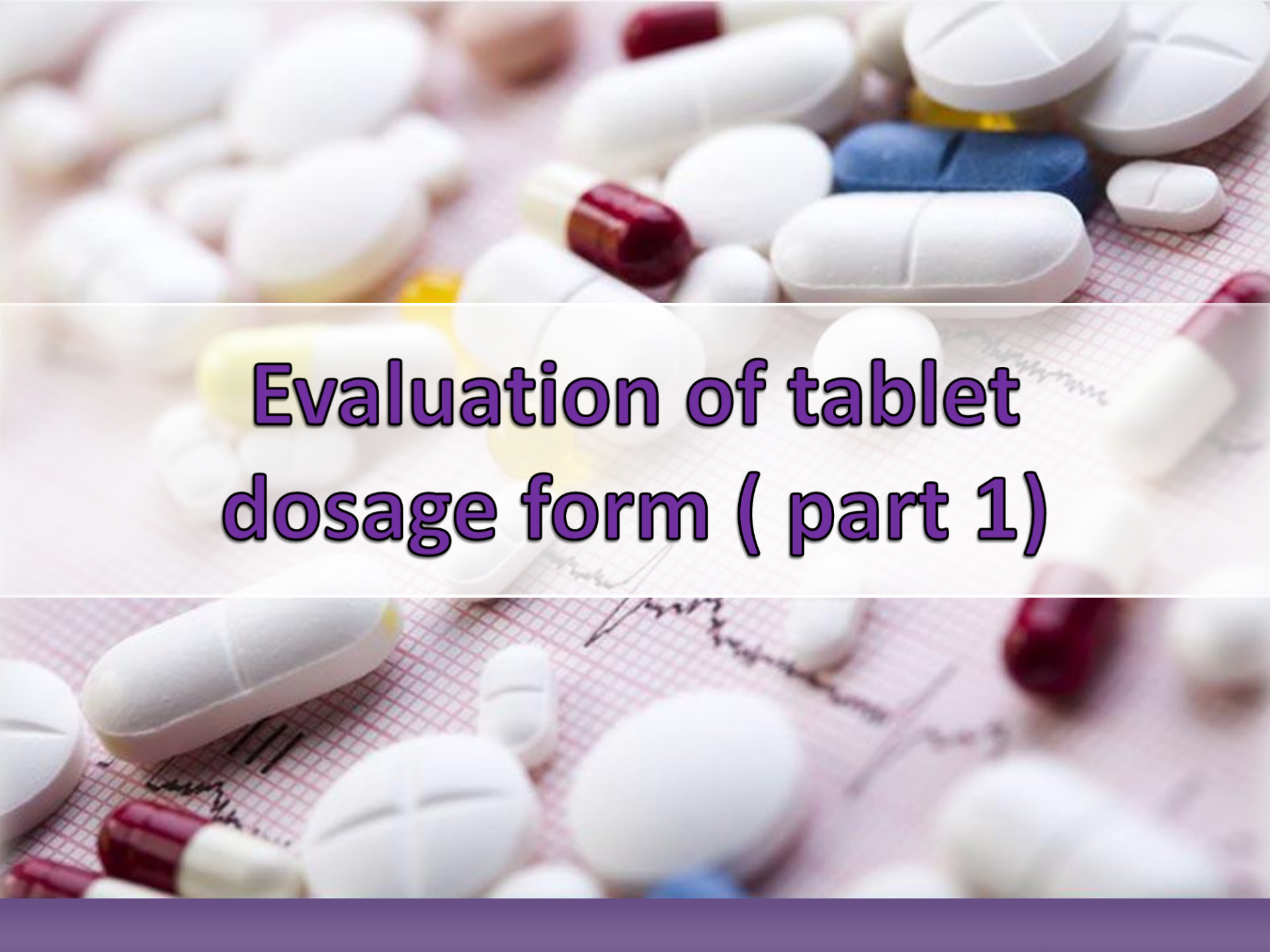

Industrial Pharmacy
laboratory



Evaluation of tablet dosage form (part 1)

Evaluation of tablet dosage form

- In tablet formulation development and during manufacturing of tablets, a number of procedures are used to assess the quality of the tablets.
- Some test methods are described in pharmacopoeias and these tests are traditionally concerned with the content and the in vitro release of the active ingredient.
- Test methods not described in pharmacopoeias are sometimes referred to as non-compendial and concern a variety of quality attributes that need to be evaluated, such as the porosity of tablets.

