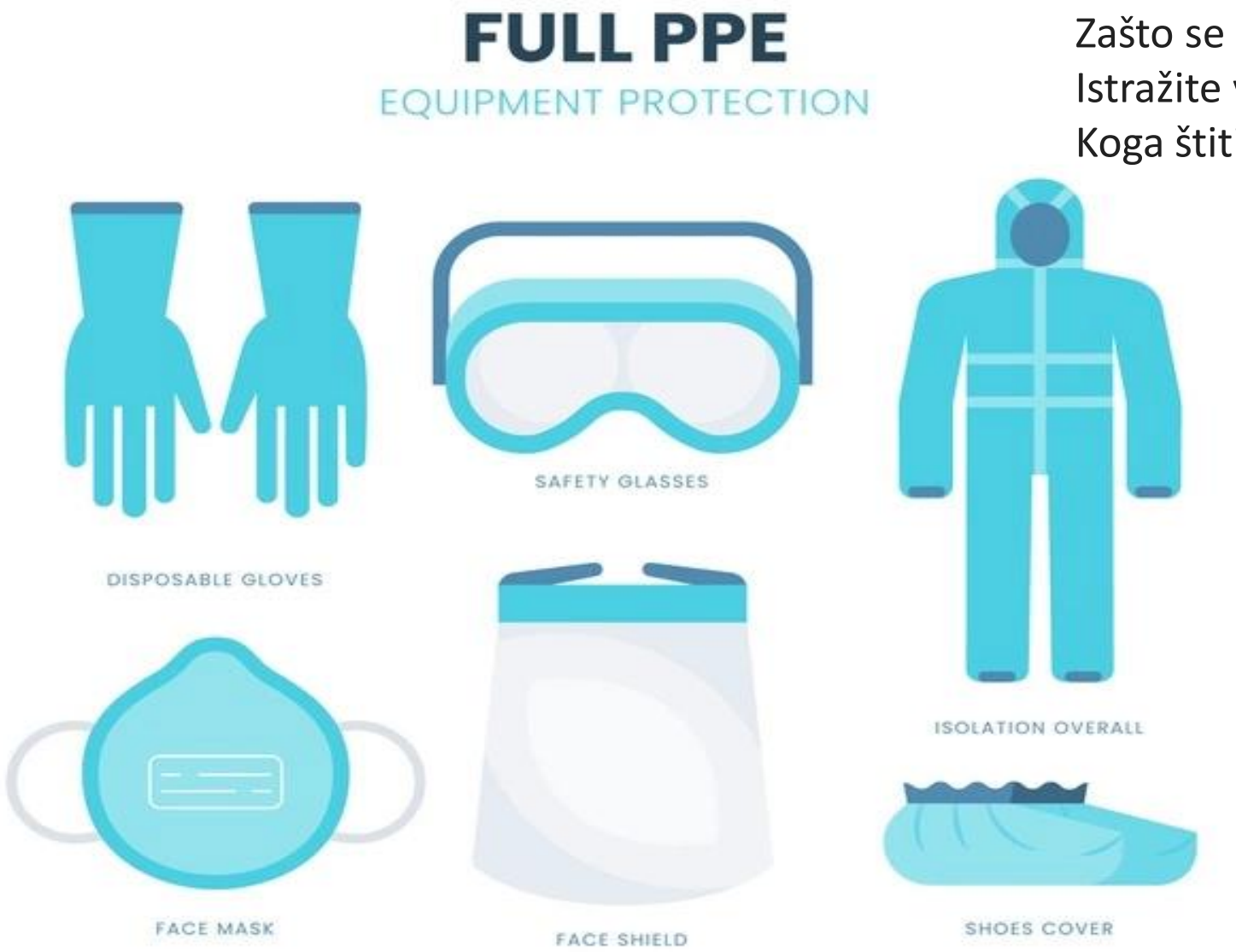
SP-2436396

Načini prijenosa virusa:

- Kapljični put (zrakom)=bliski kontakt sa zaraženom osobom
- Tjelesni doticaj s oboljelom osobom
- Dodirivanjem nedavno kontaminiranih površinama



Čemu služe zaštitne naočale i vizir?
Kada se koriste neprobojne rukavice?
Zašto se nose dva para rukavica?
Istražite vrste zaštitnih masaka?
Koga štiti kirurška maska?



