



PATH

Summary of stability data for licensed vaccines

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Summary of stability data for licensed vaccines

As of November 29, 2012

Background

The tables are an update of the original "Stability data for commonly used vaccines and novel formulations," produced by Working in Tandem, Ltd., and PATH in 2008.

The stability data contained in the tables represents information from product monographs or published stability studies that is available in the public domain.

The tables have been compiled to provide information on the relative stability of the licensed vaccines that are listed.

The information in the tables is not to be used as a guide for vaccine storage conditions; please refer to the manufacturer's latest product insert or product label for this purpose.

Approach

Information on the presentation, formulation, and stability of licensed vaccines was compiled from information available in the public domain.

Vaccines were categorized according to whether they are:

- a) Vaccines against a single pathogen.
- b) Combination vaccines, i.e., against several pathogens (e.g., diphtheria, pertussis, tetanus [DTP] and measles, mumps, rubella [MMR]).

Notes to table summarizing stability of commonly used vaccines

Vaccines	The table is not intended to be exhaustive and it does not include all currently licensed vaccines for each target disease. The vaccines listed have been selected to provide representative information on the stability of vaccines for each target.
Country of manufacture	Country of manufacture is indicated where known.
WHO prequalification	The vaccine's World Health Organization (WHO) prequalification (PQ) status is indicated. Information on PQ status is from: http://www.who.int/immunization_standards/vaccine_quality/PQ_vaccine_list_en/en/index.html , accessed March 21, 2012.
Adjuvant	The type of adjuvant (if present in the formulation) is indicated.
Formulation	Vaccines with aluminum salt-based adjuvants are assumed to be liquid formulations (unless there is information that states otherwise).
Damaged by freezing	Yes/No is based on published information on whether the vaccine is damaged by freezing. DNF (do not freeze) indicates that the summary of product characteristics (SPC) specifies that the vaccine should not be frozen, and it is assumed, therefore, that the vaccine might be damaged by freezing. In some cases (particularly lyophilized vaccines) there are data to suggest that the vaccines can withstand freeze-thawing despite DNF in the SPC. Vaccines with aluminum salt adjuvants are assumed to be damaged by freezing (freeze-sensitive) unless there is available information stating this is not the case. Lyophilized vaccines are assumed not to be damaged by freezing, unless otherwise stated.
Shelf life	The shelf life provided in the SPC/product monograph for the vaccine is shown. "Not known" indicates that the SPC states "do not use after expiration date."
VVM	The only vaccine vial monitor (VVM) type used with the vaccine is listed if known. If no VVM information is provided on the product summary sheet, it has been assumed that a VVM is not used.
Stability data	Any available stability data for each vaccine at the temperatures indicated is shown. The data are for a single exposure at the indicated temperature, unless stated otherwise.
Summary of stability data	A summary of all the available stability data for each vaccine type is provided where possible. In most cases, this is based on the conclusions in the WHO's Quality, Safety, and Standards team's 2006 document, "Temperature sensitivity of vaccines" (1).
Links	Hyperlinks are provided to the summary of product characteristics, product monograph, or package insert for each vaccine.

Summary of stability data for licensed vaccines

Abbreviations

Al	aluminum
AlOH ₃	aluminum hydroxide
AlPO ₄	aluminum phosphate
aP	acellular pertussis
AF	adjuvant formulation
AS	adjuvant system
BB-NCIPD	Bul Bio-National Center of Infectious and Parasitic Diseases, Ltd.
BCG	Bacille Calmette Guérin
CIGB	Center for Genetic Engineering and Biotechnology (Cuba)
D	diphtheria (toxoid)
DPT	diphtheria, pertussis, tetanus (toxoid) vaccine
DNF	do not freeze
F/T	freeze/thaw
GSK	GlaxoSmithKline
HAV	hepatitis A virus
HepB	hepatitis B virus
Hib	<i>Haemophilus influenzae</i> type b
HPV	human papillomavirus
ID	intradermal
IM	intramuscular
IN	intranasal
IPV	inactivated poliovirus vaccine
JE	Japanese encephalitis virus
MMR	measles, mumps, rubella vaccine
MPL	monophosphoryl lipid A
OMPC	outer membrane protein complex
OMV	outer membrane vesicle
OPV	oral poliovirus vaccine
P	pertussis
PATH	Program for Appropriate Technology in Health
PCEV	purified chicken embryo (rabies) vaccine
PQ	prequalified (WHO)
PS	polysaccharide
PS-PCV	polysaccharide-protein conjugate vaccine
PVRV	purified vero rabies vaccine
SC	subcutaneous
SPC	summary of product characteristics
SSI	Statens Serum Institut (Denmark)
T	tetanus (toxoid)
Temp susp	temporarily suspended
VVM	vaccine vial monitor
VLP	virus-like particle
WHO	World Health Organization
wP	whole cell pertussis

Summary of stability data for licensed vaccines

As of November 29, 2012

Vaccines against single pathogens

Vaccine	Manufacturer	Country of manufacture	WHO PQ	WHO Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert		WHO information	Notes	
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C				
Cholera																			
Dukoral	Crucell	Sweden	Yes	Inactivated bacteria	Oral	Liquid, with bicarbonate buffer granules	No	Yes (DNF)	36 months			27°C: 14 days (SPC)				http://www.medicines.org.uk/emc/medicine/14463/SPC/Dukoral%20Oral%20Cholera%20Vaccine.pdf http://www1.ndmctsgh.edu.tw/pharm/pic/medinsert/005DUK01E.pdf	http://www.who.int/immunization_standards/vaccine_quality/117_cholera/en/index.html		
Orc-vax (inactivated oral cholera)	Vabiotech	Vietnam	No	Inactivated bacteria	Oral	Liquid	No	Yes (DNF)	24 months						http://www.vabiotechvn.com/english/?act=sanpham&code=detail&idcat=4&id=17		Shanchol and mORCVAX (and Orc-vax) are similar but formulated by different manufacturers Vabiotech also produces mORCVAX		
Shanchol (reformulated bivalent)	Shantha Biotech	India	Yes	Inactivated bacteria	Oral	Liquid	No	Yes (DNF)	24 months	14					http://www.who.int/immunization_standards/vaccine_quality/pq_250_cholera_1dose_shantha_insert.pdf http://www.shanthabiotech.com/shanchol.htm	http://www.who.int/immunization_standards/vaccine_quality/pq_250_cholera_1dose_shantha/en/index.html	Shanchol and mORCVAX (and Orc-vax) are similar, but formulated by different manufacturers		
Summary				Inactivated bacteria	Oral	Liquid +/- buffer granules	No	Yes (DNF)	24 - 36 months		Freeze sensitive (1). Insufficient data available to make general conclusions regarding heat stability								
Haemophilus influenzae type b (Hib)																			
Act-Hib	Sanofi Pasteur	France	Yes	PS-PCV	IM	Lyophilized	No	Yes (DNF)	36 months						http://www.who.int/immunization_standards/vaccine_quality/ActHib_sanofi_pasteur_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_110_hib_1_dose_sanofi_pasteur/en/index.html			
BioHib	Bharat Biotech International Ltd.	India	No	PS-PCV	Not known	Not known	Not known	Not known	Not known						No product information found				
Hiberix	GSK	Belgium	Yes	PS-PCV	IM	Lyophilized	No	No	36 months	30					http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM179530.pdf http://www.gsk.com/products/vaccines/hiberix.htm	http://www.who.int/immunization_standards/vaccine_quality/pq_43_hib_2dose_gsk/en/index.html	Diluent can be stored at 20°-25°C, but must not be frozen		
PedvaxHib	Merck	USA	Yes	PS-PCV	IM	Liquid	Aluminum hydroxy-phosphate sulfate	Yes (DNF)	36 months						http://www.who.int/immunization_standards/vaccine_quality/PedvaxHib_Merck_product_insert_text.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_73_Haemophilus_influenzae_type_b_1_dose_Vial_MSD/en/index.html			
QuimiHib	CIGB	Cuba	Yes	PS-PCV	IM	Liquid	No	Yes (DNF)	36 months	14		> 18 months (1)		3 months (1)	http://www.heber-biotec.com/suelto%20htm/ingles/QuimiHib/suelto%20quimi%20hib%20ingles.htm	http://www.who.int/immunization_standards/vaccine_quality/PQ_198_Hib_1_dose_CIGB/en/index.html	Adjuvanted and non-adjuvanted formulations have been tested in clinical trials		
SII HibPRO	Serum Institute of India	India	Yes	PS-PCV	IM	Lyophilized	No	No	24 months	30					http://www.who.int/immunization_standards/vaccine_quality/pq_186_SII_Hib_Pl.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_186_Hib_1_dose_vial_SII/en/index.html	Diluent can be stored at 20°-25°C, but must not be frozen		
Vaxem-Hib	Novartis	Italy	Yes	PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	30					http://www.who.int/immunization_standards/vaccine_quality/VaxemHib_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_36_hib_novartis_10_dose/en/index.html			
Summary				PS-PCV	IM	Liquid or lyophilized	With/without Al-based adjuvant	Usually	24 - 36 months		Hib vaccines (lyophilized or liquid) are relatively stable (months at 25°C and 37°C). Liquid (but not lyophilized) Hib formulations are assumed to be freeze sensitive due to presence of aluminum adjuvant.								
Hepatitis A (HAV)																			
Avaxim	Sanofi Pasteur	No	Inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.medicines.org.uk/emc/medicine/6206/SPC/avaxim/				
Epaxal	Crucell	No	Inactivated virus	IM	Liquid	Virosome	Yes (DNF)	36 months							http://www.medicines.org.uk/emc/medicine/12742/SPC/epaxal/ http://www.crucell.com/Products-Epaxal		Also available from Chiron Panacea (http://www.chironpanacea.com/products/havpuro.htm#) and other companies		
Havax	Vabiotech	Vietnam	No	Inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	24 months						http://www.vabiotechvn.com/english/?act=sanpham&code=detail&idcat=4&id=10				
Havrix	GSK	No	Inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	36 months				1 - 3 weeks (1, 3)			http://www.gsk.com/products/vaccines/havrix.htm				
Healive	Sinovac	China	No	Inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	> 30 months			32 days (24)			http://www.sinovac.com.cn/en/?optionid=457		32 days stability is assumed to be at 25°C. Source states "when cold chain storage is not maintained"		
Vaqta	Merck	No	Inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	36 months			28°C: 3 months (SPC) or a series of exposures ≤ 72 hours in total (SPC)		12 months (1)		http://www.medicines.org.uk/emc/medicine/6211 http://www.merck.ca/assets/en/pdf/products/VAQTA-PM_E.pdf				
Summary				Inactivated virus	IM	Liquid	Usually AlOH ₃	Yes (DNF)	24 - 36 months		HAV vaccines are relatively heat stable (resistant to 25°C and 37°C for several months), but are assumed to be freeze sensitive due to presence of aluminum salt adjuvant.								