Introduction

Tablets evaluation

1- General appearance

2- Weight variation

3-Content uniformity

4-Mechanical strength → **Hardness**, **Friability**

5-Disintegration test

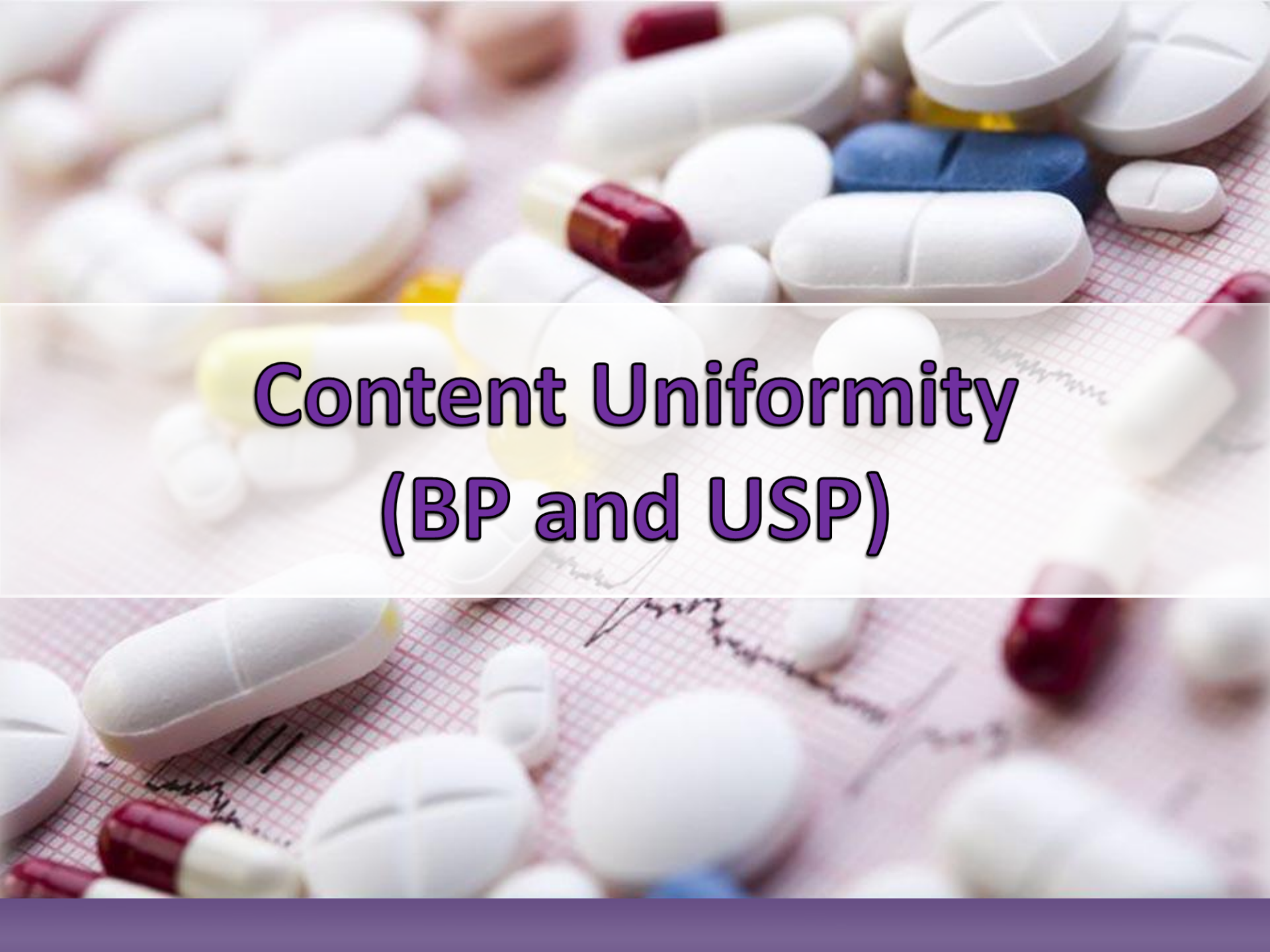
6- Dissolution test

Evaluation of tablets

1-General appearance

a- Shape and size of tablets

b-Organoleptic properties



Content Uniformity (BP and USP)

Content Uniformity

- The test for content uniformity is based on the assay of the individual contents of active substance(s) of a number of tablets to determine whether the individual contents are within limits set with reference to the average content of the sample.

Content Uniformity

- 10 tablets are assayed
- All within limit of 85-115% ⟶ pass
- If more than 1 tablet outside 85-115% or 1 tablet outside 75-125% ⟶ Failed
- If one individual content is outside the limits of 85-115 % but within the limits of 75-125 %:
- Determine the individual contents of another 20 tablets taken at random.
- 29 tablets within limit 85-115% ⟶ passed

Content Uniformity

- **Simvastatin tablets 40 mg (85-115%)**

Tablet 1	39 mg	40 * 15 % = 6 mg
Tablet 2	41 mg	Range (34-46)
Tablet 3	37 mg	
Tablet 4	45 mg	40 * 25% = 10 mg
Tablet 5	45 mg	Range (30 -50)
Tablet 6	45 mg	
Tablet 7	35 mg	
Tablet 8	43 mg	
Tablet 9	40 mg	
Tablet 10	49 mg	

Tablet Thickness (non-compendial)

Tablet Thickness

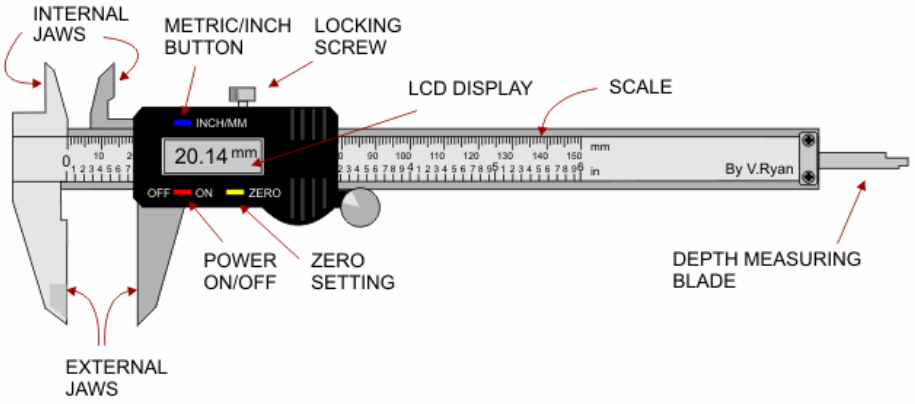
- **The thickness of a tablet is determined by:**

1. **Diameter of the die**
2. **Amount of fill permitted to enter the die**
3. **Compaction characteristics of the fill material**
4. **Force or pressure applied during compression**

Tablet Thickness

- The degree of pressure affects not only thickness but also hardness of the tablet; hardness is perhaps the more important criterion since it can affect disintegration and dissolution.

