

"Inactive" Ingredients in Vaccines

25 March 2017

http://dickatlee.com/issues/health/vaccines/vaccines_by_excipient.html

Every few years the U.S. Centers for Disease Control (CDC) publishes a new edition of its online "Pink Book," *Epidemiology and Prevention of Vaccine-Preventable Diseases*. In its Appendix B is a table (pp. B7-B10) entitled *Vaccine Excipient & Media Summary: Excipients Included in U.S. Vaccines, by Vaccine*.

Pink Book: <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>

Appendix B: <https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/appdx-full-b.pdf>

It lists all the "inactive" ingredients in each vaccine listed on the manufacturer's package insert. The most recent version of the document is the 2015 edition. The CDC has published an updated version of the table

<https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/b/excipient-table-2.pdf>

with package-insert information as of January, 2017, which is the data presented in this table. Its header states:

In addition to weakened or killed disease antigens (viruses or bacteria), vaccines contain very small amounts of other ingredients – excipients or media.

Some excipients are added to a vaccine for a specific purpose. These include:

Preservatives, to prevent contamination. For example, thimerosal.

Adjuvants, to help stimulate a stronger immune response. For example, aluminum salts.

Stabilizers, to keep the vaccine potent during transportation and storage. For example, sugars or gelatin.

Others are residual trace amounts of materials that were used during the manufacturing process and removed. These include:

Cell culture materials, used to grow the vaccine antigens. For example, egg protein, various culture media.

Inactivating ingredients, used to kill viruses or inactivate toxins. For example, formaldehyde.

Antibiotics, used to prevent contamination by bacteria. For example, neomycin.

The following table lists all components, other than antigens, shown in the manufacturers' package insert (PI) for each vaccine. Each of these PIs, which can be found on the FDA's website (see below) contains a description of that vaccine's manufacturing process, including the amount and purpose of each substance. In most PIs, this information is found in Section 11: "Description."

All information was extracted from manufacturers' package inserts, current as of January 6, 2017.

If in doubt about whether a PI has been updated since then, check the FDA's website at:

<http://www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm093833.htm>

However, while the by-vaccine organization of that table makes it useful for checking the contents of vaccines, it is not useful for seeing the range of vaccines that contain any one of these ingredients. A note at the foot of the published table points to a vaccines-by-excipient table in a book [Grabenstein JD. *ImmunoFacts: Vaccines and Immunologic Drugs – 2013* (38th revision). St Louis, MO: Wolters Kluwer Health, 2012], but not to an online source. This table is designed to fill that need. A few notes about its construction:

- **Excipient names** – Except for a very few instances (e.g., "formalin" changed to "formaldehyde," correcting misspellings, shuffling words for better sorting), the text is literally as it was in the original table. As a result, there are many cases of seemingly almost-duplicate listings for many of the components. But given that this adaptation was not based on deep knowledge of the vaccines themselves, it was considered safest to not lump these "duplicates" together, but only shuffle the words to allow them to sort adjacent to each other.
- **Categories** – In order to facilitate grouping certain ingredients into potentially useful categories, those ingredients were duplicated and prefixed with headers -- medium, bovine, canine, monkey, porcine -- and thus will be found in two places in the table.
- **Dates** – Package-insert dates were not provided in the updated table, so those in the 2015 table are provided here for reference, but the data is current as of the January 2017 inserts.
- **Growth Media** – Many of the vaccine content listing include references to growth media. In two cases:

DMEM	Dulbecco's Modified Eagle Medium
M199	Medium 199

the contents of the medium were spelled out in the Excipient Table and could be listed separately here, identified as such by (DMEM) and (M199). However, there were many other non-itemized media. Until these can be broken out, they have all been grouped here under the general category "Media."

- **Abbreviations** – To make the table more readable, excipient names have sometimes been shortened, with the remainder in footnotes; vaccines have been abbreviated with links to the full names in the vaccine list below it.

Other "Ingredients" – This table does not include inadvertent contaminants introduced in the manufacturing or storage process, such as the metal debris and biological contamination documented in a recent study

<http://medcraveonline.com/IJVV/IJVV-04-00072.pdf>

And it should be noted that manufacturers and distributors, since 1986, are not liable for damage from *any* materials contained in vaccines.

