



**Wolters Kluwer**

When you have to be right

# **Introduction to Clinical Pharmacology**

## **Chapter 47 Vaccines**

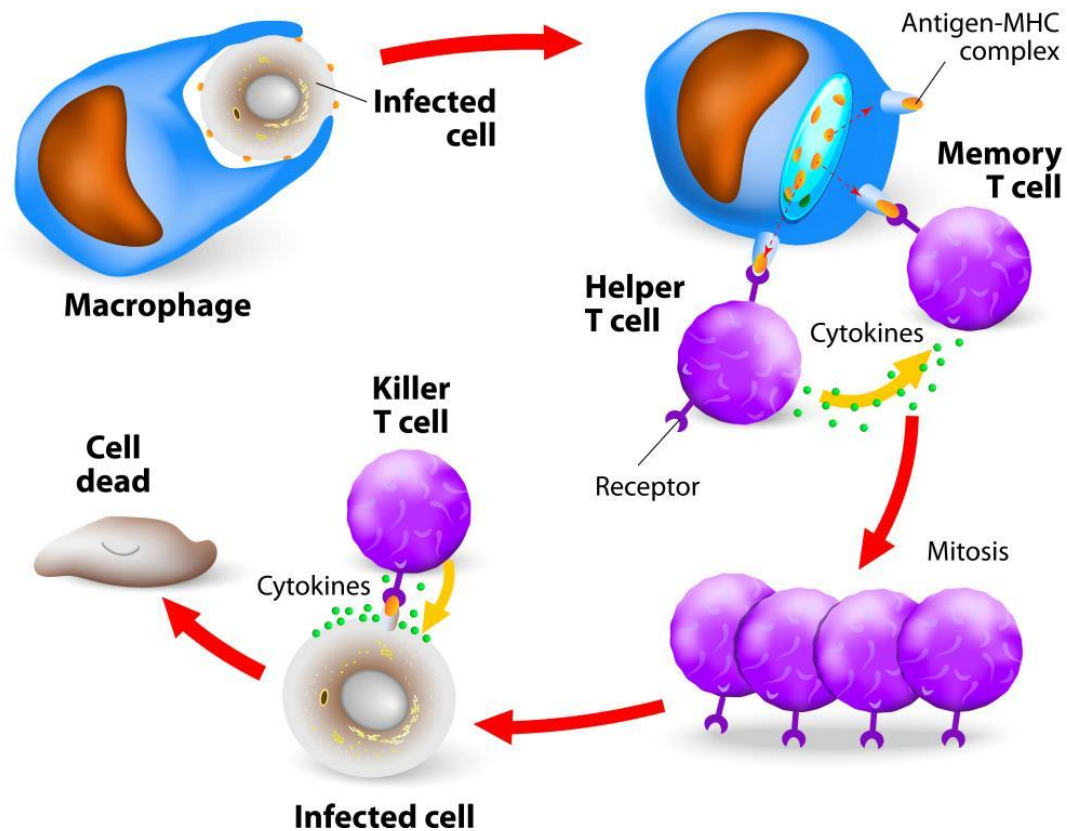
# Learning Objectives

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1. Discuss humoral immunity and cell-mediated immunity.
2. Compare and contrast the different types of immunity.
3. Explain the use of vaccines, toxoids, immune globulins, and antivenins to provide immunity against disease.
4. Distinguish preadministration and ongoing assessments the nurse should perform with the client receiving an immunologic agent.
5. Identify nursing diagnoses particular to a client receiving an immunologic agent.
6. Examine ways to promote an optimal response, management of common adverse reactions, special considerations, and important points to keep in mind when educating a client taking an immunologic agent.

