Important Vaccines in Our History

A **vaccine** helps provide active acquired immunity to an infectious disease. Historically, these vaccines typically contained a weakened or killed form of the microbe, toxin or surface protein. This stimulates the body's immune system to develop antibodies that recognize the virus as a threat and destroy it.

In 400 BC, Hippocrates described mumps, diphtheria, epidemic jaundice and other medical conditions. Jump ahead 1200 years to 1100 AD and the variolation technique was developed, involving the inoculation of children and adults with dried scab material recovered from smallpox patients. It was not until 1879, that Louis Pasteur created the first live attenuated bacterial vaccine.

Today, the WHO estimates that vaccines save an estimated 2-3 million lives each year. The effectiveness of vaccines, however, depends on everyone continuing to receive them.

The chart below describes some of the most important vaccines ever developed; staving off dire consequences for our population.

Vaccine	Vaccine Info	Hx of Disease
Measles **Mumps** **Rubella**	• Effective at preventing the disease • Exceptionally safe • Often delivered with other vaccines (MMR). • Measles vaccines have been given to over a billion people • Adverse reactions to vaccination are rare, with fever and pain at the injection site being the most common. • One dose of MMR vaccine is 93% effective against measles, 78% effective against mumps, and 97% effective against rubella. • Two doses of MMR vaccine are 97% effective against measles and 88% effective against mumps. • Phase III clinical trial for MMR vaccine included 5003 healthy children **M-M-R vaccine contains:** • Live attenuated measles virus propagated in chick embryo cell culture • Live attenuated mumps virus propagated in chick embryo cell culture • Live attenuated rubella virus propagated in human diploid lung fibroblasts	**Measles:** • Once infected, no specific treatment or cure is available. • One of the leading causes of death in a vaccine-preventable disease. • 7-8 million children died from measles each year before the vaccine was introduced. • 400 BC – reference to measles in literature • 1963 – vaccine becomes available. • 1980 - 2.6 million people died from measles • 2000 - Measles as an endemic disease was eliminated in the US, but continues to be reintroduced by international travelers. **Mumps:** • Can cause deafness, systemic inflammation, reduced fertility, sterility, myocarditis, pericarditis, hydrocephalus, seizures, and death. • During pregnancy mumps can increase risk of miscarriage • 640 BC – mumps recorded in literature • 1934 – virus discovered

	• Sorbitol, sucrose, hydrolyzed gelatin, recombinant human albumin, fetal bovine serum, neomycin, contains no preservatives	• 1970 – vaccines created and there has been a near elimination of the disease **Rubella (German Measles):** • There is no treatment for rubella • Can cause joint pain, bleeding problems, inflammation of nerves, testicular swelling, and encephalitis. • During pregnancy, rubella can result in miscarriage or child born with congenital rubella syndrome (CRS) – cataracts, deafness, issues with heart and brain. Each year about 100,000 cases of CRS occur. • 1740 – first clinical description of disease • 2015 WHO declared US free of rubella
Polio	• The Salk vaccine had been 60–70% effective against PV1 (poliovirus type 1), over 90% effective against PV2 and PV3, and 94% effective against the development of bulbar polio • Clinical trials included 623,972 children **The polio vaccine contains:** • Inactivated Type 1, Type 2 and Type 3 polio virus. • 2- 6 phenoxyethanol, formaldehyde, neomycin, streptomycin, polymyxin B and calf bovine serum albumin	• There is no cure for polio. • Treatments focused on symptom relief • .5% of cases progress to paralytic disease, where it causes muscle to become weak, floppy and poorly controlled and can lead to acute flaccid paraylsis. • 1789 – recognized as a distinct condition although it has existed for thousands of years • 1909 – virus discovered • 1950's – US had outbreak of polio • 1955 – polio vaccine approved • 1994 – polio is eliminated in US • 2002 – Europe is polio free • 2014 – India is polio free
Tetanus	• Vaccine is usually a combination of tetanus, diphtheria and pertussis. • The CDC recommends a booster vaccine every 10 years. • No one has ever studied the efficacy of tetanus toxoid and diphtheria toxoid in a vaccine trial. However, experts infer efficacy from protective antitoxin levels. • A complete vaccine series has a clinical efficacy of virtually 100% for tetanus and 97% for diphtheria.	• There is no cure once infected. • Tetanus is a bacterial infection that causes muscle spasms that can last for a few minutes. Spasms occur frequently for 3-4 weeks and some spasms can be severe enough to fracture bones. Other symptoms include: fever, sweating, headache, difficulty swallowing, HTN, tachycardia • Treatments focus on symptoms control. • Recovery from tetanus does not result in immunity because the toxin, tetanospasmin, would most likely