2-phenoxyethanol	DTaP.D	DTaP+.Pn	Polio	Tdap.A					
3-O-desacyl-4' Monophosphoryl lipid A	HPV.C								
acetone	Aden								
alcohol	Aden	Men.Ma	Men.Mo						
alpha-tocopheryl hydrogen succinate	Inf.Fa								
aluminum hydroxide.....	Anth	DTaP.I	DTaP+.K	DTaP+.Pd	HepA.H	HepAB.T	HepB.E	HPV.C	
	JapEnc	MenB.B	Tdap.B						
aluminum hydroxyphosphate sulfate.....	Hib.P								
aluminum hydroxyphosphate sulfate, amorph..	HepA.V	HebB.R	Hib+.C	HPV.G	HPV.G9				
aluminum phosphate.....	DTaP.D	DTaP+.Pd	DTaP+.Pn	HepAB.T	Td.M	Td.T	Tdap.A		
aluminum potassium sulfate	DT	Td.D							
amino acid supplement	HepA.H								
amino acids	Anth	HepAB.T	HepB.R	Hib+.C	HPV.C	HPV.G	HPV.G9	Inf.Fb	
	Men.Mv	Rot.R	Typh.O						
amino acids (M199).....	DTaP+.Pn	MMR	Polio						
amino acids solution (DMEM).....	Aden	Rot.R							
ammonium phosphate.....	Td.M								
ammonium sulfate	DT	DTaP.D	DTaP+.Pn	Hib.A	Men.Ma	Td.D	Td.T	Tdap.A	
amphotericin B	Rab.A								
anhydrous lactose	Aden								
arginine	Inf+.Fm								
ascorbic acid	Typh.O								
asparagine	BCG								
bacterial protein	HPV.C								
baculovirus and cellular DNA	Inf.Fb								
baculovirus and host cell proteins	Inf.Fb								
barium	Inf.Ag								
benzethonium chloride	Anth								
beta-propiolactone	Inf.Af	Inf.Fc	Inf.Fv	Rab.A	Rab.I				
bovine: bovine albumin	HepA.V								
bovine: bovine extract	DT								
bovine: bovine muscle tissue (US sourced).....	Td.D								
bovine: bovine serum.....	DTaP+.K	Rab.A							
bovine: bovine serum albumin	DTaP+.Pn	JapEnc							
bovine: calf serum	DTaP+.Pd	MMRV	Varic.R	Zost.F	Zost.R				
bovine: calf serum protein	Polio								
bovine: CMRL medium 1969 [1]	DTaP+.Pn								
bovine: Fenton medium [2]	DTaP.I	DTaP+.K	DTaP+.Pd	Tdap.B					
bovine: fetal bovine serum	Aden	Rot.T	Varic.F						

bovine: fetal bovine serum (M199)	DTaP+.Pn	MMR	Polio						
bovine: Latham medium [3]	Tdap.B								
bovine: Latham medium [3], mod	DTaP.I	DTaP+.K	DTaP+.Pd	Td.M					
bovine: polygeline (processed bovine gelatin)	Rab.A								
calcium carbonate	Rot.R								
calcium chloride	Inf.Af								
calcium chloride (DMEM)	Aden	Rot.R							
canine: MDCK cell protein.....	Inf.Fc								
canine: MDCK cell DNA	Inf.Fc								
carbohydrates.....	HPV.G	HPV.G9							
casamino acids	1313								
casein	Typh.O								
castor oil	Aden								
cell culture media.....	Rot.T								
cellulose acetate phthalate	Aden								
cetyltrimethylammonium bromide	Inf.Ag	Inf.Fc							
chick embryo cell culture	MMR	MMRV							
chicken protein	Rab.A								
chlortetracycline	Rab.A								
citric acid	BCG								
D-fructose	Aden								
D-glucose (DMEM).....	Aden	Rot.R							
D-mannose.....	Aden								
deoxycholate.....	MenB.B								
detergent	Hib.P	Hib+.C	Men.Ma	Men.Mo					
dextran	Rot.R								
dextrose.....	Aden	HepB.R	Hib+.C	Typh.O					
dimethyl 1-beta-cyclodextrin.....	DTaP.D								
dimethyl-beta-cyclodextrin.....	Tdap.A								
disodium phosphate	Typh.I								
<i>E. coli</i>	MenB.B	MenB.T							
EDTA.....	Inf+.Fm	Varic.F							
EDTA, sodium	Rab.A								
egg proteins.....	Inf.Af	Inf.Ag	Inf.Fl	Inf.Fv	Inf.Fz	Inf+.Fm	Rab.A	YelFev	
enzymes	Hib.P	Hib+.C							
ethanol	Hib.P	Hib+.C							
FD&C Yellow #6 aluminum lake dye.....	Aden								
ferric (III) nitrate (DMEM).....	Aden	Rot.R							

