Handbook of Pharmaceutical Granulation Technology

edited by

Dilip M. Parikh
Atlantic Pharmaceutical Services Inc.
Owings Mills, Maryland

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Binders and Solvents

Rajendra K. Khankari
CIMA LABS INC., Brooklyn Park, Minnesota

John Hontz
Glaxo Wellcome Company, Greenville, North Carolina

I. INTRODUCTION

Binders are the adhesives that are added to the tablet formulations. The role of binders is to provide the cohesiveness essential for the bonding of the solid particles under compaction to form a tablet. In a wet granulation process, binders promote size enlargement to provide granules and, thereby, improve flowability of the blend during the manufacturing process. Binders may also improve the hardness of the tablets by enhancing intragranular as well as intergranular forces. In a direct compression process, binders often act as fillers and impart compressibility to the powder blend. The cohesive properties of binders may reduce friability of the tablets and, thus, aid in their elegance. Although the purpose of using binders in a tablet formulation is not to influence its disintegration and dissolution rate, these properties may be modified owing to the altered wettability of the formulation.

II. TYPES OF BINDERS

Binders are classified as natural polymers, synthetic polymers, or sugars. The selection of a binder for a particular system is mostly empirical and depends on the previous experience of the formulator. Selection of the quantity of binder required in a particular system can be determined by optimization studies, using parameters such as granule friability, tablet friability, hardness, disintegration time, and the drug dissolution rate. Some commonly used binders in wet granulation, with their usual concentration range along with the granulating system, are listed in Table 1.

The basic properties of some widely used binders, with their method of incorporation, will be discussed in this section [1–4].

A. Natural Polymers

1. *Starch*

Starch is a polymeric carbohydrate obtained from various plant sources, such as potato, wheat, maize, rice, and tapioca. It is a generally regarded as safe (GRAS)-listed material and one of the most widely used tablet binders. It is insoluble in cold water and in alcohol, but it gelatinizes (hydrolyzes) in hot water to form a paste. Starch paste can be prepared by dispersing starch in 1–1.5 parts of cold water for initial wetting, followed by addition of 2 to 4 times as much boiling water, with continuous stirring, until a translucent paste is obtained. This is further diluted by cold water to the desired concentration. Alternatively, starch paste can also be prepared by heating the

Table 1 Commonly Used Granulating Systems

Binder	Method of incorporation	% used in formula	Solvent	% used in granulating system
Natural polymers				
Starch	Wet mixing	2–5	Water	5–25
Pregelatinized starch	Wet mixing	2–5	Water	10–15
	Dry mixing	5–10	Water	
Gelatin	Wet mixing	1–3	Water	5–10
Acacia	Wet mixing	3–5	Water	10–15
Alginic acid	Dry mixing	1–5	Water	
Sodium alginate	Wet mixing	1–3	Water	3–5
Synthetic polymers				
Polyvinylpyrrolidone	Wet mixing	0.5–5	Water or hydroalcoholic solution	5–10
	Dry mixing	5–10		
Methylcellulose	Wet mixing	1–5	Water	2–15
	Dry mixing	5–10		
HPMC	Wet mixing	2–5	Water or hydroalcoholic solution	5–10
	Dry mixing	5–10		
Na-CMC	Wet mixing	1–5	Water	5–15
	Dry mixing	5–10		
Ethylcellulose	Wet mixing	1–5	Ethanol	2–10
	Dry mixing	5–10		
Sugars				
Glucose	Wet mixing	2–25	Water	25–50
Sucrose	Wet mixing	2–25	Water	50–67
Sorbitol	Wet mixing	2–10	Water	2–25

Source: Ref. 3.

cold water suspension of starch to boiling in a steam-jacketed kettle with constant stirring.

Freshly prepared starch paste is used at a concentration of 5–25% w/w in a tablet granulation. Relatively soft and friable granules are produced when starch paste is used as a binder. Consequently, it yields tablets that disintegrate readily. During the wet-massing process, the high viscosity of the starch paste makes it difficult to evenly distribute the binder in the powder blend.

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