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The Incredible World of Tablet

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Abstract: ***Pharmaceutical oral drug delivery is the most commonly used route of administration compared to other route of administration. Solid dosage forms are administered orally like tablets, capsules, pills, powders, etc. Tablet is the most widely used safest oral route of administration. Tablets are solid dosage form can be made directly from powders or from granules or from film coated multiple units. Tablets are also containing drug substances with or without diluents and prepared by compression or moulding methods. Tablets can be classified as compressed tablets and moulded tablets.***
Keywords: Tablet, Solid dosage form, Oral route, Granulation, Evaluation test.

I. INTRODUCTION

Tablet is a solid unit dosage form of medicaments with suitable excipients or pharmaceutical oral solid dosage form. Tablets are occured in different size, shape, thickness, its hardness, weight , disintegration, and dissolution characteristics and depending on their intended use and method of manufacture.

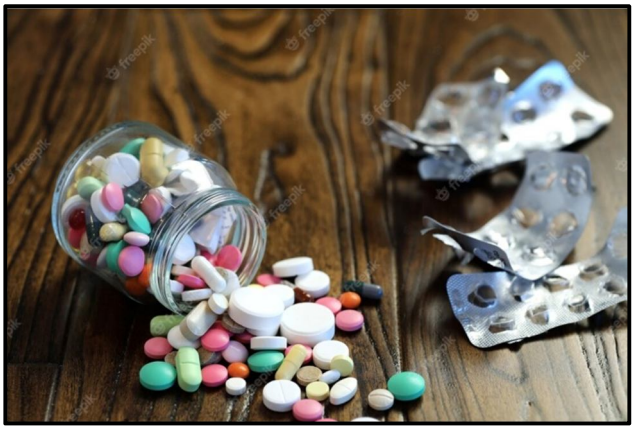


Fig.1 Tablets

A. Properties

1) Suitable for large scale production. i.e Industrial area.
2) Easy to swallow & can be self administered.
3) Tablet have physical & Chemical stability to maintain its physical attributes.
4) Should be an elegant product, free from defects.
5) Size and shape of tablets influence passing of product through GIT.
6) Odour and bitter taste can be masked by coating techniques.

B. Advantages

1) They are cheapest and easiest to package and strip.
2) Lower in cost.
3) Easy to handling.
4) Lighter and compact.
5) Having greatest chemical stability over all oral dosage forms.
6) Tablet can be easily administered.
7) Easy to dispense.
8) Easy to transport in bulk.
9) Organoleptic properties are best improved by coating of tablets.

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C. Disadvantages

1) Slow onset of action as compared to parenterals, liquid orals and capsules.
2) Poor bioavailability of poorly soluble drugs.
3) Difficulty in swallowing in some patients like pediatrics & Unconscious patients.
4) In emergency cases, intravenous or intramuscular injections are more effective.
5) Cost of production may be increase due to coating & encapsulation.
6) Irritant effects are occurred on GI mucosa by some solid. e.g. Aspirin

D. Ingredients

A substance or compound that is intended to be used in the manufacture of a pharmaceutical product as a therapeutically active compound. In active ingredients, tablets contains a number of inert materials also known as excipients or addditives.

Table.1 Role of ingredients

Sr.No	Ingredients	Function	Examples
1.	Diluents	Diluents are filler used to increased bulk volume of tablet. Also used to allow direct compression.	Calcium phosphate, Cellulose, Dextrin, Lactose, Sorbitol, Starch.
2.	Binders	To form cohesive compacts for directly compressed tablets.	Carboxymethylcellulose, Acacia, Dextrin, zein.
3.	Lubricants	Reduce the friction between the tablet and metal surface of punches.	Stearic acid, Magnesium Oxide, Talc, polyvinyl Alcohol, Poloxamer.
4.	Glidants	Enhance the flowability of powder by reducing friction between particles.	Magnesium Trisilicate, Talc, Cellulose, Starch, Aerosil.
5.	Anti-adherents	Used in tablet formulation for prevent sticking to tablet punches.	Metallic Stearate, Corn starch, Talc.
6.	Disintegrant	To promote breakdown of tablet into smaller particles.	Alginic Acid, Povidone, Carboxymethylcellulose.
7.	Colouring Agents	a. Masking off colour change. b. Product Identification. c. Production of more elegant product.	Lake Pigments, FD&C or D&C Dyes.
8..	Flavouring Agents	for improve an odour and additional taste to tablets.	Menthol, Ethyl Vanilin, Olive oil, Citrus fruits Flavours.