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes	
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C			
Hepatitis B (HepB)																		
Elovac B	Indian Immunologicals Ltd.	India	No	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.indimmune.com/hepatitis.html		
Engerix B	GSK	Belgium	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.medicines.org.uk/EMC/medicine/9283/SPC/Engerix-B+20+micrograms+1+ml+Suspension+for+injection,+Hepatitis+B+recombinant+vaccine,+adsorbed/	http://www.who.int/immunization_standards/vaccine_quality/39_hepb/en/index.html	The correct shelf life for the product is 36 months (SPC), not 24 months (as stated on WHO PQ vaccine website).
Enivac HB	Panacea	India	No	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months			Unaffected by short exposures at 25°-30°C (SPC)				http://www.panaceabiotec.com/product-pdf/vaccine1.pdf		
Euvax B	LG Life Sciences	Korea	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	30						http://www.who.int/immunization_standards/vaccine_quality/69_hepb.pdf	http://www.who.int/immunization_standards/vaccine_quality/69_hepb/en/index.html	
Fendrix	GSK	Belgium	No	Recombinant protein	IM	Liquid	AS04C (mono-phosphoryl lipid A [MPL]+ AlPO ₄)	Yes (DNF)	36 months						http://www.medicines.org.uk/EMC/medicine/16906/SPC/Fendrix/	http://public.gsk.co.uk/products/fendrix/		
HBvaxPRO	Sanofi Pasteur	France	No	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months						http://www.medicines.org.uk/EMC/medicine/9847/SPC/HBVAXPRO+10mcg/	http://www.spmso.co.uk/productPage.asp?catid=68		
Heberbiovac HB	CIGB	Cuba	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	48 months	30			1 month (SPC)	45°C: 1 week (SPC)	http://www.who.int/immunization_standards/vaccine_quality/25_hepb.pdf	http://www.who.int/immunization_standards/vaccine_quality/25_hepb/en/index.html		
Hepatitis B Uniject	BioFarma	Indonesia	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	26 months	30					http://www.who.int/immunization_standards/vaccine_quality/Leaflet_HepB_Rec.pdf	http://www.who.int/immunization_standards/vaccine_quality/10_hepb/en/index.html	Bulk vaccine from Crucell, filled by BioFarma	
Hepatitis B vaccine (4)	Instituto Butantan	Brazil	No	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	Not known									
Hepatitis B vaccine (rDNA)	Serum Institute of India Ltd.	India	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	30					http://www.who.int/immunization_standards/vaccine_quality/pq_132_133_134_hepb_sii_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_132_hepb_1dose_adult_hepb/en/index.html		
HepavaxGene	Crucell Korea	Korea	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	30					http://www.who.int/immunization_standards/vaccine_quality/04_hepb.pdf	http://www.who.int/immunization_standards/vaccine_quality/04_hepb/en/index.html		
Recombivax HB	Merck	USA	No	Recombinant protein	IM	Liquid	Alum	Yes (DNF)	Not known			One or a series of exposures ≤ 72 hours in total (SPC)				http://www.merck.ca/assets/en/pdf/products/RECOMBIVAX_HB-PM_E.pdf		
Revac-B+	Bharat Biotech International Ltd.	India	Temp susp	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	30			1 month (SPC)	45°C: 1 week (SPC)	http://www.who.int/immunization_standards/vaccine_quality/productinsertrevacb.pdf	http://www.who.int/immunization_standards/vaccine_quality/172_hepb/en/index.html	PQ status temporarily suspended from 5/12/2011	
r-Hbvax and Gene-Hbvax	Vabiotech	Vietnam	No	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months						http://www.vabiotechvn.com/english/?act=sanpham&code-detail&idcat=4&id=9	http://www.vabiotechvn.com/english/?act=sanpham&code-detail&idcat=4&id=38		
Shanvac-B	Shantha Biotechnics	India	Yes	Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	30	Damaged at ≤ -10°C (5)				http://www.who.int/immunization_standards/vaccine_quality/155_hepb.pdf	http://www.who.int/immunization_standards/vaccine_quality/155_hepb/en/index.html		
Summary				Recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	24 - 48 months		HepB vaccine is one of the most heat-stable vaccines. It is stable for years at 2°-8°C, for months at 20°-25°C, for weeks at 37°C and for days at 45°C (1). HepB vaccine is freeze sensitive (1).							
Human papillomavirus (HPV)																		
Cervarix	GSK	Belgium	Yes	Recombinant protein (VLP)	IM	Liquid	AS04 (MPL+ AlOH ₃)	Yes (DNF)	48 months	30			1 month (6) 8°-25°C: 3 days (SPC)	7 days (6) 25°-37°C: 1 day (SPC)		http://www.medicines.org.uk/EMC/medicine/20204/SPC/cervarix/	http://www.who.int/immunization_standards/vaccine_quality/PQ_180 HPV_GSK_1_dose/en/index.html	
Gardasil	Merck	USA	Yes	Recombinant protein (VLP)	IM	Liquid	Al hydroxy-phosphate sulfate	Yes (DNF)	36 months	30			One or a series of exposures ≤ 24 hours in total (SPC) Predicted half-life: 130 months (7)	Predicted half-life: 18 months (7) 45°C: Predicted half-life: 3 months (7)		http://www.merck.ca/assets/en/pdf/products/GARDASIL-PM_E.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_179 HPV_Merck/en/index.html	
Summary				Recombinant protein (VLP)	IM	Liquid	Yes	Yes	36 months		HPV vaccines are very stable. Exposures to ambient temperatures (for day-weeks) do not affect overall shelf life. They are assumed to be freeze sensitive due to presence of aluminum salt adjuvant.							

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links			
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C	Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes
Influenza: seasonal																		
Agrippal	Novartis		No	Purified virus proteins	IM	Liquid	No	Yes (DNF)	12 months							http://www.medicines.org.uk/emc/medicine/7788		
Anflu	Sinovac	China	No	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months							http://www.sinovac.com.cn/en/?optionid=459		
Begrivac	Novartis		No	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months							http://www.medicines.org.uk/emc/printfriendlydocument.aspx?documentid=19040&companyid=916		
Fluad	Novartis		No	Purified virus proteins	IM	Liquid	MFS9	Yes (DNF)	12 months							http://www2.fda.moph.go.th/drug/zone_search/files/FLUA_D_2C%2020_45_N.pdf		
Fluarix	GSK		No	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months	1 F/T cycle: no effect (8)		2 weeks: physical changes (8)				http://www.medicines.org.uk/emc/medicine/2038/SPC/fluarix/		
FluBio	BioFarma	Indonesia	No	Not known (assumed)	IM	Liquid (assumed)	Not known	Not known	Not known							No product information found		
FluLaval	GSK	Canada	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months	7						http://www.who.int/immunization_standards/vaccine_quality/Flulaval_GSK_Package_Insert_text.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_193_flu_seasonal_gsk_can/index.html	
FluMist	Medimmune		No	Live attenuated virus	IN	Liquid	No	Yes (DNF)	18 weeks (25)							http://www.astazeneca.ca/documents/ProductPortfolio/FLUMIST_PM_en.pdf	https://www.asdhealthcare.com/content/asd/cms/files/FluMist_Brochure.pdf	
Fluvax	CSL, Ltd.		No	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	Not known							http://www.csl.com.au/docs/112/286/Fluvax%20PI%20-%2020approved%20Oct2010.pdf	http://www.csl.com.au/s1/csuuhq/1217017237558/Web_Product_C/1196562642777/ProductDetail.htm	
Fluviral	GSK		No	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	Not known							http://www.gsk.ca/english/docs-pdf/Fluviral_2010.pdf		
Fluvirin	Novartis	UK	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months	7						http://www.medicines.org.uk/emc/document.aspx?documentId=20573	http://www.who.int/immunization_standards/vaccine_quality/PQ_200_flu_seasonal_novartis/index.html	
GC FLU inj	Green Cross	Korea	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months	7						http://www.who.int/immunization_standards/vaccine_quality/pq_234_influenza_seasonal_singledose_greencross_inert.pdf	http://www.who.int/immunization_standards/vaccine_quality/234_influenza_seasonal_singledose_greencross/index.html	
Inflexal V	Crucell		No	Purified virus proteins	IM	Liquid	Virosome	Yes (DNF)	12 months	Aggregation after 1 F/T cycle (8)	18 months (9)	4 weeks: no physical changes (8) 3 months (9)	24 hours: physical changes (8) 4 weeks (9)			http://www.medicines.org.uk/emc/medicine/24941/SPC/inflexal%20v/		
Influvac	Solvay		No	Purified virus proteins	IM	Liquid	No	Yes (DNF)	12 months	Physical changes after 1 F/T cycle (8)	≥ 69 weeks (10)	2 weeks: physical changes (8) 2 weeks: no effect on shelf life (10)	24 hours: physical changes (8)			http://www.medicines.org.uk/EMC/medicine/21149/SPC/influvac+2011+2012/		
Intanza (ID flu)	Sanofi Pasteur		No	Inactivated virus (split)	ID	Liquid	No	Yes (DNF)	12 months							http://www.medicines.org.uk/EMC/medicine/21743/SPC/intanza+9+microgram+strain/		
Vaxigrip (Mutagrip)	Sanofi Pasteur	France	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months	7	Physical changes after 1 F/T cycle (8)		2 weeks: physical changes (8)	24 hours: physical changes (8)		http://www.who.int/immunization_standards/vaccine_quality/pq_239_influenza_seasonal_10dose_sanofi_pasteur_inert.pdf	http://www.who.int/immunization_standards/vaccine_quality/239_influenza_seasonal_10dose_sanofi_pasteur/en/index.html	
Summary				Inactivated (split/whole)	IM	Liquid	No (usually)	Yes (DNF)	12 months	Inactivated influenza vaccines can be stable for several weeks at room temperature. Limited data suggest they are freeze sensitive.								
				Live attenuated virus	IN	Liquid	No	Yes (DNF)	18 weeks	Short shelf life (< 18 weeks). The effect of elevated temperatures is not known. They are assumed to be damaged by freezing based on information in the SPC.								