formaldehyde	Anth	DT	DTaP.D	DTaP.I	DTaP+.K	DTaP+.Pd	DTaP+.Pn	HepA.H
	HepA.V	HepAB.T	HepB.R	Hib.A	Hib.H	Hib+.C	Hib+.M	Inf.Ag
	Inf.Fa	Inf.Fl	Inf.Fz	JapEnc	Men.Ma	Men.Mv	Polio	Td.D
	Td.M	Td.T	Tdap.A	Tdap.B	Typh.I			
galactose	Typh.O							
gelatin	Typh.O	YelFev						
gelatin: (standard trivalent formulation only)...	Inf.Fz							
gelatin: hydrolyzed gelatin	MMR	MMRV	Varic.F	Varic.R				
gelatin: hydrolyzed porcine gelatin	Inf+.Fm	Zost.F	Zost.R					
gelatin: polygeline (processed bovine gelatin) .	Rab.A							
gentamicin sulfate	Inf.Fa	Inf+.Fm						
glutamate	Varic.F	Varic.R						
glutamate (M199)	DTaP+.Pn	MMR	Polio					
glutaraldehyde	DTaP.D	DTaP.I	DTaP+.K	DTaP+.Pd	DTaP+.Pn	Tdap.A	Tdap.B	
glycerin	BCG	SPx						
guinea pig cell cultures, embryonic	Varic.F	Varic.R						
hemin chloride	Hib+.C							
HEPES	SPx							
hexadecyltrimethylammonium bromide.....	Typh.I							
histidine	MenB.B	MenB.T						
human albumin	MMRV	Rab.I						
human diploid cell cultures (WI-38)	Varic.F	Varic.R						
human diploid fibroblast cell cultures (WI-38)	Aden							
human diploid lung fibroblasts (WI-38).....	MMR	MMRV						
human embryonic lung cultures	Varic.F	Varic.R						
human serum albumin	Aden	Rab.A	SPx					
hydrocortisone	Inf.Fa							
inorganic salts and sugars	Anth							
insect cell protein.....	HPV.C							
iron ammonium citrate.....	BCG							
kanamycin.....	Inf.Ag	MenB.B						
L-cystine (DMEM).....	Aden	Rot.R						
L-glutamine (DMEM)	Aden	Rot.R						
L-histidine.....	HPV.G	HPV.G9						
L-tyrosine (DMEM)	Aden	Rot.R						
lactalbumin hydrolysate.....	DTaP+.K	DTaP+.Pd						
lactose	BCG	Hib.H	Men.Mo	Typh.O				
lipids	HPV.C	Inf.Fb						
magnesium stearate.....	Aden	Typh.O						