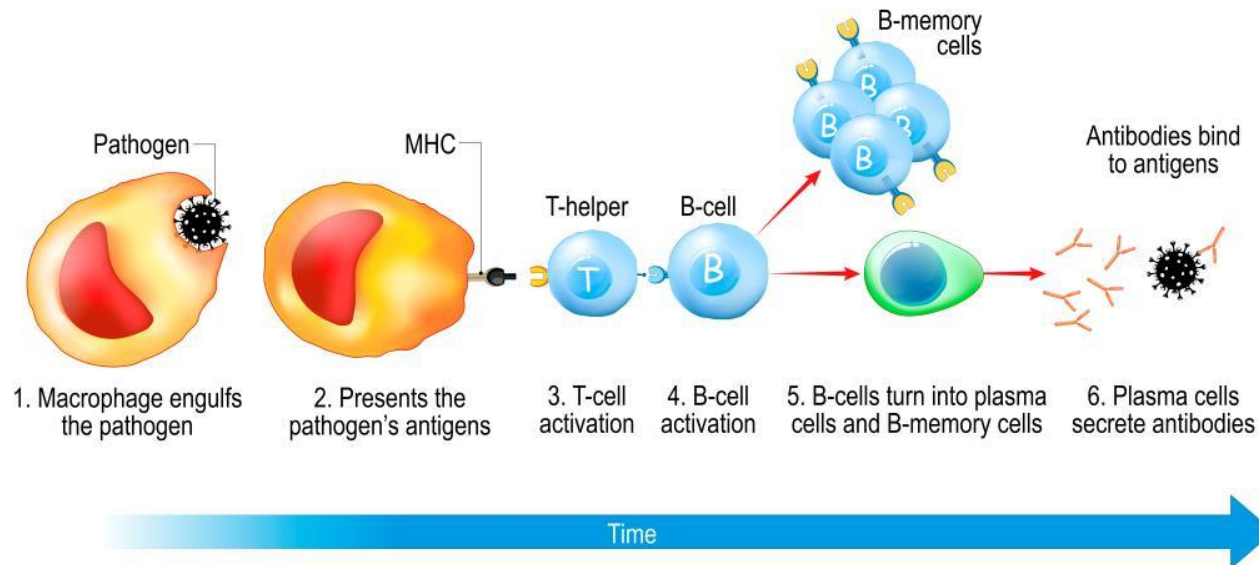
# Cell-Mediated Immunity

## CELL-MEDIATED IMMUNE RESPONSE

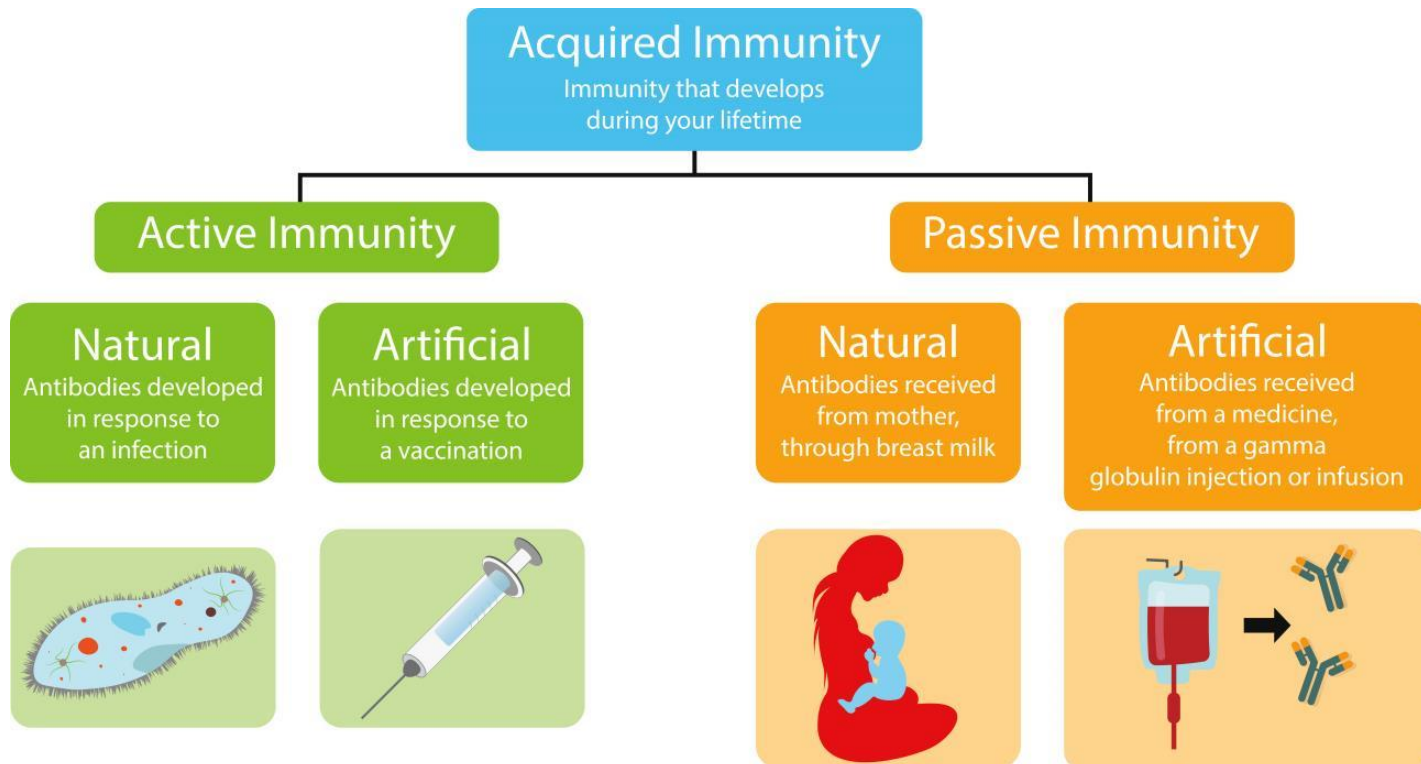


# Humoral Immunity

## Immune response humoral immunity



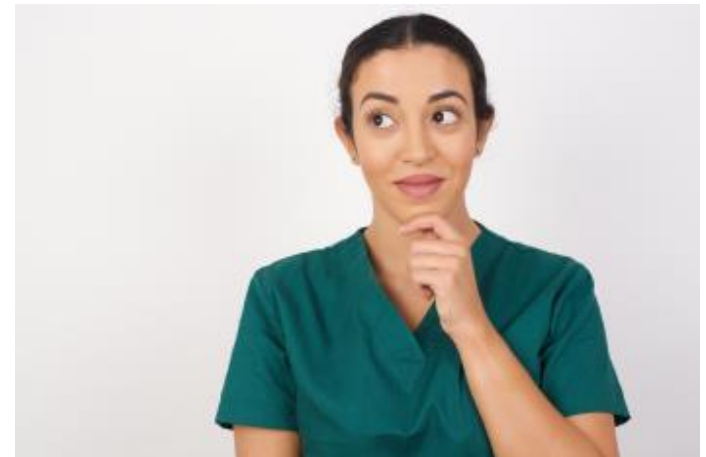
# Active and Passive Immunity



# Pharmacology in Practice #1

❖ A client travelling to South Africa and India is concerned about endemic diseases and is eager to know about any vaccination to prevent such diseases. For which of the following diseases are vaccinations given before travelling to endemic areas? Select all that apply.

- a) Typhoid
- b) Cholera
- c) Tetanus
- d) Yellow fever
- e) Rubella



# Vaccines and Toxoids

- Some capitalize on body's natural defenses: Stimulate immune response and create within-body protection to specific disease
- Some supply ready-made antibodies to provide passive immunity



# Vaccines and Toxoids—Actions and Uses

- Vaccines: contain either attenuated (weakened) or killed antigen, developed to create immunity to certain diseases; some have live organisms
- Toxin: poisonous substance produced by a bacterium (such bacterium causing tetanus)
- An attenuated toxin is capable of stimulating body to produce antitoxins or toxoids
- Both vaccines and toxoids are administered typically before exposure to the disease-causing organism to stimulate the body's immune response



# Vaccines and Toxoids—Actions and Uses (continued)

- Vaccines and toxoids are used for:
  - Routine immunization of infants and children
  - Immunization of adults against tetanus
  - Adults at high risk for certain diseases
  - Children or adults at risk for exposure to a particular disease
  - Immunization of prepubertal girls or nonpregnant women of childbearing age against rubella



# Vaccines and Toxoids—Adverse Reactions

- Common Adverse Reactions are Usually Mild:
  - Chills; fever
  - Muscular aches and pains; rash; lethargy
  - Pain and tenderness at the injection site
- Rare and can be severe:
  - Hypersensitivity reaction