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links			Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C					
Influenza: pandemic (H1N1 and H5N1)																				
Anflu (H5N1)	Sinovac	China	No	Inactivated virus (whole)	IM	Liquid	AlOH ₃	Yes (DNF)	24 months									http://www.sinovac.com.cn/en/?optionid=460		
Arepanrix (H1N1)	GSK	Belgium	No	Inactivated virus (split)	IM	Liquid	AS03 (added at point of use)	Yes (DNF)	6 months (was 18 months) (26)						50°C: hemagglutinin stable for < 1 hr (11)		http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_Product_Information/human/001201/WC500089737.pdf			
Celtura (H1N1)	Novartis	Germany	Yes	Purified virus proteins	IM	Liquid	MF59	Yes (DNF)	6 months								http://www.novartisvaccines.com/downloads/diseases-products/English_Celtura_final_241109-update_clean.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_211_h1N1_Novartis_ger/en/index.html		
Celvapan (H1N1)	Baxter	Austria	No	Inactivated virus (whole)	IM	Liquid	No	Yes (DNF)	Not known								http://www.ema.europa.eu/docs/en_GB/document_library/Other/2010/01/WC500059182.pdf			
Fluvirin (H1N1)	Novartis	UK	Yes	Purified virus proteins	IM	Liquid	No	Yes (DNF)	6 months								http://www.who.int/immunization_standards/vaccine_quality/PQ_213_H1N1_Novartis_UK/en/index.html	http://www.who.int/immunization_standards/vaccine_quality/Attachment1_Fluvirin_H1N1_Pi.pdf		
Focetria (H1N1)	Novartis	Italy	Yes	Purified virus proteins	IM	Liquid	MF59	Yes (DNF)	12 months								http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_Product_Information/human/000710/WC500023749.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_212_H1N1_novartis_italy/en/index.html		
Green Flu-S (H1N1)	Green Cross	Korea	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months								http://www.who.int/immunization_standards/vaccine_quality/GREEN_FLU-S_vial_Insert_English.pdf	http://www.who.int/immunization_standards/vaccine_quality//PQ_209_h1n1_green_cross/en/index.html		
H1N1 pandemic Influenza A	Medimmune	USA	Yes	Live attenuated virus	IN	Liquid	No	Yes (DNF)	18 weeks								http://www.who.int/immunization_standards/vaccine_quality/210_h1n1_1dose_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_210_H1N1_medimmune/en/index.html		
Humenza (H1N1)	Sanofi Pasteur	France	Yes	Inactivated virus (split)	IM	Liquid	AF03 (added at point of use)	Yes (DNF)	6 months								http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_Product_Information/human/001202/WC500094348.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_219_Influenza_Pandemic_H1N1_10_dose_vial_Sanofi/en/index.html	Humenza is not routinely produced and may no longer be authorized AF03 is an oil-in-water emulsion similar to AS03	
Influenza A (H1N1) 2009 monovalent vaccine	Sanofi Pasteur	USA	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	18 months								http://www.who.int/immunization_standards/vaccine_quality/h1n1_2009_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_216_H1N1_Sanofi_USA/en/index.html		
NasoVac (H1N1 monovalent)	Serum Institute of India Ltd.	India	No	Live attenuated virus	IN	Lyophilized	No	No (12)	9 months (target stability) (12)								http://www.seruminstitute.com/content/products/product_nasovac.htm			
Pandemrix (H1N1)	GSK	Germany	Yes	Inactivated virus (split)	IM	Liquid	AS03 (added at point of use)	Yes (DNF)	24 months								http://www.who.int/immunization_standards/vaccine_quality/Pandemrix_Package_Insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_h1n1_gsk_ger/en/index.html		
Panvax (H1N1)	CSL	Australia	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months								http://www.who.int/immunization_standards/vaccine_quality/CSL_H1N1_Pandemic_Leaflet_WHO.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_206_h1n1_csl/en/index.html	Junior formulation has shelf life of 6 months (http://www.thegovmonitor.com/world_news/asia/singapore-announces-voluntary-recall-of-panvax-junior-h1n1-vaccine-37720.html)	
Panenza (H1N1)	Sanofi Pasteur	France	Yes	Inactivated virus (split)	IM	Liquid	No	Yes (DNF)	12 months								http://www.who.int/immunization_standards/vaccine_quality/panzenza_sanofi_pasteur_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_214_H1N1_Sanofi_FR/en/index.html		
Summary				Inactivated (split/whole)	IM	Liquid	Yes or No	Yes (DNF)	6 - 24 months	Shelf life and freeze sensitivity similar to inactivated seasonal influenza vaccines. Stability varies significantly with the strain of virus in the vaccine (11).										
				Live attenuated virus	IN	Liquid or lyophilized	No	Yes (DNF) or No	< 1 year	Relatively short shelf life, possibly increased with lyophilized formulations. Effect of temperature excursion is not known. Liquid formulations are assumed to be freeze sensitive based on information in the SPC.										
Japanese encephalitis																				
IMOJEV	Sanofi Pasteur	No	Live attenuated chimeric virus	IM	Lyophilized	No	No	36 months (proposed)									http://www.tga.gov.au/pdf/auspar/auspar-imojev.pdf		Licensed in Australia and under review in Thailand Previously referred to as ChimeriVax-JE	
IXIARO	Intercell/ Novartis	No	Inactivated virus (whole)	IM	Liquid	AlOH ₃	Yes (DNF)	18 months									http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_Product_Information/human/000963/WC500037287.pdf		Recent recall due to concerns over stability at 12 months http://www.mhra.gov.uk/Publications/Safetywarnings/DrugAlerts/CON117593 , http://www.nathnac.org/pro/clinical_updates/ixiarcallback_270511.htm	
JE-VAX	Sanofi Pasteur	No	Inactivated virus (whole)	SC	Lyophilized	No	Yes (DNF)	Not known			22°C: 28 weeks (1)	1 month (1)					https://www.vaccinehoppecanada.com/secure/pdfs/ca/JEVAX_E.pdf			
JE-Vax and JEBEVAX	Vabiotech	Vietnam	No	Inactivated virus (whole)	SC	Liquid	No	Yes (DNF)	24 months								http://www.vabiotechvn.com/english/?act=sanphamin&code=detail&idcat=4&id=18 http://www.vabiotechvn.com/english/?act=sanphamin&code=detail&idcat=4&id=39		Both vaccines are produced in mouse brains	
SA 14-14-2	Chengdu Institute of Biological Products	China	No	Live attenuated virus	IM	Lyophilized	No	No	Not known		1.5 years (1)	4 months (1)	7 - 10 days (1)							
Summary				Inactivated or live attenuated	IM or SC	Liquid or lyophilized	Unusually not adjuvanted	Depends on formulation	Insufficient data available to draw conclusions on stability of new JE vaccines (IXIARO and IMOJEV). IXIARO is assumed to be freeze sensitive due to the presence of an aluminum salt-based adjuvant.											

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links			
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C	Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes
Measles																		
Abhay M	Indian Immunologicals Ltd.	India	No	Live attenuated virus	SC	Lyophilized	No	No	Not known							http://maxstarworld.com/pharmacy/product/159/product-details.html		
Attenuvax	Merck		No	Live attenuated virus	SC	Lyophilized	No	No	Not known							http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM123788.pdf		
Measles vaccine	BioFarma	Indonesia	Yes	Live attenuated virus	SC	Lyophilized	No	No (DNF diluent)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/19_measles.pdf	http://www.who.int/immunization_standards/vaccine_quality/19_measles/en/index.html	
Measles vaccine	Government Pharmaceutical Organization	Thailand	Yes	Live attenuated virus	SC or IM	Lyophilized	No	No (DNF diluent)	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/223_measles_10dose_gpombp_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_223_measles_10dose_gpombp_en/index.html	Diluent is transported outside the cold chain
Measles vaccine, live attenuated	Serum Institute of India Ltd.	India	Yes	Live attenuated virus	SC or IM	Lyophilized	No	No (DNF diluent)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/pq_146_147_148_149_measles_sii_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_147_measles_2dose_sii_en/index.html	
Rouvax	Sanofi Pasteur	France	Yes	Live attenuated virus	SC or IM	Lyophilized	No	No (DNF diluent)	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/107_measles.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_107_measles_10_dose_sanofi_pasteur/en/index.html	
Summary				Live attenuated virus	SC or IM	Lyophilized	No	No (DNF diluent)	24 - 36 months		Moderately stable. Potency is retained for >1 month at 20°-25°C and for >1 week at 37°C. Not damaged by freeze-thawing and can be stored at -20°C (1).							
Meningococcus (N. meningitidis groups A, B, C, W135, Y)																		
Menactra (Men A,C,Y,W135)	Sanofi Pasteur		No	PS-PCV	IM	Liquid	No	Yes (DNF)	24 months							http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM131170.pdf	http://www.tga.gov.au/pdf/auspar/auspar-menactra-110929.pdf	
MenaAfrivac (Meningitis A)	Serum Institute of India Ltd.	India	Yes	PS-PCV	IM	Lyophilized	AIPo ₄ (added at point of use)	Not known	36 months	30	42 months (28)	6 months (28)	40°C: ≥ 4 weeks (28)			http://www.who.int/immunization_standards/vaccine_quality/MenaAfrivac_SII_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_197_MenAconjugate_10dose_SII_en/index.html	
MenceACW (Meningitis A,C,W135)	GSK	Belgium	Yes	PS	SC	Lyophilized	No	Not known	24 months							http://www.who.int/immunization_standards/vaccine_quality/52_menin/en/index.html		
Mencevax ACWY (Meningitis A,C, Y, W135)	GSK	Belgium	No	PS	SC	Lyophilized	No	Yes (DNF)	36 months							http://www.medicines.org.uk/emc/medicine/4204/SPC/		
Menigitec (Meningitis C)	Pfizer		No	PS-PCV	IM	Liquid	AIPo ₄	No (13), but SPC states DNF	24 months		Resistant to F/T (13)	≥ 5 weeks (13)	≥ 5 weeks (13)	55°C: < 5 weeks (13)		http://www.medicines.org.uk/emc/medicine/20747		Vaccines not named in Ho et al 2001 but assumed to be Menjugate and Menigitec from formulation information
Menjugate (Meningitis C)	Novartis/Sanofi Pasteur		No	PS-PCV	IM	Lyophilized	AlOH ₃ (in diluent, added at point of use)	No (13), but SPC states DNF	36 months		Resistant to F/T (13)	≥ 5 weeks (13)	≥ 6 months (14)	55°C: ≥ 5 weeks (13)		http://www.medicines.org.uk/emc/medicine/17873		Vaccines not named in Ho et al 2001 but assumed to be Menjugate and Menigitec from formulation information
Menomune ACWY (Meningitis A,C, Y, W135)	Sanofi Pasteur		No	PS	SC	Lyophilized	No	Yes (DNF)	36 months					60°C: 6 weeks (1)		http://www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm230717.htm		
Menevo (Men A,C,Y,W135)	Novartis		No	PS-PCV	IM	Lyophilized	No	Yes (DNF)	24 months							http://www.medicines.org.uk/emc/medicine/22866/SPC/menevo%20group%20a,%20c,%20w135%20and%20y%20conjugate%20vaccine/		
MenZB (Meningitis B) (15)	Novartis		No	OMV	IM/SC	Liquid	AlOH ₃	Yes (DNF)	Not known									Approved in New Zealand and used from 2001-2008; no longer part of immunization schedule
Neisvac-C (Meningitis C)	GSK, Baxter	USA	No	PS-PCV	IM	Liquid	AlOH ₃	Yes (DNF)	Not known		≥ 42 months (2)	9 months (SPC)	40°C: 1 month (2)			http://www.gsk.ca/english/docs-pdf/NeisVac-C_PM_20090121_EN.pdf		
Polysaccharide Meningococcal A+C	BioManguinhos	Brazil	Yes	PS	SC	Lyophilized	No	No	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/23_men.pdf	http://www.who.int/immunization_standards/vaccine_quality/23_men/en/index.html	
Polysaccharide Meningococcal A+C vaccine (Meningivac)	Sanofi Pasteur	France	Yes	PS	IM or SC	Lyophilized	No	No	36 months							http://www.who.int/immunization_standards/vaccine_quality/menAC_10_dose_sanofi_pasteur_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_114_menAC_10_dose_sanofi_pasteur_en/	
VA-MENGCO-BC (Meningitis B and C)	Finlay Institute	Cuba	No	PS + OMV	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.finlay.sld.cu/cartera/Vamengocbc_Ingles09.htm	http://www.finlay.sld.cu/english/products/vamengoce1.htm	
Summary			PS	IM/SC	Lyophilized	No (usually)	Yes/No	24 - 36 months	Early PS vaccines needed to be stored frozen. More recent PS formulations have good stability (months at 25°C) (1) and are generally not freeze sensitive.									
			PS-PCV	IM	Liquid or lyophilized	Yes/No	Yes (DNF)	24 - 36 months	PS-PCV meningococcal vaccines appear to be relatively heat stable, possibly for up to 9 months at 25°C. Some of these vaccines are not freeze sensitive.									
Mumps																		
Only available in combination formulations (e.g., MMR)																		
Pertussis: acellular (aP)																		
Only available in combination formulations (e.g., DTaP)																		
Pertussis: whole cell (wP)																		
Only available in combination formulations (e.g., DTwP)																		

