

Definition & Uses



- Capsules are solid dosage forms in which the drug is enclosed within either a hard or soft soluble container or 'shell.' The shells are usually formed from gelatin; however, they also may be made from starch or other suitable substances.
- Uses
 - Hard shell capsules offer a customized dosage form that can be made easily and conveniently in the pharmacy.
 - Almost any dose desired for a variety of administration routes (oral, rectal, vaginal) can be made quickly and cheaply.
 - Because the quantity of drug formulated into capsules can be measured accurately, this system is especially ideal for potent drugs and chemicals.
 - Combining several ingredients into a single dosage form can reduce the number of products a person has to take and improve adherence.
 - Capsules can mask unpleasant taste, aroma or appearance of a drug.

Capsule Components



1. Active Ingredients

- Bulk powders (may have to aliquot)
- Manufactured solid dosage forms (tablets or capsules)
- Compatibility Issues
 - ✦ Efflorescent Powders
 - ✦ Deliquescent Powders
 - ✦ Light, Easily Aerosolized Powders

2. Excipients

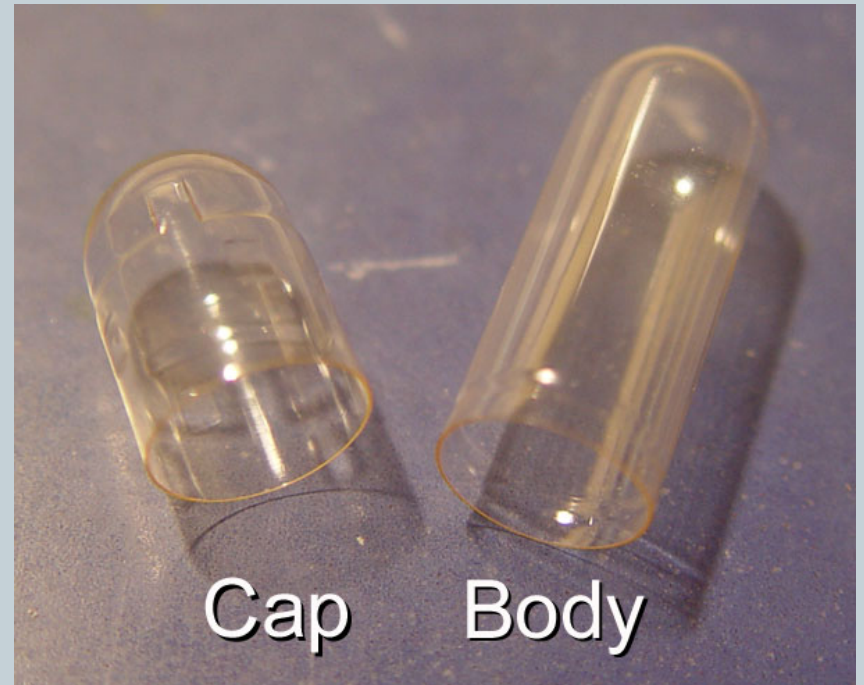
- Bulk powders (lactose, starch, Ca carbonate, Kaolin, etc.)

3. Hard or soft soluble container or shell

Capsule Types



- **Soft-shell**
- **Hard-shell**
 - Gelatin and 10-15% water
 - Require “tight storage” and adequate relative humidity
 - ✦ low humidity – capsules become brittle
 - Clear and assorted colors
 - “Cap” and “Body”



Capsule Sizes



- **Sizes**
 - 000 (largest) > 00 > 0 > 1 > 2 > 3 > 4 > 5
- **Advantages and Disadvantages**
 - Smallest capsule size (5)
 - ✦ easy to swallow
 - ✦ difficult to handle
 - ✦ little margin for weighing error
 - Large capsule size (00)
 - ✦ difficult to swallow
 - ✦ easier to handle
 - ✦ more margin for weighing error

Approximate Capacities of Gelatin Capsules for Representative Drugs and Chemicals



