

Learn from emerging virus infections (1)

Emerging viruses are zoonotic infectious viruses.

- Humans interrupted peaceful codependent relationships between viruses and natural hosts.
- Modern society invited viruses which existed in places far away from humans.

Social activities of humans keep widening.

⇒ New viruses keep emerging.

Learn from emerging virus infections (2)

Marburg disease (1967)

The source of infection was an African green monkey airlifted from Uganda.

Infections with a fatality rate of 23% broke out in west Germany

(Bering Lab. in Marburg, Ehrlich Lab. in Frankfurt) and Yugoslavia (Belgrade Lab).

(note) : 500 monkeys were imported to Tokyo around the same time.

The virus was separated in the University of Marburg.

(note) : by classical protection by mask, lab-coat, and gloves

now, BSL (Biosafety level) 4

Natural host is still unknown.

Learn from emerging virus infections (3)

Lassa fever (1969)

1969~1970 group infection in a Nigerian hospital. Fatality rate of 36~67%.

Natural host is mastomys (a large rodent). No pathogeny in mastomys; they live with the virus.

The virus is a Lassa virus, belonging to the Arenaviridae family.

The virus is shed in mastomys excreta. ⇒ It infects humans by aerosol.

(note) : dangers of imported diseases

1976 An American woman who returned from Sierra Leone was found to be infected with the virus. 552 people (including 5 Japanese on the same airplane) who may have had contact with her were kept under medical supervision for 3 weeks.

1987 A Japanese engineer who returned from Sierra Leone was hospitalized in the Institute of Medical Science at the University of Tokyo, and later found to be infected with the Lassa virus.

Learn from emerging virus infections (3)

Ebola hemorrhagic fever (often after 1976)

Hospitals are responsible for the infection in all cases.

Causes of the spread of infection :

1. Repeated use of un-sterilized hypodermic needles
2. The customs (rituals) for cleaning and dressing the dead
3. Medical treatment without wearing a protective gown

(note) : Rapid treatment is important to minimize victims.

**BSL4 level
laboratory**

Vaccines

**bacteria : pertussis vaccine, diphtheria toxoid, tetanus toxoid,
cholera vaccine, leptospirosis vaccine, pneumococcus vaccine**

**virus : polio vaccine, influenza vaccine, Japanese encephalitis vaccine,
measles vaccine, mumps vaccine, rubella vaccine, rabies vaccine
yellow fever vaccine, chicken pox vaccine, hepatitis B vaccine,
hepatitis A vaccine**

