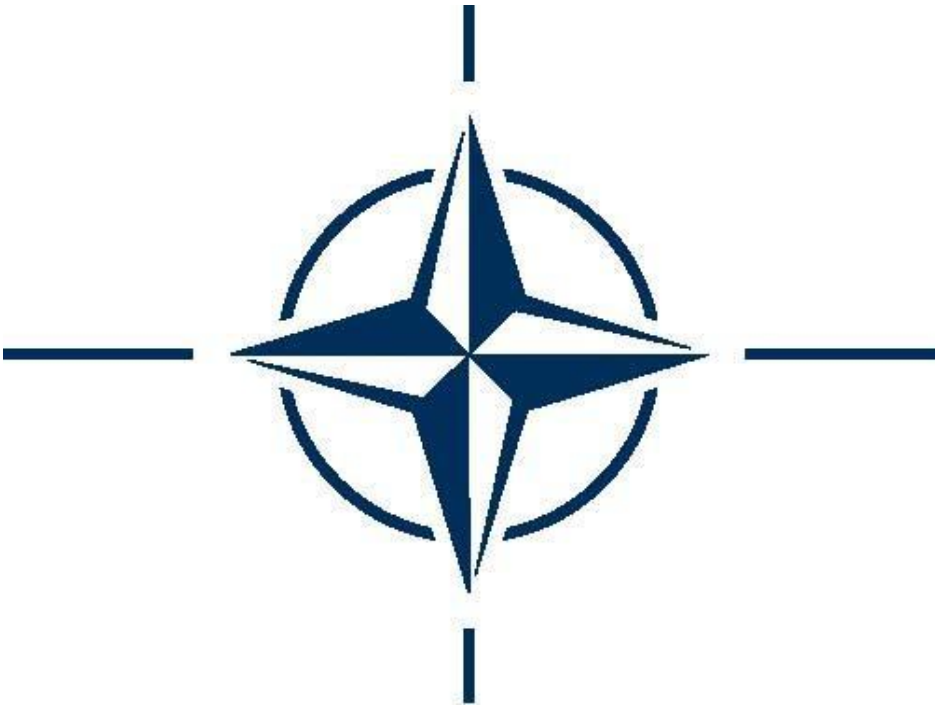
STANDARDS RELATED DOCUMENT

SRD-7 TO AJMedP-4

VACCINATIONS CATALOGUE WITHIN THE NATO & PfP FORCES

Edition A Version 3

DECEMBER 2023



NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

NATO STANDARDIZATION OFFICE (NSO)

NATO LETTER OF PROMULGATION

11 December 2023

1. The enclosed Standards Related Document SRD-7 to AJMedP-4, Edition A, Version 3, VACCINATIONS CATALOGUE WITHIN THE NATO & PfP FORCES, which has been approved in conjunction with AJMedP-4 by the nations in the Military Committee Medical Standardization Board, is promulgated herewith.

2. SRD-7 to AJMedP-4, Edition A, Version 3 is effective upon receipt and supersedes SRD-7 to AJMedP-4, Edition A, Version 2, which shall be destroyed in accordance with the local procedure for the destruction of documents.

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4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Lieutenant General, GRC (A)
Director, NATO Standardization Office

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Chapter 1 - Introduction

Aim

This catalogue of vaccination policies provides a snapshot of the vaccination practices, regulations and policies in the NATO & PfP Forces. Within this document, the term "vaccination" is used to describe the use of biological preparations to improve the immunity of individuals against a particular infectious disease. Other terms in common parlance that may refer to this process include "immunisation", and "inoculation".

Ownership of the risk and the responsibility for vacciation policy rests with the nations, and is not a matter for standardisation within the Alliance. Notwithstanding, knowledge of the similarities and differences between the policies of nations sending personnel to multinational operations is useful to medical staffs. It may also be of interest to nations in the process of reviewing their current policies.

Therefore, to better reflect the role of the catalogue, it is now maintained as a Standards Related Document in support of AJMedP-4. It will be updated annually and replaces STANAG 2037, AMedP-23 which is to be cancelled having not been updated since 2012.

Disclaimer

The catalogue is not an authoritative statement of current vaccination policies; nor does it provide evidence to support recommendations for specific vaccination policy. The annual update cycle means that the information may not reflect changes in policy since the catalogue update.

For authoritative information about current policy, or where there is still uncertainty, please refer to the national point of contact.

Data Collection Method

The information contained within the catalogue is obtained via a standardized survey of nominated points of contact for each nation. The survey is issued in January for completion by March of the same year. The update is normally published in April each year.

Custodian

The custodian of the catalogue is the Force Health Protection Branch of NATO MILMED COE. Please email your comments and/or suggestions to **info.dhsc@coemed.org**

Classification

The information contained within the catalogue is Unclassified. It has been reproduced here with the kind permission of the nations.

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Chapter 2: Vaccinations Practices in NATO & PfP Forces

		AUT	BEL	BGR	CAN	CHE
Updated Data Catalogue		2023	2023	2021	2023	2023
Adenovirus VIS						
Anthrax						
Cholera		T			M,S,T	M,S,T,R
Dengue						
Diphteria		A	A,M,S,T	A,M,S,T	A	A
Hepatitis A		A	M,S,T	M,S,T	A	M,S,T,R
Hepatitis B		A	M,S,T,O	A,M,S,T	A	A
HPV		A		R	R	A
Influenza Seasonal		A	M,S,T,R,O	R	A	A
Japanese Encephalitis		T	T		M,S,T	M,S,T,R
Leptospirosis						A
Measles		A	M,S,T	A	A	A
Meningococcal Meningitis	A,C					
	B	A			R	
	C					
	A,C,Y,W-135	A	M,S,T	M	A	A
Mumps		A	M,S,T	A	A	A
Pertussis		A	A,M,S,T	A	A	A
Pneumococcal Disesase		R	R	A	R	
Polio	live					
	inactived	A	M,S,T	A	A	A
Rabies		M,S,T	M,S,T	R	M,T,O	M,S,T,R
Rubella		A	M,S,T	A	A	A
SARS-Cov-2		R	M,S,T,O		A	A
Smallpox						O
Tetanus		A	A,M,S,T	A,M,S,T	A	A
Tickborne Encephalitis		A	S,T		M,T	A
Tuberculosis				A		
Typhoid	live				S	M,S,T,R
	inactived	M,S,T	S,T	M	M,S,T	
Varicella					A	A
Yellow Fever		T	M,S,T	T	M,S,T	M,S,T,R

Codes:

A= **All** Personnel

M= All Deployable Personnel (personnel susceptible to be deployed on a (planned) **Mission**)

S= Alert Forces (**Stand-by** with NTM < 2 months e.g. EUBG, NRF,...)

T= Personnel in areas at risk (e.g. **Travellers**,...)

R= **Recommended** / voluntary

O= **Occupations** at risk (e.g. Nurses,...)

		CZE	DEU	DNK	ESP	EST
Updated Data Catalogue		2021	2023	2023	2023	2019
Adenovirus VIS						
Anthrax		O	O			
Cholera		T,R	T	T	T,R	T
Dengue			T			
Diphteria		T,R	A	A	A	A,M,S
Hepatitis A		A	A	A	A	M,S,T
Hepatitis B		A	A	A	A	M,S,O
HPV			R			
Influenza Seasonal		M,S,R	A		M,S,R,O	A
Japanese Encephalitis		T	S,T	T	T,R	
Leptospirosis						
Measles		T,O	A	A	A	
Meningococcal Meningitis	A,C					M,T
	B	R				
	C					
	A,C,Y,W-135	A	S,T,R	T	S,T,R	S,T
Mumps		T	A	A	A	
Pertussis		T	A	A	A	
Pneumococcal Disesase			R			
Polio	live					
	inactived	M	A	A	S,T,R	M,S,T
Rabies		T	S,T	T	T,R,O	M,S,T
Rubella		T	A	A	A	
SARS-Cov-2			A	T	M,R,O	
Smallpox			R,O			
Tetanus		A	A	A	A	A,M,S,T
Tickborne Encephalitis		A	A	T	T,R	A
Tuberculosis						
Typhoid	live		M,S,T			
	inactived	M,T	M,S,T	T	M,T,R	M,S,T
Varicella			R			
Yellow Fever		T	M,S,T	T	S,T,R	M,S,T

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R= **Recommended** / voluntary

O= **Occupations** at risk (e.g. Nurses,...)