	Capsule Size							
	5	4	3	2	1	0	00	000
Approx. Volume (mL)	0.13	0.20	0.27	0.37	0.48	0.67	0.95	1.36
Drug Substance	Capacity in grams of drug powder							
Acetaminophen	0.13	0.18	0.24	0.31	0.42	0.54	0.75	1.10
Aluminum hydroxide	0.18	0.27	0.36	0.47	0.64	0.82	1.14	1.71
Ascorbic acid	0.13	0.22	0.31	0.40	0.53	0.70	0.98	1.42
Aspirin	0.10	0.15	0.20	0.25	0.33	0.55	0.65	1.10
Bismuth subnitrate	0.12	0.25	0.40	0.55	0.65	0.80	1.20	1.75
Calcium carbonate	0.12	0.20	0.28	0.35	0.46	0.60	0.79	1.14
Calcium lactate	0.11	0.16	0.21	0.26	0.33	0.46	0.57	0.80
Corn starch	0.13	0.20	0.27	0.34	0.44	0.58	0.80	1.15
Lactose	0.14	0.21	0.28	0.35	0.46	0.60	0.85	1.25
Quinine sulfate	0.07	0.10	0.12	0.20	0.23	0.33	0.40	0.65
Sodium bicarbonate	0.13	0.26	0.32	0.39	0.52	0.70	0.97	1.43

Capsule Size Selection



- ***It's your choice!***
 - Art & Science versus Trial & Error.
- Compromise between patient's comfort in swallowing and the type and amount of ingredients being encapsulated.
- Choose smallest size capsule to accommodate ingredients, “slightly” packed with minimal void space.
- Size's 2 & 3 most common for oral use

Target Weight Selection



- ***It's your choice!***
 1. Consult “Approximate Capacities of Gelatin Capsules for representative Drugs and Chemicals” Table.
 2. Choose a representative substance from the table with a density similar to that of the ingredient present in the greatest quantity in the formulation.
 3. From the table determine the **maximum** capacity in grams
 4. Multiply the maximum weight by 75% to determine the **minimum** weight
 5. Select a target weight that falls **between** the maximum and minimum capacity.
 - Choose a weight that's practical and easy to work with!
- **Common Selections**
 - Size 3, Max = 280 mg and Min (75%) = 210 mg, so use 250 mg
 - Size 2, Max = 350 mg and Min (75%) = 263 mg, so use 300 mg
 - Note: the greater the target weight, the larger the allowable error.
 - ✦ 5% of 250 mg is 12.5 mg compared to 5% of 300 mg which is 15 mg
- The difference between the selected target weight per capsule and the amount of active drug per capsule will need to be made up through the addition of an inert powder such as lactose.
 - For example, 300 mg (target weight) - 50 mg (active drug) = 250 mg lactose per capsule

Example Capsule Rx Calculations



Rx: 10 mg Drug Z per capsule

(with bulk source of Drug Z and using lactose as an excipient)

Dispense #10, for adult patient

1. Base calculations on the preparation of two extra capsules, thus 12 capsules total
2. $10 \text{ mg/capsule} \times 14 \text{ caps} = 140 \text{ mg Drug Z}$
3. Select a capsule size
 - ✦ Remember, it's your choice, here choose #3
4. Consult "*Approximate Capacities of Gelatin Capsules for representative Drugs and Chemicals*" Table to determine capacity of capsule size selected based on primary component (lactose)
 - ✦ Maximum weight for size 3 capsule and lactose = 0.280 g or 280 mg
 - ✦ Minimum weight for size 3 capsule is $0.280 \text{ g} \times 75\% = 0.210 \text{ g}$ or 210 mg
5. Target Weight selection range = 210 mg to 280 mg
6. **Logical target weight choice = 250 mg**
 - ✦ Note: allowing 5% error gives 238 mg – 263 mg range
7. Calculate total weight of powder needed to fill 14 capsules, $250 \text{ mg} \times 14 \text{ caps} = 3500 \text{ mg}$
8. Calculate amount of lactose to weigh, $3500 \text{ mg (total)} - 140 \text{ mg (Drug Z)} = 3360 \text{ mg of Lactose}$
9. Fill or Punch a total of 10 capsules to a final weight between 238 mg and 263 mg