- Tablet thickness may be measured by hand gauge (e.g. Vernier calliper) during production or by automated equipment.



Tablet Hardness

Tablet Hardness

- It is fairly common for a tablet press to exert as little as 3,000 and as much as 40,000 lb of force in the production of tablets.

- Generally, the greater the pressure applied, the harder the tablets, although the characteristics of the granulation also have a bearing on hardness.

Tablet Hardness

- Certain tablets, such as lozenges and buccal tablets, that are intended to dissolve slowly are intentionally made hard; other tablets, such as those for immediate drug release, are made soft.

- In general, tablets should be sufficiently hard to resist breaking during normal handling and yet soft enough to disintegrate properly after swallowing.

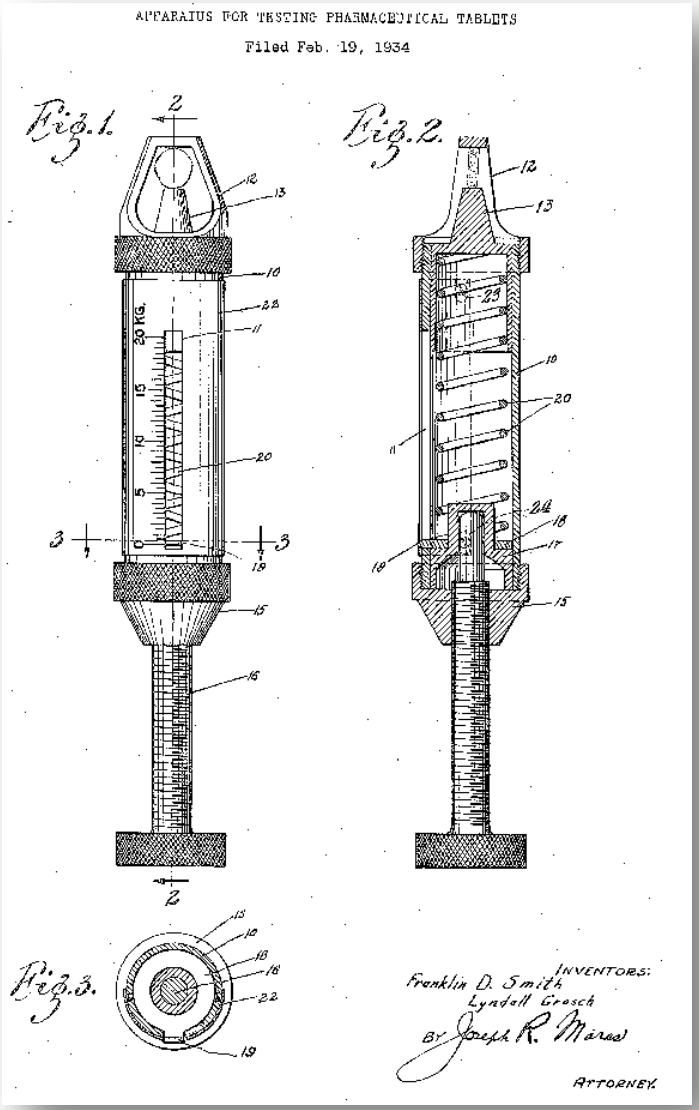
Tablet Hardness USP

- **USP:**

- **In order to achieve sufficient statistical precision for the determination of average breaking force, a minimum of 6 tablet samples should be tested.**

- **Early measuring devices were typically hand operated. For example, the Monsanto hardness tester was based on compressing tablets between two jaws via a spring gauge and screw.**

Tablet Hardness USP


APPARATUS FOR TESTING PHARMACEUTICAL TABLETS

Filed Feb. 19, 1934

Fig. 1.

Fig. 2.

Fig. 3.

Franklin D. Smith, INVENTORS:
Lyndall Grosch
By Joseph R. Mares
ATTORNEY.

Tablet Hardness USP

- In the Pfizer hardness tester, the vertically mounted tablet was squeezed in a device that resembled a pair of pliers.

Tablet Hardness USP

- In the Strong Cobb hardness tester, the breaking load was applied through the action of a small hydraulic pump that was first operated manually but was later motorized.

Tablet Hardness USP

- Problems associated with these devices were related to operator variability in rates of loading and difficulties in proper setup and calibration.