TYPES OF MASKS

Hygienic

PROTECTS YOU ✗

PROTECTS OTHERS ?

They could serve not to spread, only for healthy people

Surgical

PROTECTS YOU ✗

PROTECTS OTHERS ✓

Conforming to regulations

FFP1 without exhalation valve

PROTECTS YOU ✗

PROTECTS OTHERS ✓

Conforming to regulations

FFP2 without exhalation valve

PROTECTS YOU ✓

PROTECTS OTHERS ✓

Conforming to regulations

FFP2 FFP3 with exhalation valve

PROTECTS YOU ✓

PROTECTS OTHERS ✗

Conforming to regulations

SOURCE: MINISTERIO DE SAINDAD ESPAÑA

Wearing masks to limit the spread of COVID-19

Social distancing and good hand hygiene are the most important methods of preventing coronavirus transmission, but wearing masks in public can limit the spread of COVID-19 by people who have the virus.

Many types of masks can be made at home using fabric, T-shirts, or bandanas.

How to properly wear a mask

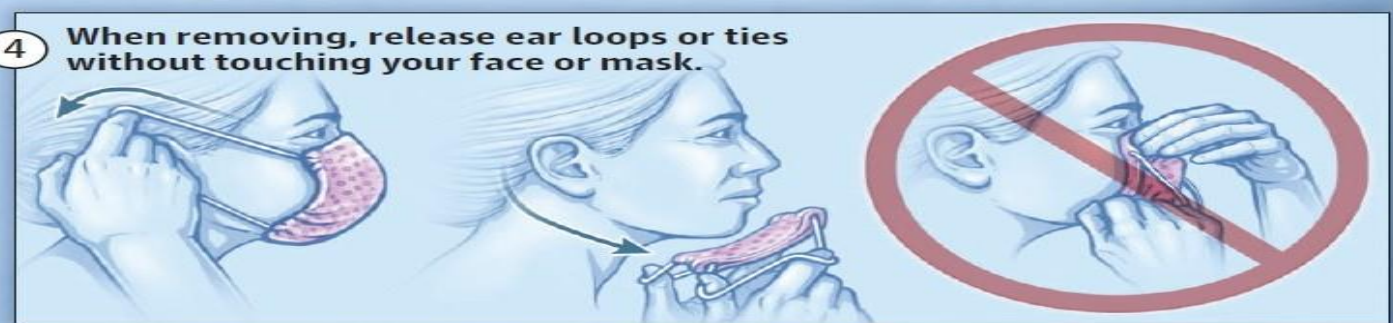
1. **Wash your hands with soap and water for at least 20 seconds before putting on mask.**

2. **Secure mask ties behind your ears or head without touching your face.**

Masks should fit well over your nose and mouth without restricting breathing.

3. **Do not touch your face or front of mask while wearing.**

4. **When removing, release ear loops or ties without touching your face or mask.**



5. **Wash your hands with soap and water for at least 20 seconds after removing mask.**

