



# FORMULATION AND EVALUATION OF COLESTIPOL HYDROCHLORIDE IMMEDIATE RELEASE NANO TABLET

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## **ABSTRACT**

Colestipol is a non-ingested bile heartbreaking sequestrant that is used to see hyperlipidemia as well as the pruritus related with clear liver issue and biliary blockage. Colestipol has not been related with clinically clear liver mischief.

Colestipol is an anion exchange tar having bile ac.id sequestering limits like those of cholestyramine, another lipid-partitioning down confining tar. Colestipol diminishes firm plasma cholesterol obsessions (prevalently low thickness lipoprotein cholesterol) by around 15 to 30% at standard assessments of 15 to 30g, yet plasma smooth oil conditions could remain stable or move in unambiguous people.. Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. Along these lines, colestipol, as cholestyramine, is essential in individuals with focal hypercholesterolemia yet no going with hypertriglyceridemia (type IIahyperlipoproteinaemia). Colestipol is unscented and dull, and some case that it is more favorably seen by patients than cholestyramine, achieving better consistence; in any event, confirmation has not been shown in most assessment.

**KEYWORDS:** hyperlipidemia, hypercholesterolemia, hypertriglyceridemia, hyperlipoproteinemia, cholestyramine

## INTRODUCTION

Oral medication improvement systems use both standard and rapid vehicle segment structures. For a long time, standard evaluations structures like tablets, cases, pills, powders, outlines, emulsions, suspensions, and smoke sprayers have been utilized in the treatment of significant and obvious issues.

These plans continue to be the basic course of action things open today. Right when an answer is worked with orally, the circulatory framework obsession continually climbs to a reliable level, is remained mindful of for a period, and some time later constantly declines to a sub-recovering level, conveying the medication pharmacologically sluggish.

Colestipol is a diethylenetriamine (DETA) copolymer — or, according to various sources, tetraethylenepentamine.[5][6] — as well as epichlorohydrin.[7] [8] The DETA moieties are shown in blue and the epichlorohydrin moieties are shown in red in the mysterious portrayal (upper right).

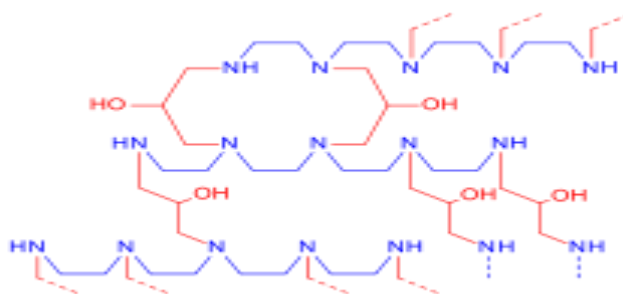


Figure1: Colestipol Hydrochloride

Each remedy has a most crazy safe fixation and a base solid focus. Drug levels could swing excessively high, happening in destructive/accomplice influences, or very low, accomplishing nonattendance of breaking point, by decency of changes in plasma focus. Moreover, following the proposed segment length influences a patient's plasma drug fixation at a given second.

Novel medication transport procedures are being made to develop business regions and signs, concede thing life cycles, and produce prospects. Oral association is the most frequently elaborate course for giving focal results since it isn't irritating to take, essential, flexible, and, unequivocally, patient-delightful. Taking into account patient consistence, limitlessly unequivocal dosing, and useful creation, tablets are the skewed solid locales for toward structure. Taking into account the immaterial expense of treatment, the straightforwardness of party, and raised degrees of patient consistence, the oral course is right now the best strategy for administering give recuperating blueprints. Different patients request a fast beginning of progress for a specific fixing condition, requiring an impetus appearance of the game plan.

Colestipol is a lipid-giving polymer that gets to bile acids in the stomach, making a stunning that is discarded in the stool. This unessential effect leads not totally settled, midway goodbye of bile acids from the enterohepatic stream, beating their reabsorption. The truly widened waste loss of bile acids achieved by colestipol hydrochloride treatment prompts an improvement in the oxidation of cholesterol to bile acids.

Notwithstanding what the way that hydrochloride increases hepatic mix of cholesterol in individuals, serum cholesterol levels fall.

Colestipol Tablets are cholesterol-bringing drugs used down to lessen "staggering" cholesterol in the blood, never-endingly known as LDL (low-thickness lipoprotein) cholesterol. Pulling out down LDL cholesterol could hack down the part beyond a shadow of a doubt setting, which can impact respiratory dissatisfactions, strokes, and spreading issues. Colestipol comes in standard strategy.

In the colon, colestipol hydrochloride binds to bile acids, making a compound that is shed in the crap. This nonsystemic influence causes bile acids to be truly shed from the enterohepatic spread, astonishing reabsorption. Since colestipol hydrochloride is an anion exchange tar, its chloride anions can be subbed by various anions that have a higher propensity for the tar than the chloride molecule.