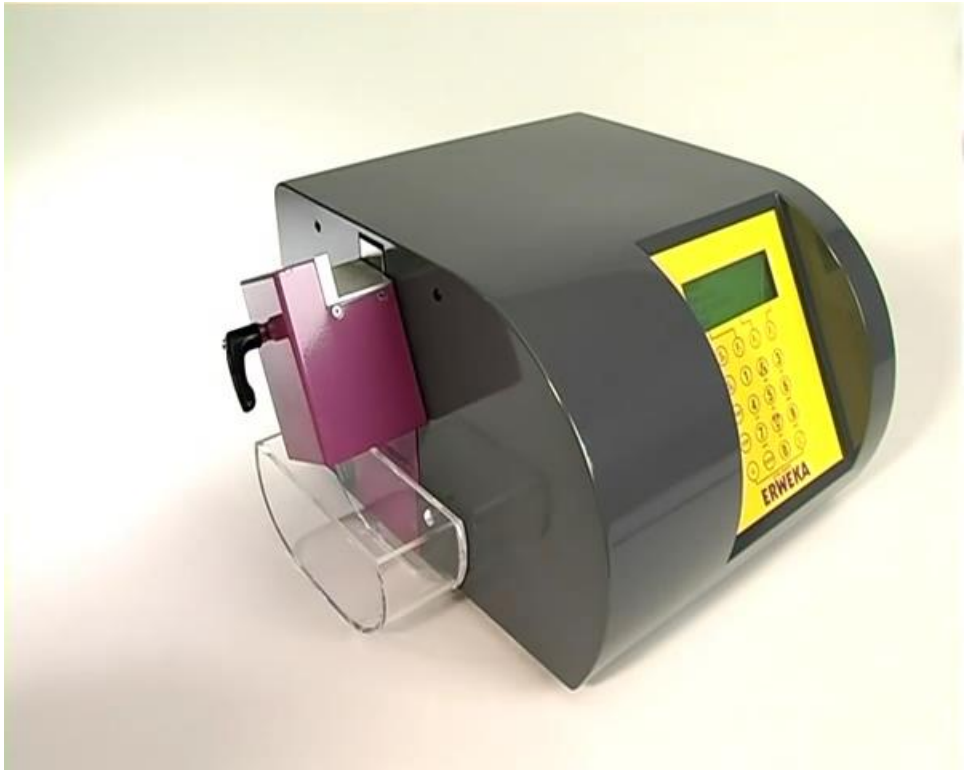
- Oral tablets have a hardness of 4 to 10kg, but hypodermic and chewable tablets have a hardness of 3 kg