II. MANUFACTURING METHODS

Tablets can be manufactured by three methods as follows:

A. Wet Granulation Method

It is most widely used tablet manufacturing method. This method consists some steps like weighing of ingredients, mixing , granulation, screening of damp mass, drying, lubrication and compression of tablets.This granulation method is used to improve the formulation properties like compressibility, powder flowability and for pharmaceutical manufacturing.

B. Dry Granulation Method

Dry granulation can be conducted on a tablet press using slugging tooling or on a roller compactor. Slugging may be used to forms granules. Dry powders can be compressed using tablet machine or rotary press. Compressed slug is passed through the mesh or through the mill & remaining lubricant added to granulation and compressed to form the tablets. Ex: Paracetamol

C. Direct Compression

It involves direct compressing of powdered mixture into the tablets. Direct compression process consists of three steps like raw material blending, tableting and coating. This method is useful for developing particle size uniformly. Ex: Aspirin

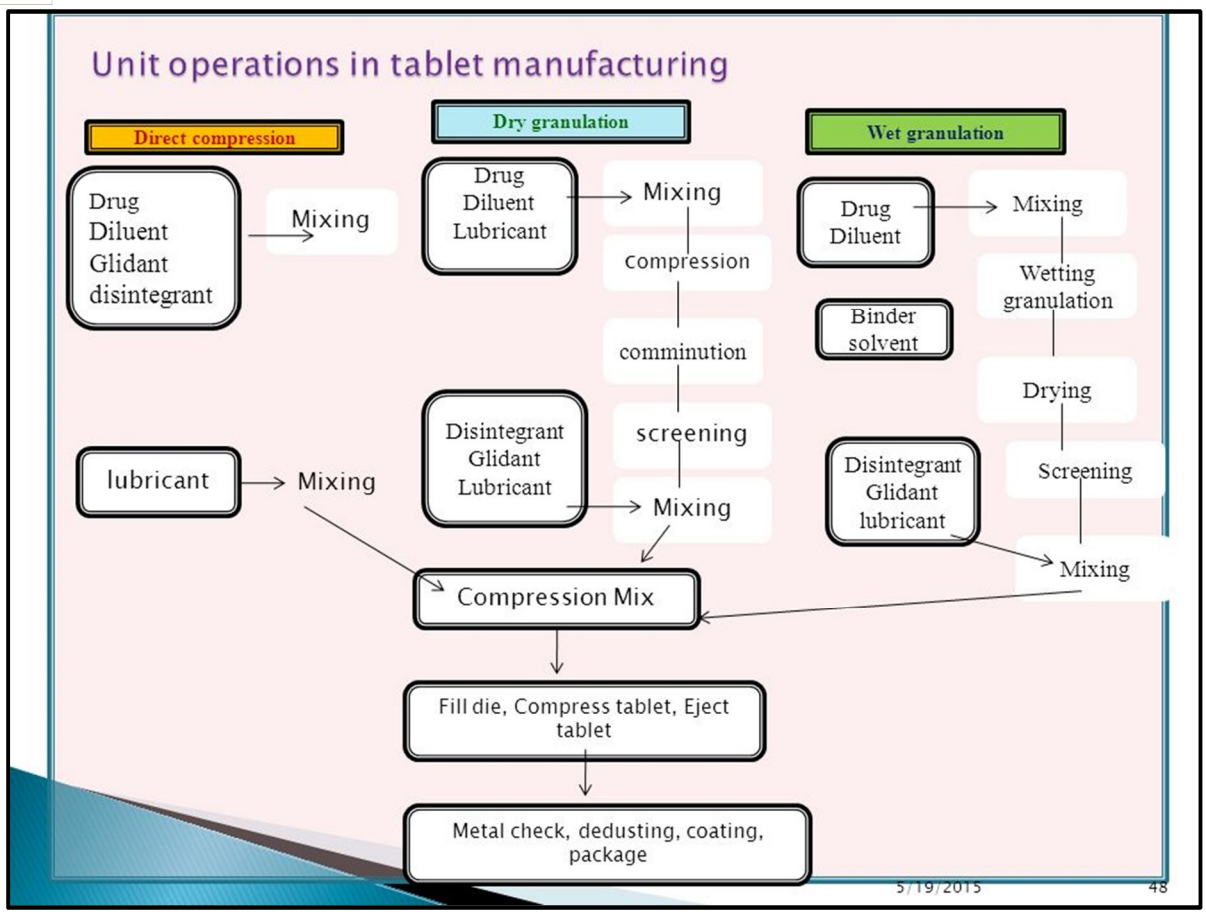


Fig.2 Manufacturing methods of tablet.