Cures

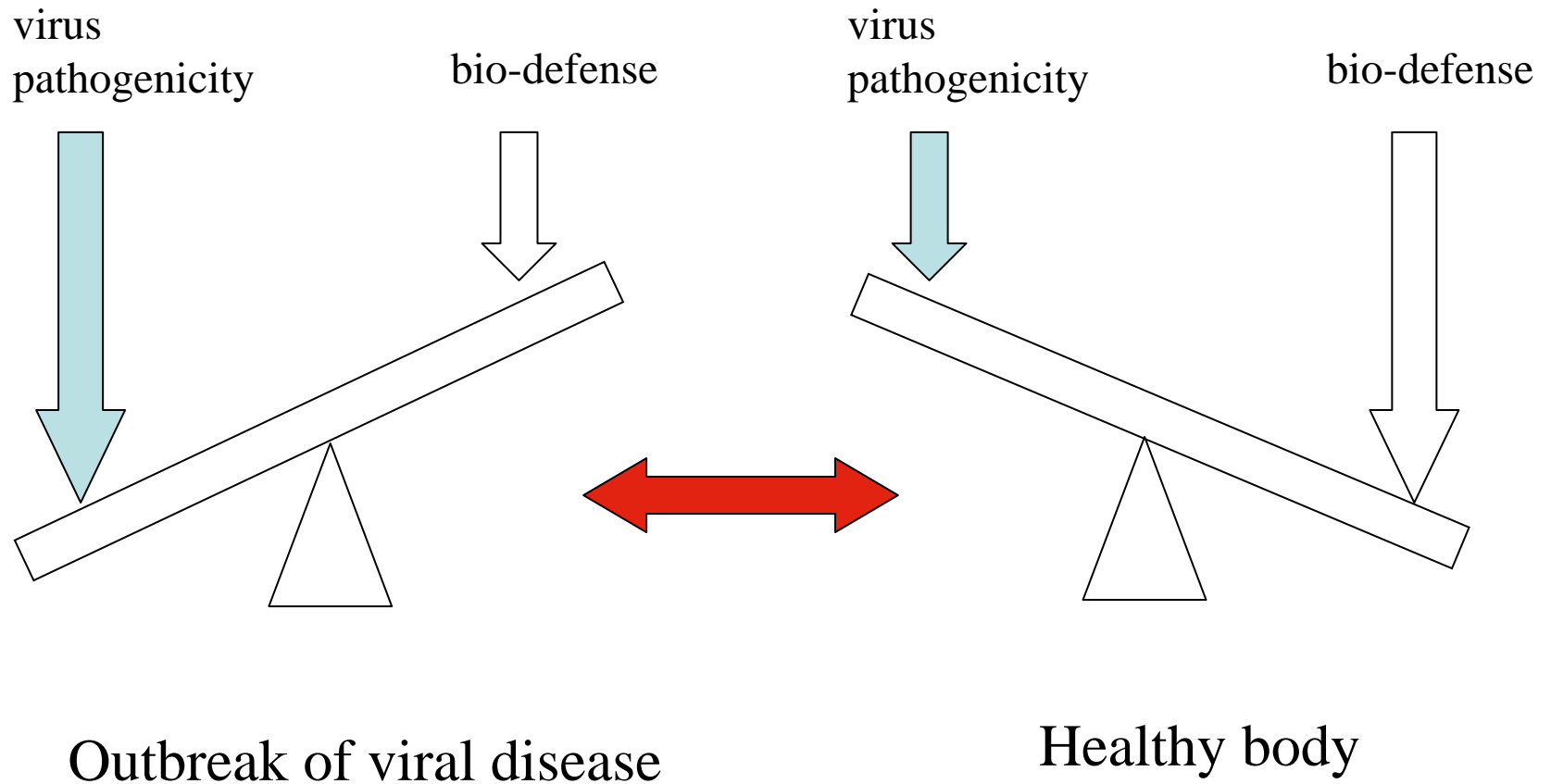
bacteria : many kinds of antibiotics

virus : acyclovir, amantadine, zanamivir, ribavirin

Vaccines

**Gives specific immunity
against pathogenic microbes**

Virus pathogenicity and bio-defense



Vaccines

- Raw vaccine
- Inactivated vaccine
- Component vaccine

Preventive vaccines

- Everybody
- Risk group
- Curative vaccines (drugs)

Good vaccines

- Peroral administration
- Effective in a single dose
- Multivalent vaccine

Pursuits

- Effectiveness
- Safety
- Developmental
research

Pathogens whose vaccines are difficult to develop

- Multiple antigenicity
- Changing antigenicity
- Reinfection and out breaks

New vaccines

- DNA vaccines
- Immunostimulating vaccines
- Mucosa vaccines

polio virus

HIV

**molecular mechanism of
infection and pathogeny**

unknown

unknown

vaccine

exists

difficult

clinical condition

acute

chronic

Pathogenicity (pathogen tropism)