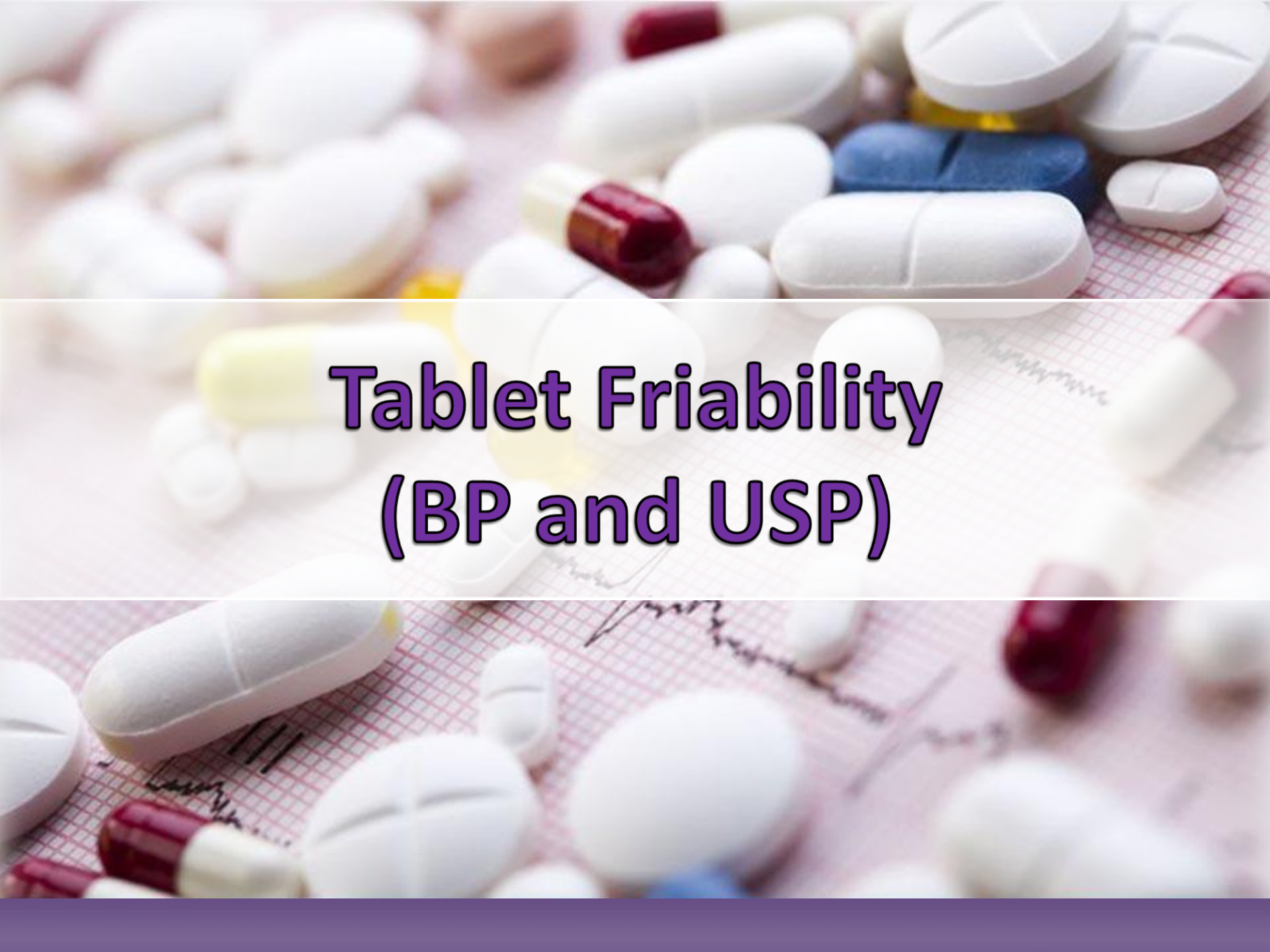
Tablet Hardness USP

Tablet Hardness BP

- **BP:**
- **Doesn’t specify certain device. However, same principle of USP.**
- **The apparatus is calibrated using a system with a precision of 1 newton.**
- **Carry out the measurement on 10 tablets, taking care that all fragments of tablets have been removed before each determination.**

Tablet Hardness BP



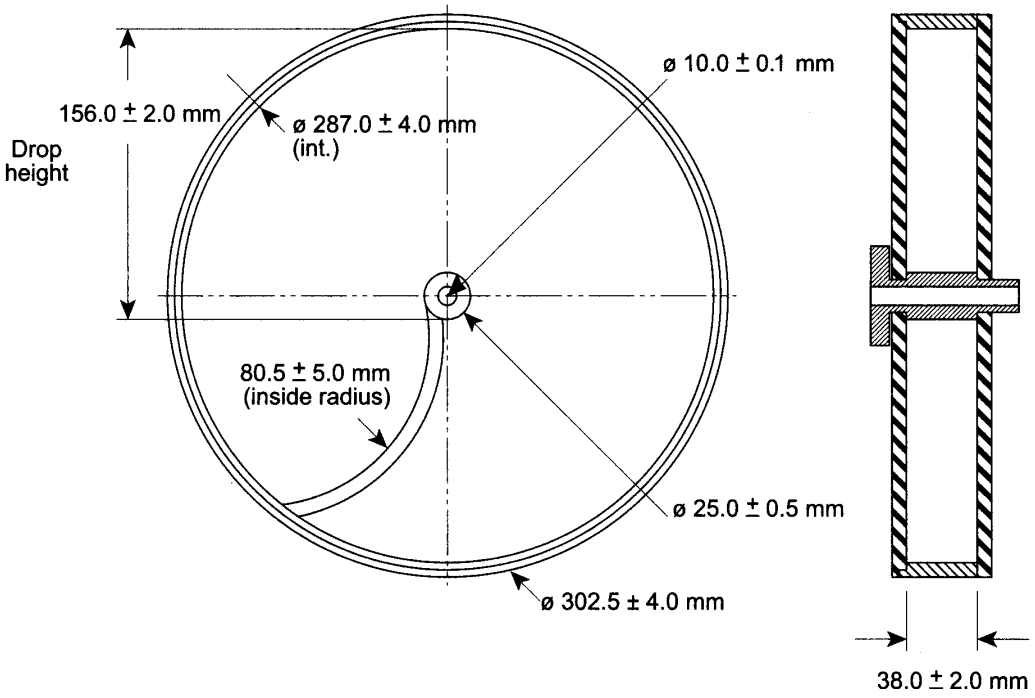


Tablet Friability (BP and USP)

Tablet Friability

- A tablet's durability may be determined through the use of a friabilator.
- This apparatus determines the tablet's friability, or tendency to crumble, by allowing it to roll and fall within the drum.
- Resistance to loss of weight indicates the tablet's ability to withstand abrasion in handling, packaging, and shipment.

Tablet Friability



Tablet Friability

- Drum rotation: 25 ± 1 r/min.
- For tablets with a unit mass of more than 650 mg, take a sample of 10 whole tablets.
- For tablets with a unit mass equal to or less than 650 mg, take a sample of whole tablets corresponding as near as possible to 6.5 g.

Tablet Friability

- The tablets are carefully dedusted prior to testing.
- Accurately weigh the tablet sample, and place the tablets in the drum.
- Rotate the drum 100 times, and remove the tablets.
- Remove any loose dust from the tablets as before, and accurately weigh.

Tablet Friability

- Generally, the test is run once.
- If obviously cracked, cleaved, or broken tablets are present in the tablet sample after tumbling, the sample fails the test.
- If the results are difficult to interpret or if the weight loss is greater than the targeted value (1%), the test is repeated twice and the mean of the 3 tests determined.
- A maximum loss of mass (obtained from a single test or from the mean of 3 tests) not greater than 1.0 % is considered acceptable for most products.