		FRA	GBR	GRC	HUN	IRL
Updated Data Catalogue		2023	2023		2023	2019
Adenovirus VIS						
Anthrax			S,R			
Cholera		O	T,R		S	M,S,T
Dengue						
Diphteria		A	A,R		A	A,M,S,T
Hepatitis A		M,S,T	A,R		A	A,M,S,T,O
Hepatitis B		A	A,R		A	A,M,S,T,O
HPV		R	A,R			
Influenza Seasonal		A	R,O		M,S,T	M,S,T,R,O
Japanese Encephalitis		T	T,R		O	M,S,T
Leptospirosis		O				
Measles		A	A,R		A	A,M,S,T
Meningococcal Meningitis	A,C					
	B					
	C					
	A,C,Y,W-135	A	T,R		A	M,S,T,O
Mumps		A	A,R		A	A,M,S,T,O
Pertussis		A	A,R		A	A,M,S,T,O
Pneumococcal Disesase			O			
Polio	live					
	inactived	A	A,R		A	M,S,T
Rabies		T,O	S,R		M,S,T	M,S,T
Rubella		A	A,R		A	A,M,S,T
SARS-Cov-2		M,S,R	R,O		A	
Smallpox						
Tetanus		A	A,R		A	A,M,S,T,O
Tickborne Encephalitis		T	S,R		T,R,O	M,S,T
Tuberculosis		O	R,O			
Typhoid	live					
	inactived	M,S,T	S,R		M,S,T,R,O	A,M,S,T
Varicella		R,O	R,O			
Yellow Fever		M,S,T	A,R		S,T,R	M,S,T

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R= **Recommended** / voluntary

O= **Occupations** at risk (e.g. Nurses,...)

		ISL	ITA	LTU	LUX	LVA
Updated Data Catalogue			2023	2023	2023	2023
Adenovirus VIS						
Anthrax						
Cholera			M,S		T	M
Dengue						
Diphteria			A	A	A	A
Hepatitis A			M,S	M,S	A	M,S
Hepatitis B				M,S,O	A	M,S,O
HPV						
Influenza Seasonal			R	A	M	R,O
Japanese Encephalitis			M,S		T	
Leptospirosis					T	
Measles				A	A	
Meningococcal Meningitis	A,C					
	B			A		
	C					
	A,C,Y,W-135		A	A	M	M,S
Mumps			A	A	A	
Pertussis			A		A	
Pneumococcal Disesase						
Polio	live					
	inactived		A	M,S	A	M,S
Rabies			M,S	M,S	M	M,S,O
Rubella			A	A	A	
SARS-Cov-2			R		M	A
Smallpox						
Tetanus			A	A	A	A
Tickborne Encephalitis			M,S	A	A	A
Tuberculosis						
Typhoid	live					
	inactived		M,S	M,S	M	M,S
Varicella			A		T	
Yellow Fever			M,S	M	M	M,S

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		NLD	NOR	POL	PRT	ROU
Updated Data Catalogue		2023	2021	2023	2019	
Adenovirus VIS						
Anthrax						
Cholera		T	S,T	M,S,T,R	T	
Dengue						
Diphteria		A	A,M,S,T,O	M,S,T,R	A,M,S,T	
Hepatitis A		M	M,S,T,O	M,S,T,R	M,S,T	
Hepatitis B		A,T	M,S,T,O	M,S,T,R,O	A,M,S,T,O	
HPV		R				
Influenza Seasonal		S,T	M,S,T,R,O	M,S,T,R	R,O	
Japanese Encephalitis		S,T		M,S,T,R	T	
Leptospirosis						
Measles		A	A,M,S,T,O	M,S,T,R	A,M,S,T,O	
Meningococcal Meningitis	A,C					
	B	T		M,S,T,R		
	C			M,S,T,R		
	A,C,Y,W-135	S,T	S,T	M,S,T,R	M,S,T	
Mumps		A	A,M,S,T,O	M,S,T,R	A,M,S,T,O	
Pertussis		A	A,M,S,T,O	R	A,M,S,T,O	
Pneumococcal Disesase		T		R	R	
Polio	live					
	inactived	A	A,M,S,T,O	M,S,T,R	A,M,S,T	
Rabies		S,T	S,T	M,S,T,R	T	
Rubella		A,T	A,M,S,T,O	M,S,T,R	A	
SARS-Cov-2		S,T				
Smallpox		T				
Tetanus		A	A,M,S,T,O	M,S,T,R	A,M,S,T,O	
Tickborne Encephalitis		S,T	S,T	M,S,T,R	S,T	
Tuberculosis			S,T		A	
Typhoid	live	S,T	S,T			
	inactived			M,S,T,R	M,S,T	
Varicella				R	T,O	
Yellow Fever		S,T	S,T	M,S,T,R	S,T	

Codes:

A= **All** Personnel

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R= **Recommended** / voluntary

O= **Occupations** at risk (e.g. Nurses,...)

		SVK	SVN	SWE	TUR	USA
Updated Data Catalogue		2019		2023	2021	2023
Adenovirus VIS						T
Anthrax					O	T
Cholera		T		T	T	T
Dengue						
Diphteria		A,M,S,T,O		A,R	A	A,M,S,T,O
Hepatitis A		A,M,S,T,O		T	A	A,M,S,T,O
Hepatitis B		A,M,S,T,O		T,O	A	A,M,S,T,O
HPV						R
Influenza Seasonal		M,S,T,O		M	M,S,T,O	A,M,S,T,O
Japanese Encephalitis		T		T	T	T
Leptospirosis						
Measles				A,R	A	A,M,S,T,O
Meningococcal Meningitis	A,C					
	B					R,O
	C					
	A,C,Y,W-135	A,M,S,T,O		T	A	A,M,S,T,O
Mumps				A,R	A	A,M,S,T,O
Pertussis		A,M,S,T,O		A,R	A	A,M,S,T,O
Pneumococcal Disesase					O	R
Polio	live					
	inactived	A,M,S,T		A,R	A	A,M,S,T,O
Rabies		T		O	T	O
Rubella				A,R	A	A,M,S,T,O
SARS-Cov-2						R
Smallpox						T
Tetanus		A,M,S,T,O		A,R	A	A,M,S,T,O
Tickborne Encephalitis		A,M,S,T,O		T,O		T
Tuberculosis		R				
Typhoid	live			T		
	inactived	M,S,T,O			T	M,S,T,O
Varicella					A	A,M,S,T,O
Yellow Fever		T		T	T	T

Codes:

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T= Personnel in areas at risk (e.g. **Travellers**,...)

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O= **Occupations** at risk (e.g. Nurses,...)

Nations Comments	
AUT	Starting with February 2023 vaccination against SARS-CoV2 isn´t mandatory anymore for international deployment, just highly recommended. Vaccination against Pneumococcal Disease recommended only from age 60 up.
BEL	No comment
BGR	Order of the Minister of the Republic of Bulgaria N 724 / National immunization schedule.
CAN	No comment
CHE	According to the national law, all vaccinations are voluntary in CHE! In this context "A" means: Recommended to all military personnel! Smallpox includes Monkeypox too.
CZE	Hepatitis A, Hepatitis B, Meningococcal Meningitis (A,C,Y, W-135) and Tickborne Encephalitis vaccination compulsory for all personnel since 2020 - occupations at risk.
DEU	No comment
DNK	No comment
ESP	Under Spanish legislation, vaccination is voluntary and requires the patient's prior, free, and informed consent as a general rule. This is valid even for military personnel that take part in operations overseas. It is the commander´s decision to authorize the deployment of personnel who refuse any vaccination. The person who refuses any recommended vaccine has to sign a "refusal of vaccination" document. Polio vaccine offered following current IHR requirements. Vaccines for Areas at Risk are chosen based on MedIntel risk assessment, information related to and from AO and duration of deployment.
EST	Vaccination against HPV, measles, mumps, pertussis, rubella and tuberculosis belongs to Estonian national routine immunization program and therefore is not reflected in the current catalogue.
FRA	Influenza seasonal vaccine: mandatory three yearly immunization. Since 2020, annual vaccination is mandatory for deployable service members (OPEX) and for healthcare workers too. Yellow vaccine: a one booster dose is needed for mission in endemic countries. ACWY meningitis vaccine: newly recruited service members systematically receive the injection of tetravalent vaccine within 1 week after their recruitment. Boosters vaccines are injected only for deployable service members. Rabies vaccine: recommended for occupations at risk (veterinary personnel) and military personnel travelling to isolated areas. Cholera vaccine: cholera vaccination is mandatory since 2018 only for peacekeeping military personnel who are deploying into areas where there is active cholera disease (in order to follow UNITED NATIONS decision).
GBR	The following vaccination guidance comes from the UK policy on immunological protection of entitled individuals which was last updated in Jun 23.
GRC	---
HUN	No comment
IRL	No comment
ISL	---
ITA	The choice among mandatory vaccines for all deployable personnel (including alert forces, personnel in areas at risk) is based on a score obtained by a risk matrix that encompasses MEDINT products, informations from the area of operations, operational engagement, logistic situation and short or long lasting deployment.
LTU	A: During the time of epidemiological situation changes all personnel get vaccination against Covid-19 vaccine, pandemic Influenza, Anthrax, Smallpox, and etc. M: Deployable personnel vaccination depends on region of mission. O: Medical personnel are vaccinated against viral Hepatitis A, Varicella during an outbreak of these infections, when they have direct contact with infected or sick (in the contagious period).
LUX	Adaptations form the published version can be made anytime after medical evaluation, if needed wrt to new operational settings and/or new epidemiological requirements.