- Proliferation
- Transmission in body
- Clinical conditions

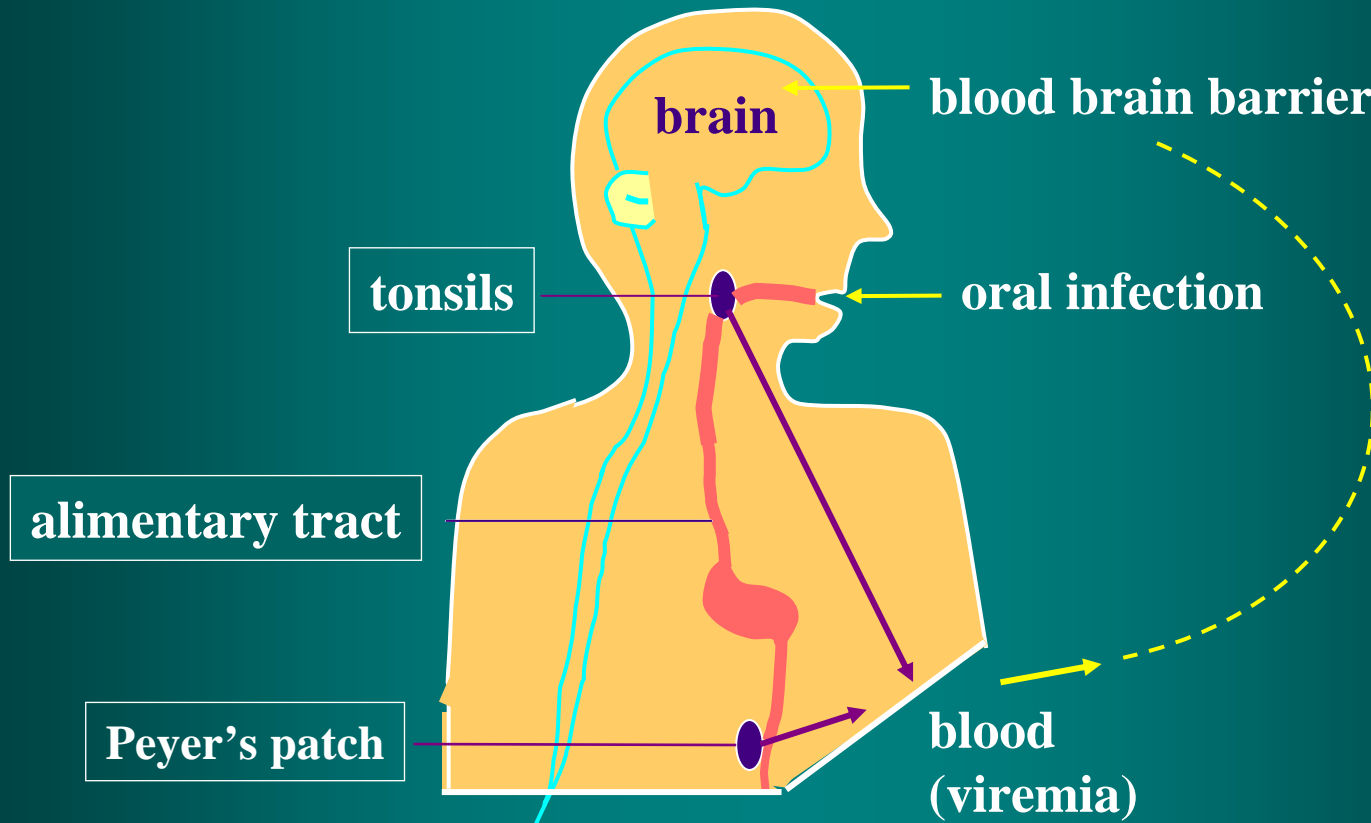
Research on infection process breeds strategies to control infections