Tablet Friability

Initial weight = 6.8212 g

After weight = 6.6935 g

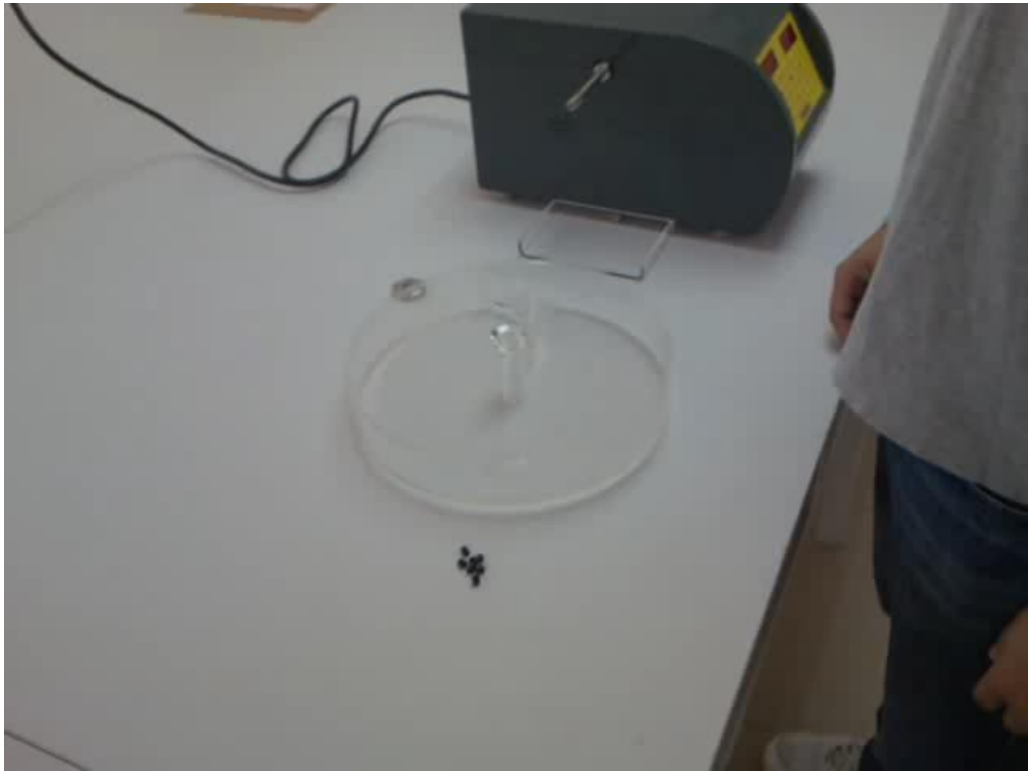
Weight difference = 6.8212 g – 6.6935 g

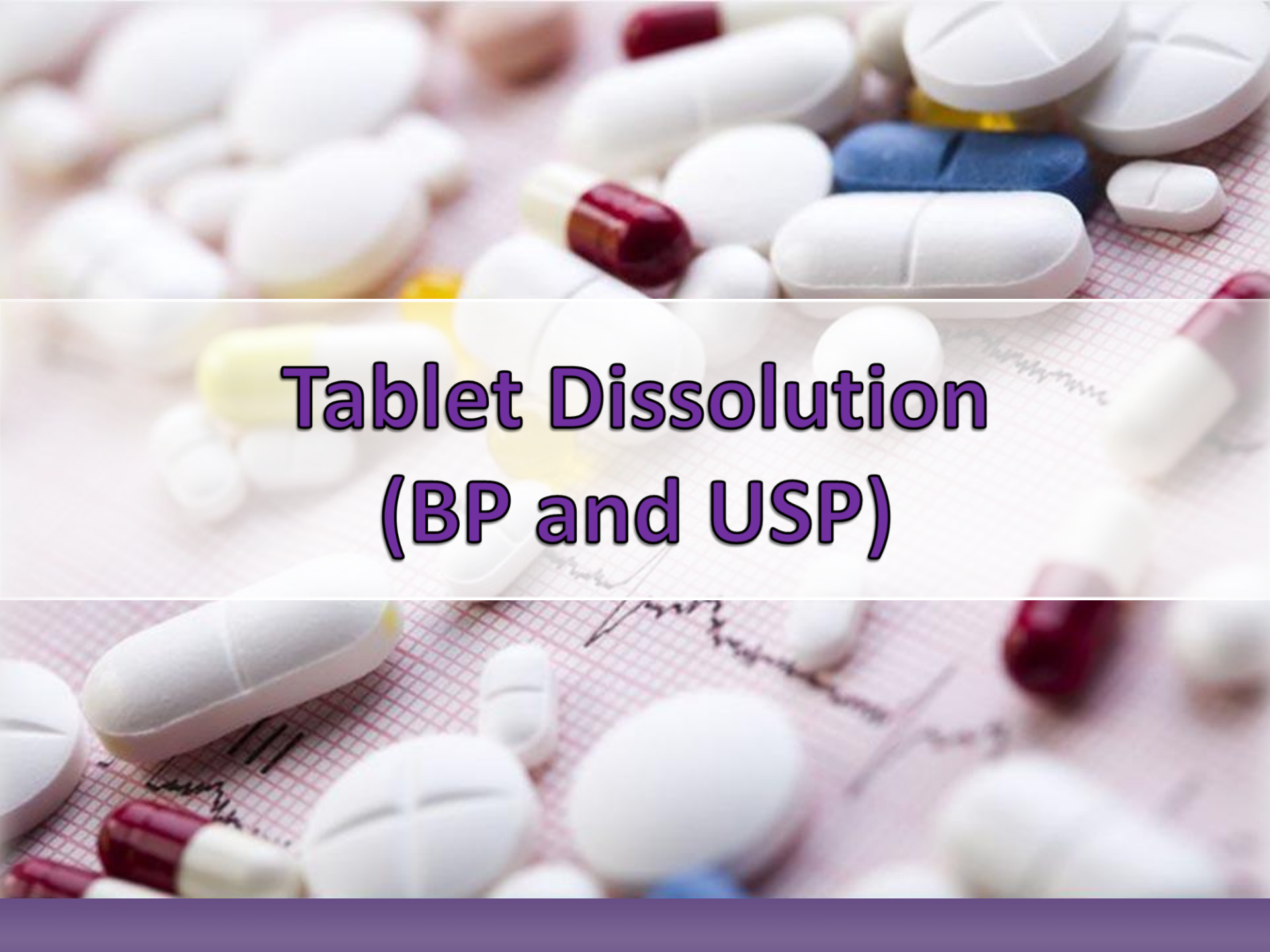
= 0.1277 g

$$\text{Percentage loss of weight} = \frac{0.1277\ g}{6.8212\ g} \times 100\%$$

= 1.87%

Tablet Friability





Tablet Dissolution (BP and USP)

Tablet Dissolution

- The goal of in vitro dissolution testing is to provide insofar as is possible a reasonable prediction of or correlation with the product's in vivo bioavailability.

- The system relates combinations of a drug's solubility and its intestinal permeability as a possible basis for predicting the likelihood of achieving a successful in vivo–in vitro correlation (IVIVC).

Tablet Dissolution

- A number of formulation and manufacturing factors can affect the disintegration and dissolution of a tablet, including:

- Particle size of the drug substance.
- Solubility and hygroscopicity of the formulation.
- Type and concentration of the disintegrant, binder, and lubricant.
- Manufacturing method, particularly the compactness of the granulation and compression force used in tableting.
- Any other in-process variables.

Tablet Dissolution

- The BP and USP includes 7 apparatus designs for drug release and dissolution testing of immediate-release oral dosage forms, extended-release products, enteric-coated products, and transdermal drug delivery devices.

- Of primary interest here are Apparatus 1 and Apparatus 2, used principally for immediate-release solid oral dosage forms.