# Vaccines and Toxoids—Contraindications

- Immunologic agents are contraindicated in clients with:
  - hypersensitivity to the agent of any of the components
  - Febrile illness, leukemia, lymphoma, immunosuppressive illness or therapy, and nonlocalized cancer
  - allergy to eggs (in some vaccines)
  - history of an allergic reaction to gelatin, neomycin, or a previous dose of one of the vaccines (measles, mumps, and rubella vaccine)
  - pregnancy/first trimester for measles, mumps, and rubella
  - acute stages of herpes zoster; delay vaccination with recombinant zoster vaccine until symptoms subside



# Vaccines and Toxoids—Interactions

- Vaccines and toxoids:
  - Corticosteroids; antineoplastic drugs; radiation therapy: depress immune system
  - Salicylates administered with varicella vaccination: risk for Reye syndrome develops
- Immune globulins and vaccinations containing live organisms:
  - Live organism vaccines should not be administered to clients within 3 months of receiving immune globulin; may interfere with the immune response to the vaccination



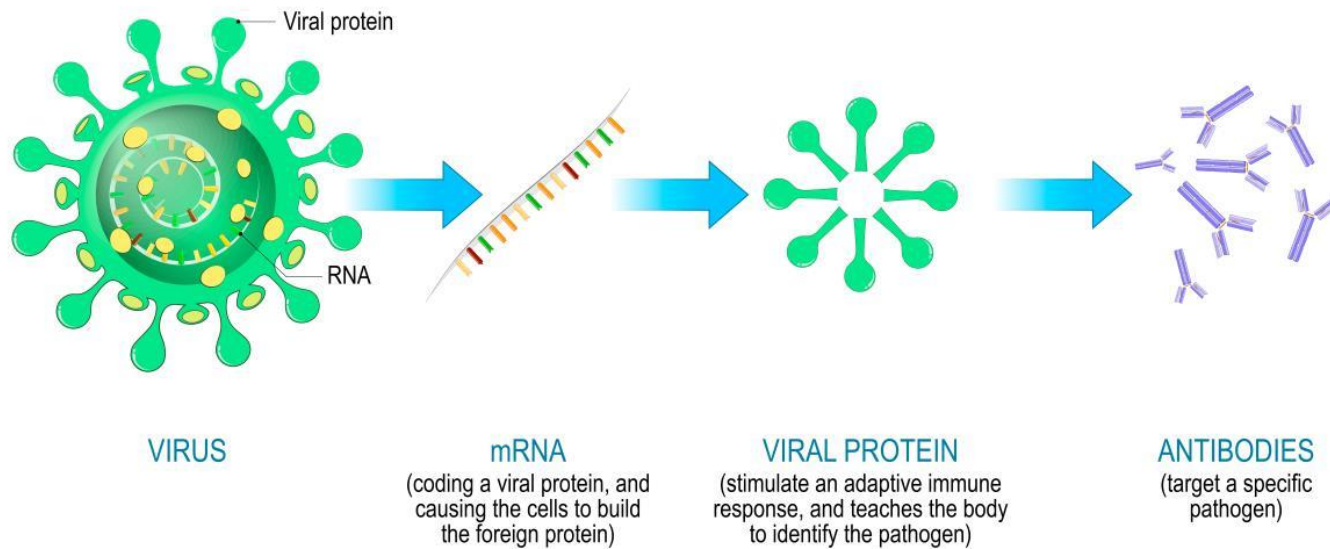
# COVID-19 Vaccines

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- COVID-19 is the disease caused by the SARS-CoV-2 virus
- Actions: use mRNA vaccine technology to trigger an immune response and build immunity to SARS-CoV-2; the vaccine helps the body to produce antibodies and activates the T-cells to recognize and respond to the Corona Spike before it can attach to a normal cell
- Vaccine hesitancy due to perceived rapid development
- COVID-19 vaccine testing was in tandem rather than sequentially
- Emergency use of the vaccine was granted