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Links	Notes
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C			
Pneumococcus																		
Pneumovax II (23 valent)	Merck		No	PS	SC/IM	Liquid	No	Yes (DNF)	28 months							http://www.medicines.org.uk/emc/medicine/1446		
Pneumo 23	Sanofi Pasteur		No	PS	SC/IM	Liquid	No	Yes (DNF)	Not known							https://www.vaccineshoppecanada.com/secure/pdfs/ca/Pnemo_23_E.pdf		
Prevnar (7-valent)	Pfizer	USA	Yes	PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/Prevnar7_Pfizer_product_insert_.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_218_pneumococcal7_1dose_wyeth/en/index.html	
Prevnar 13 (13 valent)	Pfizer	USA	Yes	PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	30				40°C: 4 days (SPC)	http://www.pfizer.ca/en/our_products/products/monograph/232	http://www.who.int/immunization_standards/vaccine_quality/PQ_222_pneumococcal13_1dose_wyeth/en/index.html		
Synflorix (10 valent)	GSK	Belgium	Yes	PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	36 months	30		3 days (SPC)	1 day (SPC)		http://www.gsk.ca/english/docs-pdf/Synflorix_PM_20090505_EN.pdf	http://www.who.int/immunization_standards/vaccine_quality/Synflorix_WHO_leaflet_EN_May_2011.pdf		
Summary				PS	SC/IM	Liquid	No	Yes (DNF)	28 months		Limited data suggest pneumococcal PS vaccines are relatively stable at elevated temperatures and are not freeze sensitive.							
PS-PCV				IM	Liquid	Yes	Yes (DNF)	24-36 months		Data suggest pneumococcal PS-PCVs are relatively unstable at elevated temperatures and are freeze sensitive.								
Polio: oral poliovirus vaccines (OPV); bivalent and monovalent																		
Bivalent OPV: (types 1 and 3)	GSK	Belgium	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/PQ_185_bOPV13_GSK_20_dose/en/index.html.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_196_bOPV13_20_dose_Vial_Biofarm_en/index.html	
Bivalent OPV: (types 1 and 3)	BioFarma	Indonesia	Yes	Live attenuated virus	Oral	Liquid	No	No	24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/PQ_196_bOPV13_20_dose_Vial_Biofarm_en/index.html	No information provided on stability at 2°-8°C	
Bivalent OPV: (types 1 and 3)	Haffkine Pharmaceutical Corporation	India	Yes	Live attenuated virus	Oral	Liquid	No	No	24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/PQ_201_bOPV13_20_dose_Vial_Haffkine_en/index.html	No information provided on stability at 2°-8°C	
Bivalent OPV: (types 1 and 3)	Novartis	Italy	Yes	Live attenuated virus	Oral	Liquid	No	No	24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_251_bopv13_20dose_novartis_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_251_bopv13_20dose_novartis/en/index.html		
Bivalent OPV: (types 1 and 3)	Panacea	India and Indonesia	No	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_194_bopv13_panacea_productinsert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_194_bOPV13_20_dose_Vial_Panacea_BF_bulk/en/index.html	Bulk vaccine is provided by BioFarma	
Bivalent OPV: (types 1 and 3)	Sanofi Pasteur	France	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_247_bopv13_20dose_sanofi_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_247_bopv13_20dose_sanofi/en/index.html		
Bivalent OPV: Biopolio (types 1 and 3)	Bharat Biotech International Ltd.	India	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_244_bopv13_10dose_bharat_biotech_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_244_bopv13_10dose_bharat_biotech/en/index.html		
Monovalent OPV: (OPV monovalent type 3)	Novartis	Italy	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_227_mopv3_20dose_novartis_productinsert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_227_mopv3_20dose_novartis/en/index.html		
Monovalent OPV: (type 1)	BioFarma	Indonesia	Yes	Live attenuated virus	Oral	Liquid	No	No	24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/PQ_190_mOPV1_20_dose_Vial_Biofarm_en/index.html	No information provided on stability at 2°-8°C	
Monovalent OPV: (type 1)	Panacea	India and Indonesia	No	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_188_mOPV1_20dose_panacea_bf_bulk_productinsert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_188_mOPV1_20_dose_Vial_Panacea_BF_bulk/en/index.html		
Monovalent OPV: Biopolio M1 (type 1)	Bharat Biotech International Ltd.	India	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_240_mopv1_10dose_bharat_biotech_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_240_mopv1_10dose_bharat_biotech/en/index.html		
Monovalent OPV: BIOPOLIO M3 (type 3)	Bharat Biotech International Ltd.	India	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_243_mopv3_20dose_bharat_biotech_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_243_mopv3_20dose_bharat_biotech/en/index.html		
Monovalent OPV: Mono OPV 1	Novartis	Italy	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/Package_Insert_mOPV1_novartis.pdf	http://www.who.int/immunization_standards/vaccine_quality/33_opv/en/index.html		
Monovalent OPV: Monovalent type 1 OPV, IP	Haffkine Pharmaceutical Corporation	India	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/mOPV1_Haffkine_multilingual_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_187_mOPV1_20_dose_Vial_Haffkine/en/index.html		
Monovalent OPV: Monovalent Type 2 Poliomyelitis Vaccine, Live (Oral)	Panacea	India and Indonesia or Italy	No	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_233_mopv2_20dose_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_233_mopv2_20dose_panacea/en/index.html	Bulk vaccine is provided by BioFarma or Novartis	
Monovalent OPV: Monovalent Type 3 Poliomyelitis Vaccine, Live (Oral)	Panacea	India and Indonesia or Italy	No	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/pq_230_mopv3_panacea_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_230_mopv3_panacea/en/index.html	Bulk vaccine is provided by BioFarma or Novartis	
Monovalent OPV: Polio Sabin Mono T1	GSK	Belgium	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2					http://www.who.int/immunization_standards/vaccine_quality/mOPV1_GSK_product_insert_french_spanish_portuguese.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_188_mOPV1_GSK_20_dose/en/index.html		
Monovalent OPV: Polio Sabin Mono Three (oral)	GSK	Belgium	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/pq_229_mopv3_20dose_gsk.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_229_mopv3_20dose_gsk/en/index.html	No information provided on stability at 2°-8°C; assumed to be 6 months based on all other OPVs
Monovalent OPV: Polio Sabin Mono Two (oral)	GSK	Belgium	Yes															