**Conventional vaccines : prevent infection/outbreak by neutralizing
antibodies**

**Preventing infection : discover the molecular mechanism of infection
process in the first target cell**

**Preventing outbreak : discover the molecular mechanism of whole
process from infection to outbreak**

Dissemination of Polio Virus in Humans

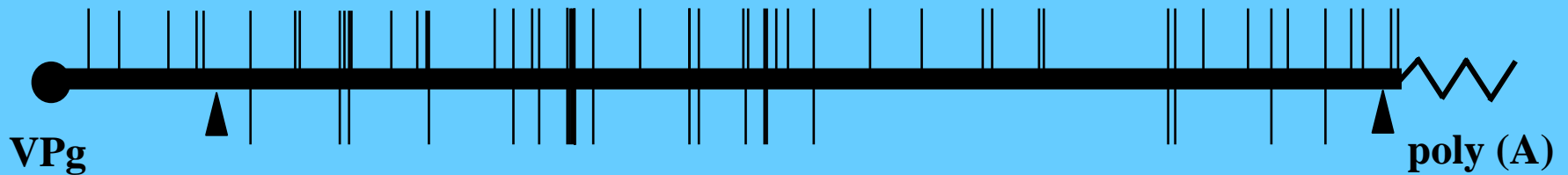


	alimentary tract	viremia	CNS
Virulent strain	○	○	○
Attenuated strain	○	×	×

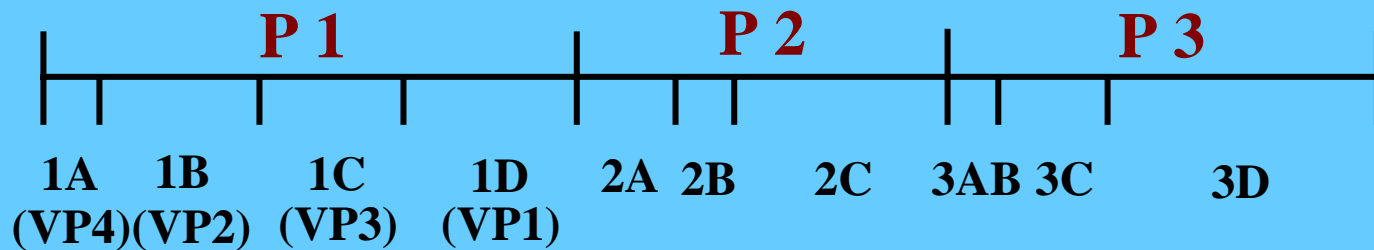
Length of Nucleotides (kb)