Compounding Goals



- Accuracy
- Fine particle size
 - trituration
- Thorough Blending
 - powder must be homogenous
- Proper Capsule Size Selection
- Aesthetic Appearance

Methods of Preparation



Hand Filling (Punching)

1. Calculate
2. Weigh components
3. Mix and blend
4. Block powder
5. “Punch” or “Scoop”
6. Weigh for accuracy
7. Secure and lock cap
8. Polish



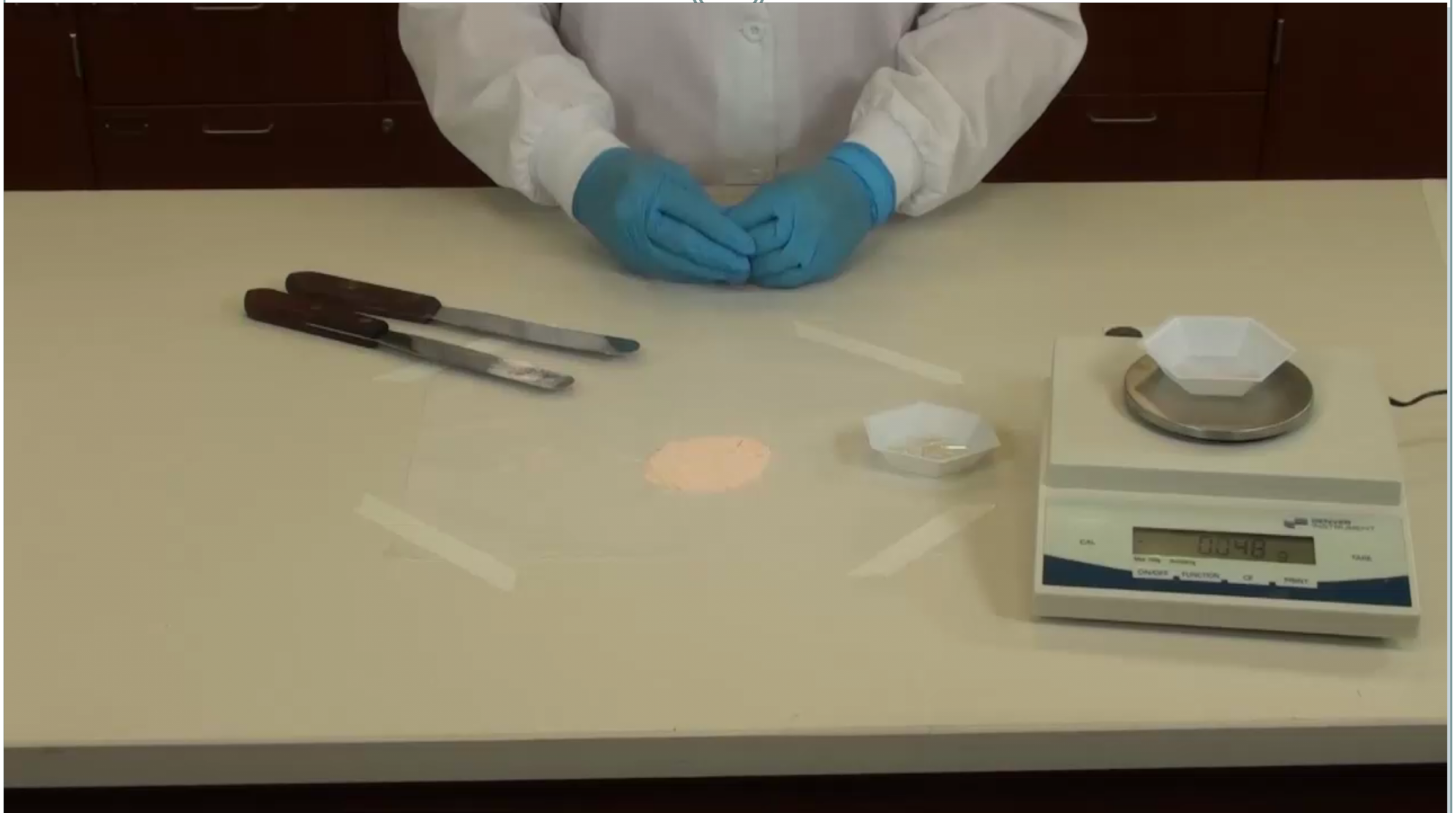
Capsule Weighing Procedure: Digital Balance



