

THE DEVELOPMENT AND ADMINISTRATION OF THE MEASLES VACCINE

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LOTS-MC

WHAT IS THE MEASLES?

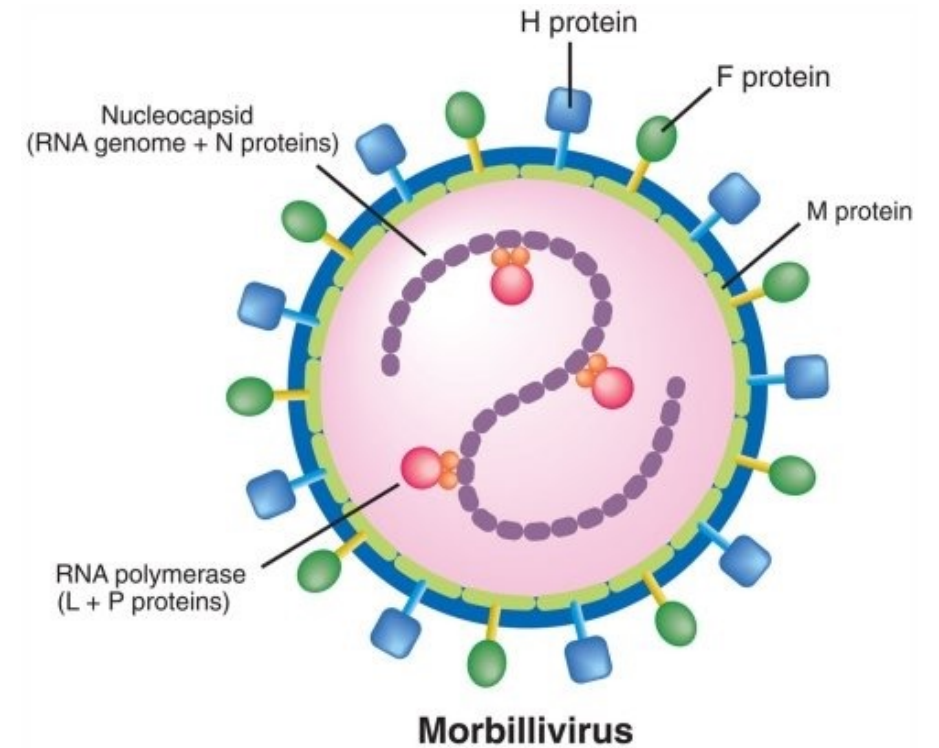
- Highly contagious infection caused by Morbillivirus
 - Also known as the rubeola virus
- Incubation time of 10-14 days



<https://www.news-medical.net/news/20200217/Measles-re-emerging-globally.aspx>
<https://www.cdc.gov/measles/symptoms/signs-symptoms.html>

THE STRUCTURE

- Single-stranded RNA with an envelope
- Has many proteins that help with invasion of the body
 - F protein: Membrane Fusion
 - H protein: Hemagglutinin
- Lives in the nose or throat mucus of infected person → airborne transmission



CONDITIONS OF THE MEASLES

1. Classic: Unvaccinated person gets the virus
2. Modified: Vaccinated person gets the virus, doesn't have a sufficient immune response
3. Atypical: Those vaccinated with killed virus, doesn't have a sufficient immune response
4. Post-Infectious Neurologic Measles: Individuals who contracted the virus, ended up with encephalitis
5. Severe: Virus takes major toll on the body, usually is fatal
6. Complications: Encephalitis, Otitis Media, Pneumonia



<https://www.providencemedical.com.au/how-to-take-care-of-a-family-member-with-flu-like-symptoms/>

TREATMENTS

- Since the Measles is a viral infection, antibiotics are not typically given
- Instead, the best way to alleviate symptoms include:
 - Resting
 - Pushing fluids
 - Switching between Tylenol & Ibuprofen to alleviate fever
 - Humidifiers can help dry cough and sore throat

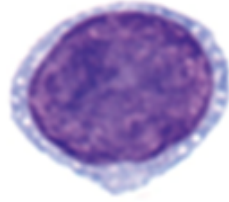
(Higuera, 2019)

Small lymphocyte

(Parham, 2021)

