VOLUME 4 NUMBER 4

Secundum Artem

Current & Practical Compounding Information for the Pharmacist.

COMPOUNDING CAPSULES

INTRODUCTION

The most versatile of all dosage forms is the capsule. The administration of liquid and solid drugs enclosed in hard gelatin capsules is one of the most frequently utilized dosage forms in Western medicine. Capsules are unit doses of drugs enclosed within soluble shells of gelatin or similar material, intended to be swallowed whole. Capsules are available in many different sizes and shapes and can be used for the administration of powders, semisolids and liquids. Unpleasant tastes and odors of drugs are effectively masked by the practically tasteless capsule shell which dissolves or or is digested in the stomach after about ten to twenty minutes. Capsules also can be used as a means of providing accurately measured doses for administration rectally or vaginally.

When a physician prescribes a tablet, the choice is limited to commercially-available products. A capsule, however, can be prepared extemporaneously with a great deal of dosing flexibility for the physician and pharmacist. The contents of capsules should only be opened and administered with food or liquids when the Pharmacist concurs.

HISTORICAL CONSIDERATIONS

Mothes, a French pharmacist, invented the soft gelatin capsule in 1833; it was improved by Dublanc in 1834. The hard gelatin capsule was patented in 1846 and a two-piece version was patented in 1865. The usage rate and acceptance of the capsule was initially very low, but when in the early 1900s drugs became widely available in solid, powder forms in dose ranges easily administered orally, medication encapsulation increased phenomenally. Capsules first appeared in USP XII, in 1942.

Factors such as taste concealment and elegance contributed greatly to the increase in medication encapsulation. Capsules can be prepared in many colors and provide a nice presentation of the drug; portability, light weight, and rapid drug release are additional advantages of encapsulation.

In the past few years, pharmacists have been preparing greater numbers of capsules extemporaneously. Marketplace factors have influenced growth of this segment of compounding: some drug products have been removed from the market by their manufacturers due to low sales volume; pharmacists often have access to pure chemical or another doage form of the same drug, from which capsules may be compounded. There are occasions when a patient is unable to swallow a tablet but can ingest a capsule, creating another opportunity for the pharmacist to provide tailored service to the patient. Further, drug regimen compliance may be enhanced and therapeutic outcomes improved when two or more medications are combined into one capsule, making it easier for the patient to remember to take the medications. Finally, the release of a drug product can be altered by the formulation and technique of encapsulation.

Capsules offer an opportunity for the pharmacist to provide tailored service to the patient.

DEFINITIONS/EXAMPLES

Capsules generally are made of hard or soft gelatin. Hard gelatin capsules include those filled with a powder, semisolid or liquid and can be prepared to release the drug rapidly or over a predetermined period of time. Soft gelatin capsules generally provide standard release.

Hard gelatin capsules are actually cartridges, shells or "envelopes" made mostly of gelatin, sugar and water (and may contain a dye and/or opacifying agent), and are designed to serve as carriers for drug products. They also may contain about 0.15% sulfur dioxide to prevent decomposition.

Soft gelatin or "elastic" capsules are prepared from gelatin, glycerin and water and can be filled with a liquid, suspension, or a powder.

Hard and soft gelatin capsules protect the ingredients from direct exposure to the atmosphere prior to administration and provide a taste barrier. After reaching the gastrointestinal tract, capsules may release their contents at different rates based upon the physicochemical properties of the active drug and the excipients.

Encapsulation may enhance drug regimen compliance and improve therapeutic outcomes.

APPLICATIONS/USES

The primary application of capsules is for the oral administration of drugs. Capsules can be prepared to be elegant, convenient and easily identifiable.

Capsules are not suitable for drugs that are very soluble, such as salts (potassium chloride, potassium bromide, ammonium chloride). In these situations, the fluid penetrating the capsule rapidly dissolves the salt and creates a highly concentrated solution which

Loyd V. Allen, Jr., Ph.D., R.Ph., Professor Emeritus, University of Oklahoma, HSC College of Pharmacy, Oklahoma City, OK 73190.

can cause nausea and vomiting when it contacts the gastric mucosa.

Strongly efflorescent or deliquescent materials are not suitable for capsules since efflorescent materials may cause capsules to soften when water is lost and strongly deliquescent powders may make the capsule shell brittle when the moisture is extracted from the shell into the powder.