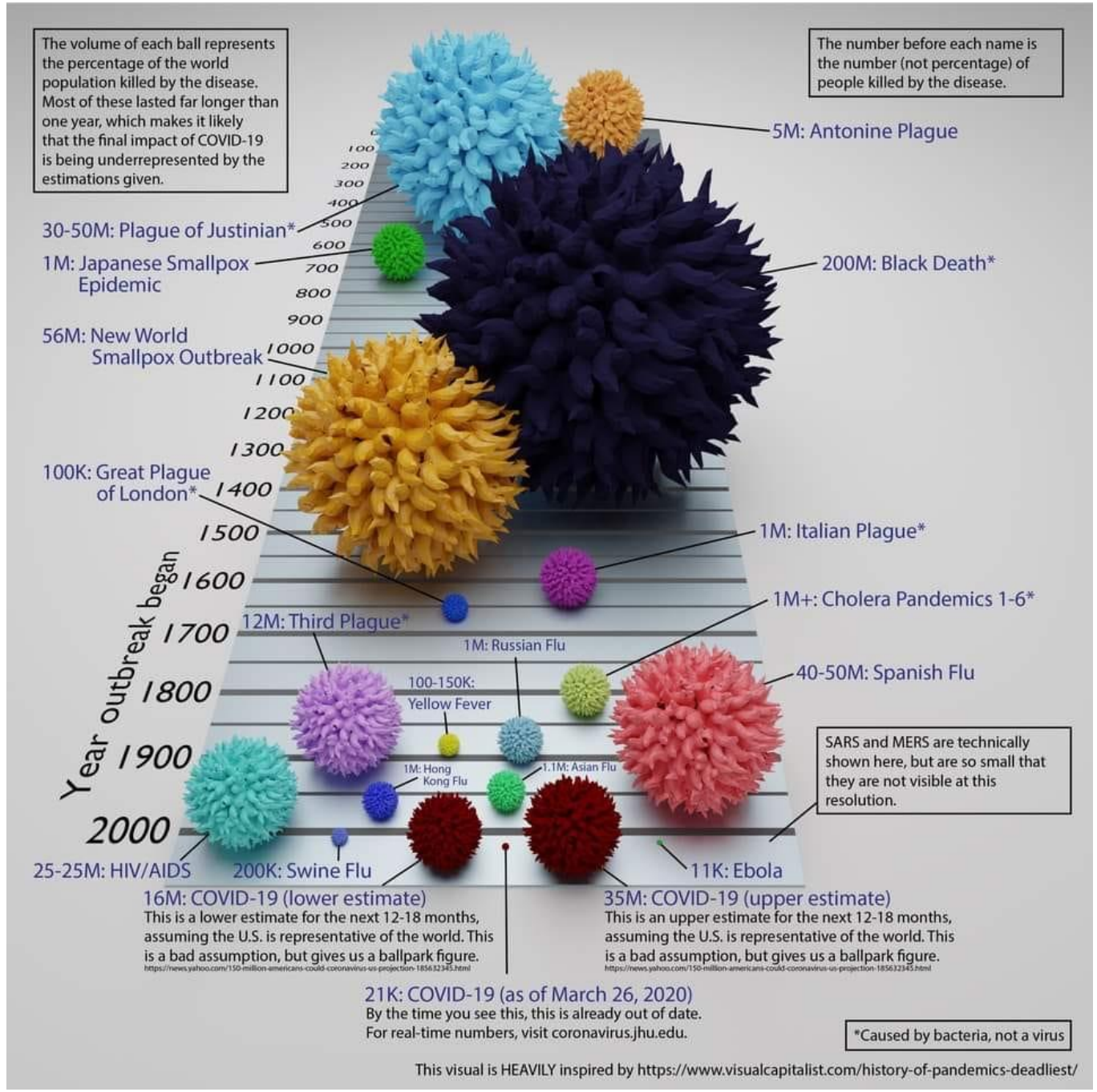
A. Rekito

Masks should be washed routinely with soap and water or laundry detergent to prevent contamination.