Nations Comments	
LVA	Vaccination against tuberculosis, pertussis, poliomyelitis, measles, rubella, epidemic parotitis, varicella is included into the Latvian national childhood vaccination schedule. Therefore, necessity of booster vaccination of deployable personnel is evaluated IAW actual epidemiological situation in the deployment region. Diphtheria, tetanus is included into the national immunization program and is compulsory for all military personnel of the Latvian National Armed Forces. Vaccination against tick-borne encephalitis is compulsory for all military personnel. Vaccination against Hepatitis B is required to the personnel of certain professions, for instance, medical practitioners - occupations at risk. Vaccination against Hepatitis A and Hepatitis B (if HepB has not been received within childhood vaccination schedule), is performed to all deployable personnel as well as personnel of alert forces. Rabies vaccine is provided to all deployable personnel as well as personnel of alert forces. Cholera vaccination is carried out to the military personnel shortly prior deployment to the risk area.
NLD	August 2023: all vaccinations under revision. New guidelines planned for January 2024.
NOR	M = absolute minimum, depending on region of mission others will be added S = all vaccines indicated T = not neccesarily all, dependent on destination
POL	No comment
PRT	BCG was generally given to every newborn in Portugal until 2016, and so all military born in Portugal has been vaccinated.
ROU	---
SVK	Head sanitarian of Ministry of Defence guidance is in line with STANAG 2037 (Ed.9,2012) AMedp - 23 and as well as with currend WHO guidance.
SVN	---
SWE	No comment
TUR	According to the Directive on Combating Infectious Diseases and Epidemics of the MoD, pneumococcal vaccine is administered to personnel, flying personnel, personnel working in closed areas (submarine, etc.) as well as personnel working in occupations at risks (nurses,…) who are in the risk group due to the underlying disease.
USA	The Joint Regulation on the Immunizations and Chemoprophylaxis for the Prevention of Infectious Diseases is undergoing revision. Additional updates to vaccination requirements and recommendations have occurred since Oct 2013 IAW ACIP recommendations.

National Guidelines References		
AUT	2023	Austrian Armed Forces Vaccination Guideline 2023
BEL	2018	ACWB-GID-INFECT-001
BGR	2008	Order of the Minister of the Republic of Bulgaria N 724 / National immunization schedule.
CAN	Varied	Internal CAF policies.
CHE	2023	Vaccination Guidelines of the Swiss Federal Office of Public Health FOPH.
CZE		Regulations of Chief of Public Health MoD
DEU	2021	A1-840/8-4000 "Impf- und sonstige Prophylaxemaßnahmen -Fachlicher Teil"
DNK	2023	Danish Armed Defence Vaccination Policy
ESP	2021	Spanish Ministry of Health Immunizations Programs Technical Guidelines 02/21, 5 February 2021, from Surgeon General Office on "Immunizations in the Armed Forces"
EST	2013	Chief of Defence guidance # 227
FRA	2023	French armed forces immunization schedule
GBR	2023	Joint Service Publication 950 Vol 7 Ch 1 Pt 1
GRC		---
HUN	2023	Vaccination Protocol - HDF 2023
IRL		No Data
ISL		---
ITA	2023	MOD and Ministry of Health Regulations
LTU	2021	Order of the Minister of National Defense
LUX	2021	Army Regulation
LVA		Latvian NAF vaccination regulations and internal orders, based on LVA Cabinet Regulation No. 330 Vaccination Regulations, CIV immunization recommendations and guidelines as well as deployment region risk assessment results.
NLD		I-MGA035 and RIM (Under Revision).
NOR	2019	NOR regulation on vaccine and medical prophylaxis
POL	2023	Polish National Regulations
PRT		No Data
ROU		---
SVK	2008	Head sanitarian of Ministry of Defence guidance
SVN		---
SWE		No Data
TUR		Directive on Combating Infectious Diseases and Epidemics of MoD
USA	2013	Immunizations and Chemoprophymaxis for the Prevention of Infectious Diseases (Joint Service Regulation)

Diseases Description and Vaccines

Updated: **SEP 2023**
Sources: http://www.who.int/immunization/en/ - https://www.cdc.gov/ - http://www.phac-aspc.gc.ca

Adenovirus

Adenoviruses are medium-sized (90-100 nm), non-enveloped icosohedral viruses with double-stranded DNA. More than 50 types of immunologically distinct adenoviruses can cause infections in humans. Adenoviruses are relatively resistant to common disinfectants and can be detected on surfaces, such as doorknobs, objects, and water of swimming pools and small lakes.
Adenoviruses most commonly cause respiratory illness. The illnesses can range from the common cold to pneumonia, croup, and bronchitis. Depending on the type, adenoviruses can cause other illnesses such as gastroenteritis, conjunctivitis, cystitis, and, less commonly, neurological disease.
People with weakened immune systems are at high risk for developing severe illness caused by adenovirus infection. Some people infected with adenoviruses, especially those who have weakened immune systems, can have ongoing infections in their tonsils, adenoids, and intestines that do not cause symptoms. They can shed the virus for weeks or longer.

Currently, there is no adenovirus vaccine available for the general public.
A live, oral vaccine against adenovirus types 4 and 7 is approved by the U.S. Food and Drug Administration only for U.S. military personnel ages 17 through 50 years who may be at higher risk for infection from these two adenovirus types. The vaccine is recommended by the U.S. Department of Defense for military recruits entering basic training in order to prevent acute respiratory disease. It may also be recommended for other military personnel at high risk for adenovirus infection

Anthrax

Anthrax is a serious infectious disease caused by gram-positive, rod-shaped bacteria known as *Bacillus anthracis*. It occurs naturally in soil and commonly affects domestic and wild animals around the world. People can get sick with anthrax if they come in contact with infected animals or contaminated animal products. Anthrax can cause severe illness in both humans and animals.
Anthrax is **not** contagious, which means you can't catch it from another person like the cold or flu. People get infected with anthrax when spores get into the body. When anthrax spores get inside the body, they can be "activated." The bacteria can then multiply, spread out in the body, produce toxins, and cause severe illness.
This can happen when people breathe in spores, eat food or drink water contaminated with spores, or get spores in a cut or scrape in the skin. It is very uncommon for people in the United States to get infected with anthrax.

Anthrax is rare, and most people will never be exposed to it. There is a vaccine licensed to prevent anthrax, but it is only recommended for routine use in certain groups of at-risk adults (for example, some members of the military and laboratory workers).

Cholera

Cholera is an acute diarrhoeal infection caused by eating or drinking food or water that is contaminated with the bacterium *Vibrio cholerae*. Cholera remains a global threat to

public health and is an indicator of inequity and lack of social development. Researchers have estimated that every year, there are 1.3 to 4.0 million cases of cholera, and 21 000 to 143 000 deaths worldwide due to the infection.
Cholera is an extremely serious disease that can cause severe acute watery diarrhoea with severe dehydration. It takes between 12 hours and 5 days for a person to show symptoms after consuming contaminated food or water. Cholera affects both children and adults and can kill within hours if untreated.
Most people infected with *Vibrio cholerae* do not develop any symptoms, although the bacteria are present in their faeces for 1-10 days after infection. This means the bacteria are shed back into the environment, potentially infecting other people.
Cholera is often predictable and preventable. It can ultimately be eliminated where access to clean water and sanitation facilities, as well as good hygiene practices, are ensured and sustained for the whole population.

Several vaccines can help prevent cholera and improve health outcomes. But cholera vaccines are not 100% effective. Currently there are three WHO pre-qualified oral cholera vaccines (OCV): Dukoral®, Shanchol™, and Euvichol®. All three vaccines require two doses for full protection. Dukoral® is administered with a buffer solution that, for adults, requires 150 ml of clean water. Dukoral® can be given to all individuals over the age of 2 years. There must be a minimum of 7 days, and no more than 6 weeks, delay between each dose. Children aged 2-5 require a third dose. Dukoral® is mainly used for travellers. Two doses of Dukoral® provide protection against cholera for 2 years. Shanchol™ and Euvichol® are essentially the same vaccine produced by two different manufacturers. They do not require a buffer solution for administration. They are given to all individuals over the age of one year. There must be a minimum of two weeks delay between each dose of these vaccines. Two doses of Shanchol™ and Euvichol® provide protection against cholera for 3 years, while a single dose provides short term protection.
Shanchol™ and Euvichol® are the vaccines currently available for mass vaccination campaigns through the Global OCV Stockpile, which is supported by Gavi, the Vaccine Alliance. More than 20 million doses of OCVs have been used in mass vaccination campaigns. The campaigns have been implemented in areas experiencing an outbreak, in areas at heightened vulnerability during humanitarian crises, and among populations living in highly endemic areas, known as “hotspots”.
A mix of live, killed and conjugated vaccines are in development that have the potential of providing longer term protection with an easier-to-administer schedules.
These vaccines are not available in the United States. The US uses Vaxchora (lyophilized CVD 103-HgR) which is a single-dose, oral vaccine for use in people aged 2–64 who are traveling to an area of active cholera transmission. Vaxchora should be taken at least 10 days before travel to an area of active cholera transmission.