Capsules can be administered rectally and vaginally. Piercing the capsule with a pin or needle will allow easier penetration of the aqueous body fluids. It is best to use very water soluble excipients in these situations since hydrophobic excipients may decrease the amount of drug released.

COMPOSITION

Hard gelatin capsules consist of two parts; the "base" or "body", the longer and lesser diameter portion, and the "cap", which is the shorter and slightly larger diameter portion. The cap is designed to slide over the base portion and form a snug seal.

For human use, eight different sizes of gelatin capsules are generally used, ranging from the smallest, No. 5, through the largest, No. 000. The numerical designation for a capsule is arbitrary and bears no indication as to the capacity of the capsule. The capacity of a capsule is dependent upon the density and characteristics of the powders in the application. The capsule size only offers a relative "volume" designation.

An example of the different weights of materials that can be held by capsules is shown in Table 1.

Veterinary compounding has been increasing dramatically in recent years. Veterinary capsules are available in sizes designated as No. 10, No. 11, and No. 12, with relative capacities of 1 oz, ½ oz and ¼ oz.

Colored capsules are available in almost any desired form and combination: solid colors (base and cap are the same) or mixed (bases and caps in different colors). Almost any color can be prepared as a special order. If colored capsules are not available, the pharmacist can add an approved dye to the powdered material and place the powder inside a clear capsule.

The ratio of the active ingredient to the excipients can be varied as required to produce capsules of different strengths. Due to the variation in density of materials, a direct relationship usually is not obtained and these tables must be constructed by individual pharmacies based upon the materials used in compounding. It may be advantageous and save time to construct a table, or grid, as the following example illustrates.

Progesterone Oral Capsules
Quantity #100, Number 1 Size Capsules

	25 mg	50 mg	100 mg	200 mg
Progesterone, Micronized	2.5 G	5 G	10 G	20 G
Lactose	35 G	30 G	20 G	—
Weight of Contents/Capsule	0.375 G	0.35 G	0.3 G	0.2 G

PREPARATION METHODS/TECHNIQUES

Source of Equipment and Materials

Materials are available for the extemporaneous preparation of capsules from a variety of sources. Equipment for extemporaneously preparing up to 100 capsules at a time is available at a very reasonable cost. Some of the equipment already in a pharmacy can be used for preparing capsules and for some of the quality control procedures that should be followed.

Sources of drugs for capsules include the pure powder, tablets, capsules and even liquids. The pure powders generally require no further treatment prior to their use and present the fewest complicating factors. Tablets generally must be comminuted finely prior to incorporation into the capsule powder mix. Only standard release tablets should be used, not altered-/controlled-release tablets. Capsules can be used as the source of the drug by opening the capsule shell and emptying the contents. The "closed capsules" which have gelatin bands, seals, or locking mechanisms can be opened and the powder removed by using a clean razor blade to cut the capsule in two pieces. The capsules may be broken in a mortar and the powder separated from the shell fragments using a sieve. Liquids can be evaporated to dryness using appropriate means, or may be taken up with an adsorbent prior to incorporation into the capsule powder mix. Injectable products for reconstitution can be used, but may be somewhat more expensive as a source for the active ingredient.

Preparation of the Powder

The individual ingredients are weighed or measured. An excess quantity is obtained sufficient for an extra capsule or an extra 5-10% to accommodate loss of powder during manipulations (except for controlled drug substances). If the ingredients are solids, particle sizes should be reduced by comminution to approximately the same size range. It may help to pass the powders through a sieve (60 to 100 mesh, depending upon the powders). Mix using geometric dilution to ensure uniform distribution of the active drugs throughout the mix. Add a few drops of alcohol, water or mineral oil to light, fluffy, or "difficult to manage" powders for easier manipulation; which of these to add would depend upon the powders involved and usually only one or two drops are required.

Some pharmacists mix powders in plastic bags. If done carefully, it will minimize the amount of powder floating in the air and minimize contamination of the ingredients. Personal safety may dictate that a mask be worn. Whatever method is used, homogeneity is the primary goal when mixing the ingredients.