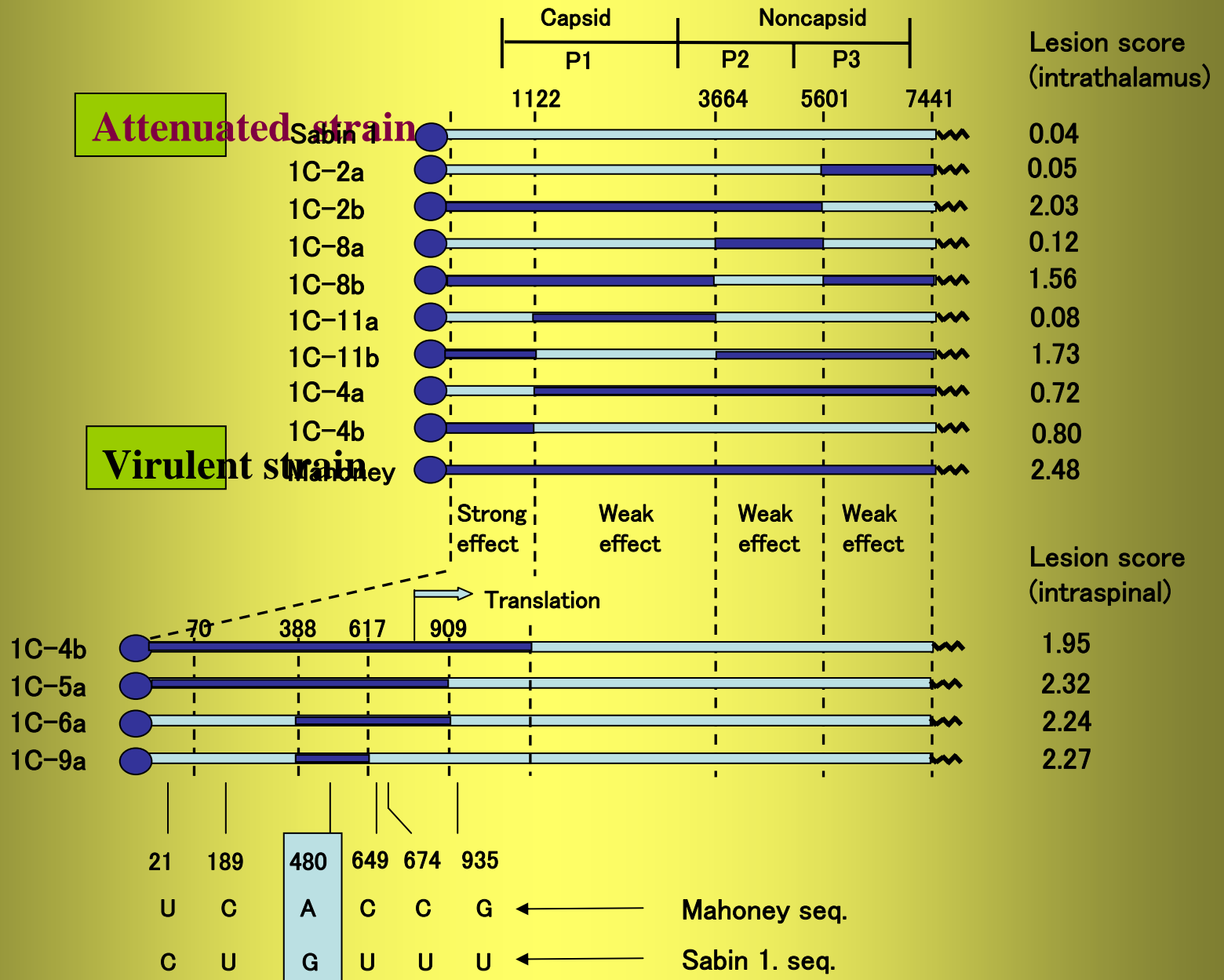
different nucleotides



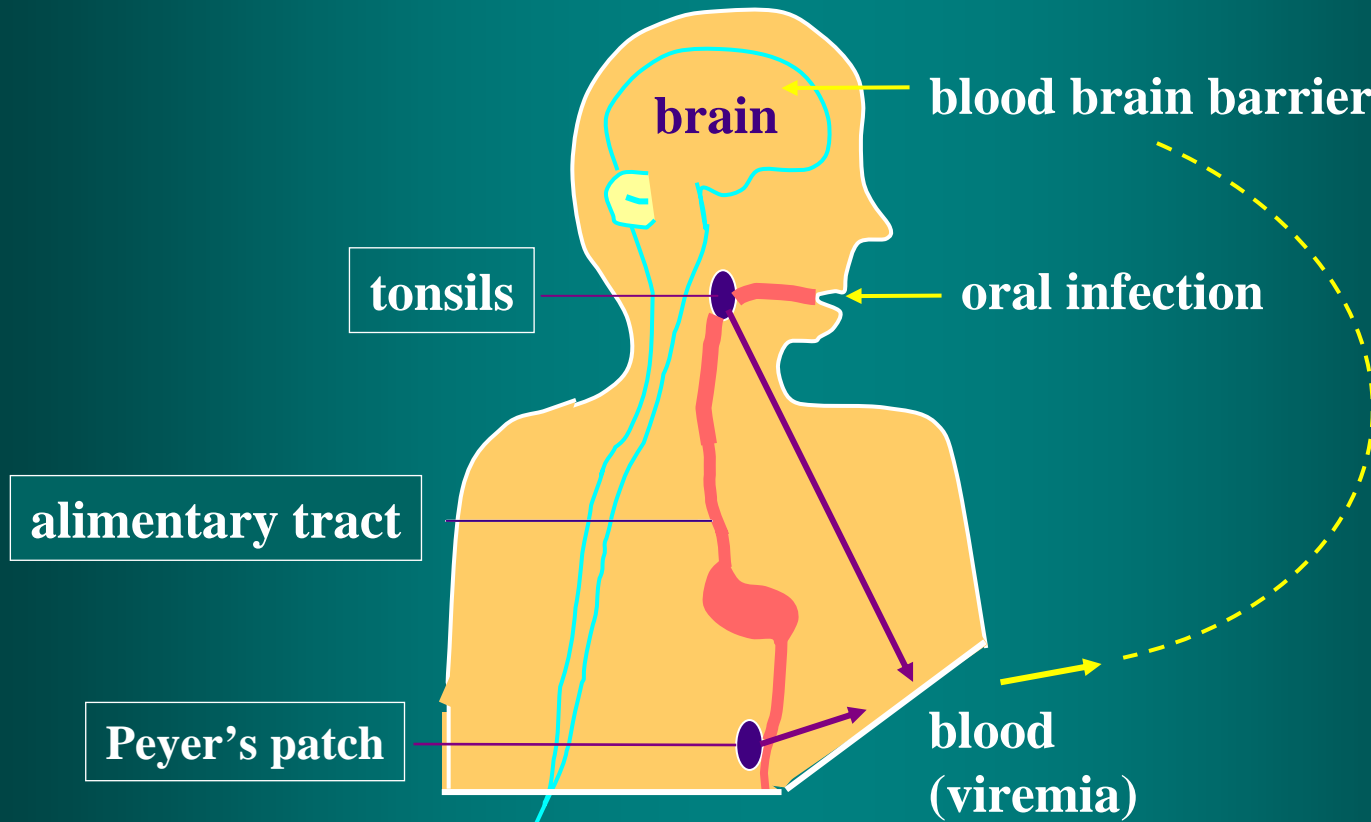
different amino acids



強毒株と弱毒株の組換え体ウイルスのゲノム構造

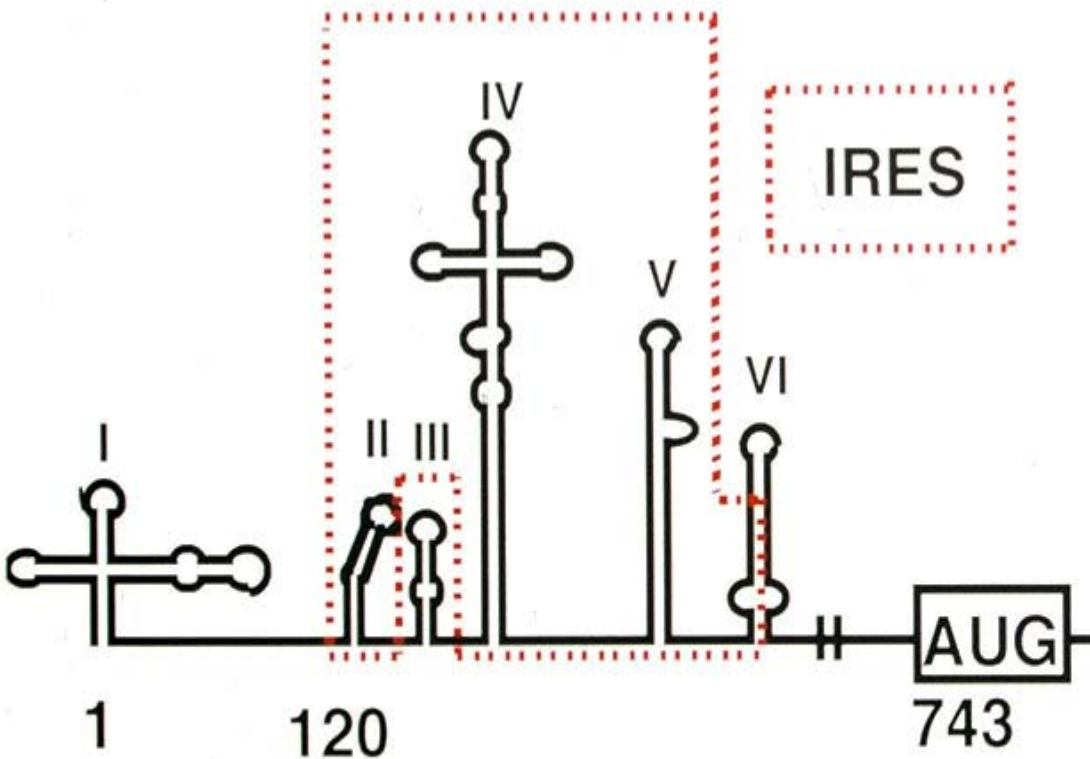


Dissemination of Polio Virus in Humans



	alimentary tract	viremia	CNS
Virulent strain	○	○	○
Attenuated strain	○	×	×