Dengue

Dengue is a mosquito-borne viral infection that is common in warm, tropical climates. Infection is caused by any one of four closely related dengue viruses (called serotypes) and these can lead to a wide spectrum of symptoms, including some which are extremely mild (unnoticeable) to those that may require medical intervention and hospitalization. In severe cases, fatalities can occur. There is no treatment for the infection itself but the symptoms that a patient experiences can be managed.

In 2023 the incidence of dengue increases across all global regions, especially in parts of the Americas. WHO reported that dengue affects approximately 129 countries, including European countries, with estimated 100 to 400 million cases globaly reported every year.. Dengue epidemics tend to have seasonal patterns, with transmission often peaking during and after rainy seasons. There are several factors contributing to this increase and they include high mosquito population levels, susceptibility to circulating serotypes, favourable air temperatures, precipitation and humidity, all of which affect the reproduction and feeding patterns of mosquito populations, as well as the dengue virus incubation period. Lack of proactive control interventions and staff are some of the other challenges.

As of 2023, there are two commercially available vaccines, sold under the brand names Dengvaxia and Qdenga.
The first dengue vaccine, Dengvaxia (CYD-TDV) by Sanofi Pasteur, was first licensed in December, 2015, in Mexico. It has been registered for use in individuals 9-45 years of age living in endemic areas. CYD-TDV is a live recombinant tetravalent vaccine based on the yellow fever 17d backbone and is registered as a 3-dose vaccine given on a 0/6/12 month schedule. Several other vaccine candidates are in clinical or pre-clinical development.
WHO recommends prevention of dengue through vector control methods such as mosquito habitat removal and use of insecticides. Dengvaxia is only recommended in those who have previously had dengue fever or populations in which most people have been previously infected.TAK-003 or DENVax, sold under the brand name Qdenga and made by Takeda, is a recombinant chimeric attenuated vaccine with DENV1, DENV3, and DENV4 components on a dengue virus type 2 (DENV2) backbone. Qdenga is designated for people not previously infected and registered for use in individuals from 4 years and above.
The development of a safe and effective dengue vaccine is a high priority and WHO supports this effort through technical guidance and advice.

Diphteria

Vaccination against diphtheria has reduced the mortality and morbidity of diphtheria dramatically, however diphtheria is still a significant child health problem in countries with poor routine childhood immunization coverage. In countries endemic for diphtheria, the disease occurs mostly as sporadic cases or in small outbreaks. Diphtheria is fatal in 5 - 10% of cases, with a higher mortality rate in young children. Treatment involves administering diphtheria antitoxin to neutralize the effects of the toxin, as well as antibiotics to kill the bacteria.

Diphtheria vaccine is a bacterial toxoid, ie. a toxin whose toxicity has been inactivated. The vaccine is normally given in combination with other vaccines, including tetanus and pertussis (e.g. DTwP/DTaP, pentavalent vaccine). For adolescents and adults the diphtheria toxoid is frequently combined with tetanus toxoid in lower concentration (Td vaccine).
WHO recommends a 3-dose primary vaccination series with diphtheria containing vaccine followed by 3 booster doses. The primary series should begin as early as 6-week of age with subsequent doses given with a minimum interval of 4 weeks between doses. The 3 booster doses should preferably be given during the second year of life

(12-23 months), at 4-7 years and at 9-15 years of age. Ideally, there should be at least 4 years between booster doses.

Hepatitis A

Hepatitis A is an inflammation of the liver caused by the hepatitis A virus (HAV). The virus is primarily spread when an uninfected (and unvaccinated) person ingests food or water that is contaminated with the faeces of an infected person. The disease is closely associated with unsafe water or food, inadequate sanitation, poor personal hygiene and oral-anal sex.

Unlike hepatitis B and C, hepatitis A does not cause chronic liver disease but it can cause debilitating symptoms and rarely fulminant hepatitis (acute liver failure), which is often fatal. WHO estimates that in 2016, 7134 persons died from hepatitis A worldwide (accounting for 0.5% of the mortality due to viral hepatitis).

Hepatitis A occurs sporadically and in epidemics worldwide, with a tendency for cyclic recurrences. Epidemics related to contaminated food or water can erupt explosively, such as the epidemic in Shanghai in 1988 that affected about 300 000 people *(1)*. They can also be prolonged, affecting communities for months through person-to-person transmission. Hepatitis A viruses persist in the environment and can withstand food production processes routinely used to inactivate or control bacterial pathogens.

Several hepatitis vaccines are available internationally. Both inactivated and live attenuated hepatitis A vaccines are highly immunogenic and immunization will generate long-lasting, possibly life-long, protection against hepatitis A in children as well as in adults.

Vaccination against hepatitis A should be part of a comprehensive plan for the prevention and control of viral hepatitis, including measures to improve hygiene and sanitation and measures for outbreak control.

WHO recommends that vaccination against hepatitis A virus be integrated into the national immunization schedule for children aged 1 year or older, if indicated on the basis of local factors, including incidence of acute hepatitis A, level of endemicity, and consideration of cost-effectiveness.

The use of hepatitis A vaccine, rather than passive prophylaxis with immune globulin, is recommended for pre-exposure prophylaxis for individuals considered at increased risk, such as travellers to areas of higher hepatitis A endemicity, men who have sex with men, and people with chronic liver diseases. The vaccine can also be given as post-exposure prophylaxis to close contacts of acute cases of hepatitis A.

Hepatitis B

Hepatitis B is an infection of the liver caused by the hepatitis B virus. The infection can be acute (short and severe) or chronic (long term) that puts people at high risk of death from cirrhosis and liver cancer.

It can spread through contact with infected body fluids like blood, saliva, vaginal fluids and semen. It can also be passed from a mother to her baby.

Hepatitis B is a major global health problem. The burden of infection is highest in the WHO Western Pacific Region and the WHO African Region, where 116 million and 81 million people, respectively, are chronically infected. Sixty million people are infected in the WHO Eastern Mediterranean Region, 18 million in the WHO South-East Asia Region, 14 million in the WHO European Region and 5 million in the WHO Region of the Americas.

Hepatitis B can be prevented with a safe and effective vaccine. The vaccine is usually given soon after birth with boosters a few weeks later. It offers nearly 100% protection against the virus.
The hepatitis B vaccine is given as a series of three shots. The first dose is given within 24 hours of birth. The second dose is given one to two months after the first dose, and the third dose is given between 6 months and 18 months of age. The vaccine is also recommended for those up to 60 years of age who have not previously received it and those 60 years and older who are at increased risk or who simply want the protection afforded by vaccination..
WHO recommends that all health care workers receive the vaccine to prevent the risk of Hepatitis B in health care settings.

Human Papillomavirus (HPV)

HPV is the most common viral infection of the reproductive tract. Most sexually active women and men will be infected at some point in their lives, and some may be repeatedly infected. More than 90% of the infected populations eventually clear the infection.
Cervical cancer is by far the most common HPV-related disease. Nearly all cases of cervical cancer can be attributed to HPV infection.
Although most HPV infections clear up on their own and most pre-cancerous lesions resolve spontaneously, there is a risk for all women that HPV infection may become chronic and pre-cancerous lesions progress to invasive cervical cancer.
It takes 15 to 20 years for cervical cancer to develop in women with normal immune systems. It can take only 5 to 10 years in women with weakened immune systems, such as those with untreated HIV infection. Cancers from HPV can be prevented with vaccines.
The highest prevalence of cervical HPV among women is in sub-Saharan Africa (24%), followed by Latin America and the Caribbean (16%), eastern Europe (14%), and South-East Asia (14%) (2). Prevalence in men is highly variable based on sexual trends.