Selection of Capsule Size

As a general rule, 65 mg to 1000 mg of powdered material can be encapsulated. Capsule selection usually is not difficult when this information is combined with a knowledge of the ingredient characteristics and the patient's ability to swallow. The larger capsules (No. 00 and No. 000) are more difficult to swallow, and the smaller capsules (No. 5 and No. 4) may be difficult to handle, especially for the elderly. The capsule size selected should be slightly larger than that needed to hold the powder and additional diluent powder included to provide a full capsule. If the active drug powder bulk is small, it may be necessary to add a larger quantity of diluent to enable the use of a larger capsule size for handling convenience. If the powder bulk is large, it may be necessary to provide half-strength capsules, so smaller capsules can be used for ease of swallowing.

The proper capsule size is usually determined by refering to various published tables or by experimentation, as follows.

1. Weigh the "active" ingredients as well as other "excipients" that must be present in the formulation in fixed amounts. This can be done for a single capsule or calculated for multiple capsules.
2. Mix the powders together, exclusive of the diluent.
3. Place the required quantity of powder for a single capsule in a capsule base that is just slightly larger than what is required to hold the material and replace the cap.
4. Weigh the capsule.
5. Add diluent, *e.g.* lactose, to the capsule until it is full.
6. Weigh the capsule.
7. Subtract the weight obtained in step 4 from the weight obtained in step 6. This is the required quantity of diluent for each capsule.
8. Multiply by the number of capsules to be prepared to obtain the required quantity of diluent for the total prescription.

Note: During the mixing process or during comminution, the diluent may increase in "bulk" and a lesser quantity may be required than anticipated. This can be observed by comminuting the diluent before adding it to the capsule in step #5.

When the proper capsule size has been selected, the entire quantity of capsules required for the specific prescription involved should be removed from bulk stock and the container closed to minimize contamination potential.

The capsule should be selected so that the required quantity of powder is held in the base and the cap only serves to retain the powder. After the cap is in place, the capsule can be "tapped" so that the contents will fill the entire capsule.

Encapsulation Process

Two general methods are: individual hand filling and capsule machine filling.

Hand filling:

The powder is arranged on a suitable surface with a spatula so that the thickness of the pile is about ⅓ the length of the capsule body. This is to avoid contacting the powder with the hands when punching capsules. The use of gloves or fingercots is recommended to minimize contact with the powder and to avoid fingerprints on the capsules. Another option is use of the cap from a second capsule slipped over the base of a capsule to be filled as a holder while punching. Using this technique, capsules do not touch the compounding pharmacist's hands.

The capsule is pressed into the powder with a slight rotation as it enters the powder and reaches the working surface to aid in packing the powder. When the capsule becomes full, a slight resistance can be felt as the capsule is pressed through the powder. After filling and weighing a few capsules, the pharmacist usually will obtain a "feel" for the resistance required for the amount of fill required.

After filling, the weight of the capsule is checked and powder added or removed to obtain the correct weight. Capsules can be weighed on a pharmaceutical or electronic laboratory balance using an empty gelatin capsule of the same size as a tare.

An alternative hand filling method involves "blocking and dividing" the powder into individual portions for each capsule. This approximation is not very accurate and is not recommended.

To pack powders that will not stick in the capsules when punching, place each capsule base on its side and use a spatula to guide or fill the powder. Care must be exercised so that the capsule is not scraped or scratched.

Granular materials are particularly difficult to punch into capsules because they are not very cohesive. This problem may be alleviated by reducing the particle size to the point at which the powders stick together.

Capsule filling devices:

A number of different manually-operated capsule filling devices are commercially available for filling up to 50 or 100 capsules at a time. These machines can be used for preparing smaller quantities of capsules by blocking off unused holes with an index card.

The method of using these machines requires a careful determination of the capsule formulation. The powder is blended as previously discussed. Empty gelatin capsules are placed into the device and oriented so that the cap is on top. The machine is worked to separate the base from the cap and the portion of the machine holding the caps is removed and set aside. The capsule bases are allowed to "drop" into place so that the tops are flush with the working surface. The powder mix is spread over the working surface. A plastic spatula can be used carefully to spread the powder uniformly and evenly into the capsule bases or the machine can be "tapped" to spread the powder and drop it down into the capsule bases. A small device consisting of several "pegs" on a handle can be used to tamp the powder into the capsule bases gently and evenly. Any remaining powder then is spread evenly over and into the capsule bases and tamped. These procedures are repeated until all of the powder is in the capsules. The capsule caps are then fitted over the machine, fixed in place, and the filled capsules removed, dusted using a clean cloth, and packaged.

