RECONSTITUTION OF SOLUTIONS

CALHOUN COMMUNITY COLLEGE
RECONSTITUTION

• A DRUG IN POWDERED FORM IS NECESSARY WHEN A MEDICATION IS UNSTABLE AS A LIQUID FORM FOR A LONG PERIOD.

• THIS POWDERED DRUG MUST BE RECONSTITUTED OR DISSOLVED WITH A STERILE DILUENT BEFORE ADMINISTRATION.
RECONSTITUTION

- The process of adding a **SOLVENT** or **DILUENT** to a medication in powdered form to dissolve it and form a solution

  *EX: CRYSTAL LIGHT*

- Reconstitution is performed mostly in the pharmacy except those medications needed to be reconstituted immediately before administration

- **SOLUTE** – A powder or liquid concentrate to be dissolved or diluted

- **SOLVENT (DILUENT)** – A liquid that is added to the powder or liquid concentrate

- **SOLUTION** – The liquid that results when the solvent dissolves the solute
PRINCIPLES OF RECONSTITUTION

• **YOU MUST FOLLOW THE MANUFACTURERS DIRECTION FOR RECONSTITUTION.** THEY WILL PROVIDE:

1. THE EXPIRATION DATE
2. TYPE OF DILUENT/SOLVENT TO USE *(STERILE WATER, STERILE NORMAL SALINE, 5% DEXTROSE & BACTERIOSTATIC WATER – SOME POWDERED MEDS FOR ORAL USE MAY EVEN BE RECONSTITUTED WITH TAP WATER): NEVER ASSUME THE TYPE OR AMOUNT OF DILUENT TO BE USED…*
3. AMOUNT (ML) OF DILUENT/SOLVENT TO BE USE
4. LENGTH OF TIME MEDICATION IS GOOD ONCE MIXED *(SEVERAL HOURS TO SEVERAL DAYS ~ SOME UP TO 14 DAYS)*
5. WHERE TO STORE ONCE MIXED (SHELF, REFRIGERATOR, ETC)
PRINCIPLES OF RECONSTITUTION (CON’T)

• IF NO DIRECTIONS ARE PROVIDED, USE THE PDR, YOUR POCKET DRUG GUIDE, OR CALL THE PHARMACY FOR GUIDANCE (FOLLOW FACILITY WHERE YOU ARE WORKING POLICY)

• IF A MULTI-DOSE VIAL, ONCE MIXED, YOU MUST LABEL THE MEDICATION WITH YOUR INITIALS, DATE AND TIME MIXED, EXPIRATION DATE, ALONG WITH THE FINAL CONCENTRATION AFTER MIXTURE

• RECOGNIZE THAT AFTER THE DILUENTS IS ADDED TO THE POWDER, THERE MAY BE ADDITIONAL (DISPLACED) VOLUME TO THE SOLUTION
  
  • EX: ADD 0.5 ML TO 2 G OF POWDERED MEDICATION TO PROVIDE APPROXIMATE VOLUME OF 1 ML (2 G/1 ML)
DIFFERENT IV AND IM RECONSTITUTION INSTRUCTIONS

For I.M. or I.V. Use
CAUTION: Addition of diluent generates pressure within the vial. Vent slowly.
For I.V. solution—Dilute with at least 5 ml Sterile Water for Injection or other approved diluent. SHAKE WELL TO DISSOLVE. See literature.
For I.M. solution—Add 1.5 ml of an approved diluent. SHAKE WELL TO DISSOLVE. Provides an approximate volume of 1.8 ml (280 mg per ml). For dosage and administration see literature.
Prior to Reconstitution: Protect from Light; Store at 59° to 86°F.
After Reconstitution: Store in a refrigerator and use within 7 days. If kept at room temperature, use within 24 hours. Once reconstituted, light protection is not needed.
Each vial contains: 500 mg of Ceftazidime and 59 mg of Sodium Carbonate. Sodium content: approximately 27 mg (1.2 mEq) of sodium per vial.
WV 4622 AMX
Eli Lilly & Co., Indianapolis, IN 46285, U.S.A.
Exp. Date/Control No.
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NDC 0002-7230-01
VIAL No. 7230

Equivalent to
500 mg
Ceftazidime Activity

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THINK TIME

1. WHAT IS THE TOTAL DOSAGE STRENGTH OF TAZIDIME IN THE VIAL? ______

2. HOW MUCH DILUENT IS ADDED TO THE VIAL TO PREPARE THE MEDICATION FOR IM USE? ____________________________________________________________

3. WHAT DILUENT IS RECOMMENDED FOR RECONSTITUTION FOR IM ADMINISTRATION? __________________________________________________________