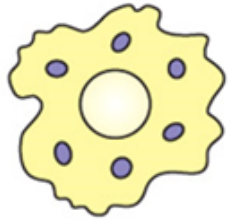


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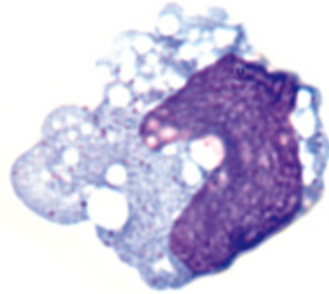


Production of antibodies (B cells) or cytotoxic and helper functions (T cells)

Macrophage



j

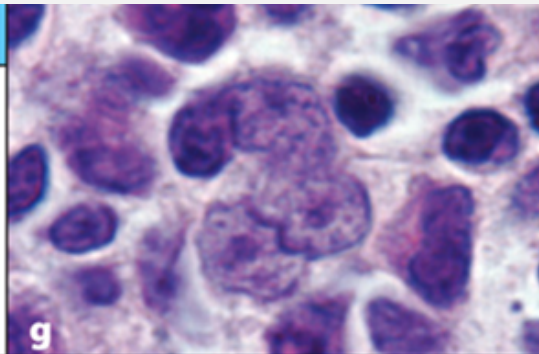


Phagocytosis and killing of microorganisms.
Activation of T cells and initiation of immune responses

Dendritic cell



g



Activation of T cells and initiation of adaptive immune responses

HOW THE MEASLES ATTACKS THE IMMUNE SYSTEM

- Attacks lymphocytes, dendritic cells, and macrophages
 - Virus spreads to lymphoid tissue that's close by & enters the bloodstream
 - The infected cells allow the virus to transfer itself to epithelial cells
- Virus will stop interferon production once the host enters prodromal stage
 - Proteins on virus will facilitate apoptosis pathways on immune cells

(Kondamudi & Waymack, 2021)

THE ADAPTIVE IMMUNE SYSTEM'S FIGHT

- Antigen-specific antibodies & activated T cells begin to circulate
- Cytotoxic T cells (CD8+) and Helper T cells (CD4+) move into tissues & areas the virus has taken over
- T cells circulate/proliferate and produce cytokines
- All work together to get rid of the virus and infected cells
- Levels of CD4+ stay high → viral RNA can be found in respiratory secretions even after infection is infected