The HPV vaccine is not used to treat HPV infections or diseases caused by HPV, but instead to prevent the development of cancers.
Currently there are six licensed HPV vaccines: three bivalent, two quadrivalent, and one nonavalent vaccine. Those that have been prequalified are being marketed in countries throughout the world. All vaccines are highly efficacious in preventing infection with virus types 16 and 18, which are together responsible for approximately 70% of cervical cancer cases globally. The vaccines are also highly efficacious in preventing precancerous cervical lesions caused by these virus types. The quadrivalent vaccine is also highly efficacious in preventing anogenital warts, a common genital disease which is virtually always caused by infection with HPV types 6 and 11. The nonavalent provides additional protection against HPV types 31, 33, 45, 52 and 58. Data from clinical trials and initial post-marketing surveillance conducted in several continents show HPV vaccines to be safe.
The primary target group in most of the countries recommending HPV vaccination is young adolescent girls, aged 9-14. For all vaccines, the vaccination schedule depends on the age of the vaccine recipient.
As per the December 2022 WHO Position on HPV vaccines, WHO recommends the following schedule:

- A one or two-dose schedule for girls aged 9-14
- A one or two-dose schedule for girls and women aged 15-20
- Two doses with a 6-month interval for women older than 21

A minimum of 2 doses and when feasible 3-doses remain necessary for those known to be immunocompromised and/or HIV-infected.
Some countries have started to vaccinate boys as the vaccination prevents HPV related cancers in males as well as.
HPV vaccination does not replace cervical cancer screening. In countries where HPV vaccine is introduced, screening programmes population-based screening programmes are needed to identify and treat cervical pre-cancer and cancer to reduce cervical cancer incidence and deaths.

Influenza (Seasonal)

Seasonal influenza is an acute respiratory infection caused by influenza viruses which circulate in all parts of the world.
There are 4 types of influenza viruses, types A, B, C and D. Influenza A and B viruses circulate and cause seasonal epidemics of disease.

- Influenza A viruses are further classified into subtypes according to the combinations of the hemagglutinin (HA) and the neuraminidase (NA), the proteins on the surface of the virus. Currently circulating in humans are subtype A(H1N1) and A(H3N2) influenza viruses. The A(H1N1) is also written as A(H1N1)pdm09 as it caused the pandemic in 2009 and subsequently replaced the seasonal influenza A(H1N1) virus which had circulated prior to 2009. Only influenza type A viruses are known to have caused pandemics.
- Influenza B viruses are not classified into subtypes, but can be broken down into lineages. Currently circulating influenza type B viruses belong to either B/Yamagata or B/Victoria lineage.
- Influenza C virus is detected less frequently and usually causes mild infections, thus does not present public health importance.
- Influenza D viruses primarily affect cattle and are not known to infect or cause illness in people.

The constantly evolving nature of influenza viruses requires continuous global monitoring and frequent reformulation of influenza vaccines.
The World Health Organization (WHO) convenes technical consultations in February and September each year to recommend viruses for inclusion in seasonal influenza vaccines for the northern and southern hemispheres, respectively. These recommendations are based on information provided by the WHO Global Influenza Surveillance Network (GISN), now the WHO Global Influenza Surveillance and Response System. Since 2004, influenza A(H5N1), A(H9N2) and other subtypes of influenza viruses have also been taken into consideration by GISRS for pandemic preparedness purposes.
The development of high yield candidate vaccine viruses is a complex process, involving collaboration of laboratories involved in developing reassortants and WHO Collaborating Centres (CCs). Two technologies are currently being used: classical reassortment (available since 1971) and reverse genetics, a patent technology.
Once developed, these candidate reassortants are sent to WHO CCs for characterization of their antigenic and genetic properties before being released to

interested institutions on request. Reference reagents are subsequently developed and standardized by Essential Regulatory Laboratories (ERLs), in collaboration with vaccine manufacturers and made available to manufacturers worldwide upon request.

Japanese Encephalitis

Japanese encephalitis virus JEV is the most important cause of viral encephalitis in Asia. It is a mosquito-borne flavivirus, and belongs to the same genus as dengue, yellow fever and West Nile viruses.
The first case of Japanese encephalitis viral disease (JE) was documented in 1871 in Japan.
The annual incidence of clinical disease varies both across and within endemic countries, ranging from <1 to >10 per 100 000 population or higher during outbreaks. A literature review estimates nearly 68 000 clinical cases of JE globally each year, with approximately 13 600 to 20 400 deaths. JE primarily affects children. Most adults in endemic countries have natural immunity after childhood infection, but individuals of any age may be affected.

There are four main types of Japanese Encephalitis (JE) vaccines currently in use: inactivated mouse brain-based vaccines, inactivated cell-based vaccines, live attenuated vaccines, and live recombinant vaccines.
JE vaccination should be integrated into national immunization schedules in all areas where JE is recognized as a public health priority.
Monitoring vaccine impact in settings where JE vaccine has been introduced is a research priority.

Leptospirosis

Leptospirosis is a bacterial disease that affects humans and animals. It is caused by bacteria of the genus *Leptospira*. In humans, it can cause a wide range of symptoms, some of which may be mistaken for other diseases. Some infected persons, however, may have no symptoms at all.
Without treatment, Leptospirosis can lead to kidney damage, meningitis (inflammation of the membrane around the brain and spinal cord), liver failure, respiratory distress, and even death.
Immunization by means of vaccines seems to provide a certain degree of protection. Vaccines are, in principle, suspensions of killed leptospires. Protection is largely serovar-specific. In areas where many serovars are causing leptospirosis, a vaccine must consist of different serovars matching those circulating locally. In some countries, e.g. China, where many serovars occur, vaccines consist of a mixture of a few of the most prevalent. Protective antibodies are produced only against the serovars present in the particular vaccine used.

Measles (Rubeola)

Measles is a highly contagious viral disease. It remains an important cause of death among young children globally, despite the availability of a safe and effective vaccine.
Even though a safe and cost-effective vaccine is available, in 2021, there were an estimated 128 000 measles deaths globally, mostly among unvaccinated or under vaccinated children under the age of 5 years.Measles is still common in many developing countries, particularly in parts of Africa and Asia. In 2022, 74% of children received both doses of the measles vaccine, and about 83% of the world's children

received one dose of measles vaccine by their first birthday through routine health services – the lowest since 2008.. The overwhelming majority (more than 95%) of measles deaths occur in countries with low per capita incomes and weak health infrastructures.

Routine measles vaccination for children, combined with mass immunization campaigns in countries with low routine coverage, are key public health strategies to reduce global measles deaths.
The measles vaccine has been in use since the 1960s. It is safe, effective and inexpensive. WHO recommends immunization for all susceptible children and adults for whom measles vaccination is not contraindicated. Reaching all children with 2 doses of measles vaccine, either alone, or in a measles-rubella (MR), measles-mumps-rubella (MMR), or measles-mumps-rubella-varicella (MMRV) combination, should be the standard for all national immunization programmes.

Meningococcal Meningitis

Meningococcal meningitis and septicaemia are caused by various serogroups of Neisseria meningitidis (meningococcus) which is an aerobic Gram-negative encapsulated bacteria. At least 12 serotypes of meningococcus have been characterized by differences in the polysaccharide capsule, of which groups A, B and C account for about 90% of meningococcal disease. Recent outbreaks of group Y and W135 strains suggest that these serotypes are gaining in importance. N. meningitidis is one of the most common causes of bacterial meningitis in the world and the only bacterium capable of generating large epidemics of meningitis. Explosive epidemics with incidence rates of up to 1000 cases per 100,000 inhabitants have been reported, particularly in the meningitis belt, an area of sub-Saharan Africa, which stretches from Senegal in the west to Ethiopia in the east.. Meningococcus is transmitted by aerosol or direct contact with respiratory secretions of patients or healthy human carriers.
N. meningitidis can cause a variety of diseases. Invasive meningococcal disease (IMD) refers to the range of invasive diseases caused by N. meningitidis, including septicemia, arthritis and meningitis. Similarly, *S. pneumoniae* causes other invasive diseases including otitis and pneumonia

Meningococcal meningitis is largely a vaccine preventable disease and several vaccines are available for protection from the most common serogroups causing disease. They are used both for routine immunization and to respond to meningitis epidemics. Until recently, serogroup A strains were the major cause of epidemic and endemic meningococcal disease in the meningitis belt in sub-Saharan African. The introduction of a meningococcal A conjugate vaccine (MenACV) in belt countries has led to a dramatic reduction in the number of cases due to N. *meningitidis* A. A significant residual disease burden is now caused by serogroups C, W and X in these epidemic-prone areas. The meningococcal B polysaccharide capsule cross-reacts with human antigens and is poorly immunogenic. Tailored serogroup B vaccines based on the outer membrane vesicles of clonal strains have been developed to control specific outbreaks. Two protein-based vaccines are now available that offer broad protection against serogroup B meningococcal disease.