	There are two Tdap vaccines used in the United States: Adacel® and Boostrix®. **Adacel® contains:** • tetanus toxoid, diphtheria toxoid, and acellular pertussis antigens • aluminum phosphate, formaldehyde (trace residual), glutaraldehyde, 2-phenoxyethanol **Boostrix® contains:** • tetanus toxoid, diphtheria toxoid, inactivated PT, FHA, pertactin • aluminum hydroxide, sodium chloride, formaldehyde (trace residual), polysorbate 80	be lethal before it would provoke an immune response. • 10% of cases are fatal • 300's BC – Hippocrates describes Tetanus • 1884 – cause of disease determined by Antonio Carle & Giorgio Rattone • 1924 – vaccine developed • Before widespread use of the vaccine, an average of 580 cases of tetanus and an average of 472 deaths from tetanus were reported. Today, tetanus is uncommon in the United States, with an average of 29 reported cases annually from 1996 through 2008.
Varicella **(Chicken Pox)**	• Vaccine protects about 70 to 90 percent of people from disease. • Before routine immunization, the number of cases each year was similar to the number of people born. The numbers in the US has decreased nearly 90%. • Minor side effects may include pain at the site of injection, fever, and rash. **Vaccine contains:** • Live weakened virus • Inactive Ingredients: sucrose, hydrolyzed gelatin, sodium chloride, monosodium L-glutamate, sodium phosphate dibasic, potassium phosphate monobasic, potassium chloride, residual components of MRC-5 cells including DNA and protein, sodium phosphate monobasic, EDTA, neomycin, fetal bovine serum.	• There is no cure • Treatment is symptom management • Complications of varicella can include pneumonia, brain inflammation, and bacterial skin infections. • The disease is more severe in adults. • If infection occurs in first 28 weeks of pregnancy, it can lead to fetal varicella syndrome. Effects on the fetus can range in severity and could include: arterial ischemic stroke, brain damage, eye damage, neurological disorders, hypoplasia, anal and bladder sphincter dysfunction, skin disorders • 1658 – first documented use of term: chicken pox • 1888 – connection to shingles discovered • 1995 – vaccine introduced • 2015 – 6400 deaths globally, down from 8900 from 1990.
Shingles	• Two doses of vaccine is more than 90% effective at preventing shingles and PHN. • Protection stays above 85% for at least the first four years after you are vaccinated. • Studies show the vaccine is safe and side effects are mild and can include, sore arm, redness and swelling at the injection site, fatigue, muscle pain, headache, fever, stomach pain and nausea. • 38,000 participants in clinical trial	• After a chickenpox infection, the virus remains dormant in the body's nerve tissues. • Later in life the virus can be reactivated and cause shingles. • Shingles affects 1 in 5 adults that had chickenpox as a child. • Characterized by painful rash with blisters, typically in a stripe on one side of the body or face. • This usually heals in 2-4 weeks but some can develop postherpetic neuralgia (PHN) which is nerve pain that

	Vaccine contains: • Glycoprotein E from varicella zoster virus • Plant extract (Quillaja saponaria Molina, fraction 21 (QS-21)) and a bacterial extract (3-O-desacyl-4'-monophosphoryl lipid A (MPL)) • Inactive ingredients: Cholesterol, dipotassium phosphate, dioleoyl phosphatidylcholine, disodium phosphate anhydrous, polysorbate 80, potassium dihydrogen phosphate, sodium chloride, sodium dihydrogen phosphate dihydrate, sucrose and water for injections.	can last for months or years. If the rash involves the eye, vision loss can occur. • 1767 – Dr. William Heberden distinguished difference between shingles and small pox • 1953 – link between chicken pox and shingles discovered

VACCINES CURRENTLY AVAILABLE FOR USE ACCORDING TO THE WORLD HEALTH ORGANIZATION

1. Cholera 2. Dengue fever[6] 3. Diphtheria 4. Ebolavirus 5. Haemophilus influenzae type b 6. Hepatitis A 7. Hepatitis B 8. Hepatitis E 9. Human papillomavirus infection 10. Influenza	11. Japanese encephalitis 12. Malaria[6] 13. Measles 14. Meningococcal disease 15. Mumps 16. Pneumococcal disease 17. Pertussis 18. Poliomyelitis 19. Rabies 20. Rotavirus gastroenteritis	21. Rubella – German Measles 22. Tetanus 23. Tick-borne encephalitis 24. Tuberculosis 25. Typhoid fever 26. Varicella – chicken pox 27. Yellow fever 28. Shingles (Herpes Zoster)

NOW TWO NEW VACCINES FOR COVID-19 CAN BE ADDED TO THIS LIST!