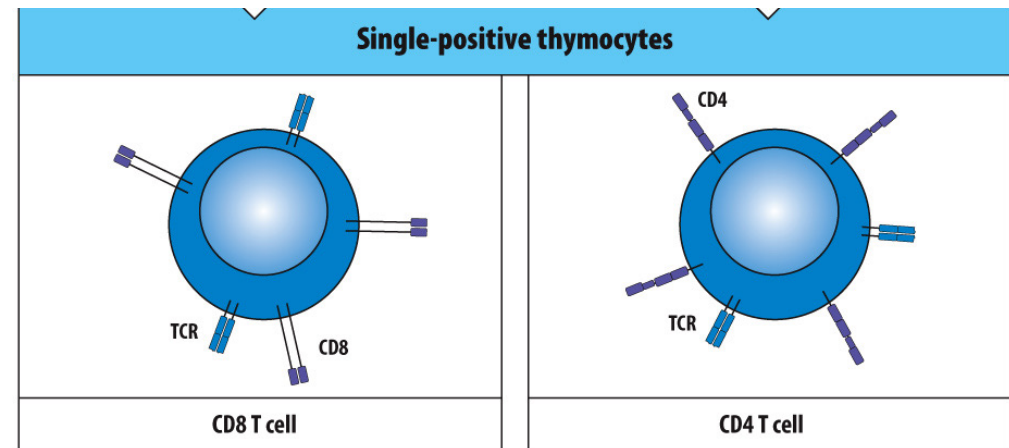


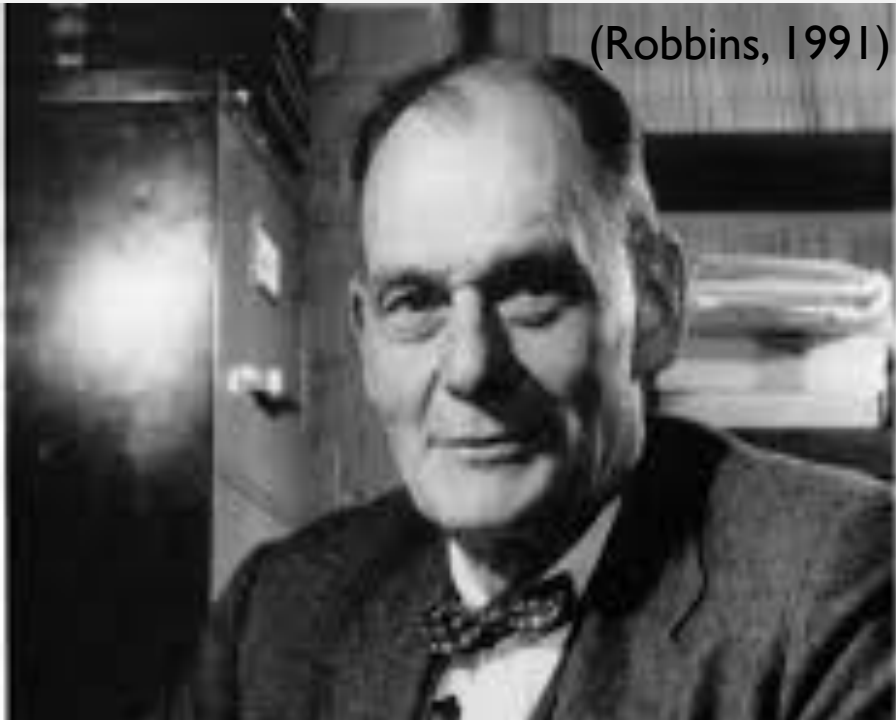
Figure 7.17 The Immune System, 4th ed. (© Garland Science 2015)

IMMUNOSUPPRESSION & IMMUNE AMNESIA

- Measles was the first immunosuppressive virus found
- Causes a proliferation of measles-specific lymphocytes which will replace memory B & T cells
 - Recognition and fighting the virus decreases greatly
- Makes secondary infections more dangerous
 - Transient lymphopenia, pneumonia, pregnancy issues (low birthweight, miscarriages, maternal death)



(Martin, 2010)

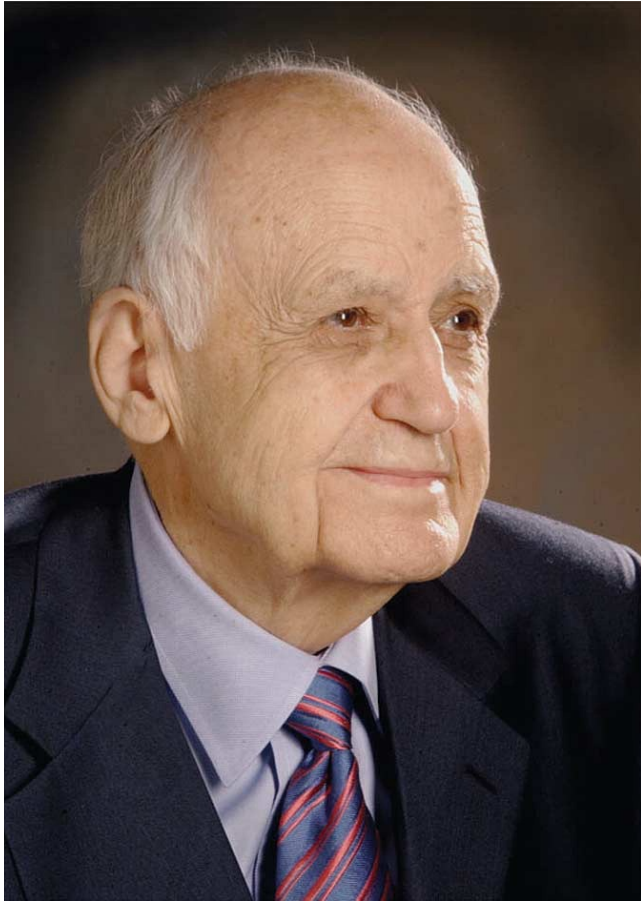


(Robbins, 1991)

THE FIRST VACCINES

- John Enders & Thomas C. Peebles (1954) got blood samples from infected students
- Was successful in isolating the virus, and created two vaccines
- The first was an inactivated one, tested on monkeys and caused severe pneumonia, hemorrhagic/vesicular rashes, and high fevers & was withdrawn
- The second was created by Enders & colleagues in 1963
 - Vaccine was accepted and licensed to the US

(CDC, 2020)



(Oransky, 2005)