Filling capsules with a semisolid mass:

If the material to be placed into hard gelatin capsules is a semisolid, it can be encapsulated by either forming a pipe or pouring a melt.

1. Pipe

If the material is sufficiently plastic, it can be rolled into a pipe with a diameter slightly less than that of the inner diameter of the capsule in which it will be enclosed. The desired quantity of material is cut using a spatula or knife, the length determining the weight of the material enclosed. The pieces may be dusted with corn starch (check patient allergies) prior to individual insertion into the capsules.

If a material is too fluid to be worked as described, it may be necessary to add cornstarch or some similar material to yield a more firm consistency. The quantity to be added can be determined empirically.

2. Semisolid pour

If the material is too firm to roll into a pipe but its melting point is satisfactory, it can be melted and poured into the capsule bases, cooled, and the caps replaced. A stand to hold the capsule bodies may be fashioned from a block of wood into which a series of holes the diameter of the capsule caps is drilled. When capsule caps are glued into these holes, capsule bases may be inserted for filling without scratching or marking by the wood.

This method also can be used to enhance the bioavailability of drugs which are poorly soluble and exhibit bioavailability problems. For this purpose, the drug is added to a melt of a material such as polyethylene glycol (PEG) or *Polybase*™ (Paddock). The mixture is heated and stirred until the powder is either melted or thoroughly mixed in the PEG. The melt is cooled to just above the melting point of the PEG and poured into the capsule shells as described. When this method is used, the desired quantities can be measured using a pipet, syringe, or calibrated dropper to deliver the volume to the individual capsules.

Excipients useful in formulating these products are shown in Table 2.

Liquids in Hard Gelatin Capsules:

Liquids can be prepared in hard gelatin capsules if the gelatin is not soluble in the liquid to be encapsulated; alcoholic solutions and fixed and volatile oils work well. It may be necessary to determine the solubility of gelatin in the liquid by experimentation. The liquid can be measured accurately using a pipette (micropipet) or a calibrated dropper and dropped into the gelatin base, taking care not to touch the opening. The gelatin caps can be touched, open end down, on a moist towel to soften the gelatin at the opening of the caps or a cotton swab dipped in warm water can be rubbed around the edge of the capsule cap to soften. The cap is placed over the base containing the liquid with a slight twist and the softened edge of the cap should form a seal with the base to prevent leakage. Prior to packaging, these capsules should be placed on a clean, dry sheet of paper and observed for leakage.

Another method of sealing makes use of a warm gelatin solution that is painted around the capsules and the inside of the caps prior to placing on the base.

TABLE 1

Weight, in mg, of different powders that can be contained in various size capsules.

Material	5	4	3	2	1	0	00	000
Aspirin	65	130	195	260	325	490	650	975
Sodium Bicarbonate	130	260	325	390	510	715	975	1430
Quinine Sulfate	65	97	130	195	227	325	390	650
Bismuth Subnitrate	120	250	400	550	650	800		

Compiled from Eli Lilly Capsule box information and *Pharmaceutical Dosage Forms and Drug Delivery Systems*, 5th ed., HC Ansel and NG Popovich.

Cleaning and Packaging

It is imperative that every precaution to minimize traces of moisture or body oils on capsules be taken to reduce powders sticking to the surface, which would create disagreeable appearance and taste. Cleaning capsules is difficult if they have become moist or sticky. The capsules should be handled so that they retain their dryness and shiny appearance. Use of gloves provides a more hygienic environment and helps preserve the dry, shiny capsule appearance.

An old method, where gloves are unavailable, is: (1) wash and dry hands thoroughly, (2) keep the fingers dry by the friction of a towel that is stripped through the tightly clenched fingers until a clearly perceptible heat is generated, (3) four or five capsules may be prepared before there will be a need to repeat the process.

If the capsules have been kept dry, clinging surface powder can be removed by rolling between folds of a cloth or by shaking in a cloth formed into a bag or hammock. Another method of cleaning capsules is to place them in a container that is filled with sodium bicarbonate, sugar or salt then gently to roll the container. The contents then can be poured into a 10 mesh sieve and the "cleaning salt" allowed to pass through the screen, which collects the capsules.