Mumps

Mumps is an acute infectious disease caused by a paramyxovirus. Although the disease is usually mild, up to 10% of patients can develop aseptic meningitis; a less common but more serious complication is encephalitis, which can result in death or disability. Permanent deafness, orchitis, and pancreatitis are other untoward effects of mumps. Based on data reported to WHO up to April 1998, mumps vaccine is routinely used by national immunization programmes in 82 countries/areas: 23 (92%) of 25 developed countries, 19 (86%) of 22 countries with economies in transition (mainly the Newly Independent States of the former Soviet Union), and 40 (24%) of 168 developing countries. Countries that have achieved high coverage have shown a rapid decline in mumps morbidity. Furthermore, in many of these countries, mumps-associated encephalitis and deafness have nearly vanished. This review considers the disease burden due to mumps; summarizes studies on the immunogenicity, efficacy, and safety of different strains of mumps vaccine; and highlights lessons learned about implementing mumps immunization in different countries. Countries already using mumps vaccine should monitor immunization coverage and establish routine mumps surveillance with investigation of outbreaks. Where mumps is targeted for elimination, countries need to add a second dose of mumps vaccine for children, keeping in mind that the disease may still occur in susceptible adults.

Safe and effective vaccines against mumps have been available since the 1960s. The vaccine is most often incorporated into national immunization programmes in a combined measles-mumps-rubella (MMR) vaccine. In countries where large-scale immunization against mumps has been implemented, the incidence of the disease has dropped dramatically.
WHO recommends integrating strategies to control mumps with existing high priority goals of measles and rubella control or elimination. Once the decision has been made to include mumps vaccine, the use of combined MMR vaccine is strongly encouraged.

Pertussis

Pertussis, also known as whooping cough, is a highly contagious respiratory infection caused by the bacterium *Bordetella pertussis.* In 2018, there were more than 151 000 cases of pertussis globally.
Pertussis spreads easily from person to person mainly through droplets produced by coughing or sneezing. The disease is most dangerous in infants, and is a significant cause of disease and death in this age group.
The first symptoms generally appear 7 to 10 days after infection. They include a mild fever, runny nose and cough, which in typical cases gradually develops into a hacking cough followed by whooping (hence the common name of whooping cough). Pneumonia is a relatively common complication, and seizures and brain disease occur rarely.
People with pertussis are most contagious up to about 3 weeks after the cough begins, and many children who contract the infection have coughing spells that last 4 to 8 weeks. Antibiotics are used to treat the infection.

The best way to prevent pertussis is through immunization. The three-dose primary series diphtheria-tetanus-pertussis (DTP3) (- containing) vaccines decrease the risk of severe pertussis in infancy. In 2018, 86% of the global target population had received the recommended three doses of DTP-containing vaccine during infancy.

WHO recommends the first dose be administered as early as 6 weeks of age; with subsequent doses given 4-8 weeks apart, at age 10-14 weeks and 14-18 weeks. A booster dose is recommended, preferably during the second year of life. Based on local epidemiology, further booster doses may be warranted later in life.
Vaccination of pregnant women is effective in preventing disease in infants too young to be vaccinated. National programmes may consider vaccination of pregnant women with pertussis-containing vaccine as a strategy additional to routine primary infant pertussis vaccination in countries or settings with high or increasing infant morbidity/mortality from pertussis.

Pneumococcal

Streptococcus pneumoniae is a bacterium that is the cause of a number of common diseases, ranging from serious diseases such as meningitis, septicaemia and pneumonia to milder but commoner infections such as sinusitis and otitis media. Pneumococcal diseases are a common cause of morbidity and mortality worldwide, though rates of disease and death are higher in developing countries than in industrialized country settings, with the majority of deaths occurring in sub-Saharan Africa and Asia. Disease is most common at the extremes of age, i.e, in young children and among the elderly. The organism is transmitted mainly through respiratory droplets and colonizes the back of the nose (nasopharynx). Infection of other parts of the body, resulting in disease, occur through direct spread or through invasion of the blood stream.

Out of over 90 serotypes, only a small minority cause most disease. There are 2 available pneumococcal conjugate vaccines (PCV) that target either 10 or 13 of the most prevalent serotypes.
Currently available PCVs are safe and efficacious. WHO recommends the inclusion of PCVs in childhood immunization programmes worldwide. In particular, countries with high childhood mortality (i.e. under 5 mortality rate of >50 deaths/1000 births) should make the introduction of these multicomponent PCVs a high priority.
In many countries, the routine use of pneumococcal conjugate vaccines has dramatically reduced the incidence of serious diseases due to the organism with virtual disappearance of disease due to serotypes of the organism in the vaccines used.

Poliomyelitis

Poliomyelitis (polio) is a highly infectious viral disease that largely affects children under 5 years of age. The virus is transmitted by person-to-person spread mainly through the faecal-oral route or, less frequently, by a common vehicle (e.g. contaminated water or food) and multiplies in the intestine, from where it can invade the nervous system and cause paralysis. One in 200 infections leads to irreversible paralysis. Among those paralysed, 5–10% die when their breathing muscles become immobilized.
In 1988, the World Health Assembly adopted a resolution for the worldwide eradication of polio, marking the launch of the Global Polio Eradication Initiative. Since than two of the three wild poliovirus (WPV) serotypes (types 2 and 3) have been eradicated. As at 2022, endemic wild poliovirus type 1 remains in two countries: Pakistan and Afghanistan.
Wild poliovirus cases have decreased by over 99% since 1988, from an estimated 350 000 cases in more than 125 endemic countries to 22 reported cases in 2022 but an increase from 6 WPC in 2021.

Outbreaks of polio caused by circulating vaccine-derived polioviruses (cVDPVs) can occur when oral poliovirus vaccine (OPV) strains circulate for a prolonged time in underimmunized populations, allowing reversion to neurovirulence. A total of 859 cVDPV cases occurred during 2022, an increase of 23% from 698 cases in 2021.

Polio can be prevented through immunization. Polio vaccine, given multiple times, almost always protects a child for life. The development of effective vaccines to prevent paralytic polio was one of the major medical breakthroughs of the 20th century.
Oral poliovirus vaccines (OPV) are the predominant vaccine used in the fight to eradicate polio. There are different types of oral poliovirus vaccine, which may contain one, a combination of two, or all three different serotypes of attenuated vaccine:

- Novel oral polio vaccine type 2 (nOPV2) - is a modified version of the type 2 monovalent OPV (mOPV2), used to better address the evolving risk of type 2 circulating vaccine-derived poliovirus (cVDPV2).
- *Monovalent oral polio vaccines (mOPV1, mOPV2 and mOPV3) – protect against each individual type of poliovirus, respectively.*
- Bivalent oral polio vaccine (bOPV) – elicits a better immune response against poliovirus types 1 and 3 than trivalent OPV, but does not give immunity against serotype 2. As well as in routine immunization, bOPV will be used for outbreak response against poliovirus types 1 and 3 outbreaks.
- *Trivalent oral polio vaccine (tOPV) – The trivalent vaccine was withdrawn in April 2016 and replaced with the bivalent oral poliovirus vaccine (bOPV), which contains only attenuated virus of types 1 and 3. This is because continued use of tOPV threatened to continue seeding new type 2 circulating vaccine-derived polioviruses (cVDPV2), despite the wild type 2 virus being eradicated in 1999.*
- *Inactivated polio vaccine (IPV) – protects against poliovirus types 1, 2, and 3*

If enough people in a community are immunized, the virus will be deprived of susceptible hosts and will die out. High levels of vaccination coverage must be maintained to stop transmission and prevent outbreaks occurring.

Rabies

Rabies is a viral zoonotic disease that causes progressive and fatal inflammation of the brain and spinal cord. Clinically, it has two forms:

1. Furious rabies – characterized by hyperactivity and hallucinations.
2. Paralytic rabies – characterized by paralysis and coma.

Although fatal once clinical signs appear, rabies is entirely avoidable; vaccines, medicines and technologies have long been available to prevent death from rabies. Nevertheless, rabies still kills tens of thousands of people each year. Of these cases, approximately 99% are acquired from the bite of an infected dog.
Dog-mediated human rabies can be eliminated by tackling the disease at its source: infected dogs. Making people aware of how to avoid the bites of rabid dogs, to seek treatment when bitten and to vaccinate animals can successfully disrupt the rabies transmission cycle.
Rabies is estimated to cause 59 000 human deaths annually in over 150 countries, with 95% of cases occurring in Africa and Asia. Due to underreporting and uncertain estimates, this number is likely a gross underestimate. The burden of disease is disproportionally borne by rural poor populations, with approximately half of cases attributable to children under 15 years of age.