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes		
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C				
Polio: oral poliovirus vaccines (OPV); trivalent																			
Trivalent OPV: Biopolio	Bharat Biotech International Ltd.	India	No	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.bharatbiotech.com/p_biopolio.htm		The vaccine is shipped with a VVM. This is assumed to be VVM 2, because this VVM is used with other OPVs.	
Trivalent OPV: OPV IP	Panacea	India and Italy	No	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/90_opv/en/index.html		Bulk vaccine is provided by Novartis	
Trivalent OPV: OPVERO	Sanofi Pasteur	France	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/PQ_101_opv_10_dose_sanofi_pasteur/en/index.html		6 months stability at 2°-8°C is assumed from other products WHO information only provides information on	
Trivalent OPV: Oral polio	BioFarma	Indonesia	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/PQ_13_OPV_trivalent_10_dose_Vial/en/index.html			
Trivalent OPV: Polio Sabin	GSK	Belgium	Yes	Live attenuated virus	Oral	Liquid	No	No	18 or 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/45_opv/en/index.html			
Trivalent OPV: Polioral	Novartis	Italy	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/32_opv/en/index.html		6 months stability at 2°-8°C is assumed from other products WHO only provides information on stability at -20°C	
Trivalent OPV: Polioviral vaccine	Haffkine Pharmaceutical Corporation	India	Yes	Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C	2						http://www.who.int/immunization_standards/vaccine_quality/64_opv.pdf			
Summary				Live attenuated virus	Oral	Liquid	No	No	6 months plus 24 months at -20°C		OPVs can be frozen and are stable for an extended period at -20°C. They are relatively heat sensitive with a shelf life of 6 months at 2°-8°C (1, 16).								
Polio: Inactivated Poliovirus Vaccine (IPV)																			
IMOVAZ POLIO	Sanofi Pasteur	France	Yes	Inactivated virus (whole)	IM	Liquid	No	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/IMOVAZ_Polio_sanofi_pasteur_product_Insert_Sept_2009.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_99_ipv_10_dose_sanofi_pasteur/en/		
IPV Vaccine SSI / VeroPol	Statens Serum Institut (SSI)	Denmark	Yes	Inactivated virus (whole)	IM/SC	Liquid	No	Yes (DNF)	18 months or 36 months (SSI website)	7	2 years (17)	24°C: ≤20 days (17)	32°C: < 20 days (17)			http://www.who.int/immunization_standards/vaccine_quality/pq_232_ipv_1dose_ssi_insert.pdf	http://tinyurl.com/7q38gf4	Stability data (17) from SSI, but not necessarily the licensed formulation of IPV	
Poliomyelitis vaccine	Netherlands Vaccine Institute	Netherlands	Yes	Inactivated virus (whole)	IM	Liquid	No	Yes (DNF)	24 months							http://www.who.int/immunization_standards/vaccine_quality/pq_231_ipv_1dose_nvi_product_insert.pdf	http://tinyurl.com/VeroPol-IPV-SSI	IPV 1 is less stable (approximately 2 years at 2°-8°C) than IPV 2 and 3 (approximately 20 years at 2°-8°C) (17)	
Poliorix	GSK	Belgium	Yes	Inactivated virus (whole)	IM	Liquid	No	Yes (DNF)	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/poliorix_package_insert_en_june10.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_220_ipv_1dose_gsk/en/index.html		
Summary				Inactivated virus (whole)	IM	Liquid	No	Yes (DNF)	18 - 36 months		IPV is freeze sensitive but relatively heat stable as a stand-alone vaccine. The stability of the trivalent vaccine is limited by the type 1 component (17).								
Rabies																			
Abhayrab	Indian Immunologicals Ltd.	India	No	Inactivated virus (whole)	IM or ID	Lyophilized	No	No	Not known							http://www.indimmune.com/abhayrab.html		Sometimes referred to as PVRV (purified vero rabies vaccine) Approved for ID use in some countries, including India	
Indirab	Bharat Biotech International Ltd.	India	No	Inactivated virus (whole)	IM	Lyophilized	No	No	Not known							http://www.bharatbiotech.com/p_indirab.htm			
RabAvert	Novartis		No	Inactivated virus (whole)	IM	Lyophilized	No	No	Not known				3 months (1)			http://www.novartisvaccines.com/downloads/diseases-products/us-pl-rabavert.pdf		Sometimes referred to as PCEV Approved for ID use in some countries, including India	
Rabies vaccine (18)	Instituto Butantan	Brazil	No	Inactivated virus (whole)	IM	Liquid (18)	No	Not known	Not known		≥ 14 months (19)		30 days (19)	45°C: 12 hours (19)					
Rabipur	Chiron	India	Yes	Inactivated virus (whole)	IM or ID	Lyophilized	No	No	48 months							http://www.who.int/immunization_standards/vaccine_quality/Product_Insert_Rabipur_India_multilingual.pdf	http://www.who.int/immunization_standards/vaccine_quality/29_rabies/en/index.html	Sometimes referred to as PCEV Approved for ID use in some countries, including India	
Rabipur	Novartis	Germany	Yes	Inactivated virus (whole)	IM or ID	Lyophilized	No	No	48 months							http://www.who.int/immunization_standards/vaccine_quality/Rabipur_Product_Insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/28_rabies/en/index.html	Sometimes referred to as PCEV Approved for ID use in some countries, including India	
Rabivax	Serum Institute of India Ltd.	India	No	Inactivated virus (whole)	IM	Liquid	AIPO ₄	Yes (DNF)	Not known							http://www.seruminstitute.com/content/products/product_rabivax.htm			
Vaxirab or Lyssavac-N	Zydus-Cadila	India	Yes	Inactivated virus (whole)	IM	Lyophilized	No	No	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/166_rabies.pdf	http://www.who.int/immunization_standards/vaccine_quality/166_rabies/en/index.html		
Verorab	Sanofi Pasteur	France	Yes	Inactivated virus (whole)	IM or ID	Lyophilized	No	No	36 months							http://www.who.int/immunization_standards/vaccine_quality/verorab_sanofi_pasteur_product_insert_2010.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_112_rabies_1_dose_sanofi_pasteur/en/	Sometimes referred to as PVRV Approved for ID use in some countries, including India	
Summary				Inactivated virus (whole)	IM	Usually lyophilized	Usually no	No (unless adjuvanted)	24 - 48 months		Very stable in lyophilized form (months at 25°C and weeks at 37°C (1). Based on the available data they are assumed not to be freeze sensitive.								

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Links	Notes
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C			
Rotavirus																		
Rotarix	GSK	Belgium	Yes	Live attenuated virus	Oral	Liquid	No	No	36 months	14	Can be frozen at -20°C for ≤ 12 hours (SPC)					http://www.who.int/immunization_standards/vaccine_quality/Rotarix_Liquid_oral_applicator_product_insert_text_2009.pdf	http://www.who.int/immunization_standards/vaccine_quality/174_rotavirus/en/index.html	
Rotarix	GSK	Belgium	Yes	Live attenuated virus	Oral	Lyophilized	No	No	36 months	14	Can be frozen at -20°C for ≤ 12 hours (SPC)			≥ 7 days (20)		http://www.who.int/immunization_standards/vaccine_quality/Rotarix_lyophilized_product_insert_text_2009.pdf	http://www.who.int/immunization_standards/vaccine_quality/63_rotavirus/en/index.html	Diluent can be stored at ambient temperatures (< 37°C)
Rotateq	Merck	USA	Yes	Live attenuated virus	Oral	Liquid	No	Not known	24 months		Potency maintained < 0°C (SPC)	9°-25°C: 48 hours				http://www.who.int/immunization_standards/vaccine_quality/PQ_167_Rotavirus_MS1_dose_tube/en/index.html		
Summary				Live attenuated virus	Oral	Liquid or lyophilized	No	No	24 - 36 months		Resistant to elevated temperatures (> 25°C) for hours (Rotateq) or days (Rotarix). They are not freeze sensitive.							
Rubella																		
Rubella Vaccine, live, attenuated	Serum Institute of India Ltd.	India	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months	14	Long-term storage at -20°C recommended					http://www.who.int/immunization_standards/vaccine_quality/pq_150_151_152_153_rubella_sii.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_150_rubella_1dose_sii/en/index.html	
Rudivax	Sanofi Pasteur	France	No	Live attenuated virus	SC or IM	Lyophilized	No	No	Not known							http://www.dobreszczepionki.pl/ulotki/Rudivax_po_angielsku.pdf		
Summary				Live attenuated virus	SC or IM	Lyophilized	No	No	24 months		More stable than measles and mumps vaccines (1). Potency is retained for > 1 month at 20°-25°C, and for > 1 week at 37°C. They are not freeze sensitive and can be stored at -20°C (1).							
Tetanus toxoid (T)																		
Abhay TOX	Indian Immunologicals Ltd.	India	No	Purified protein	IM	Liquid	AlPO ₄	Assumed to be freeze sensitive due to aluminum salt adjuvant	Not known							http://maxstarworld.com/pharmacy/product/161/product-details.html		
Shan TT	Shantha Biotech	India	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/159_tet.pdf	http://www.who.int/immunization_standards/vaccine_quality/159_tet/en/index.html	For adults and infants > 7 years old
Tetanus Toxoid Adsorbed	Serum Institute of India Ltd.	India	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							http://www.seruminstitute.com/content/products/product_tetanus_toxoid.htm		
Tetanus Toxoid Vaccine Adsorbed	Biological E	India	Yes	Purified protein	IM	Liquid	Yes	Assumed to be freeze sensitive due to aluminum salt adjuvant	36 months	30						http://www.biologica.com/product_portfolio/category_vaccine.htm#c	http://www.who.int/immunization_standards/vaccine_quality/PQ_191_TT_20_dose_Vial_BioE/en/index.html	
Tetatox TT vaccine	Bulgarian National Center of Infectious and Parasitic Diseases (BB-NCIPD) Ltd.	Bulgaria	Temp susp	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/76_tet.pdf	http://www.who.int/immunization_standards/vaccine_quality/76_tet/en/index.html	Temporary suspension of supply through United Nations agencies of BB-NCIPD vaccines, April 28, 2011
TETAVAX	Sanofi Pasteur	France	Yes	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/tetanus_sanofi_pasteur_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_105_tet_10_dose_sanofi_pasteur/en/index.html	
TT vaccine	BioFarma	Indonesia	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/16_tet.pdf	http://www.who.int/immunization_standards/vaccine_quality/16_tet/en/index.html	
Vax-Tet	Finlay Institute	Cuba	No	Purified protein	IM	Liquid	AlOH ₃	Assumed to be freeze sensitive due to aluminum salt adjuvant	Not known							http://www.finlay.sld.cu/english/products/vaxtete1.htm		
Summary				Purified protein	IM	Liquid	AI based	Yes	24 - 36 months		Very heat-stable vaccine; resistant to damage by temperatures up to 55°C (1), but freeze sensitive due to presence of aluminum adjuvant (1).							
Tuberculosis																		
BCG	BioFarma	Indonesia	No	Live attenuated bacterium	ID	Lyophilized	No	No	Not known							No product information		No product information
BCG Freeze Dried Glutamate vaccine	Japan BCG Laboratory	Japan	Yes	Live attenuated bacterium	ID	Lyophilized	No	No	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/68_bcg.pdf	http://www.who.int/immunization_standards/vaccine_quality/68_bcg/en/index.html	
BCG vaccine	BB-NCIPD Ltd.	Bulgaria	Temp susp	Live attenuated bacterium	ID	Lyophilized	No	No	36 months	30						http://www.who.int/immunization_standards/vaccine_quality/BCG_vaccine_product_insert_20dose.pdf	http://www.who.int/immunization_standards/vaccine_quality/BCG_10_dose_ampoules_BB-NCIPD/en/index.html	Temporary suspension of supply through United Nations agencies of BB-NCIPD vaccines, April 28, 2011
BCG vaccine	Serum Institute of India Ltd.	India	Yes	Live attenuated bacterium	ID	Lyophilized	No	No	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/118_bcg.pdf	http://www.who.int/immunization_standards/vaccine_quality/118_bcg/en/index.html	Even more stable if stored at -20°C
BCG vaccine SSI	SSI Serum Institut	Denmark	Yes	Live attenuated bacterium	ID	Lyophilized	No	No	12 - 24 months	14						http://www.who.int/immunization_standards/vaccine_quality/165_bcg.pdf	http://www.who.int/immunization_standards/vaccine_quality/165_bcg/en/index.html	
BCG vaccine (freeze dried)	Sanofi Pasteur	France	No	Live attenuated bacterium	ID	Lyophilized	No	Yes (DNF)	Not known							https://www.vaccinehoppecanada.com/secure/pdfs/ca/BCG_Vaccine_E.pdf		
Summary				Live attenuated bacterium	ID	Lyophilized	No	No	12 - 36 months		Stability at elevated temperatures varies widely among different strains and manufacturers (1). They are not freeze sensitive (1).							