Poliovirus IRES and Host Factors



Cellular factors for IRES

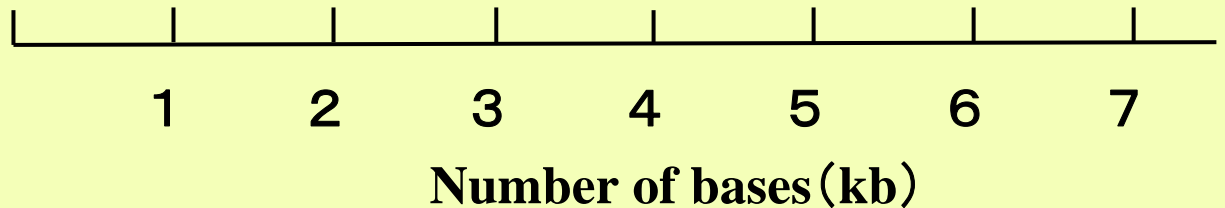
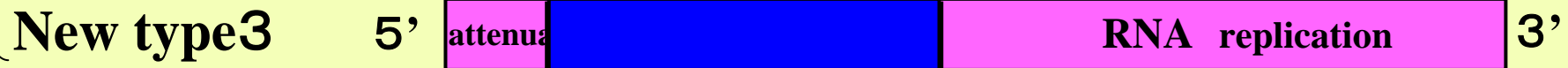
La protein (SLVI)
PCBP-1,2 (SLI, IV)
PTB (SLV)

IRES: Internal Ribosome
Entry Site

Genetic stability of nucleotides that influence the attenuation phenotype of the polio virus.