magnesium sulfate	BCG				
magnesium sulfate (DMEM)	Aden	Rot.R			
mannitol	SPx				
medium: CMRL 1969 (suppl. w/ calf serum)...	DTaP+.Pn				
medium: complex fermentation	Hib.P				
medium: CY medium	Men.Mv				
medium: Eagle MEM (DMEM) mod	Polio				
medium: Fenton medium[2]	DTaP.I	DTaP+.K	DTaP+.Pd	Tdap.B	
medium: fermentation growth media	MenB.T				
medium: Franz complete medium	Men.Mv				
medium: Latham medium [3]	Tdap.B				
medium: Latham medium [3], mod	DTaP.I	DTaP+.K	DTaP+.Pd		
medium: Minimum Essential Medium	MMR				
medium: Mueller Hinton agar	Men.Ma				
medium: Mueller Hinton casein agar	Men.Mo				
medium: Mueller-Miller	Td.D				
medium: Mueller-Miller [5]	DTaP+.Pn	Tdap.A			
medium: Mueller-Miller [5], mod	DTaP.D	Td.T			
medium: Mueller-Miller medium, mod	DT	Hib.A	Men.Ma		
medium: Mueller's growth medium	DTaP+.Pn				
medium: Mueller's growth medium, mod	DTaP.D	Tdap.A			
medium: Mueller's media [4], mod	Td.M				
medium: semi-synthetic	Hib.H	Hib+.M	Typh.I		
medium: Stainer-Scholte medium	DTaP.D	Tdap.A			
medium: Stainer-Scholte medium [6]	DTaP+.Pn				
medium: Stainer-Scholte medium, liquid	Tdap.B				
medium: Stainer-Scholte medium, liquid, mod	DTaP.I	DTaP+.K	DTaP+.Pd		
medium: synthetic	Hib+.M				
medium: Watson Scherp media	Men.Ma	Men.Mo			
micro crystalline cellulose	Aden	HepB.R			
mineral salts	Hib+.C	HPV.C	HPV.G	HPV.G9	Inf.Fb
monkey kidney cells	Polio				
monkey: Vero (monkey kidney) cells	DTaP+.K	DTaP+.Pd	JapEnc		
monosodium glutamate	Aden	Inf+.Fm			
monosodium L-glutamate	MMRV	Varic.F	Varic.R	Zost.F	Zost.R
monosodium phosphate	Typh.I				
MRC-5 (human diploid) cells	DTaP+.Pn	HepA.V	HepAB.T	MMRV	Rab.I
MRC-5 (human diploid) cells [7]	Varic.F	Varic.R	Zost.F	Zost.R	
MRC-5 (human diploid) cellular proteins	HepA.H				

neomycin	DTaP+.Pn	HepA.V	Inf.Fv	MMR	MMRV	Polio	Rab.A	SPx
neomycin	Varic.F	Varic.R	Zost.F	Zost.R				
neomycin sulfate.....	DTaP+.K	DTaP+.Pd	HepA.H	HepAB.T	Inf.Af	Inf.Ag	Rab.I	
nicotinamide adenine dinucleotide	Hib+.C							
nonylphenol ethoxylate.....	Inf.Fv							
ovalbumin	Inf.Fa							
peptone.....	DT	Td.D						
phenol	Hib.P	Hib+.C	Pneu.23	SPx	Typh.I			
phenol red (DMEM)	Aden	Rot.R						
phenol red indicator	Rab.I							
phosphate	MMR	Varic.F	Varic.R					
phosphate buffer	HepAB.T	HepB.R	Inf.Fa	Inf.Fc	Inf.Fl	Inf.Fv		
phosphate buffers.....	HepB.E	Inf.Fz	Men.Ma					
pladone C	Aden							
polacrilin potassium.....	Aden							
polydimethylsiloxane.....	Typh.I							
polymyxin	Inf.Fv							
polymyxin B	DTaP+.K	DTaP+.Pd	Inf.Af	Polio	SPx			
polymyxin B sulfate.....	DTaP+.Pn							
polysorbate 20.....	HepA.H	HepAB.T	Inf.Fb					
polysorbate 80.....	DTaP.I	DTaP+.K	DTaP+.Pd	DTaP+.Pn	HPV.G	HPV.G9	Inf.Ag	Inf.Fc
	MenB.T	Pneu.13	Rot.T					
polysorbate 80 (Tween 80).....	Inf.Fa	Tdap.B						
porcine circovirus type 1 [8].....	Rot.R							
porcine circoviruses type 1 and 2 DNA [9].....	Rot.T							
porcine: hydrolyzed porcine gelatin	Inf+.Fm	Zost.F	Zost.R					
potassium aluminum sulfate	HepB.R	Hib+.C						
potassium chloride.....	Inf.Af	MMRV	Varic.F	Varic.R	Zost.F	Zost.R		
potassium chloride (DMEM).....	Aden	Rot.R						
potassium glutamate	Rab.A							
potassium phosphate.....	Aden	BCG						
potassium phosphate, dibasic	Inf+.Fm	MMRV						
potassium phosphate, monobasic	Inf.Af	Inf+.Fm	MMRV	Varic.F	Varic.R	Zost.F	Zost.R	
protamine sulfate	JapEnc							
recombinant human albumin	MMR							
sodium bicarbonate.....	Aden	MMRV						
sodium borate	HepA.V	Hib+.C	HPV.G	HPV.G9				
sodium citrate	Rot.T							
sodium deoxycholate	Inf.Fa	Inf.Fl						