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes				
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C						
Typhoid																					
Typbar	Bharat Biotech International Ltd.	India	No	PS	IM	Liquid	No	Not known	Not known							http://www.bharatbiotech.com/p_tybar.htm					
Typherix	GSK	Belgium	No	PS	IM	Liquid	No	Yes (DNF)	36 months							http://www.medicines.org.uk/emc/medicine/2063/SPC/typherix/					
Typhim Vi	Sanofi Pasteur	France	Yes	PS	IM	Liquid	No	Yes (DNF)	36 months	30		22°C: 2 years (1)	6 months (1)			http://www.who.int/immunization_standards/vaccine_quality/pq_238_typhoid_20dose_sanofi_pasteur_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_238_typhoid_20dose_sanofi_pasteur/en/index.html				
vax-TyVi	Finlay Institute	Cuba	No	PS	IM	Liquid	No	Yes	Not known							http://www.finlaysid.cu/english/products/vaxtyvie1.htm					
Vivotif (Ty21a)	Crucell (Berna)	Switzerland	No	Live attenuated bacterium	Oral	Enteric coated capsules	No	Not known	18 months			7 days (1)	12 hours (1)			http://www.medicines.org.uk/emc/medicine/17476/SPC/vivotif/		Also marketed as Typhoral (Novartis)			
Summary				PS	IM (usually)	Liquid	No	Yes	36 months	PS vaccines are stable at 25°C (years) and 37°C (months) (1). They are freeze sensitive (1).											
				Live attenuated bacterium	Oral	Enteric coated capsules	No	Not known	18 months	Insufficient data to make general conclusions regarding the stability of live oral <i>S. typhi</i> vaccines.											
Varicella																					
Varilix	GSK	Belgium	No	Live attenuated virus	SC	Lyophilized	No	No	24 months							http://www.medicines.org.uk/emc/medicine/9787/SPC/varilix/					
Varivax	Sanofi Pasteur, MSD	USA	No	Live attenuated virus	SC / IM	Lyophilized	No	No (SPC)	24 months	Stable at -15°C (21)		15°C: approximately 4 months (21)				http://www.medicines.org.uk/emc/medicine/15264		In the USA, recommended storage for Varivax (Merck) is frozen (-50°C to -15°C). In the UK, the recommended storage for Varivax (Sanofi Pasteur MSD) is refrigerated (2°C - 8°C)			
										Not affected by repeat exposures to freezing temperatures (SPC)	≥ 2 years (21)	27°C: 6 hours (SPC)				http://www.merck.ca/assets/en/pdf/products/VARIVAX_III-PM_E.pdf					
Summary		Live attenuated virus		SC / IM	Lyophilized		No	No	24 months	Not freeze sensitive but relatively unstable at elevated temperatures, even when lyophilized.											
Yellow fever																					
Stabilized yellow fever vaccine	Institut Pasteur Dakar	Senegal	Yes	Live attenuated virus	SC	Lyophilized	No	No	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/66_yf.pdf	http://www.who.int/immunization_standards/vaccine_quality/66_yf/en/index.html				
Stamaril	Sanofi Pasteur	France	Yes	Live attenuated virus	SC	Lyophilized	No	No	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/113_yf.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_113_yellow_fever_10_dose_sanofi_pasteur/en/				
Yellow fever	BioManguinhos	Brazil	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/20_yf.pdf	http://www.who.int/immunization_standards/vaccine_quality/20_yf/en/index.html				
Yellow fever vaccine, live, freeze dried	Chumakov Institute	Russia	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/PQ_Yellow_Fever_IPVE_product_insert_english.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_176_YF_IPVE_2_dose/en/index.html				
YF-Vax	Sanofi Pasteur	USA	No	Live attenuated virus	SC	Lyophilized	No	No (assumed) (SPC states DNF)	Not known			Half-life: 14 days (SPC)	45-47°C: half-life 3-4 days (SPC)			http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM142831.pdf					
Summary		Live attenuated virus		SC	Lyophilized		No	No	24 - 36 months	Not freeze sensitive (1). Moderately heat stable (months at 25°C, weeks at 37°C) (1). Heat stability differs significantly among different vaccines and strains (1).											

Summary of stability data for licensed vaccines

As of November 29, 2012

Combination vaccines

Vaccine	Manufacturer	Country of manufacture	WHO PQ	Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes		
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C				
Diphtheria, tetanus																			
Abhay DAG	Indian Immunologicals Ltd.	India	No	Purified protein	Not known	Not known	Yes (assumed)	Assumed to be freeze sensitive due to aluminum salt adjuvant	Not known							No product information found			
Adsorbed DT vaccine	BioFarma	Indonesia	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/08_diptet.pdf	http://www.who.int/immunization_standards/vaccine_quality/08_diptet/en/index.html		
DECAVAC (adults)	Sanofi Pasteur	USA	No	Purified protein	IM	Liquid	Aluminum potassium sulphate	Yes (DNF)	Not known							http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM246215.pdf		For individuals 7 years and older who have not had prior DT vaccination	
DifTet	BB-NCIPD	Bulgaria	Temp susp	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/78_diptet.pdf	http://www.who.int/immunization_standards/vaccine_quality/78_diptet/en/index.html	Temporary suspension of supply through UN agencies of BB-NCIPD vaccines, April 28, 2011	
Diphtheria and Tetanus Vaccine Adsorbed (Pediatric)	Serum Institute of India	India	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	36 months	30						http://www.who.int/immunization_standards/vaccine_quality/pq_119_120_121_diptet_sii.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_120_diptet_10dose_sii/en/index.html		
Diphtheria and Tetanus Vaccine Adsorbed for Adults and Adolescents	Serum Institute of India	India	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/pq_122_123_124_diptetadult_sii_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_122_diptetadult_1dose_sii/en/index.html		
Diphtheria-tetanus (adults)	Finlay Institute	Cuba	No	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.finlay.sld.cu/cartera/dT_ingles09.htm			
diTe booster	SSI	Denmark	No	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.ssi.dk/English/Vaccines/diTeboster/Description%20of%20dTeboster.aspx		Marketed by CSL Ltd as an adult DT booster vaccine	
DT VAX	Sanofi Pasteur	France	Yes	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/91_diptet.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_92_DT_20_dose_vial_Sanofi_Pasteur/en/index.html		
IMOVAZ dT adult	Sanofi Pasteur	France	Yes	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/93_diptetadult.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_93_diptetadult_10_dose_vial_sanofi_pasteur/en/index.html		
Teta-dif (adults)	BB-NCIPD	Bulgaria	Temp susp	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	14						http://www.who.int/immunization_standards/vaccine_quality/80_diptetadult.pdf	http://www.who.int/immunization_standards/vaccine_quality/80_diptetadult/en/index.html	Temporary suspension of supply through UN agencies of BB-NCIPD vaccines, April 28, 2011	
Tetanus-diphtheria (adults)	BioFarma	Indonesia	Yes	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	30						http://www.who.int/immunization_standards/vaccine_quality/pq_246_td_10dose_biofarma_product_insert_label.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_246_td_10dose_biofarma/en/index.html		
VA-DIFTET	Finlay Institute	Cuba	No	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.finlay.sld.cu/cartera/vadiftet_ingles.htm			
Summary				Purified protein	IM	Liquid	AI based	Yes (DNF)	24 - 36 months		Diphtheria and tetanus toxoids are some of the most heat-stable vaccines, stable for months at room temperature and weeks at								
Diphtheria, tetanus, pertussis (acellular) (DTaP)																			
Adacel (reduced antigen content)	Sanofi Pasteur	Canada	No	Purified protein	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							https://www.vaccineshoppecanada.com/secure/pdfs/ca/ADACEL_E.pdf		For use in individuals 4-64 years old	
Boostrix DTaP (reduced antigen content)	GSK	Belgium	No	Purified protein	IM	Liquid	AlPO ₄ + AlOH ₃	Yes (DNF)	Not known							http://www.medicines.ie/medicine/13394/SP/Boostrix%20%28%20%20%29+Suspension+for+injection/		For use in individuals ≥ 4 years old	
Infanrix	GSK	Belgium	No	Purified protein	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM124514.pdf			
Summary				Purified protein	IM	Liquid	AI based	Yes (DNF)	24 - 26 months (assumed)		Data on stability of aP-containing vaccines are limited. Acellular pertussis vaccines are expected to have a similar stability profile to other protein vaccines (1) and to be freeze sensitive.								
Diphtheria, tetanus, pertussis (whole cell) (DTwP)																			
Abhay TAG	Indian Immunologicals Ltd.	India	No	Purified protein, inactivated bacteria	Not known	Not known	Not known	Not known	Not known							No product information			
ComVac3	Bharat Biotech International Ltd.	India	No	Purified protein, inactivated bacteria	Not known	Not known	Not known	Not known	Not known							No product information			
D.T.COQ/D.T.P	Sanofi Pasteur	France	Yes	Purified protein, inactivated bacteria	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/PQ_95_DTP_SP_PI_957620.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_95_dtp_10_dose_vial_sanofi_pasteur/en/		
Diphtheria-Tetanus-Pertussis vaccine adsorbed	Serum Institute of India	India	Yes	Purified protein, inactivated bacteria	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/pq_126_dtp_sii_10dose_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_126_dtp_sii_10dose_en/index.html		
DTP vaccine	BioFarma	Indonesia	Yes	Purified protein, inactivated bacteria	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/09_dtp.pdf	http://www.who.int/immunization_standards/vaccine_quality/09_dtp/en/index.html		
DTP vaccine	Finlay Institute	Cuba	No	Purified protein, inactivated bacteria	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.finlay.sld.cu/cartera/dtp_ingles09.htm			
DTP vaccine	Instituto Butantan	Brazil	No	Purified protein, inactivated bacteria	Not known	Not known	Not known	Not known	Not known							No product information			
Summary				Purified protein, inactivated bacteria	IM	Liquid	AI based	Yes (DNF)	24 - 36 months		Freeze sensitive but relatively heat stable (months at room temperature and weeks at 37°C) (1). Stability of pertussis is the limiting factor for the overall stability of DTwP vaccines (1).								
Diphtheria, tetanus, inactivated poliovirus (DT-IPV)																			
Td Polio adsorbed	Sanofi Pasteur	Canada	No	Purified protein, inactivated virus	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							https://www.vaccineshoppecanada.com/secure/pdfs/ca/Td_Polio_Adsorbed_E.pdf		For individuals 7 years and older who have not had prior DT vaccination	
Summary				Purified protein, inactivated virus	IM	Liquid	AI based	Yes (DNF)	Not known		Similar stability to DT vaccines. Stability of IPV component appears to be enhanced by presence of adjuvant and/or other toxoids (17). Freeze sensitive.								