1. Place balance on smooth, level surface
2. Ensure weighing pan is clean
3. Place weighing boat or paper and an empty capsule on weighing pan (ensure same size capsule)
4. Zero (tare) the balance. After this step do not touch the tare button again during the weighing operation
5. Remove empty capsule but leave weigh boat on balance. The digital display will read a negative value which represents the weight of the empty capsule shell
6. Weigh filled capsule
7. Add or remove powder until target weight obtained

Suggestions: 1) don't cap tightly and 2) weigh within margin of error

Handing Filling Capsules - Procedure



Methods of Preparation



- Capsule Filling Machines (e.g. Jaansun)



Jaansun Capsule Machine - Procedure



*How to use a capsule
filling machine
By RC Compounding*

How-to video on how to make capsules using a capsule filling machine, by RC Compounding
Uploaded on Jan 14, 2010, <http://www.youtube.com/watch?v=WNYjHITHjh8>

Preparation guidelines



- **Quality Control**

- The most important quality control measure is to check the weight of each capsule.
- Allowable error is $\pm 5\%$ of the stated weight of the capsule.
- In small batches, each capsule weight should be measured and documented in the compounding record.
- When compounding in larger quantities, a combination of individual capsule weights as well as group weights of 10 capsules can be used.

- **Packaging and Storage**

- Gelatin capsules should be stored at room temperature and maintained at a constant humidity.
- High humidity may cause the gelatin to soften whereas low humidity can may them dry enough to become brittle and crack.

Preparation guidelines



- **Quantity to Prepare – USP Chapter 795**
 - Solid dosage forms
 - “prepare an amount of the total formulation sufficient to allow the prescribed amount or quantity to be accurately dispensed”
 - Practically
 - ✦ Loss is common during formulation
 - ✦ ***Always*** prepare excess
 - Lab
 - ✦ Always base calculations on a ***minimum of 4 extra capsules***

- **Beyond Use Dating – USP Chapter 795**
 - “For Solid Dosage Forms (including capsules)
 - ✦ The BUD is not later than the time remaining until the earliest expiration date of any API or 180 days, whichever is earlier.”

Documentation and Labeling

- **Rx Documentation**

- Record the size and color of the capsules on the front of the Rx.
 - ✦ The number of the capsule size is usually written inside a triangle and the capsule color recorded beneath it.
- Note any excess controlled substance.

- **Labeling**

- Weight of active drug per capsule (e.g. “Drug Name XX mg Capsules”)

Dr. James T. Warren, Family Practice
3-G Medical Arts Building

Recorded manufacturer/lot # and exp date for each API on back

Name: Stanley M. Bontrager

Address: 421 East 21st Street Date: 2/21/20XX

 Morphine Sulfate 10 mg
Dextromethorphan 30 mg Capsules
Dispense 15 (fifteen)
Sig: i po qid prn severe coughing


CLEAR

Refill: 0 *morphine:*
170 mg weighed
150 mg dispensed
20 mg discarded

James T. Warren
Signature

DEA# AW1351977

 University Pharmacy
1313 Main Street, ST, 76543
(987) 555-1212 

Stanley M. Bontrager Date: 02/21/2014

Morphine Sulfate 10 mg, Dextromethorphan 30 mg Oral Capsules

Take one capsule by mouth four times a day as needed for severe coughing.

Prescriber: James T. Warren Rx#: 83668667
Quantity: 15 Original Date: 02/21/2014
Refills: 0 Do Not Use After: 08/21/2014
Mfr.: CMPD RPh Init.: LWD