Biološko oružje i bioterorizam

danas su zarazne bolesti koje u kratkom vremenu mogu usmrtiti veliki broj ljudi rijetkost (higijena, napredak medicine)

- ‘Crna Smrt’
- u 13. st. kuga je smanjila broj stanovnika u Europe za 30-50%


The volume of each ball represents the percentage of the world population killed by the disease. Most of these lasted far longer than one year, which makes it likely that the final impact of COVID-19 is being underrepresented by the estimations given.
The number before each name is the number (not percentage) of people killed by the disease.
Year outbreak began
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
5M: Antonine Plague
30-50M: Plague of Justinian*
1M: Japanese Smallpox Epidemic
200M: Black Death*
56M: New World Smallpox Outbreak
100K: Great Plague of London*
1M: Italian Plague*
1M+: Cholera Pandemics 1-6*
12M: Third Plague*
1M: Russian Flu
40-50M: Spanish Flu
100-150K: Yellow Fever
SARS and MERS are technically shown here, but are so small that they are not visible at this resolution.
1M: Hong Kong Flu
1.1M: Asian Flu
25-25M: HIV/AIDS
200K: Swine Flu
11K: Ebola
16M: COVID-19 (lower estimate)
This is a lower estimate for the next 12-18 months, assuming the U.S. is representative of the world. This is a bad assumption, but gives us a ballpark figure.
https://news.yahoo.com/150-million-americans-could-coronavirus-us-projection-185632345.html
35M: COVID-19 (upper estimate)
This is an upper estimate for the next 12-18 months, assuming the U.S. is representative of the world. This is a bad assumption, but gives us a ballpark figure.
https://news.yahoo.com/150-million-americans-could-coronavirus-us-projection-185632345.html
21K: COVID-19 (as of March 26, 2020)
By the time you see this, this is already out of date.
For real-time numbers, visit coronavirus.jhu.edu.
*Caused by bacteria, not a virus
This visual is HEAVILY inspired by https://www.visualcapitalist.com/history-of-pandemics-deadliest/

Po čemu je biološko oružje posebno ?

Vrijeme inkubacije

- - djeluje sa zadrškom
- - i kod najvirulentijih patogena (npr. virus Ebole, uzročnih kuge) smrt nastupa tek za nekoliko dana

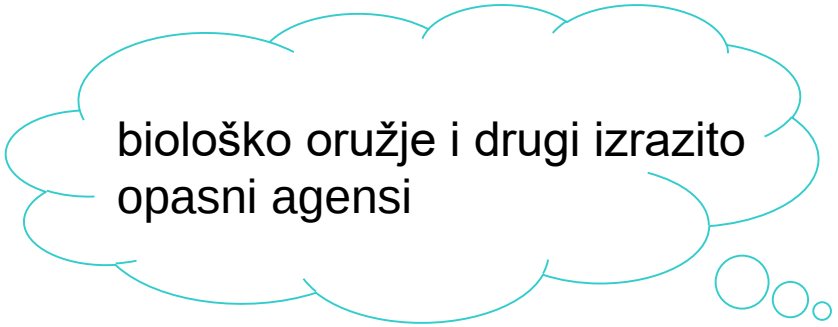
Način primjene problematičan

- - širenje zrakom – zračne struje
- - ciljano (terorizam) – npr. poštom (spore antraksa), putem zaraženih ljudi

Po čemu je biološko oružje posebno ?

- Vrlo zahtjevna (i skupa) proizvodnja

BIOHAZARD



Nivo biosigurnosti 1
Nivo biosigurnosti 2
Nivo biosigurnosti 3
Nivo biosigurnosti 4

NIVO 1

- nije vjerojatno da će uzrokovati bolest kod ljudi
  - nepatogeni sojevi *E. coli*

NIVO 2

- mogu uzrokovati bolest kod ljudi i biti opasni za djelatnike koji s njima rade, ali nije vjerojatno daljnje širenje bolesti, postoje mogućnosti prevencije i liječenja
  - adenovirusi, *Streptococcus pneumoniae*

NIVO 3

- uzrokuju opasne bolesti, postoji mogućnost širenja, ali najčešće i mogućnost prevencije i liječenja
  - antraks

NIVO 4

- uzrokuju opasne bolesti, velik rizik i za djelatnike i za daljnje širenje bolesti, nema učinkovite prevencije ni mogućnosti liječenja
  - virus ebole, lasa virus