It must be emphasized that these cleaning methods are only effective if the capsules have been kept clean and dry. Once capsules become soiled and dull, they cannot be cleaned effectively.

EQUIPMENT REQUIRED

The basic equipment required for the extemporaneous preparation of capsules can be as simple as:

Balance, Torsion® Mortar and Pestle
Pill Tile/Spatula

Additional equipment for producing larger quantities can include:

Balance, Electronic Capsule Machine

PHYSICOCHEMICAL UNIQUENESS

Physical and chemical interactions between active drugs, active drug(s) and excipients, and active drug/excipients and the gelatin shell must be considered. When excipients are used, the Pharmacist must take into account patient hypersensitivities.

Hard gelatin capsules normally contain about 10%-15% moisture. Gelatin can absorb up to ten times its weight in water. Therefore, capsules stored in high humidity absorb moisture and may become malformed or misshapen; if stored in low humidity, they become dry and brittle and may crack. A relative humidity range of 30-45% is best for encapsulation. If a drier environment is required because of characteristics of the drug

to be encapsulated, exposure should be limited.

It may be advantageous to add agents to improve the characteristics of the material for the preparation or administration steps.

Magnesium stearate is sometimes used to enhance the flowability of particles and ease of filling capsules. It is usually present at concentrations less than 1% but is hydrophobic and may affect the bioavailability of drug.

Sodium lauryl sulfate up to 1% may be included to enhance the bioavailability of drugs contained within capsules.

Incompatibilities:

Deliquescent powders can be prepared by adding a finely-powdered bulking material such as starch or magnesium oxide to decrease the tendency of the powders to absorb moisture.

Eutectic mixtures can be incorporated into capsules by keeping the problematic ingredients separate, adding an inert powder, and mixing lightly prior to encapsulation. Also, the use of the next larger size capsule will minimize the contact of the powder particles with each other, minimizing the tendency to liquify. Materials that can help to prevent or correct eutectics are included in Table 3, along with other excipients that can be useful in capsule preparation. An alternative technique is to form the eutectic and absorb the liquid into a powder which is then encapsulated.

Capsules within capsules:

If one ingredient must be separated from others in the formulation, a small capsule, such as a No. 5, may be filled with one powder and placed into a larger capsule with the remaining ingredients in the formulation. For elegance, the inside capsule should not be visible through the larger capsule.

Tablets within capsules:

If a small tablet containing a necessary ingredient is commercially available, this small tablet can be placed inside the capsule following the addition of a small quantity of the powder,and the filling completed. The inside tablet should not be visible through the capsule.

QUALITY CONTROL

Since the pharmacist is responsible for the quality of the capsules prepared, it is important to keep the work area clean and neat and to conduct some quality control checks to help assure the products contain the correct material in the right quantity. This can be assisted with a routine: read the label on the bottle at least three times and record the necessary information (*e.g.* source and lot number) on the compounding formulation record. The only reliable method of filling capsules accurately is to weigh each individual capsule, but this generally is not feasible. Rather, representative samples are weighed after preparation. The weights can be included on the formulation record for documentation. It is good practice to weigh some capsules individually and to weigh groups of, for example, ten capsules. This provides data for the accuracy of the capsule fill. Groups of ten capsules are weighed because empty gelatin capsules may vary by as much as 15% in their weight. This seems like a rather large amount but the capsules are light and contribute a minor part of the total weight of a filled capsule. Composite weighings will average out small variations in the empty capsule weights.

STORAGE/LABELING

Empty gelatin capsules should be stored at room temperature at constant humidity. High humidity may cause softening of the capsules and low humidity may cause drying and cracking of the capsules. Storage of capsules in glass containers will provide protection not only from extreme humidity but also from dust.

Storage of filled capsules is dependent on the characteristics of the drugs they contain. Semisolid filled hard gelatin capsules should be stored away from excessive heat, which may cause a softening or melting of the contents.