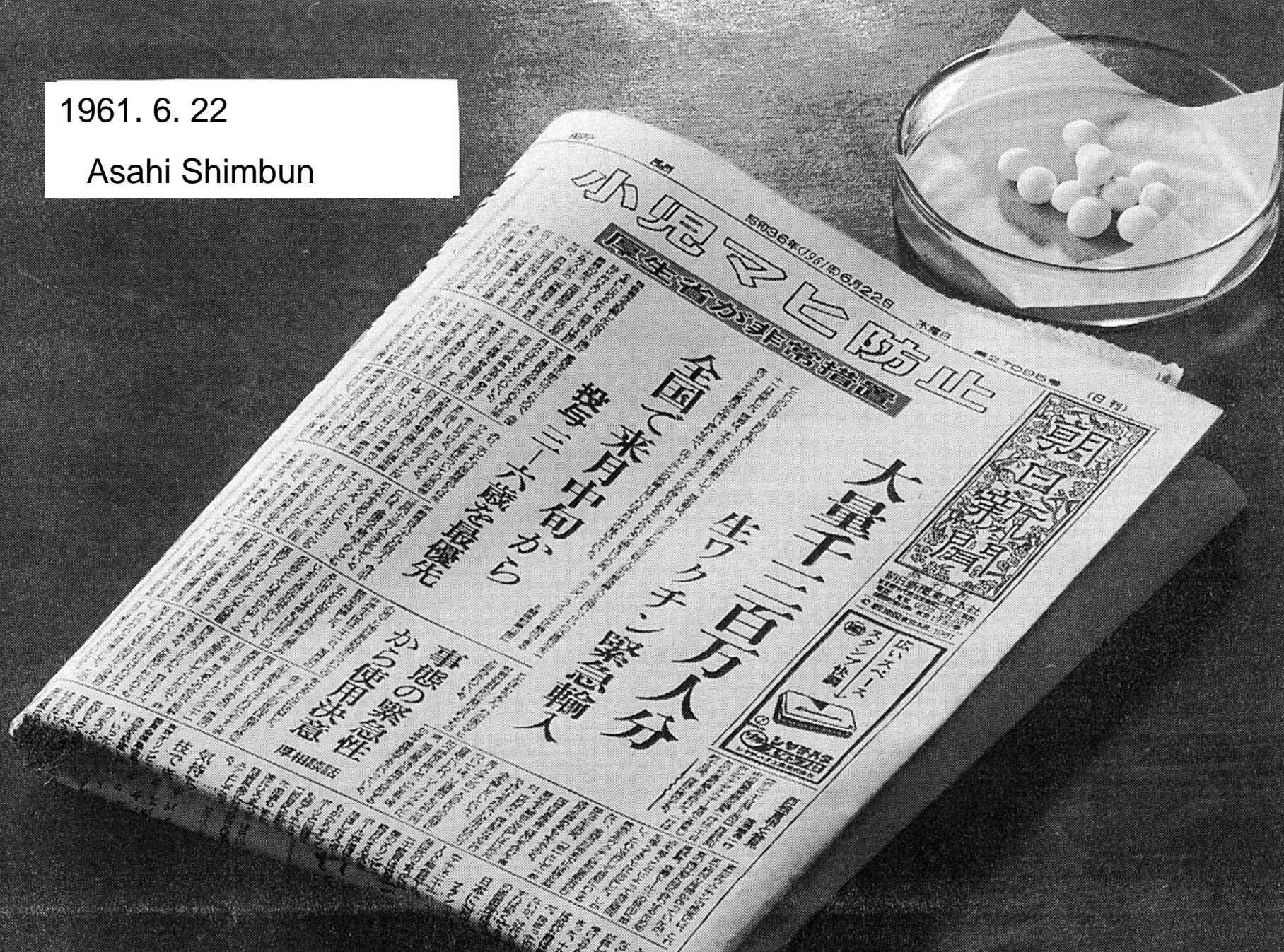
	N480(Type 1)	N481(Type 2)	N472(Type 3)
Nucleotide in Sabin strain genomes	G	A	U
Nucleotides detected in excreted viruses	G(83%) A(17%)	A(28%) G(72%)	U(0%) C(100%)