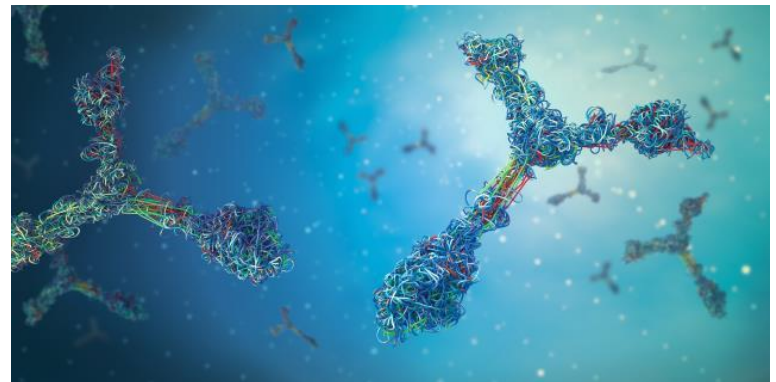
# COVID-19 Vaccines—mRNA Technology Mechanism of Action

## mRNA vaccine (mechanism of action)



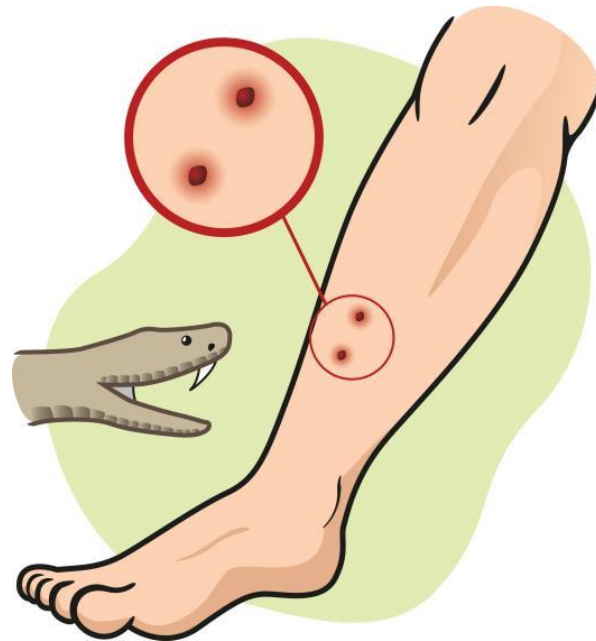
# Immune Globulins and Antivenins—Actions and Uses

- Immune globulins:
  - Proteins present in the blood serum or plasma that contain antibodies
  - Solutions obtained from human or animal blood containing antibodies formed by body to specific antigens
  - Used to provide passive immunization to one or more infectious diseases; rapid but short duration of immunity for 1 to 3 months



# Immune Globulins and Antivenins—Uses

- Antivenins:
  - Used for passive, transient protection from toxic effects of bites by spiders and snakes
  - Administered within 4 hours after exposure for most effective response





# Immune Globulin—Adverse Reactions

- Rare but Most Common Reactions:
  - Local tenderness and pain at injection site
  - Urticaria
  - Angioedema
  - Erythema
  - Malaise
  - Nausea and diarrhea
  - Headache
  - Chills and fever



# Antivenins—Adverse Reactions

- Hypersensitive Reactions occur within 30 minutes of administration:
  - Apprehension
  - Flushing
  - Itching and urticaria
  - Edema of the face, tongue, throat
  - Cough dyspnea
  - Vomiting
  - Cyanosis
  - Collapse



-ANAPHYLAXIS-

# Immune Globulins and Antivenins— Contraindications

- Immune globulins contraindicated in clients with:
  - a history of allergic reactions after administration of human immunoglobulin preparations
  - isolated immunoglobulin A deficiency
  - diabetes, or older than 65 years, or receiving nephrotoxic drugs (IVIg products)
- Antivenins contraindicated in clients with:
  - Hypersensitivity to equine serum or any other component of serum



# Immune Globulins and Antivenins—Precautions

- Immune globulins used with extreme caution in:
  - Clients with history of allergies
  - Pregnancy (pregnancy category C) and lactation
  - Children
- Antivenins are used with extreme caution in:
  - Pregnancy (pregnancy category C) and lactation
  - Children