CAPSULE ADMINISTRATION

Capsules of the size No. 5 through No. 0 generally are not too difficult to swallow. Many patients may have difficulty swallowing the No. 00 and No. 000 capsules. If this occurs, the patient may be advised to place the capsule on the back of the tongue before drinking a liquid, or to place the capsule in warm water for a few seconds prior to taking to make it slide over mucous membranes easily. The pharmacist may suggest an alterative dosage form, *e.g.* smaller capsules or a liquid or rectal preparation.

ALTERED RELEASE

The rate of release of capsule contents can be varied according to the nature of the drug and the capsule excipients. If the drug is water soluble and a fast release is desired, the excipients should be hydrophilic and neutral. If a slow release of water-soluble drug is desired, hydrophobic excipients will reduce the rate of drug dissolution. If the drug is insoluble in water, hydrophilic excipients will provide a faster release; hydrophobic and neutral excipients will slow its release.

A very rapid release of the capsule contents can be obtained by piercing holes in the capsule to allow faster penetration by fluids in the gastrointestinal tract, or by adding a small quantity of sodium bicarbonate and citric acid to assist in opening the capsule by the evolution of carbon dioxide. About 0.1 to 1% of sodium lauryl sulfate may be added enhance the penetration of water into the capsule and speed dissolution.

If slower release of the active drug is desired, it can be mixed with various excipients, such as cellulose polymers (methylcellulose) or sodium alginate. In general, the rate of release is delayed as the proportion of polymer or alginate is increased relative to water soluble ingredients, such as lactose.

It should be mentioned that it is difficult to predict the exact release profile for a drug and to obtain consistent results from batch to batch. Further, reliable, consistent blood levels and duration of action can only be proved with controlled bioequivalence studies. In addition, many medications exhibit narrow therapeutic indices (toxic and therapeutic doses are very close). Therefore, extemporaneous attempts to alter release rates to this extent should be avoided.

TABLE 2

Excipients that can be used as matrices for semisolid capsules.

Vegetable oils	
Cotton seed	Olive
Maize	Soya
Nut	
Hydrogenated vegetable oils	
Castor	Palm
Coconut	Soya
Cotton seed	
Vegetable fats: Carnauba wax	Cocoa butter
Animal fats	
Beeswax	Spermaceti
Lanolin	
Hydrocarbons: Paraffin	
Fatty alcohols	
Lauryl	Stearyl
Cetyl	
Fatty acids	
Lauryl	Palmitic
Myristic	Stearic
Esters	
Glycol stearates	Ethyl oleate
Isopropyl myristate	
Mixed esters	
Liquid	Solid
Miglyol 812	Suppocire
Labrafil	Witepsol
	Fattibase®, Paddock

Coating capsules:

Coatings have been applied extemporaneously to enhance appearance and conceal taste, as well as to prevent release of the medication in the stomach (enteric coated products). Most coating of capsules requires considerable formulation skill and quality control equipment found in manufacturing facilities.

Capsules can be coated to delay the release of the active drug until it reaches a selected portion of the gastrointestinal tract. Materials found suitable include stearic acid, shellac, casein, cellulose acetate phthalate and natural and synthetic waxes; the basis of their use is their acid insolubility but alkaline solubility. Many of the newer coating materials are time:erosion-dependent rather than acid:base-dependent, *i.e.* they erode over time on exposure to gastrointestinal contents rather than over a pH gradient. There are, in addition, a number of newer materials with predictable pH solubility profiles. Coatings applied to modify release of a drug should be avoided in the dispensing pharmacy, but the addition of a coating to

conceal taste can enhance patient compliance.

In general, the application of a coating requires skill and additional equipment. A general coating can be applied but should probably only be used in medications that would not be of a critical nature. In many cases, experience must be developed for specific formulations depending upon the requests of the physicians and the needs of the individual patients.

Several coating methods may be used and are described as follows.

1. Beaker-flask coating. Place a very small quantity of the coating material in the flask and gently heat until it has melted. Add a few capsules, remove from the heat and rotate the flask to start application of the coating. Periodically add a few more drops of melted coating material with continued rotation. The addition of very small quantities is all that is required to keep the capsules from sticking together and clumping.
2. Dipping. Heat the coating material in a beaker at the lowest feasible temperature. Individual capsules can be dipped using tweezers, allowing the coating to cool and repeating the process until a sufficient layer has been developed.
3. Spraying. An alcoholic or ethereal solution of the coating material is prepared and placed in a small sprayer (a model airplane paint sprayer works well). The capsules are placed on a screen in a well-ventilated area. The solution of coating material is applied in very thin coats with sufficient time allowed for drying between coats (A hair dryer may be used cautiously for this step). The process is repeated until a sufficient layer has been developed.