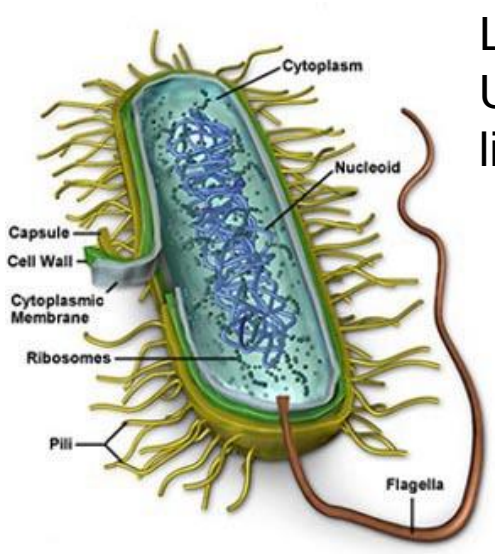
Rad u laboratoriju četvrtog nivoa biosigurnosti

M Lipsitch et al. Science 2012;336:1529-1531

Published by AAAS

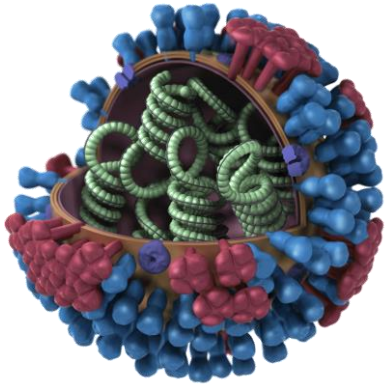
Što može služiti kao biološko oružje ?

BAKTERIJA?



Lako se uzgajaju
Uglavnom postoje lijekovi (antibiotici)

VIRUSI?



Uzgajaju se u živim stanicama (skuplje)
Uglavnom ne postoje lijekovi

EUKARIOTI?

Plasmodium, *Entamoeba*
Teško se kultiviraju

patogene gljivice
Mogu se uzgajati u laboratoriju

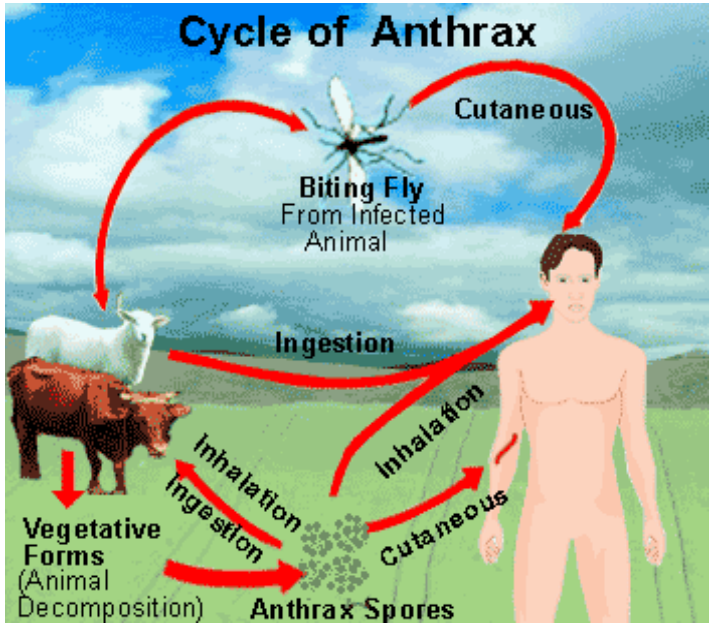
Antraks

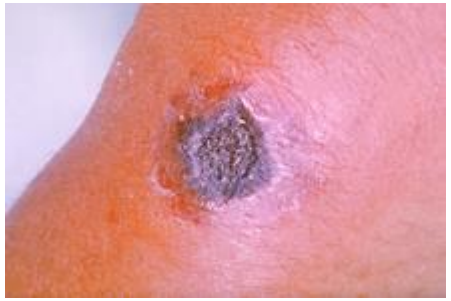
• = bedrenica, uglavnom bolest stoke i divljih životinja