# Immune Globulins and Antivenins—Interactions

- Antibodies in immune globulin preparations:
  - Interfere with immune response to live virus vaccines, particularly measles, others, such as mumps and rubella
- Antivenins:
  - No known interactions



# Nursing Process—Client Receiving a Vaccine #1

## ❖ Preadministration Assessment

- Objective Data
  - General client appearance
  - Vital signs



# Nursing Process—Client Receiving a Vaccine #2

- ❖ **Preadministration Assessment (continued)**
  - **Subjective Data**
    - Previous vaccine history
    - Basic medical history (conditions that are contraindicated with vaccine)
    - Allergy history



# Nursing Process—Client Receiving a Vaccine #3

## ❖ Ongoing Assessment

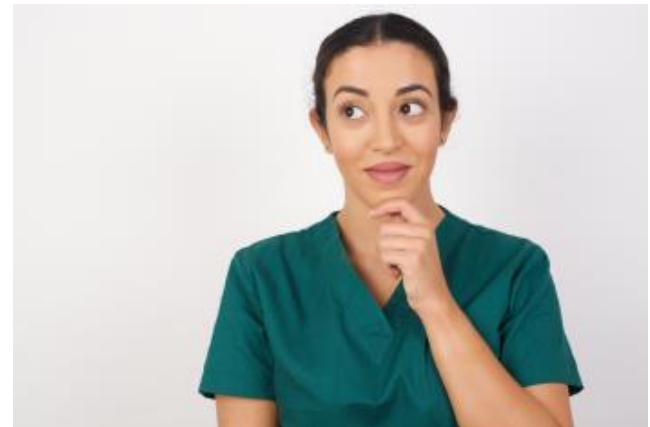
- During observation period after administration:
  - Signs of hypersensitivity
  - Keep resuscitation equipment nearby





## Pharmacology in Practice #2

- ❖ A client is advised to stay in the clinic for observation for about 30 minutes after administering an immunologic agent. Which of the following signs should the nurse assess for to identify a hypersensitivity reaction? Select all that apply.
- a) Pruritus
  - b) Laryngeal edema
  - c) Dyspnea
  - d) Renal failure
  - e) Convulsions



# Nursing Process—Client Receiving a Vaccine #4

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## ❖ Nursing Diagnosis

- Acute Pain related to adverse reactions (pain and discomfort at the injection site, muscular aches, and pain)
- Altered Health Seeking Behavior related to timing of immunization schedule

# Nursing Process—Client Receiving a Vaccine #5

## ❖ Planning

- Expected client outcomes depend on the reason for administration of the immunologic agent but include:
  - Optimal response to the immunologic agent
  - Support of client needs related to the management of adverse reactions
  - Understanding of and adherence with the prescribed immunization schedule

# Nursing Process—Client Receiving a Vaccine #6

## ❖ Implementation

- Promoting an Optimal Response to Therapy
  - Most vaccine preparations require refrigeration; have a back-up plan for storage if you lose power
  - Read directions enclosed with vaccine



# Nursing Process—Client Receiving a Vaccine #7

## ❖ Implementation

- Promoting Optimal Response to Therapy—*Multiple Vaccines at One Visit*
  - The number of vaccines that children receive has increased with new vaccine developments; clients and parents can become distressed, and this can cause delays in recommended vaccinations.



# Nursing Process—Client Receiving a Vaccine #8

## ❖ Implementation

- Promoting Optimal Response to Therapy—*Multiple Vaccines at One Visit (continued)*
  - Nurses can decrease distress by the following:
    - Do not aspirate IM injections and give most painful injection last
    - Use a pacifier during the procedure if younger than 2 years
    - Parent should be present and hold the child; the child older than 3 years should sit up
    - Use a topical anesthetic

# Nursing Process—Client Receiving a Vaccine #9

## ❖ Implementation

- Promoting Optimal Response to Therapy—*Delaying Immunization*
  - Delays of vaccines are indicated for certain circumstances
  - Clients can receive most vaccines while also mildly ill (e.g., cold with low-grade fever)
  - Vaccines are held until after a client has recovered from a moderate to severe illness
  - Read the vaccine package insert or visit the Immunization Action Coalition website to see specific contraindications