Tablet Dissolution

- **<u>Apparatus 1 (basket)</u>**

1- vessel

a- Made of brosilicate glass

b-Semi hemispherical bottom

C- Capacity 1000 ml

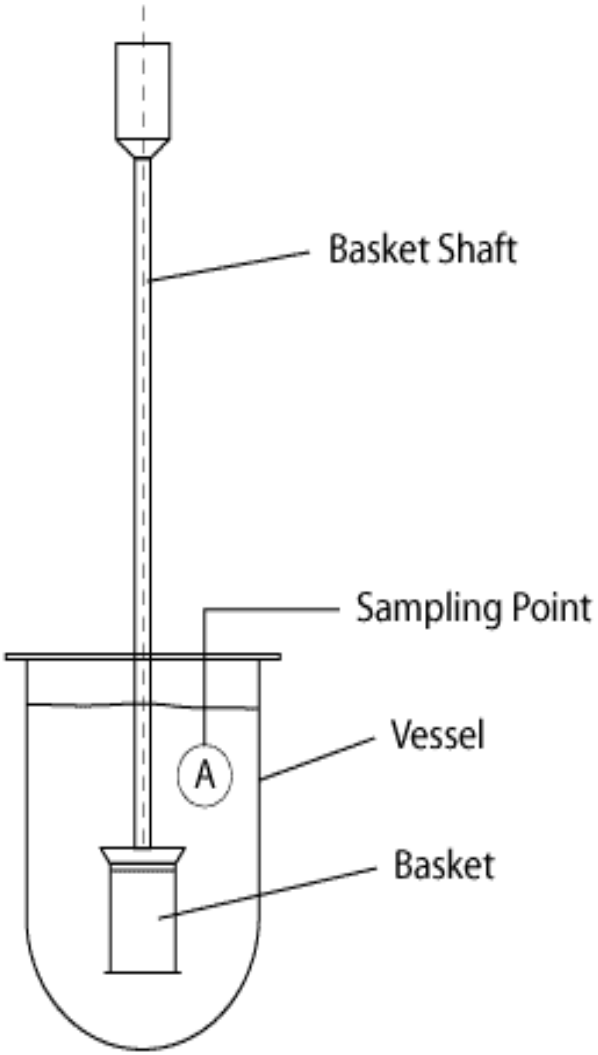
2-Shaft

a- Stainless steel

b- Rotate smoothly

3- Cylindrical basket

4- Motor



Evaluation of tablets

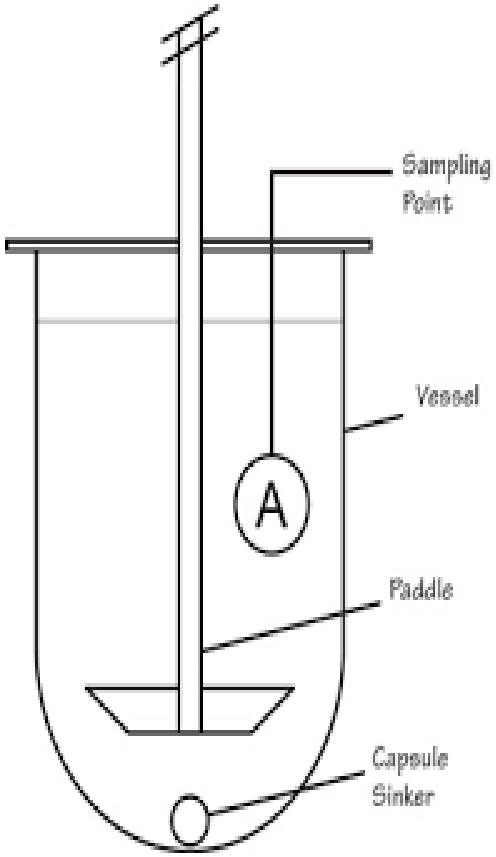
- **<u>Apparatus 2 (paddle)</u>**

a-Vessel as the same as apparatus 1

b-Shaft: a blade pass through the shaft

c-Stirring element :stainless steel or tefflon

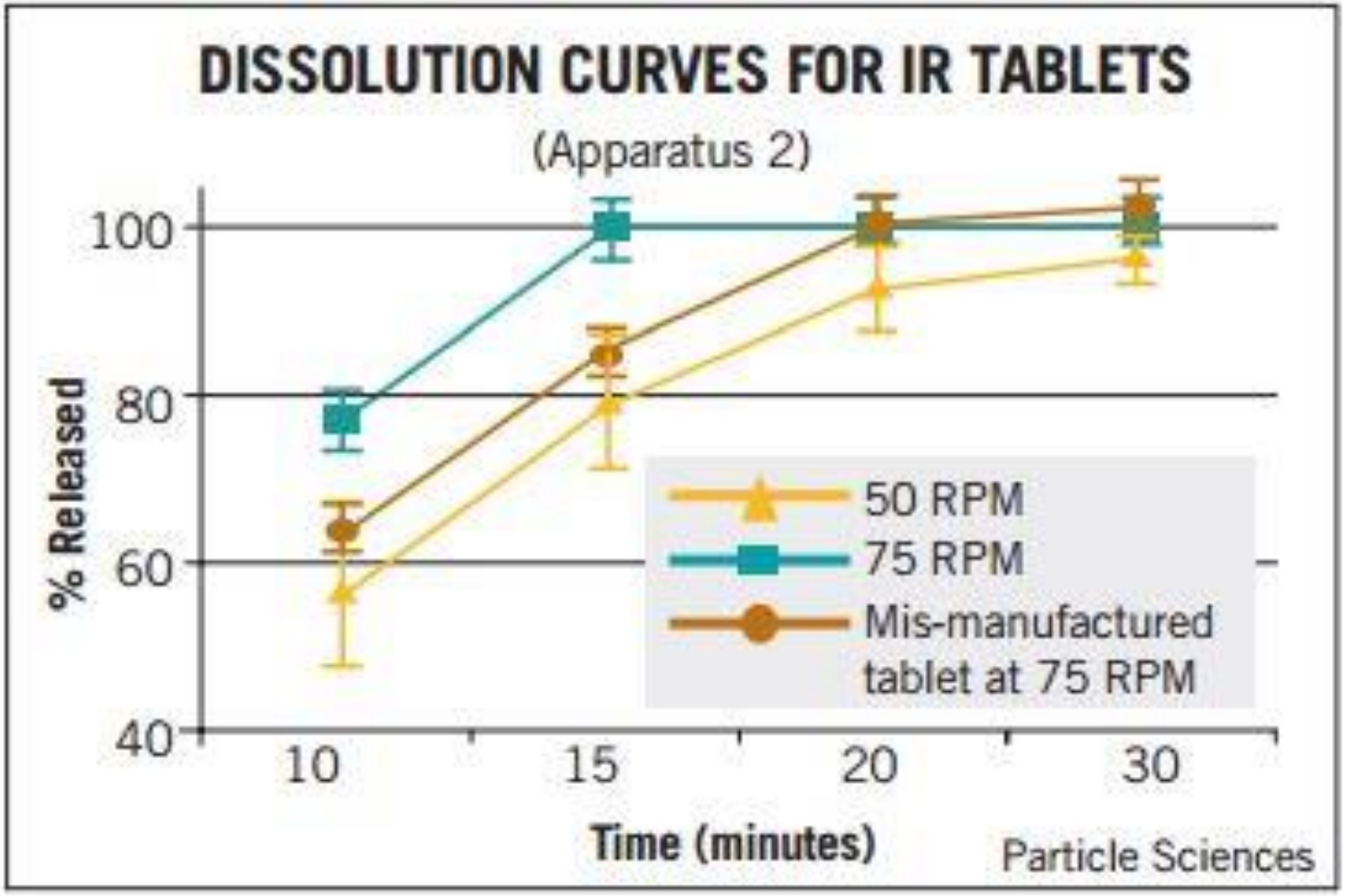
d-Sinker : platinum wire used to prevent tablet floating



Evaluation of tablets

Tablet Dissolution

Figure 2



Tablet Dissolution

- **Procedure**
- **In each test, a volume of the dissolution medium (as stated in the individual monograph) is placed in the vessel and allowed to come to 37°C ± 0.5°C.**
- **Then, the stirrer is rotated at the speed specified.**
- **At stated intervals, samples of the medium are withdrawn for chemical analysis of the proportion of drug dissolved.**
- **The tablet or capsule must meet the stated monograph requirement for rate of dissolution, for example, "not less than 85% of the labelled amount is dissolved in 30 minutes."**


RC-1
DISSOLUTION TESTER

"The end is just a new beginning."