Two types of vaccines to protect against rabies in humans exist - nerve tissue and cell culture vaccines. WHO recommends replacement of nerve tissue vaccines with the more efficacious, safer vaccines developed through cell culture as soon as possible. Cell culture vaccines which are more affordable and require less vaccine have been developed in recent years.
Intradermal immunization using cell-culture-based rabies vaccines is an acceptable alternative to standard intramuscular administration. Intradermal vaccination has been shown to be as safe and immunogenic as intramuscular vaccination, yet requires less vaccine, for both pre- and post-exposure prophylaxis, leading to lower direct costs. This alternative should thus be considered in settings constrained by cost and/or supply issues.
Pre-exposure prophylaxis is recommended for anyone at continual, frequent or increased risk of exposure to rabies virus, either by nature of their residence or occupation.
Periodic booster injections are recommended as an extra precaution only for people whose occupation puts them at continual or frequent risk of exposure. If available, antibody monitoring of personnel at risk is preferred to the administration of routine boosters.
Post-exposure prophylaxis (PEP) consists of wound treatment, the administration of rabies vaccines based on WHO recommendations, and if indicated, the administration of rabies immunoglobulin. PEP than depend on the type of contact with the suspected rabid animal. For category I exposure (touching or feeding animals, licks on intact skin), no prophylaxis is required; for category II (nibbling of uncovered skin, minor scratches or abrasions without bleeding), immediate vaccination; and for category III (single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks, licks on broken skin, exposures to bats), immediate vaccination and administration of rabies immunoglobulin are recommended.

Rubella

Transmitted in airborne droplets when infected people sneeze or cough, rubella is an acute, usually mild viral disease traditionally affecting susceptible children and young adults worldwide. Rubella infection just before conception and in early pregnancy may result in miscarriage, fetal death or congenital defects known as congenital rubella syndrome (CRS). The highest risk of CRS is found in countries with high rates of susceptibility to rubella among women of childbearing age.

Rubella vaccines are commonly given in a combination vaccine with measles (MR), measles and mumps (MMR), or measles, mumps and varicella (MMRV).
Large-scale rubella vaccination during the last decade has drastically reduced or practically eliminated rubella and CRS in many developed and in some developing countries. Indeed, the western hemisphere and several European countries have eliminated rubella and CRS.
WHO recommends that all countries that have not yet introduced rubella vaccine, and are providing two doses of measles vaccine using routine immunization and/or supplementary immunization activities should consider the inclusion of RCV in their immunization programme.

SARS-Cov-2

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus.

Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness. Anyone can get sick with COVID-19 and become seriously ill or die at any age.

The best way to prevent and slow down transmission is to be well informed about the disease and how the virus spreads. Protect yourself and others from infection by staying at least 1 metre apart from others, wearing a properly fitted mask, and washing your hands or using an alcohol-based rub frequently. Get vaccinated when it's your turn and follow local guidance.

The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. These particles range from larger respiratory droplets to smaller aerosols. It is important to practice respiratory etiquette, for example by coughing into a flexed elbow, and to stay home and self-isolate until you recover if you feel unwell.

There are several COVID-19 vaccines approved for use by WHO (given Emergency Use Listing) and from other stringent regulatory agencies (SRAs). The first mass vaccination programme started in early December 2020 and the number of vaccination doses administered globally is updated regularly on the WHO COVID-19 dashboard.

Different types of vaccines against COVID-19 have been developed, including:

- inactivated or weakened virus vaccines (i.e., Sinovac-Coronavac, Sinopharm, Bharat, Valneva), which use a form of the virus that has been inactivated or weakened so that it doesn't cause disease but still generates an immune response;
- protein-based vaccines (i.e., Novavax / Serum Institute of India), which use harmless fragments of proteins or protein shells that mimic the COVID-19 virus to safely generate an immune response;
- viral vector vaccines (i.e., AstraZeneca/Oxford, Janssen, CanSino), which use a safe virus that cannot cause disease but serves as a platform to produce coronavirus proteins to generate an immune response; and
- RNA and DNA vaccines (i.e., Pfizer/ BioNTech, Moderna), which use genetically engineered RNA or DNA to generate a protein that itself safely prompts an immune response.

For the latest information on vaccines, please visit the COVID-19 vaccines page:

- https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines
- https://extranet.who.int/pqweb/sites/default/files/documents/Status_COVID_VAX_08AUgust2023.pdf

Smallpox

Smallpox is an acute contagious disease caused by the variola virus, a member of the orthopoxvirus family. It was one of the most devastating diseases known to humanity and caused millions of deaths before it was eradicated. It is believed to have existed for at least 3000 years.

The smallpox vaccine, created by Edward Jenner in 1796, was the first successful vaccine to be developed. He observed that milkmaids who previously had caught cowpox did not catch smallpox and showed that a similar inoculation could be used to prevent smallpox in other people.

The WHO launched an intensified plan to eradicate smallpox in 1967. Widespread immunization and surveillance were conducted around the world for several years. The last known natural case was in Somalia in 1977. In 1980 WHO declared smallpox eradicated – the only infectious disease to achieve this distinction. This remains among the most notable and profound public health successes in history.

The smallpox vaccine is a live virus vaccine made from a virus called vaccinia, which is a “pox” type virus related to smallpox. The vaccine helps the body develop immunity to smallpox. It does not contain the smallpox virus and cannot give anyone smallpox. Smallpox vaccination provides high level immunity for 3-5 years and decreasing immunity thereafter. If a person is vaccinated again later, immunity lasts even longer. Historically, the vaccine has been effective in preventing smallpox infection in 95% of those vaccinated. The live vaccinia virus that is contained in the vaccine may cause mild reactions, such as rash, fever and head and body aches. The live vaccinia virus that is contained in the vaccine may cause mild reactions, such as rash, fever and head and body aches.

The smallpox vaccine is currently not recommended for the general public. The vaccine is now being offered to those who may be called upon to respond in the event of a smallpox case or outbreak.

In 2002, World Health Assembly (WHA) Resolution 55.16 urged Member States to share expertise, supplies and resources to rapidly contain a public health emergency or mitigate its effects. The resolution further requested the WHO Director General to examine the possible development of collaborative mechanisms to prepare and stockpile resources for a potential PHEIC. The SVES currently consists of two components:

A physical stockpile of vaccine held by WHO Headquarters in Switzerland, which is composed of calf-lymph smallpox vaccines from a variety of sources dating from the final years of the eradication program that are regularly tested for potency. It is estimated to consist of approximately 2.4 million doses when reconstituted and delivered by bifurcated needle.

A pledged stockpile held by Donor countries in their respective national stockpiles for use in time of international need upon request by WHO, which currently consists of 31.01 million doses of smallpox vaccine held by France, Germany, Japan, New Zealand, and the United States.

Tetanus

Tetanus is a serious illness contracted through exposure to the spores of the bacterium, *Clostridium tetani*, which live in soil, saliva, dust and manure. The bacteria can enter the body through a deep cuts, wounds or burns affecting the nervous system. The infection

leads to painful muscle contractions, particularly of the jaw and neck muscle, and is commonly known as “lockjaw”.
People of all ages can get tetanus but the disease is particularly common and serious in newborn babies and their mothers when the mother is unprotected from tetanus by the vaccine, tetanus toxoid. Tetanus occurring during pregnancy or within 6 weeks of the end of pregnancy is called maternal tetanus, while tetanus occurring within the first 28 days of life is called neonatal tetanus.
The disease remains an important public health problem in many parts of the world, but especially in low-income countries or districts, where immunization coverage is low and unclean birth practices are common. WHO estimates that in 2018 (the latest year for which estimates are available), 25 000 newborns died from neonatal tetanus, 88% reduction from the situation in 2000.

Tetanus can be prevented through immunization with tetanus-toxoid-containing vaccines (TTCV), which are included in routine immunization programmes globally and administered during antenatal care contacts.
To be protected throughout life, WHO recommends that an individual receives 6 doses (3 primary plus 3 booster doses) of TTCV. The 3-dose primary series should begin as early as 6 weeks of age, with subsequent doses given with a minimum interval of 4 weeks between doses.
The 3 booster doses should preferably be given during the second year of life (12–23 months), at 4–7 years of age, and at 9–15 years of age. Ideally, there should be at least 4 years between booster doses.
There are many kinds of vaccines used to protect against tetanus:

- diphtheria and tetanus (DT) vaccines
- diphtheria, tetanus, and pertussis (whooping cough) (DTaP) vaccines
- tetanus and diphtheria (Td) vaccines
- tetanus, diphtheria, and pertussis (Tdap) vaccines.

Neonatal tetanus can be prevented by immunizing women of reproductive age with TTCV, either during pregnancy or outside of pregnancy. Additionally, robust medical practices can also prevent tetanus disease including clean delivery and cord care during childbirth, and proper wound care for surgical and dental procedures.