4. WHAT IS THE FINAL CONCENTRATION OF THE SOLUTION PREPARED FOR IM ADMINISTRATION? __________________________________________________________

5. HOW LONG DOES THE MEDICATION RETAIN ITS POTENCY AT ROOM TEMPERATURE? ______________ IF REFRIGERATED? ______________

6. 400 MG IM Q 8 HRS IS ORDERED. HOW MANY ML WILL YOU GIVE? __________________________________________________________
THINK TIME ANSWERS

1. WHAT IS THE TOTAL DOSAGE STRENGTH OF TAZIDIME IN THE VIAL? **500 MG**

2. HOW MUCH DILUENT IS ADDED TO THE VIAL TO PREPARE THE MEDICATION FOR IM USE? **1.5 ML**

3. WHAT DILUENT IS RECOMMENDED FOR RECONSTITUTION FOR IM ADMINISTRATION? **APPROVED DILUENT**

4. WHAT IS THE FINAL CONCENTRATION OF THE SOLUTION PREPARED FOR IM ADMINISTRATION? **280 MG/ML**

5. HOW LONG DOES THE MEDICATION RETAIN ITS POTENCY AT ROOM TEMPERATURE? **24 HOURS** IF REFRIGERATED? **7 DAYS**

6. 400 MG IM Q 8 HRS IS ORDERED. HOW MANY ML WILL YOU GIVE?

   **400 MG** X **1 ML = 1.42 ML = 1.4 ML**

   **280 MG**
• ORDER: SOLU-MEDROL 200 MG IV Q 6 H
RECONSTITUTION DRUG ORDER

• **FIRST**, TO FILL THE ORDER, HOW MUCH AND WHAT TYPE OF DILUENT MUST YOU ADD? ___________________________________________

• **SECOND**, WHAT IS THE SUPPLY DOSAGE OF THE RECONSTITUTED SOLU-MEDROL? WHEN ADDING 8 ML OF DILUENT, THE SUPPLY DOSAGE IS _______ MG/ML

• **THIRD**, WHAT IS THE RESULTING TOTAL VOLUME OF THIS RECONSTITUTED SOLUTION? THE TOTAL VOLUME IS _____________. (YOU KNOW THIS BECAUSE 62.5 MG/ML × ____________ = 500 MG).

• **FINALLY**, HOW MANY FULL DOSES OF SOLU-MEDROL ARE AVAILABLE IN THIS VIAL? THE VIAL CONTAINS 500 MG AND THE ORDER IS FOR 200 MG. THERE ARE ____________ FULL DOSES IN THE VIAL. A RECONSTITUTION LABEL IS NEEDED.

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RECONSTITUTION DRUG ORDER ANSWERS

• **FIRST**, TO FILL THE ORDER, HOW MUCH AND WHAT TYPE OF DILUENT MUST YOU ADD? *8 ML OF BACTERIOSTATIC WATER*

• **SECOND**, WHAT IS THE SUPPLY DOSAGE OF THE RECONSTITUTED SOLU-MEDROL? WHEN ADDING 8 ML OF DILUENT, THE SUPPLY DOSAGE IS *62.5 MG/ML*

• **THIRD**, WHAT IS THE RESULTING TOTAL VOLUME OF THIS RECONSTITUTED SOLUTION? THE TOTAL VOLUME IS *8 ML* (YOU KNOW THIS BECAUSE 62.5 MG/ML × 8 ML = 500 MG).

• FINALLY, HOW MANY FULL DOSES OF SOLU-MEDROL ARE AVAILABLE IN THIS VIAL? THE VIAL CONTAINS 500 MG AND THE ORDER IS FOR 200 MG. THERE ARE *2* FULL DOSES IN THE VIAL. A RECONSTITUTION LABEL IS NEEDED.
RECONSTITUTION DOSAGE CALCULATION

• CALCULATE ONE DOSE.
  
  • **STEP 1. CONVERT** - NO CONVERSION IS NECESSARY
    
    • ORDER: SOLU-MEDROL 200 MG IV Q.6H
    • SUPPLY: 62.5 MG/ML
  
  • **STEP 2. THINK**
    
    • YOU WANT TO GIVE MORE THAN 1 ML.
  
  • **STEP 3. CALCULATE**
    
    $\frac{D}{H} \times Q = \frac{200 \text{ mg}}{62.5 \text{ mg}} \times 1\text{ mL} = 3.2 \text{ mL}$ given IV q 6 h
MORE SAMPLES

First, to fill the order, how much and what type of diluent must you add? 

______________________________

Second, what is the supply dosage of the reconstituted PCN V?