Vaccine	Manufacturer	Country of manufacture	WHO PQ	WHO Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes	
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C			
Diphtheria, tetanus, pertussis (whole cell), Haemophilus influenzae type b (DTwP-Hib)																		
Diphtheria-Tetanus-Pertussis (wP)-Haemophilus influenzae type b	Serum Institute of India	India	Yes	Purified protein, inactivated bacteria (wP), PS-PCV	IM	Liquid and lyophilized (Hib)	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/pq_217_dtphib_1dose_sii_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_217_dtphib_1dose_sii/en/index.html	
DTP-Hib (23)	BioManguinhos	Brazil	No	Purified protein, inactivated bacteria (wP), PS-PCV	IM	Liquid and lyophilized (Hib)	AlOH ₃	Yes (DNF)	Not known							http://www.fiocruz.br/bio_eng/cgi/cgilua.exe/sys/start.htm?sid=210		
Easy four	Panacea Biotech	India	No	Inactivated bacteria (wP), PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							http://www.chironpanacea.com/common/pdfs/PI_Easyfour.pdf		
Quattvaxem	Novartis	Italy	Yes	Purified protein, inactivated bacteria (wP), PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/Quattvaxem_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_38_DTPHib_Novartis_10_dose/en/	
TETRAAct-HIB	Sanofi Pasteur	France	Yes	Purified protein, inactivated bacteria (wP), PS-PCV	IM	Liquid and lyophilized (Hib)	AlOH ₃	Yes (DNF)	36 months							http://www.who.int/immunization_standards/vaccine_quality/SP_Tetract-Hib_product_insert_Oct_2009.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_97_dtphib_10_dose_sanofi_pasteur/en/	
TriHIBit (Tripedia plus ActHIB)	Sanofi Pasteur	France	No	Purified protein, inactivated bacteria (wP), PS-PCV	IM	Liquid and lyophilized (Hib)	Aluminum potassium sulphate	Yes (DNF)	Not known							http://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm101580.pdf		
Summary				Purified protein, inactivated bacteria (wP), PS-PCV	IM	Fully liquid, or liquid + lyophilized Hib	Al based	Yes (DNF)	24 - 36 months		No stability data found on fully liquid DTP-Hib combinations. Assumed to be freeze sensitive due to presence of aluminum salt adjuvants.							
Diphtheria, tetanus, pertussis (whole-cell) , hepatitis B (DTwP-hepB)																		
ComVac4-HB	Bharat Biotech International Ltd.	India	No	Purified protein, inactivated bacteria (wP), recombinant protein	Not known	Liquid (assumed)	Not known	Not known	Not known							No product information		
Diphtheria, Tetanus, Pertussis and Hepatitis-B Vaccine Adsorbed	Serum Institute of India	India	Yes	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/pq_129_dtpherb_10dose_sii_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_129_dtpherb_10dose_sii/en/index.html	Possibly the same as SII Q-VAC
DTP - Hep B 10	BioFarma	Indonesia	Yes	Purified protein, inactivated bacteria (wP), recombinant protein	IM/SC	Liquid	AlPO ₄	Yes (DNF)	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/12_dtphep.pdf	http://www.who.int/immunization_standards/vaccine_quality/12_dtphep/en/index.html	
EcoVac 4	Panacea Biotech	India	No	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							http://www.panaceabiotec.com/product-pdf/vaccine3.pdf		Available in Unijet™ injection system
Euforvac Inj	LG Life Sciences	Republic of Korea	No	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid (assumed)	Al based (assumed)	Yes (DNF)	36 months							http://www.lglis.com/prod/new_product_view.jsp?ke_gubun=EN&n_pro_seq=19		
Eutravac Inj	LG Life Sciences	Republic of Korea	No	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid (assumed)	Al based (assumed)	Yes (DNF)	30 months							http://www.lglis.com/prod/new_product_view.jsp?ke_gubun=EN&n_pro_seq=18		
Shantetra	Shantha Biotech	India	No	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							http://cdsco.nic.in/pi/Shantetra_P1%5B1%5D.pdf		
Titanrix HB	GSK	Belgium	Yes	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid	AlOH ₃ and AlPO ₄	Yes (DNF)	36 months	14						http://ec.europa.eu/health/documents/community-register/1996/199607192906/anx_2906_en.pdf	http://www.who.int/immunization_standards/vaccine_quality/55_diph_teta/en/index.html	
Trivac HB	CIGB	Cuba	No	Purified protein, inactivated bacteria (wP), recombinant protein	IM	Liquid	AlOH ₃	Yes (DNF)	Not known							http://www.heberbiotec.com/suelto%20htm/Ingles/Trivac%20HB/suelto%20Trivac%20hb%20ingles.htm		
Summary				Purified protein, inactivated bacteria (wP), recombinant protein	IM/SC	Liquid	Al based	Yes (DNF)	24 - 36 months		No data found on the stability of combination vaccines containing DTP and HepB. Stability is expected to be similar to DTP vaccines. Assumed to be freeze sensitive due to presence of aluminum salt adjuvant.							
Diphtheria, tetanus, pertussis (acellular), inactivated poliovirus (DTaP-IPV)																		
Infanrix IPV	GSK	Belgium	No	Purified Protein (incl. aP), inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.medicines.org.uk/emc/medicine/14555/SPC		
Quadracel	Sanofi Pasteur		No	Purified Protein (incl. aP), inactivated virus	IM	Liquid	AlPO ₄	Yes (DNF)	Not known							https://www.vaccineshoppecanada.com/secure/pdfs/ca/Quadracel_E.pdf		Possibly the same as Repevax
Repevax	Sanofi Pasteur	France	No	Purified Protein (incl. aP), inactivated virus	IM	Liquid	AlPO ₄	Yes (DNF)	36 months							http://www.medicines.org.uk/emc/medicine/15256		Possibly the same as Quadracel
Summary				Purified Protein (incl. aP), inactivated virus	IM	Liquid	Al based	Yes (DNF)	36 months		Stability similar to DTP vaccines (weeks at 37°C) (1). Stability of IPV component appears to be enhanced by presence of adjuvant and/or other toxoids (17). Assumed to be freeze sensitive due to presence of aluminum salt adjuvants and IPV (also freeze sensitive).							

Vaccine	Manufacturer	Country of manufacture	WHO PQ	WHO Vaccine type	Delivery route	Formulation	Damaged by freezing	Shelf life (2°–8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes	
										Freeze-thaw	2°–8°C	25°C	37°C	>37°C			
Diphtheria, tetanus, pertussis (whole cell), hepatitis B, <i>Haemophilus influenzae</i> type b (DTwP-HepB,Hib); "pentavalent vaccine"																	
ComVac5	Bharat Biotech International Ltd.	India	No	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	Not known	Not known	Not known	Not known							No product information		
DTP-HepB + Hib	Biological E	India	Yes	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	IM	Liquid and lyophilized (Hib)	Yes	Yes (DNF)	24 months	14					http://www.biologique.com/product_portfolio/category_vaccine.htm#c	http://www.who.int/immunization_standards/vaccine_quality/pq_249_dtp_hepb_hib_10dose_biological/en/index.html	
DTwP-HepB + Hib	Serum Institute of India	India	Yes	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	IM	Liquid and lyophilized (Hib)	AlPO ₄	Yes (DNF)	24 months	14					http://www.who.int/immunization_standards/vaccine_quality/pq_195_204_205_dtphhepbhib_lyo_liq_sii_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_205_dtp_hepb_hib_10dose_si_en/index.html	
Easyfive	Panacea Biotech	India	No	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	Not known						http://www.chironpanacea.com/common/pdfs/PI_Easyfive.pdf		
Heberpenta-L	CIGB	Cuba	No	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	Not known	Liquid	Not known	Not known	Not known						http://www.heber-biotec.com/heberpenta/index.htm		Liquid + lyophilized Hib formulation is also produced
Quinvaxem	Crucell Korea	Republic of Korea	Yes	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	36 months	14					http://www.who.int/immunization_standards/vaccine_quality/quinvaxem_PI_eng.pdf	http://www.who.int/immunization_standards/vaccine_quality/07_dtphheb/en/index.html	
Titanrix-Hib	GSK	Belgium	Yes	Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	IM	Liquid and lyophilized (Hib)	Yes	Yes (DNF)	36 months	14					http://www.who.int/immunization_standards/vaccine_quality/PQ_57_Penta_GSK_2_dose/en/	The all-liquid formulation, Zilibrix-Hib, is no longer being produced	
Summary				Purified protein, inactivated bacteria (wP), recombinant protein, PS-PCV	IM	Fully liquid, or liquid + lyophilized Hib	Al based	Yes (DNF)	24 - 36 months		No data found on the stability of pentavalent vaccines. Assumed to be freeze sensitive due to presence of aluminum salt adjuvant.						
Diphtheria, tetanus, pertussis (acellular), inactivated poliovirus, <i>Haemophilus influenzae</i> type b (DTaP-IPV,Hib)																	
Pediacel	Sanofi Pasteur	France	No	Purified protein (incl aP), inactivated virus, PS-PCV	IM	Liquid	AlPO ₄	Yes (DNF)	48 months						http://www.medicines.org.uk/emc/medicine/15257/SPC/pediacel/		
Pentacel	Sanofi Pasteur	Canada and France	No	Purified protein (incl aP), inactivated virus, PS-PCV	IM	Liquid and lyophilized (Hib)	AlPO ₄	Yes (DNF)	Not known						http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM109810.pdf		Very similar to Daptacel, but Pentacel vaccine contains twice the amount of detoxified pertussis toxin and four times the amount of filamentous hemagglutinin (FHA)
Pentaxim	Sanofi Pasteur	France	No	Purified protein (incl aP), inactivated virus, PS-PCV	IM	Liquid and lyophilized (Hib)	AlOH ₃	Yes (DNF)	36 months						http://www.eda.moph.gov.eg/Download/Docs/Files/8_Pentaxim_SPC.pdf		
Summary				Purified protein (incl aP), inactivated virus, PS-PCV	IM	Fully liquid, or liquid + lyophilized Hib	Al based	Yes (DNF)	36 - 48 months		No data found on the stability of DTP-IPV Hib vaccines. Assumed to be freeze sensitive due to presence of aluminum salt adjuvant.						
Diphtheria, tetanus, pertussis (acellular), hepatitis B, inactivated poliovirus (DTaP-HepB-IPV)																	
Pediarix	GSK	Belgium	No	Purified protein (inc. aP), inactivated virus, recombinant protein	IM	Liquid	AlPO ₄ and AlOH ₃	Yes (DNF)	Not known						http://us.gsk.com/products/assets/us_pediarix.pdf		
Summary				Purified protein (inc. aP), inactivated virus, recombinant protein	IM	Liquid	Al based	Yes (DNF)	Not known		No data found on the stability of DTP-HepB-IPV combinations. Assumed to be freeze sensitive due to presence of aluminum salt adjuvant.						
Diphtheria, tetanus, pertussis (acellular), hepatitis B, <i>Haemophilus influenzae</i> type b, inactivated poliovirus vaccine (DTaP-HepB-Hib-IPV); "hexavalent vaccine"																	
Hexavac	Sanofi Pasteur	France	No	Purified protein (incl. aP), inactivated virus, recombinant protein, PS-PCV	IM	Liquid	AlOH ₃	Yes (DNF)	36 months						http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Product_Information/human/000298/WC500074586.pdf		
Infanrix hexa	GSK	Belgium	No	Purified protein (incl. aP), inactivated virus, recombinant protein, PS-PCV	IM	Liquid and lyophilized (Hib)	AlOH ₃ and AlPO ₄	Yes (DNF)	36 months						http://www.medicines.ie/medicine/13596/SPC/infanrix+Hexa+_Powder+and+suspension+for+suspension+for+injection/		
Summary				Purified protein (incl. aP), inactivated virus, recombinant protein, PS-PCV	IM	Fully liquid, or liquid + lyophilized Hib	Al based	Yes (DNF)	36 months		No data found on the stability of hexavalent combinations. Overall stability is likely to be similar to DTP-IPV combinations.						
Hepatitis A and hepatitis B																	
Bilive	Sinovac	China	No	Recombinant protein, inactivated virus	IM	Liquid	AlOH ₃	Yes (DNF)	24 months						http://www.sinovac.com.cn/en/?optionid=458		
Twinrix	GSK	Belgium	No	Recombinant protein, inactivated virus	IM	Liquid	AlOH ₃ and AlPO ₄	Yes (DNF)	36 months			21°C: 2 weeks (22)	1 week (22)		http://www.medicines.org.uk/emc/medicine/2061/SPC/twinrix%20adult%20vaccine,%20suspension%20for%20injection%20in%20pre-filled%20syringe/		
Summary				Recombinant protein, inactivated virus	IM	Liquid	Al based	Yes (DNF)	24 - 36 months		Hepatitis A and B vaccines are both relatively heat stable. The combination vaccine is likely to be stable at 20°C and 37°C for weeks and days, respectively. Assumed to be freeze sensitive due to presence of aluminum salt adjuvant.						