Tick-borne Encephalitis

Tick-borne encephalitis (TBE) is an acute viral illness caused by two closely related viruses of the family *Flaviviridae*: the central European encephalitis (CEE) virus, found in many European countries, and the Russian spring-summer encephalitis (RSSE) virus, found predominantly in the Asian parts of the former Soviet Union and in forested regions of China and Japan. CEE virus is found is every European country, with the exception of Belgium, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom, and is transmitted primarily by the tick *Ixodes ricinus*. RSSE virus is most prevalent in the eastern part of the former Soviet Union and is transmitted by the tick *Ixodes persulcatus*. On rare occasions, infection can result from consumption of unpasteurized milk from infect goats, sheep or cows. There is no direct person-to-person transmission.
In Asia, the disease is characterized by abrupt onset of fever, severe headache, nausea and vomiting and severe back pain often associated with focal epilepsy and flaccid paralysis, especially of the shoulder girdle. Such paralysis may be permanent. The central European form of the disease has a longer course, often with biphasic fever, but

severe sequelae are less frequent. The initial febrile stage is normally not associated with disease of the central nervous system, but the second phase, following approximaely 4-10 days after apparent recovery, is characterized by fever and meningoencephalitis. The case-fatality rate is approximately 20% for the Asian form of the disease and 1-5% for the European form.

People can protect themselves from ticks by wearing appropriate clothing, including long trousers and closed footwear, when hiking or camping in countries or areas at risk. The whole body should be inspected daily and attached ticks removed as soon as possible. The consumption of unpasteurized dairy products should also be avoided in those areas.
Immunization offers the most effective protection. Currently, there are 4 widely used vaccines of assured quality: FSME-Immun and Encepur, manufactured in Austria and Germany respectively, and based on European strains of the virus; and TBE-Moscow and EnceVir, manufactured in the Russian Federation and based on Far-Eastern strains. The 4 vaccines are considered to be safe and effective.
In areas where the disease is highly endemic, WHO recommends that vaccination be offered to all age groups, including children.
Ticks also transmit Borreliosis (Lyme disease), which is a bacterial infection. TBE vaccination is not effective against this disease, which however is treatable with antimicrobials.

BCG (Tuberculosis)

Tuberculosis (TB) is an infectious disease that most often affects the lungs and is caused by a *Mycobacterium tuberculosis*. It spreads through the air when infected people cough, sneeze or spit. TB is preventable and curable.
Over 80% of cases and deaths are in low- and middle-income countries. TB occurs in every part of the world. In 2021, the largest number of new TB cases occurred in WHO's South-East Asian Region (46%), followed by the African Region (23%) and the Western Pacific (18%). Around 87% of new TB cases occurred in the 30 high TB burden countries, with more than two thirds of the global total in Bangladesh, China, the Democratic Republic of the Congo, India, Indonesia, Nigeria, Pakistan, and the Philippines.
About a quarter of the global population is estimated to have been infected with TB bacteria. About 5–10% of people infected with TB will eventually get symptoms and develop TB disease. Those who are infected but not (yet) ill with the disease cannot transmit it. TB disease is usually treated with antibiotics and can be fatal without treatment. In certain countries, the Bacille Calmette-Guérin (BCG) vaccine is given to babies or small children to prevent TB. The vaccine prevents TB outside of the lungs but not in the lungs.
Multidrug-resistant tuberculosis (MDR-TB) is a form of TB caused by bacteria that do not respond to isoniazid and rifampicin, the 2 most effective first-line TB drugs. MDR-TB is a growing health threat worldwide.

The bacille Calmette-Guérin (BCG) vaccine has existed for 80 years and is one of the most widely used of all current vaccines, reading >80% of neonates and infants in countries where it is part of the national childhood immunization programme. The BCG vaccine is not given as part of the routine vaccination schedule in many countries.

But it could be given on when a child or adult is thought to have an increased risk of coming into contact with TB. The BCG vaccine should only be given once in a lifetime.
BCG vaccine has a documented protective effect against meningitis and disseminated TB in children. It does not prevent primary infection and, more importantly, does not prevent reactivation of latent pulmonary infection, the principal source of bacillary spread in the community. The impact of BCG vaccination on transmission of Mtb is therefore limited.
The biological interaction between Mtb and the human host is complex and only partially understood. Recent advances in areas such as mycobacterial immunology and genomics have stimulated research on numerous new experimental vaccines, but it is unlikely that any of these urgently need vaccines will be available for routine use within the next few years. In the meantime, optimal utilization of BCG is encouraged.

Typhoid

Typhoid fever is a life-threatening systemic infection caused by the bacterium *Salmonella enterica* serovar Typhi (commonly known as *Salmonella* Typhi). Typhoid is usually spread through the ingestion of contaminated food or water.
Typhoid occurs predominantly in association with poor sanitation and lack of clean drinking water, in both urban and rural settings. However, urbanization, with associated overcrowded populations and inadequate water and sanitation systems, as well as climate change have the potential to further increase the global burden of typhoid. In addition, increasing antibiotic resistance is making it easier for typhoid to spread and more difficult to be treated.
An estimated 9 million people get sick from typhoid and 110 000 people die from it worldwide every year (2019 figures).
Travellers are at risk of developing typhoid fever in many typhoid endemic countries, particularly in Asia and sub-Saharan Africa. Elsewhere, travellers are usually at risk when exposed to low standards of personal hygiene or food hygiene and poor water quality.
Even vaccinated travellers should take care to avoid consumption of potentially contaminated food and water as vaccination does not confer 100% protection.

Access to safe water and adequate sanitation, health education, appropriate hygiene among food handlers, and typhoid vaccination are all effective strategies for prevention and control of typhoid.
There are three recommended typhoid vaccines :

1. typhoid conjugate vaccine, an injectable vaccine for children from 6 months of age and adults up to 65 years;
2. unconjugated Vi polysaccharide vaccine, an injectable vaccine for people over 2 years; and
3. live attenuated oral vaccine, suitable for people over the age of 6 years.

Typhoid conjugate vaccine has been recommended for routine use as a single dose in childhood immunization programmes since October 2017. The latter two vaccines have been used for many years in older children and adults at risk of typhoid, including travellers; they do not provide long-lasting immunity and require multiple doses to maintain protection.

Varicella-Zoster (Chickenpox)

Varicella-zoster virus (VZV) causes both varicella (chickenpox) by primary infection and herpes zoster (HZ or shingles) by endogenous reactivation from latency. VZV circulates worldwide. Acquisition of infection tends to be at a younger age in temperate countries (> 90% infected by adolescence in absence of vaccination programme), compared to an older distribution in tropical countries. Varicella shows a winter/spring or cool/dry month predominance, and can occur in large outbreaks every 2–5 years. VZV is highly contagious with secondary attack rates from varicella cases ranging from 61–100%. The virus spreads person-to-person primarily by inhalation of aerosols from vesicular fluid of skin lesions, by direct contact with rash and possibly by infected respiratory tract secretions. Without vaccination, almost everyone in the population acquires wild-type varicella infection by adulthood.

Varicella can be prevented by immunization and multiple vaccine formulations of the live attenuated vaccine, based on the Oka VZV strain, have been available since 1974. Varicella vaccines are available as a single antigen and in combination with measles, mumps and rubella vaccine.

Yellow Fever

Yellow fever is an epidemic-prone mosquito-borne vaccine preventable disease that is transmitted to humans by the bites of infected mosquitoes. Yellow fever is caused by an arbovirus (a virus transmitted by vectors such mosquitoes, ticks or other arthropods) transmitted to humans by the bites of infected *Aedes* and *Haemagogus* mosquitoes.
These day-biting mosquitoes breed around houses (domestic), in forests or jungles (sylvatic), or in both habitats (semi-domestic). Yellow fever is a high-impact high-threat disease, with risk of international spread, which represents a potential threat to global health security.
Occasionally, infected travellers have exported cases to countries that are free of yellow fever. However, the disease can only spread easily to a new country if there are mosquito species able to transmit it, specific climatic conditions, and the animal reservoir needed to maintain it. There is no specific anti-viral drug for yellow fever.
As of 2023, 34 countries in Africa and 13 countries in Central and South America are either endemic for, or have regions that are endemic for, yellow fever.

Yellow fever is prevented by a vaccine, which is safe and affordable. A single dose of yellow fever vaccine is sufficient to grant life-long protection. The yellow fever vaccine provides immunity within one week in 95% of people vaccinated. A booster dose is not needed. All currently available yellow fever vaccines are live and attenuated formulations.
In accordance with the International Health Regulations (IHR), countries have the right to require travellers to provide a certificate of yellow fever vaccination. If there are medical grounds for not getting vaccinated, this must be certified by the appropriate authorities.

- Countries with risk of yellow fever transmission and countries requiring yellow fever vaccination (November 2022) (who.int)
- Vaccination requirements and recommendations for international travellers; and malaria situation per country – 2022 edition (who.int)

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