III. TABLET COATING

Tablet coating is the process in which coating material is applied on the surface of tablet for achieving desired properties of dosage form.

A. Objectives

1) Mask the colour, odour and taste of the drug .
2) Protects the drug from gastric environment of stomach in case of acid.
3) Avoids chemical incompatibility.
4) To increase the stability.
5) For product identity.
6) Provide an elegant finish to the tablet.

B. Types of Coating

1) Sugar Coating
2) Film Coating
3) Enteric Coating
4) Press Coating
5) Specialized Coating
a) Compressed Coating
b) Electrostatic Coating
c) Dip Coating
d) Vacuum Film Coating

C. Coating Processes

1) Pan Coating
2) Fluid Bed Coating
3) Compression coating

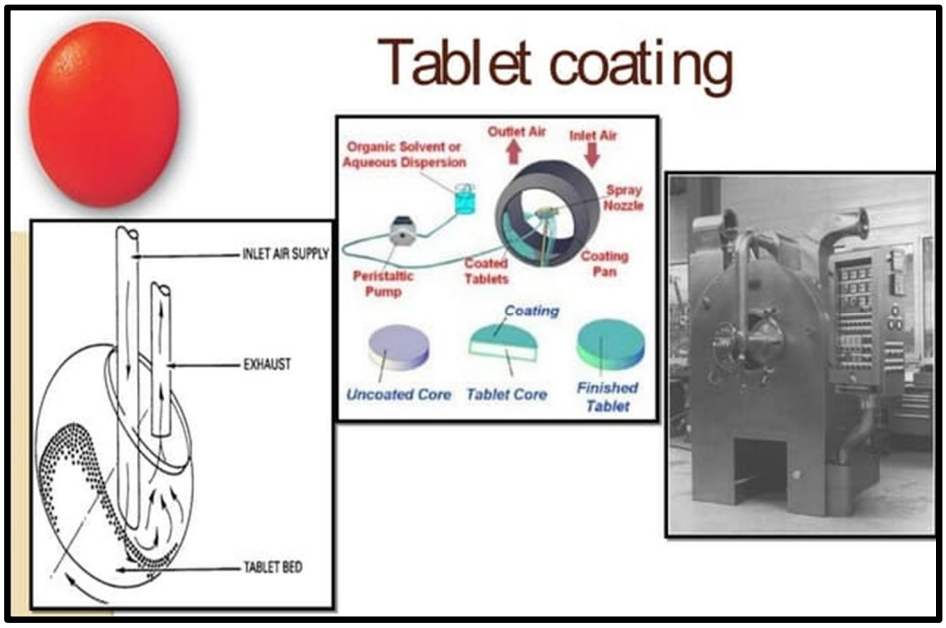


Fig.3 Tablet Coating Process

IV. TYPES OF TABLETS

A. Oral Tablet for Ingestion

1) Standard Compressed Tablets, e.g. Paracetamol Tablets
2) Multiple Compressed Tablets, e.g. Aspirin Tablets
a) Compression Coated Tablets
b) Sugar Coated Tablets, e.g. Multivitamin Tablets
- Film Coated Tablets, e.g. Metronidazole Tablets
- Gelatin Coated Tablets, e.g. Famolate Tablet
- Enteric Coated Tablets, e.g. Besacodyl Tablets

c) Layered Tablets
d) Inlay Tablets
3) Targeted Tablets
a) Floating Tablet, e.g. Ranitidine
b) Colon Targeting Tablet, e.g. Prednisolone
4) Chewable Tablets, e.g. Antacid Tablets
5) Dispersible Tablets, e.g. Analgesic (Ibuprofen)

B. Tablets Used In Oral cavity

1) Buccal Tablets, e.g. Vit C tablets
2) Dental cones e.g. Parasorb Cone
3) Lozenges & Troches, e.g. Strepsils.
4) Sublingual Tablets, e.g. Vicks Menthol Tablets
5) Mouth Dissolved / Rapidlly Dissolving Tablets, e.g. Stemetil MD

C. Tablets Administered By Other Routes

1) Vaginal Tablets, e.g. Clotrimazole Tablets

2) Rectal Tablets, e.g. Dulcolax.
3) Implants

D. Tablets Used To prepared Solution
1) Effervescent Tablets, e.g. Dispirin Tablets (Aspirin)
2) Molded Tablets
a) Hypodermic Tablets
b) Dispensing / Soluble Tablets, e.g.Enzyme Tablets (Digiplex)
3) Tablet Triturate, e.g. Enzyme Tablets (Digilex)