______________________________

Third, what is the resulting total volume of this reconstituted solution? The total volume is ___________
First, to fill the order, how much and what type of diluent must you add?

117 ml of water

Second, what is the supply dosage of the reconstituted PCN V?
125 mg/5mL

Third, what is the resulting total volume of this reconstituted solution? The total volume is 200 mL
1. What is the total strength of Zithromax in this vial? ___________________

2. How much diluent is added to the vial to prepare the drug for use? ______

3. What diluent is recommended for reconstitution? _____________________

4. What is the final concentration of the prepared solution for administration? __________________________________________
ANSWERS

1. What is the total strength of Zithromax in this vial? **500 mg**

2. How much diluent is added to the vial to prepare the drug for use? **4.8 mL**

3. What diluent is recommended for reconstitution? **Sterile Water**

4. What is the final concentration of the prepared solution for administration? **100 mg/mL**
1. What is the total strength of Kefzol in this vial? ______________________
2. How much diluent is added to the vial to prepare the drug for use? _______
3. What diluent is recommended for reconstitution? _____________________
4. What is the final concentration of the prepared solution for administration? __________________________________________
5. How long will the reconstituted material retain its potency at room temperature? ________________________________
ANSWERS
1. What is the total strength of Kefzol in this vial? **500 mg**
2. How much diluent is added to the vial to prepare the drug for use? **2 mL**
3. What diluent is recommended for reconstitution? **Sterile Water**
4. What is the final concentration of the prepared solution for administration? **225 mg/mL**
5. How long will the reconstituted material retain its potency at room temperature? **24 hours**
RECONSTITUTION OF NON-INJECTABLE SOLUTIONS

- ENTERAL FEEDINGS – NUTRITION ADMINISTERED VIA THE GASTROINTESTINAL TRACT (NG TUBE, J TUBE OR G TUBE) MAY BE FULL STRENGTH OR DILUTED.
CONTINUOUS FULL STRENGTH FEEDING ORDERS

• ORDER: NEPRO 400 ML TO INFUSE OVER 8 HRS FOLLOWED BY 100 ML WATER AFTER EACH FEED. DETERMINE THE RATE IN ML PER HOUR.
  ➢ \( \frac{400 \text{ ML}}{8 \text{ HR}} = \boxed{50 \text{ ML/HR}} \)

• ORDER: ENSURE 1200 ML TO INFUSE OVER 24 HRS FOLLOWED BY 250 ML WATER AFTER EACH FEED. DETERMINE THE RATE IN ML PER HOUR.
  ➢ \( \frac{1200 \text{ ML}}{24 \text{ HR}} = \boxed{50 \text{ ML/HR}} \)
CALCULATING SOLUTIONS

• **STEP ONE:** PREPARE SOLUTIONS OF SPECIFIC STRENGTH, DETERMINE AMOUNT OF **SOLUTE**:

\[ D \times Q = X \]

D (DESIRE DSOLUTION STRENGTH)
Q (QUANTITY OF DESIRE DSOLUTION)
X (AMOUNT OF SOLUTE)

ORDER: 1/3 STRENGTH ENSURE 900 ML VIA NG TUBE OVER 8 HRS

\[
\frac{1}{3} \times 900 \text{ ML} = \text{AMOUNT OF SOLUTE}
\]

900/3 = 300 ML

YOU NEED 300 ML OF THE SOLUTE (ENSURE)
CALCULATING SOLUTIONS

• **STEP TWO:** DETERMINE AMOUNT OF SOLVENT NEEDED:

  • \( Q - S = X \)

  \( Q \) (QUANTITY OF DESIRED SOLUTION)  

  \( S \) (AMOUNT OF LIQUID SOLUTE)  

  \( S \) (AMOUNT OF SOLVENT)

ORDER: 1/3 STRENGTH ENSURE 900 ML VIA NG TUBE OVER 8 HRS

\[ Q \text{ (900 ML)} - S \text{ (300 ML)} = S \text{ (600 ML)} \]

THEREFORE, YOU WOULD ADD 600 ML OF WATER TO 300 ML OF ENSURE TO MAKE 900 ML OF 1/3 STRENGTH ENSURE.
ORDER: ¼ STRENGTH ISOMIL 12 OZ VIA NASOGASTRIC TUBE OVER 6 HOURS.

CONVERT OZ TO ML: ____________ ML

AMOUNT OF SOLUTE (ISOMIL): ____________ ML

AMOUNT OF SOLVENT (WATER): ____________ ML

HOW MANY ML /HR WILL YOU ADMINISTER THE ISOMIL?