SUMMARY

Capsules have been used for over a century and occupy an important place in the drug delivery system armamentarium. In addition to being relatively easy to manufacture, they are amenable to small scale compounding by the pharmacist to prepare specific products for individual patient needs. New excipients enable the design and development of products that can enhance bioavailability and prepare site-specific release of products, as well as enhance the elegance of this popular dosage form.

TABLE 3

Excipients that can be used to enhance compatibility of eutectic mixtures.

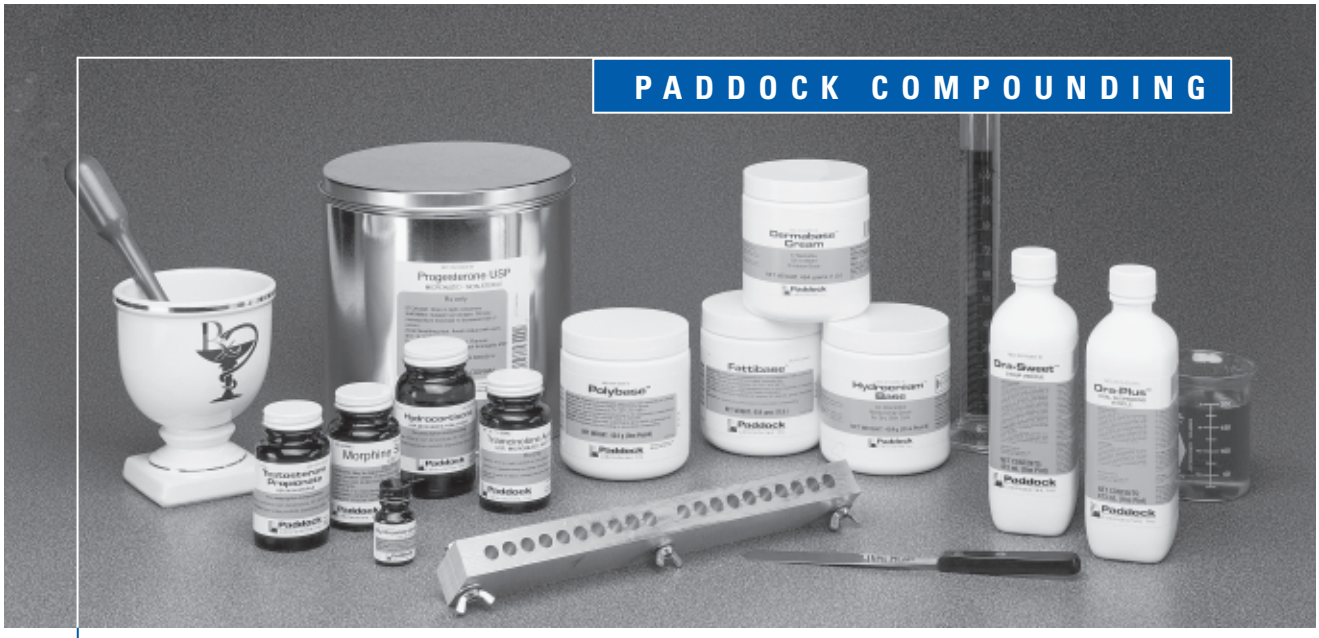
Effective	
Magnesium carbonate	
Kaolin	
Light magnesium oxide	
Less Effective	
Heavy magnesium oxide	
Tribasic calcium phosphate	
Silica gel	
Relatively Ineffective	
Talc	
Lactose	
Starch	
Useful excipients as diluents for other purposes in capsules	
Bentonite	Magnesium oxide
Calcium carbonate	Silica gel
Lactose	Starch
Mannitol	Talc
Magnesium carbonate	Tapioca powder

ERRATUM

Formulation for "Polyethylene Glycol Troches with Suspending Agent", p. 5, col. 1 of SA 4:2, should read;

Polyethylene Glycol 1000	34.5gm
Active Drug, example	4.8 gm
Silica gel	0.37gm
Acacia	0.61gm
Nutra-Sweet®	0.73gm
Flavor	5 drops

Makes 24 troches with 200mg active drug in each.