# Nursing Process—Client Receiving a Vaccine #10

## ❖ Implementation

- Promoting Optimal Response to Therapy—*Documentation of Immunizations*
  - Document the following information in client's chart or form:
    - Date of vaccination; route and site; vaccine type; manufacturer
    - Lot number and expiration date
    - Name, address, and title of individual administering vaccine
    - When to return if a booster is indicated



# Nursing Process—Client Receiving a Vaccine #11

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Acute Pain**
      - Increase fluids in diet; allow for adequate rest
      - Keep atmosphere quiet and nonstimulating
      - Acetaminophen may be prescribed
      - Do not aspirate during injection



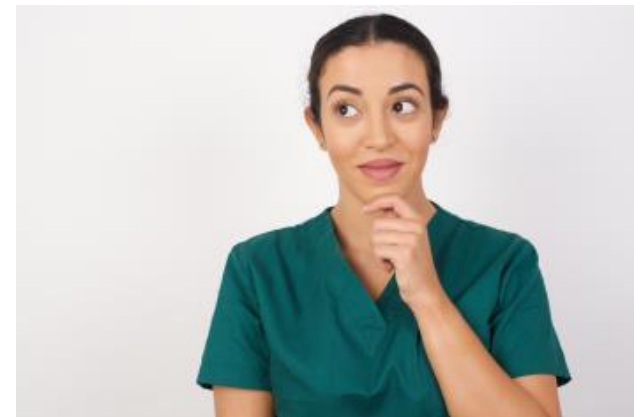
# Nursing Process—Client Receiving a Vaccine #12

## ❖ Implementation

- Monitoring and Managing Client Needs
  - **Acute Pain (continued)**
    - Topical numbing solution can be prescribed and applied by parent prior to appointment
    - Use two nurses to give two injections at the same time to pediatric clients
    - Treat local irritation at injection site with warm or cool compresses, depending on client's preference
    - Palpable lump after DTaP is normal and should resolve

# Pharmacology in Practice #3

- ❖ A child complains of pain at the injection site following the administration of the measles vaccine. Which of the following interventions should a nurse instruct the parent to implement for pain management following vaccine administration? Select all that apply.
- a) Administer acetaminophen
  - b) Massage the injection site
  - c) Decrease fluid intake
  - d) Encourage adequate rest
  - e) Apply heat



# Nursing Process—Client Receiving a Vaccine #13

## ❖ Implementation

- Monitoring and Managing Client Needs
  - **Altered Health Seeking Behavior**
    - Many parents have fears about vaccine reactions stemming from a published study falsely linking autism with the MMR vaccine
    - Educate and encourage parents to have their infants and young children receive immunizations
    - A personalized immunization plan can be printed from the CDC Immunization website
    - Provide parents with copy of the record of immunizations

# Nursing Process—Client Receiving a Vaccine #14

## ❖ Implementation—Educating the Client and Family

- Discuss risks of contracting vaccine-preventable diseases and benefits of immunization
- Instruct parents to bring immunization records to all visits
- Provide date for return for next vaccination
- Discuss adverse reactions and methods to combat these reactions



# Nursing Process—Client Receiving a Vaccine #15

## ❖ Implementation—Educating the Client and Family

- Clients travelling globally need to consult with their primary healthcare provider well in advance of travel to make sure required vaccinations are administered in time to produce adequate immunity



# Nursing Process—Client Receiving a Vaccine #16

## ❖ Evaluation

- Was the therapeutic effect achieved and the disease for which the immunization given prevented?
- Were adverse reactions: identified, reported, and managed?
  - Acute injection pain is managed successfully
  - Client or parents/guardians adhere to the immunization schedule
- Did client express confidence and demonstrate understanding of drug regimen?

## Turn and Talk—Case Study

You are standing in line at the grocery store pharmacy waiting to get your yearly flu vaccine. The person in front of you is speaking very loudly and is saying “the yearly vaccine is just a way for the pharmacies and grocery stores to make money. If it’s the flu why do they have to do this every year?”

1. The yearly influenza vaccine is what form of immunity?
2. As a nurse, how would you explain the need for yearly booster vaccines for the influenza virus?