(12 OZ) ____ ML DIVIDED BY 6 = ____ ML PER HOUR
SOLUTION CALCULATION ANSWER

- ORDER: \( \frac{1}{4} \) STRENGTH ISOMIL 12 OZ VIA NASOGASTRIC TUBE OVER 6 HOURS.
- CONVERT OZ TO ML: \( 12 \times 30 \) ML = 360 ML
- AMOUNT OF SOLUTE (ISOMIL): \( \frac{1}{4} \) OF 360 = 90 ML
- AMOUNT OF SOLVENT (WATER): 360-90 = 270 ML
- HOW MANY ML /HR WILL YOU ADMINISTER THE ISOMIL?
  - (12 OZ) 360 ML DIVIDED BY 6 = 60 ML PER HOUR
SOLUTION CALCULATION (EXAMPLE)

- ORDER: 2/3 STRENGTH ENSURE 6 OZ P.O. Q 4 H FOR 24 HRS.

- CONVERT OZ TO ML: _________ ML

- THE ORDER READS ADMINISTER 2/3 STRENGTH ENSURE 6 OZ EVERY 4 HOURS FOR 24 HOURS (24 ÷ 4 = 6 TIMES YOU WILL ADMINISTER 6 OZ)

  • WHAT IS THE TOTAL ML YOU WILL ADMINISTER IN 24 HOURS? ________

- AMOUNT OF SOLUTE (ENSURE): ___________ ML

- AMOUNT OF SOLVENT (WATER): ___________ ML
SOLUTION CALCULATION ANSWER

ORDER: 2/3 STRENGTH ENSURE 6 OZ P.O. Q 4 H FOR 24 HRS.

CONVERT OZ TO ML: 6 X 30 ML = 180 ML

THE ORDER READS ADMINISTER 2/3 STRENGTH ENSURE 6 OZ EVERY 4 HOURS FOR 24 HOURS (24 ÷ 4 = 6 TIMES YOU WILL ADMINISTER 6 OZ)

WHAT IS THE TOTAL ML YOU WILL ADMINISTER IN 24 HOURS? 180 ML X 6 (HOURS) = 1080 ML

AMOUNT OF SOLUTE (ENSURE): 2/3 OF 180 = 120 ML

AMOUNT OF SOLVENT (WATER): 180 – 120 = 60 ML
• The physician orders ampicillin 500 mg IM every 6 hours for a patient with pneumonia.

• How much diluent will be added to the bottle? ________

• What is the concentration after reconstitution? ________

• How many milliliters will the nurse administer? ________
ANSWERS

• THE PHYSICIAN ORDERS AMPICILLIN 500 MG IM EVERY 6 HOURS FOR A PATIENT WITH PNEUMONIA.

• HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? 3.5 ML

• WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? 250MG/ML

• HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? 500 MG X 1 ML = 2 ML

250 MG

For IM use, add 3.5 mL diluent (read accompanying insert). Resulting solution contains 250 mg ampicillin per mL. Use solution within 1 hour. This vial contains ampicillin sodium equivalent to 1 gram ampicillin. Usual Dosage: Adults—250 to 500 mg IM q. 6h.

READ ACCOMPANYING INSERT for detailed indications, IM or IV dosage and precautions.

APOTHECON®
A Bristol-Myers Squibb Company 740420DRL-3
Princeton, NJ 08540 USA 34-00148-01
• THE PHYSICIAN ORDERS ANCEF 500 MG IM EVERY 12 HOURS FOR A PATIENT WITH CELLULITIS.

• HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? _______

• WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? _______

HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? _______
ANSWERS

• THE PHYSICIAN ORDERS ANCEF 500 MG IM EVERY 12 HOURS FOR A PATIENT WITH CELLULITIS.

• HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? 2.5 ML

• WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? 330 MG/ML

• HOW MANY MILLILITERS WILL THE NURSE ADMINISTER?

\[\text{500 MG} \times 1 \text{ ML} = 1.51 = 1.5 \text{ ML}\]

330 MG

![Image of ANCEF label]
• VANCOCIN 1000 MG ORAL EVERY 6 HOURS HAS BEEN ORDERED FOR A PATIENT WITH COLITIS.
• HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? _______
• WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? _______
• HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? _______
ANSWERS

• VANCOCIN 1000 MG ORAL EVERY 6 HOURS HAS BEEN ORDERED FOR A PATIENT WITH COLITIS.

• HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? 20 ML

• WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? 250 MG/5ML

• HOW MANY MILLILITERS WILL THE NURSE ADMINISTER?

  \[1000 \text{ MG} \times 5 \text{ ML} = 20 \text{ ML}\]

  \[250 \text{ MG}\]