Paddock is your source for compounding actives, compounding vehicles and professional support.

Vehicles: Aquabase ◆ Dermabase ◆ Fattibase ◆ Hydrocream ◆ Liqua-Gel
Ora-Plus ◆ Ora-Sweet ◆ Ora-Sweet SF ◆ Polybase ◆ Suspendol-S
Actives: Colistin ◆ Dexamethasone ◆ Hydrocortisone ◆ Hydromorphone
Morphine ◆ Progesterone ◆ Testosterone ◆ Triamcinolone... & others

1-800-328-5113
www.paddocklabs.com

SMART ALTERNATIVES

Paddock Laboratories, Inc.

New from Paddock

All issues of Secundum Artem available online at www.paddocklabs.com

Vol 12 No 2 Compounding for Scalp Disorders
Vol 12 No 1 Compounding for Wound Care
Vol 11 No 4 Compounding for Superficial Fungal Infections
Vol 11 No 3 A History of Pharmaceutical Compounding
Vol 11 No 2 Compounding for Phonophoresis
Vol 11 No 1 Compounding for Acne
Vol 10 No 4 Compounding for Iontophoresis
Vol 10 No 3 Compounding for Dermatology Patients
Vol 10 No 2 Compounding for Dentists and Dental Patients
Vol 10 No 1 Pharmaceutical Compounding Resources on the Internet
Vol 9 No 4 Compounding for Patients with Psoriasis
Vol 9 No 3 Compounding for Diabetic Patients
Vol 9 No 2 Compounding For Hospice Patients
Vol 9 No 1 Compounding For Geriatric And Arthritis Patients
Vol 8 No 4 Compounding For The Management Of Pain
Vol 8 No 3 Need For Extemporaneous Formulations In Pediatric Patients
Vol 8 No 2 Compounding For Male Andropause
Vol 8 No 1 Compounding For Hormone Replacement Therapy
Vol 7 No 4 Packaging, Storage and Distribution of Compounded Pharmaceuticals
Vol 7 No 3 Compounding, Stability and Beyond-Use Dates
Vol 7 No 2 Veterinary Compounding
Vol 7 No 1 Compounding Nasal Preparations
Vol 6 No 4 Compounding Ophthalmic Liquids
Vol 6 No 3 Inhalation Products
Vol 6 No 2 Stability of Extemporaneously Prepared Pediatric Formulations Using Ora-Plus® with Ora-Sweet® and Ora-Sweet SF™ - Part III
Vol 6 No 1 Stability of Extemporaneously Prepared Pediatric Formulations Using Ora-Plus® with Ora-Sweet® and Ora-Sweet SF™ - Part II
Vol 5 No 4 Stability of Extemporaneously Prepared Pediatric Formulations Using Ora-Plus® with Ora-Sweet® and Ora-Sweet SF™ - Part I
Vol 5 No 3 Compounding Medication Sticks
Vol 5 No 2 Pharmaceutical Compounding Calculations
Vol 5 No 1 Pharmaceutical Compounding Tips and Hints
Vol 4 No 6 General "Good Manufacturing Practices" for Nonsterile Products
Vol 4 No 5 Compounding Gels
Vol 4 No 4 Compounding Capsules
Vol 4 No 3 Pharmacy Compounding Equipment
Vol 4 No 2 Troches and Lozenges
Vol 4 No 1 Emulsions
Vol 3 No 4 Compounding Suppositories: Part II
Vol 3 No 3 Compounding Suppositories: Part I
Vol 3 No 2 Compounding Topical Dosage Forms: Ointments, Creams, Pastes and Lotions
Vol 3 No 1 Compounding Oral Liquids
Vol 2 No 1 Preparation of Oral Suspensions and Syrups: Basic Concepts
Vol 1 No 2 Topical Antibiotic Dosage Forms
Vol 1 No 1 Ointment Compounding: Basic Concepts

Paddock Laboratories, Inc.
3940 Quebec Ave. N.
Minneapolis, MN 55427-9841

PRSRT STD
U.S. Postage
PAID
Minneapolis, MN
Permit No. 1700