sodium dihydrogen phosphate dihydrate.....	HepB.E	HPV.C							
sodium hydrogenocarbonate (DMEM).....	Aden	Rot.R							
sodium hydroxide	Rot.T								
sodium metabisulphite	JapEnc								
sodium phosphate (DMEM)	Aden	Rot.R							
sodium phosphate, dibasic	Inf.Af	Inf.Fb	MMRV	Varic.F	Varic.R	Zost.F	Zost.R		
sodium phosphate, monobasic	Inf.Af	Inf.Fb	Varic.F	Varic.R					
sodium phosphate, monobasic monohydrate....	Rot.T								
sodium pyruvate (DMEM)	Aden	Rot.R							
sodium taurodeoxycholate	Inf.Af								
sorbitol	MMR	MMRV	Rot.R	YelFev					
soy peptone	HepB.R	Hib+.C							
soy peptone broth.....	Pneu.13								
streptomycin	Polio								
succinate buffer.....	Pneu.13								
sucrose	Aden	DTaP+.Pn	Hib.A	Hib+.M	Inf.Af	Inf.Fa	Inf.Fz	Inf+.Fm	
	JapEnc	MenB.B	MMRV	Rot.R	Rot.T	Typh.O	Varic.F	Varic.R	
	Zost.F	Zost.R							
sucrose (M199)	DTaP+.Pn	MMR	Polio						
thimerosal	Inf.Fl	Td.D							
thimerosal (multi-dose vial only)	Inf.Af	Inf.Fz	Men.Mo						
thimerosal (multi-dose vial) [10]	Inf.Fv								
thimerosal (trace)	DT	Td.M							
tris (trometamol)-HCl	Hib+.M								
Triton X-100	Inf.Fb								
Triton X-100 (octoxynol-10)	Inf.Fa								
Triton X-100 (octylphenol ethoxylate)	Inf.Fz								
urea	Varic.R	Zost.R							
viral protein.....	HPV.C								
vitamin solution, concentrated (DMEM).....	Aden	Rot.R							
vitamins	Anth	HPV.C	HPV.G	HPV.G9	Inf.Fb				
vitamins (M199)	DTaP+.Pn	MMR	Polio						
xanthan.....	Rot.R								
yeast	Pneu.13								
yeast [11]	Hib+.C								
yeast extract	Men.Mv	Typh.O							
yeast protein.....	DTaP+.Pd	HepAB.T	HepB.E	HepB.R	HPV.G	HPV.G9			

Footnotes:

1. supplemented with calf serum
2. containing bovine extract
3. derived from bovine casein
4. containing bovine extracts
5. casamino acid medium (without beef heart infusion)
6. modified by the addition of casamino acids and dimethyl-betacyclodextrin
7. residual components, including DNA and protein
8. PCV-1 is present in Rotarix, not known to cause disease in humans.
9. PCV-1 and PCV-2 DNA has been detected in RotaTeq. PCV-1 and PCV-2 are not known to cause disease in humans.
10. trace only in prefilled syringe
11. vaccine contains no detectable yeast DNA

Vaccines in the CDC Excipient Table

with the (non-CDC) abbreviation used in the above table, and the manufacturer's package insert date as of 2015