Vaccine	Manufacturer	Country of manufacture	WHO PQ	WHO Vaccine type	Delivery route	Formulation	Adjuvant	Damaged by freezing	Shelf life (2°-8°C)	VVM type*	Available stability data				Links Summary of product characteristics (SPC), product monograph, or package insert	WHO information	Notes	
											Freeze-thaw	2°-8°C	25°C	37°C	>37°C			
Hepatitis A and typhoid																		
Hepatyrix	GSK	Belgium	No	Inactivated virus, PS	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.medicines.org.uk/emc/medicine/2537/SPC/hepatyrix/		
Vivaxim	Sanofi Pasteur	France	No	Inactivated virus, PS	IM	Liquid	AlOH ₃	Yes (DNF)	36 months							http://www.sanofipasteur.com.au/sanofi-pasteur2/media/AVPI_AU/EN/47/1509/VIVAXIM%20PI%20for%20AUS.pdf		
Summary				Inactivated virus, PS	IM	Liquid	AlOH ₃	Yes (DNF)	36 months	No data found on the stability of HA vaccine and typhoid combination vaccines. Assumed to be freeze sensitive due to presence								
Hepatitis B and Haemophilus influenzae type b (HepB-Hib)																		
Comvax	Merck Sharp and Dohme	USA	No	Recombinant protein, PS-PCV, OMPC	IM	Liquid	Aluminum hydroxy-phosphate sulfate	Yes (DNF)								http://www.merck.com/product/usa/pi_circulars/c/comvax/comvax_pi.pdf		
Summary				Recombinant protein, PS-PCV, OMPC	IM	Liquid	AI based	Yes (DNF)	36 months	No data found on the stability of hepB and Hib combination vaccines. Assumed to be freeze sensitive due to presence of aluminum salt adjuvant.								
Measles and rubella																		
MoRu-Viraten	Crucell	Switzerland	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months	14						http://www.who.int/immunization_standards/vaccine_quality/900923hxpp.002_product_insert.pdf	http://www.who.int/immunization_standards/vaccine_quality/03_measles/en/index.html	Further production of this vaccine has ceased Prequalification will be maintained until November 30, 2012, the expiry date of the final batch produced
Measles and rubella virus vaccine live USP	Serum Institute of India	India	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months	14	Long-term storage at -20°C is recommended					http://www.who.int/immunization_standards/vaccine_quality/pq_138_139_140_141_mr_si.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_141_mr_10dose_si.pdf	
Summary				Live attenuated virus	SC	Lyophilized	No	No	24 months	Measles and rubella combination vaccines are relatively stable in the lyophilized state (months at 25°C and weeks at 37°C) (1). They are not damaged by freezing.								
Measles, mumps, and rubella (MMR)																		
Priorix	GSK	Belgium	Yes	Live attenuated virus	SC	Lyophilized	No	No (assumed); SPC does not state DNF	24 months	7						http://www.gsk.ca/english/docs-pdf/Priorix_2011.pdf	http://www.who.int/immunization_monitoring/diseases/measles_surveillance/en/	
M-M-R II	Merck Sharp and Dohme	USA	Yes	Live attenuated virus	SC	Lyophilized	No	No (SPC)	24 months	7	Can be stored between -50°C and 8°C (SPC)		One or a series of exposures ≤ 6 hours in total (SPC)			http://www.who.int/immunization_standards/vaccine_quality/PQ_168_MMR_MS_Pl_July2008.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_168_MMR_1_dose_Vial_MS_D/en/index.html	
Trimovax Merieux	Sanofi Pasteur	France	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months						http://www.who.int/immunization_standards/vaccine_quality/108_mmr.pdf	http://www.who.int/immunization_standards/vaccine_quality/PQ_109_mmr_10_dose_sanofi_pasteur/en/		
Measles, mumps and rubella vaccine, live, attenuated	Serum Institute of India	India	Yes	Live attenuated virus	SC	Lyophilized	No	No	24 months	14	Long-term storage at -20°C is recommended					http://www.who.int/immunization_standards/vaccine_quality/pq_142_143_144_145_mmr_si.pdf	http://www.who.int/immunization_standards/vaccine_quality/pq_145_mmr_10dose_si/en/index.html	
MMR	BioManguinhos	Brazil	No	Live attenuated virus	SC	Lyophilized	No	No	Not known						http://www.fiocruz.br/bio_eng/cgi/cgilua.exe/sys/start.htm?sid=212		Technology transfer from GSK	
Abhayvac 3	Indian Immunologicals Ltd.	India	No	Live attenuated virus	SC	Lyophilized	No	No	Not known						http://www.indimmune.com/mmr.html			
Summary				Live attenuated virus	SC	Lyophilized	No	No	24 months	MMR combination vaccines are relatively stable in the lyophilized state (weeks-months at 25°C and days-weeks at 37°C) (1). They are not damaged by freezing.								
Measles, mumps, rubella, and varicella																		
ProQuad	Merck Sharp and Dohme	USA	No	Live attenuated virus	SC	Lyophilized	No	No (assumed)	18 months						http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_Product_Information/human/000622/WC500044070.pdf		Initially produced as a frozen formulation Addition of urea as stabilizer allowed production of a refrigerator-stable formulation	
Priorix-Tetra	GSK	Belgium	No	Live attenuated virus	SC	Lyophilized	No	Yes (DNF)	Not known						http://www.gsk.ca/english/docs-pdf/Priorix_tetra_2010.pdf			
Summary				Live attenuated virus	SC	Lyophilized	No	No	18 months	Very little data found on the stability of MMRV combinations. Not damaged by freezing. Heat stability is likely to be limited by the varicella component.								
Meningococcus and Hib																		
Menitorix	GSK	Belgium	No	PS-PCV	IM	Lyophilized	No	Yes (DNF)	3 years	Not affected by repeated exposure to freezing temperatures (27)				>5 weeks (27)	>56°C: >5 weeks (27)	http://www.medicines.org.uk/emc/medicine/17189/SPC/menitorix/		
Summary				PS-PCV	IM	Lyophilized	No	Yes (DNF)	3 years	Stability of combination vaccine appears to be better than the two monovalent vaccines.								

Summary of stability data for licensed vaccines

References		Link
1 WHO 2006	Temperature sensitivity of vaccines	http://whqlibdoc.who.int/hq/2006/WHO_IVB_06.10_eng.pdf
2 Lee et al 2007	Long-term thermal stability of group C meningococcal polysaccharide-tetanus toxoid conjugate vaccine. <i>Human Vaccine</i> . 3(1):27-32.	http://www.ncbi.nlm.nih.gov/pubmed/17264684
3 Wiedermann and Ambrosch 1994	Immunogenicity of an inactivated hepatitis A vaccine after exposure at 37 degrees C for 1 week. <i>Vaccine</i> . 12(5):401-402.	http://www.ncbi.nlm.nih.gov/pubmed/8023546
4 De Moraes et al 2010	Immunogenicity of the Brazilian hepatitis B vaccine in adults. <i>Revista de Saude Publica</i> . 44(2):1-6.	http://www.scielo.br/pdf/rsp/v44n2/en_17.pdf
5 Chen et al 2009	Characterization of the freeze sensitivity of a hepatitis B vaccine. <i>Human Vaccines</i> . 5(1):26-32.	http://www.ncbi.nlm.nih.gov/pubmed/18971625
6 Le Tallec et al 2009	Cervarix, the GSK HPV-16/HPV-18 AS04-adjuvanted cervical cancer vaccine, demonstrates stability upon long-term storage and under simulated cold chain break conditions. <i>Human Vaccines</i> . 5(7):467-474.	http://www.ncbi.nlm.nih.gov/pubmed/19377291
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