E. Structure Wise
1) Core Tablets
2) Concave Convex Tablets
3) Divisible Tablets
4) Aperture Tablets

F. Action Wise
1) Modified Release Tablet



Fig.4 Types of Tablets

V. EVALUATION TESTS FOR TABLETS

A. Non – Official Tests
1) General Appearance: The identity of tablets and elegance is essential for acceptance from consumer. Control of general appearance involves measurements of tablets like size, shape, colour, odour, Taste, Surface texture.
a) Size & Shape: It can be dimensionally controlled & described. Thickness of tablet can be measured by micrometre or by other device. Standard sized of tablets are about > 5 mm in diameter.
b) Organoleptic Properties: It involves identification of colour, odour, taste and appearance. Colour distribution should be uniform with no mottling. The colour, odour, tastes comparison compared with standard samples.

2) Hardness: Tablet crushing strength is also known as hardness of tablet. Hardness testing of tablets are useful with stand mechanical shakes during handling, manufacturing, packing ans shipping. Tablet hardnes defined as the force requird for breaking tablet in dimetric compression. Hardness for compressed tablet is 5 to 8 kg.

Generally used hardness testers are:

a) Monsanto Tester
b) Strong - Cobb Tester
c) Pfizer Tester
d) Erwika Tester
e) Schleuniger Tester



Fig.4 Monsanto Hardness Tester

3) *Friability:* Friability can be defined as % of weight loss by tablets due to mechanical action (like manufacturing, packing and transportation process) during the test. Friability tester is also known as the Roche Friabilator. It is performed for compressed and uncoated tablets. Roche Friabilator consists a plastic chamber which revolves 25 rpm.& dropping tablets from height of 6 inches in friabilator chamber . This instrument is operate for 100 revolutions. For the passing this test weight of tablet needed less than 0.1 to 0.5%

B. Official Tests

1) *Weight Variation:* Weight variation is the quality control test which is used to confirm uniformity of dosage unit and it also support to identity, safety and quality of the product. This test is used weighing 20 tablets individually calculating average weight and compare individual tablet weight to the average.

Weight variation = (IW- AW)/ AW× 100%

Where, IW= Individual weight

AW= Average weight

2) *Content Uniformity:* It is based on assay. It is useful for determine the amount of active ingredients by assay metods. Out of 30 tablets 10 tablets are assayed for content uniformity.

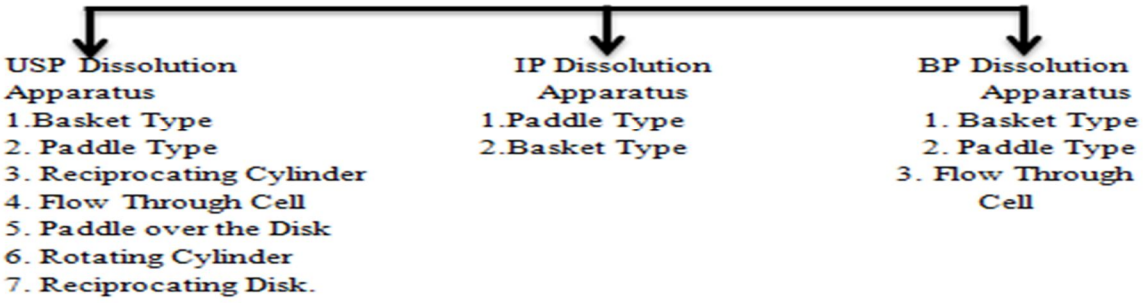
IP: active less than 10 mg / 10%.

BP: active less than 2 mg / 2%

USP:active less than 25 mg / 25%

3) *Dissolution:* Dissolution is a process in which solid substance solubilises in a given solvent. Dissolution kinetics is important in determining the bioavailability of drug. Ex. Griseofulvin

Different Types Of Dissolution apparatus:



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4) *Disintegration:* Disintegration is the time required for the tablet to break into small particles. This test is carried out by disintegration test apparatus U.S.P device. It includes 6 glass tubes that are 3 open at top and 10 mesh screen at bottom end. Use 6 tablets (each tablet in each tube) and the basket rack is positioned in 1-L beaker of water ,simulated gastric fluid or intestinal fluid at 37 © .Tablets remain 2.5 cm below the surface of liquid on their upword movement and not closer than 2.5cm from the bottom of the beaker in their downword movement .Move the basket containing the tablets up and down through distance of 5-6 cm at a frequency of 28 to 32 cycles per minute.Floating of tablets can be prevented by placing perforated plastic discs on each tablet.