Aden	Adenovirus – March 2011	Inf.Fz	Influenza (Fluzone: Standard (Trivalent and Quadrivalent), High-Dose, & Intradermal) – 2014
Anth	Anthrax (Biothrax) – May 2012	Inf+.Fm.....	Influenza (FluMist) Quadrivalent – July 2013
BCG.....	BCG (Tice) – February 2009	JapEnc	Japanese Encephalitis (Ixiaro) – May 2013
DT.....	DT (Sanofi) – December 2005	Men.Ma	Meningococcal (MCV4Menactra) – April 2013
DTap.D	DTaP (Daptacel) – October 2013	Men.Mv	Meningococcal (MCV4Menveo) – August 2013
DTap.I.....	DTaP (Infanrix) – November 2013	Men.Mo	Meningococcal (MPSV4Menomune) – April 2013
DTap+.K...	DTaP-IPV (Kinrix) – November 2013	MenB.B	Meningococcal (MenB – Bexsero) – 2015
DTap+.Pd	DTaP-HepB-IPV (Pediarix) – November 2013	MenB.T	Meningococcal (MenB – Trumenba) – October 2015
DTap+.Pn .	DTaP-IPV/Hib (Pentacel) – October 2013	MMR	MMR (MMR-II) – June 2014
Hib.A	Hib (ActHIB) – January 2014	MMRV	MMRV (ProQuad) – March 2014
Hib.H	Hib (Hiberix) – March 2012	Pneu.13	Pneumococcal (PCV13 – Prevnar 13) – January 2014
Hib.P	Hib (PedvaxHIB) – December 2010	Pneu.23	Pneumococcal (PPSV-23 – Pneumovax) – May 2014
Hib+.C	Hib/Hep B (Comvax) – December 2010	Polio	Polio (IPV – Ipol) – May 2013
Hib+.M	Hib/Mening. CY (MenHibrix) – 2012	Rab.I	Rabies (Imovax) – April 2013
HepA.H	Hep A (Havrix) – December 2013	Rab.A.....	Rabies (RabAvert) – March 2012
HepA.V	Hep A (Vaqta) – February 2014	Rot.T	Rotavirus (RotaTeq) – June 2013
HepB.E	Hep B (Engerix-B) – December 2013	Rot.R	Rotavirus (Rotarix) – May 2014
HepB.R.....	Hep B (Recombivax) – May 2014	SPx	Smallpox (Vaccinia – ACAM2000) – September 2009
HepAB.T ..	Hep A/Hep B (Twinrix) – August 2012	Td.D.....	Td (Decavac) – March 2011
HPV.C	Human Papillomavirus (HPV) (Cervix) – November 2013	Td.T	Td (Tenivac) – April 2013
HPV.G	Human Papillomavirus (HPV) (Gardasil) – June 2014	Td.M.....	Td (Mass Biologics) – February 2011
HPV.G9	Human Papillomavirus (HPV) (Gardasil 9) – December 2014	Tdap.A.....	Tdap (Adacel) – March 2014
Inf.Af	Influenza (Afluria) – December 2013	Tdap.B	Tdap (Boostrix) – February 2013
Inf.Ag	Influenza (Agriflu) – 2013	Typh.I	Typhoid (inactivated – Typhim Vi) – March 2014
Inf.Fa	Influenza (Fluarix) Trivalent and Quadrivalent – June 2014	Typh.O.....	Typhoid (oral – Ty21a) – September 2013
Inf.Fb	Influenza (Flublok) – March 2014	Varic.F	Varicella (Varivax) Frozen – March 2014
Inf.Fc	Influenza (Flucelvax) – March 2014	Varic.R	Varicella (Varivax) Refrigerator Stable – March 2014
Inf.Fv	Influenza (Fluvirin) – February 2014	YelFev	Yellow Fever (YF-Vax) – May 2013
Inf.Fl.....	Influenza (Flulaval) Trivalent and Quadrivalent – February 2013	Zost.F.....	Zoster (Shingles – Zostavax) Frozen – February 2014
		Zost.R	Zoster (Shingles – Zostavax) Refrigerator Stable – February 2014