THE THIRD & IMPROVED VACCINE

- In 1968, Maurice Hilleman and colleagues released a new measles vaccine
- Contained a live but weakened version of the virus (compared to Enders')
- This is the vaccine that has been used since its creation
- This strain of the virus and vaccine has been combined with other vaccines for mumps, rubella, and varicella

(CDC, 2020)

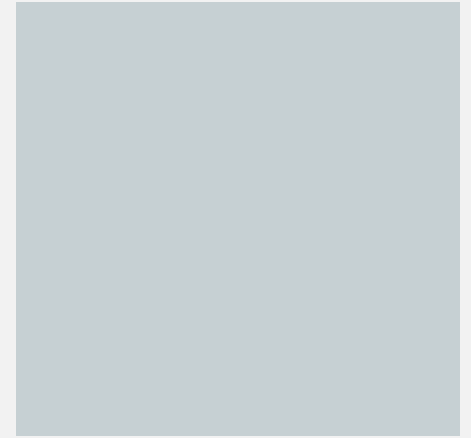
Vaccine	Age	1 st Dose	2 nd Dose
MMR	Toddlers/Pre-school usually Can also be given to adults	12-15 months	4-6 years
MMRV	ONLY 12 mo. – 12 yrs.	12-15 months	4-6 years

DOSING AND FREQUENCY OF VACCINES

TARGET POPULATIONS

- Most common population is toddlers for first dose (12-15 months)
- Adults and teenagers can get the vaccine if not administered as a child
- Any high-risk population
 - Immunocompromised
 - Pregnant women
 - College students
 - Healthcare workers or individuals who travel

(CDC, 2021)



<https://www.jglawnc.com/practice-areas/workplace-injuries/covid-19-and-healthcare-workers/>

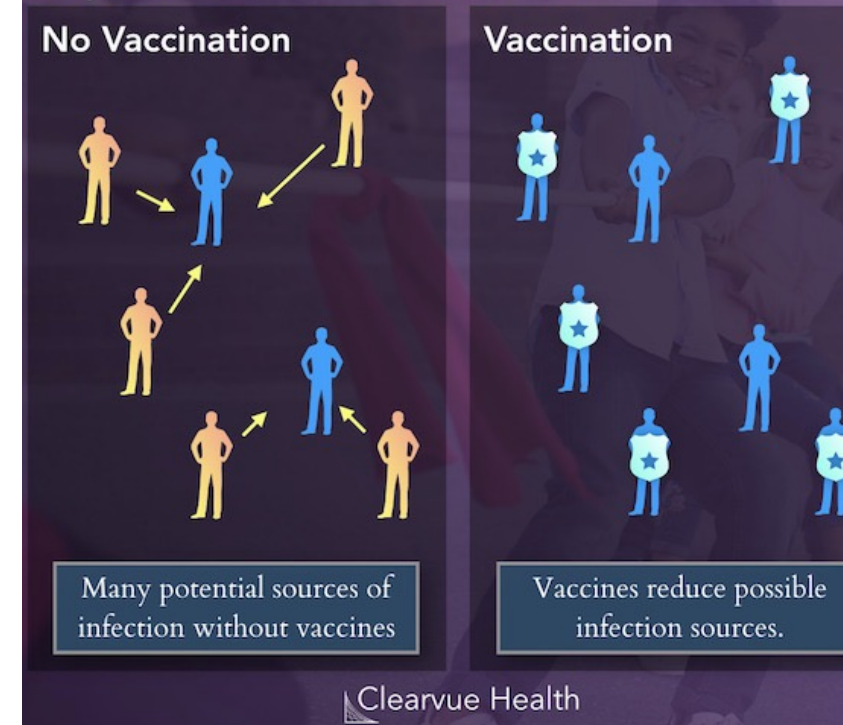
<https://www.livescience.com/50877-regnancy-body-changes.html>

HERD IMMUNITY

- Some of the population are unable or unwilling to get the vaccine, so herd immunity is an effective way to keep the population safe
- 1 measles individual can infect 18 others
- Herd Immunity is reached when 95% of a community is immunized → protects the other 5%

Herd Immunity

Higher vaccination rates reduce infection rates for everyone, vaccinated and unvaccinated.





RECENT STATISTICS OF THE MEASLES

- As of 2021, the United States had 47 Measles cases
- Third world countries consistently have thousands more, due to inaccessibility of the vaccine
- The Measles is still a very real virus, even amongst the current pandemic
 - Vaccines should still be available to other countries, and education/awareness should remain in place

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