Table.2 Disintegration period of tablets

Type of tablets	Time Of Disintegration
Uncoated conventional tablets	15 min
Sugar coated tablets	60 min.
Film coated tablets	60 min.
Dispersible tablets	< 5 min.
Effervescent tablets	< 3 min.

TABLET DEFECTS:

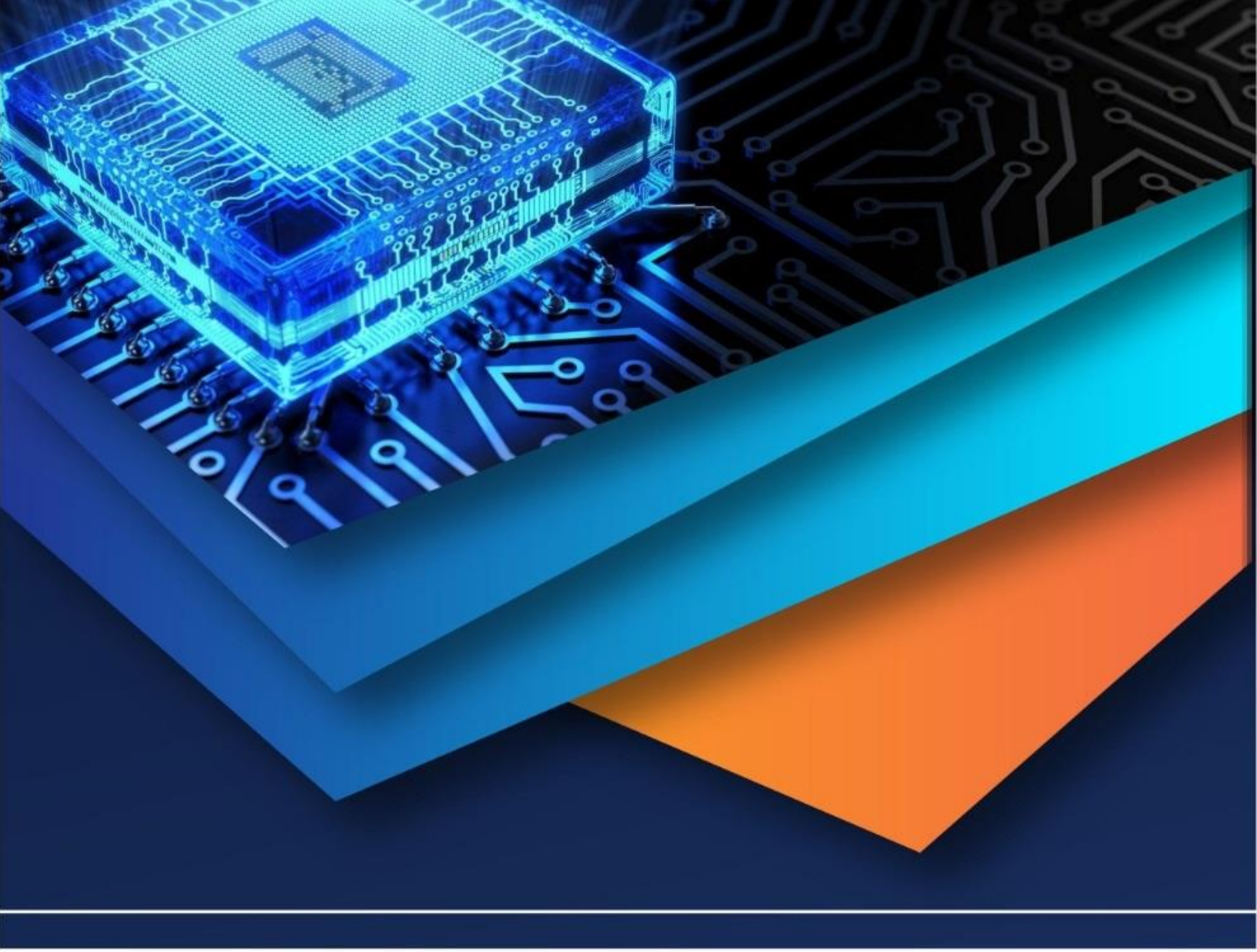


Fig.5 Defects of tablets [13]

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