Candidate strains

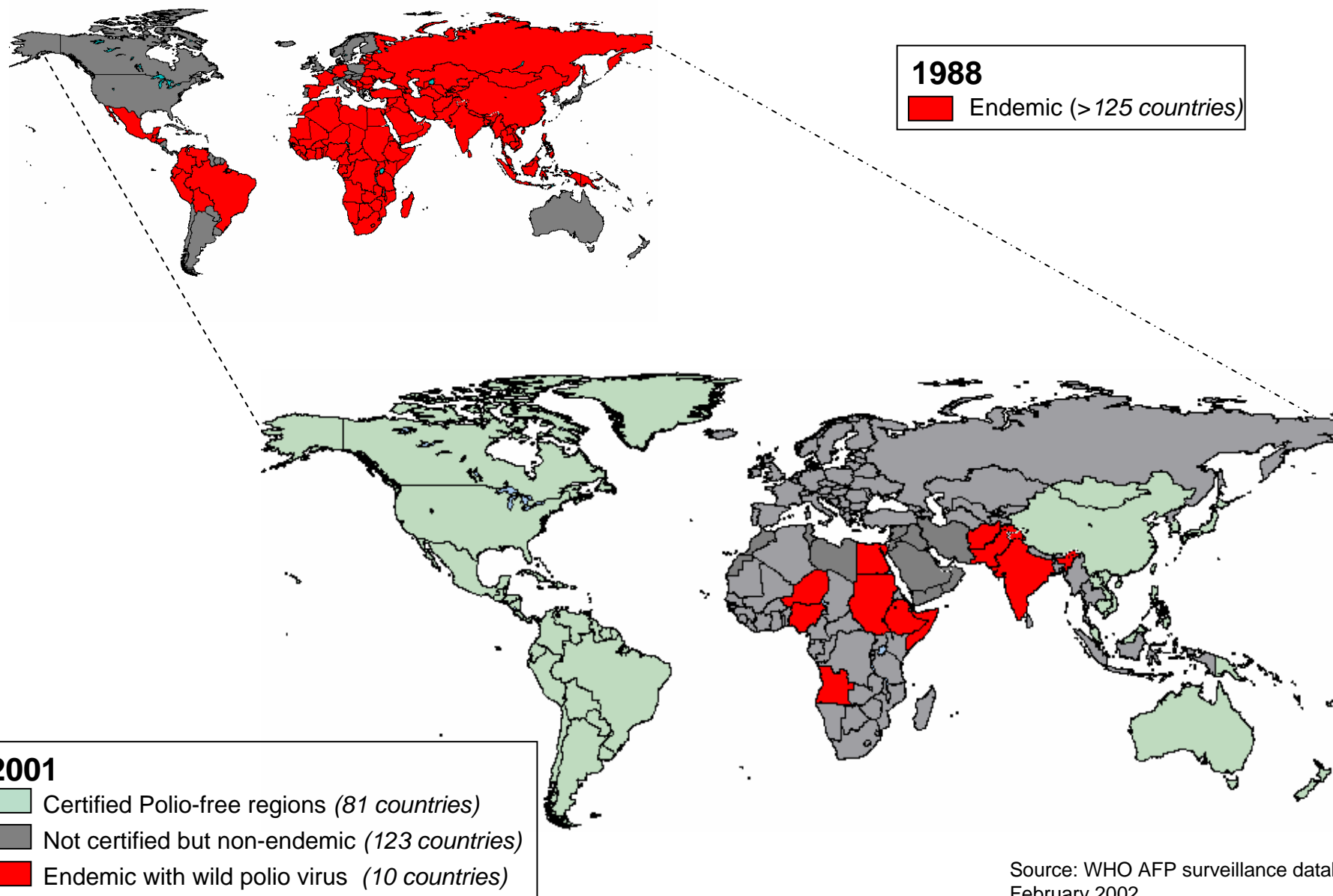


1961. 6. 22

Asahi Shimbun



Polio Eradication Progress, 1988 - 2001



WHO policy for a polio eradication plan (2000)