• uzročnik je *B. anthracis* – relativno lako se uzgaja i formira spore koje su vrlo otporne i mogu se zadržavati u tlu godinama

• kod čovjeka u tri oblika: gastrointestinalni, kožni i plućni

• najopasniji je plućni oblik koji se razvija nakon udisanja spora *B. anthracis* – smrtnost 45-90%





Antraks je gotovo savršeno biološko oružje

vrlo infektivan

letalan

B. anthracis

lako ga je proizvesti

spore dugoživuće

Antraks

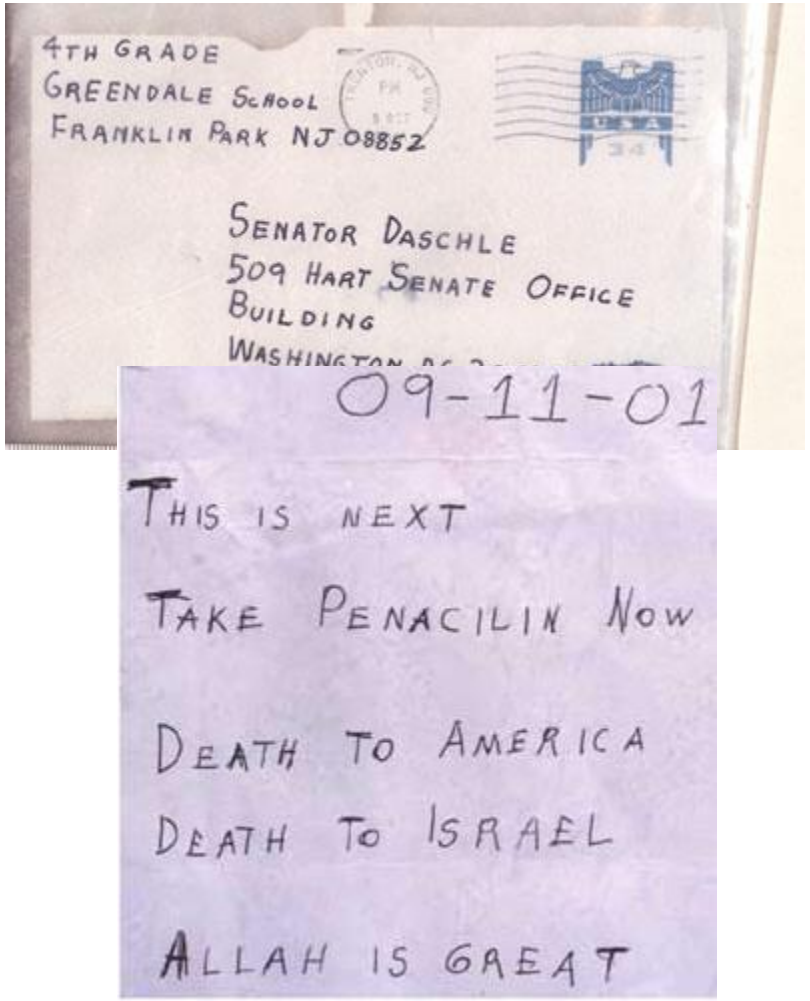

GRUINARD ISLAND
THIS ISLAND IS
GOVERNMENT PROPERTY
UNDER EXPERIMENT
THE GROUND IS CONTAMINATED
WITH ANTHRAX AND DANGEROUS.
LANDING IS PROHIBITED
BY ORDER

Napad antraksom 2001. g. u SAD

- pisma sa sporama antraksa poslana medijskim kućama, senatorima

- 22 ljudi zaraženo, 11 dobilo plućni oblik – 5 umrlo

- psihološki učinak ogroman



Kodirana poruka ?

TTT AAT TAT
Phe Asn Tyr = PAT
F N Y = FNY