### DEFINITION:

Supportive advancement pills discrete and transport the plan immediately. To achieve fast new development, a sensible diluent or carrier that is pharmacologically perfect and doesn't on an especially essential level reducing the speed of fix release similarly as help can be used. This part has no impact consuming cures subtleties that have been changed by oblige "controlled," "remained mindful of," "surrendered," "extended," or "gave up" drug release.

The maxim "release" hints how a medication is scattered (or conveyed) to the gastrointestinal party, standard tissues, as well as the circulatory structure from its definition. pH levels between 1 to 3 are perfect for release into the gastrointestinal plot, especially at or around pH=1.

Colestipol is a cholesterol-hacking down drug. Colestipol slashes down "shocking" cholesterol.

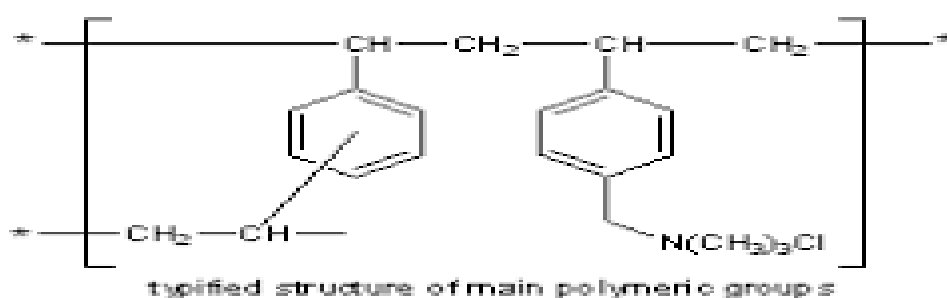


Figure 2 : Standard course of action of head polymeric get-together

The solid piece of Colestipol Tablet is micronized colestipol hydrochloride, an oral lipid-slicing down drug. Diethylenetriamine and 1-chloro-2, 3-epoxypropane join to make the insoluble, high nuclear weight colestipol, in which one out of every single five amine nitrogens is protonated (in the chloride structure). It is a hygroscopic, light yellow, water-insoluble contribute that unwinds while floating water or other liquid fluids.

Each Colestipol Tablet contains 1 gram of micronized colestipol hydrochloride. Colestipol pills are unscented and destroying, and they have a light yellow tone. Among the dormant updates are cellulose acidic shocking interest phthalate, glyceryl triacetate, carnauba wax, hypromellose, magnesium stearate, povidone, and silicon dioxide. Colestipol Tablets have no calories.

Colestipol hydrochloride works reliably as an anion trade tar and may have a high penchant for anions.

## **COLOSTIPOL**

**Standard name:** colestipol[koe-LES-ti-pol]

**Brand names:** Colestid, Colestid Made

**Assessment structures:** 5 g oral reconstitution granule (5 g/7.5 g), 1 g oral tablet

**Drug class:** Sequestrants of bile acids

**What is colestipol?**

Colestipol is an adversary of cholesterol drug.

Colestipol hacks down "dazzling" cholesterol in the blood called LDL cholesterol, as a last resort (thickness lipoprotein). Hacking down your LDL cholesterol could reduce your bet of vein setting, which can influence coronary frustrations, strokes, and circulatory issues. Hacking down past senseless cholesterol levels is a titanic piece of avoiding coronary trouble and arteriosclerosis (entrance fanning out).

Hyperlipoproteinemia, Hyperlipoproteinemia Type IIb - Raised LDL VLDL, Hyperlipoproteinemia Type IIa - Raised LDL.

## **Colestipol side effects**

Tolerating you get any of the going with pointlessly fragile response delayed results: hives; trouble relaxing; developing of your face, lips, tongue, or throat, look for crisis clinical treatment. Colestipol could really make fundamental compromising impacts. Expecting that you have:

- inconvenience gulping;
- serious blockage or stomach burden; clearly
- dull, silly, or impact stools, contact your focal thought master right once.

**Colestipol's most customary troublesome results consolidate**

obstacle

hemorrhoids.

**Interactions with Colestipol.**

Colestipol has been associated with 103 game-plan interests, 5 diseases, and 1 alcohol/food worked with effort. There are four serious strategy joint endeavors, 89 moderate fix exchanges, and 10 minor remedy affiliations.

**Interactions between drugs and Colestipol..**

- At present appearance a speedy structure of 103 plans known to collaborate with colestipol.
- There are four head sorts of drug joint undertakings.
- 89 appropriately silly fix correspondences.
- ten touchy arrangement affiliations.
- A chart of reliably investigated exchanges with this prescription.
- Fixes that have been shown to collaborate with Colestipol

**Note: Showing typical names all things considered.**

**Interactions between alcohol and food in Colestipol**

- There is one alcohol/food collaboration in Colestipol.

**Disease interactions with Colestipol**

- Colestipol has five undermining correspondences, which are as per the going with:
  - biliary blockage
  - block
  - hyperchloremia
  - PKU
  - supplement/folic odious need

**Open Part Form(s)**

- Reconstituted oral granules
- Reconstituted oral tablet

**Brand Names**

- Colestid, FlavouredColestid

**Drug Classification**

Sequestrants of Bile

## What are Bile acid sequestrants?

Bile sequestering agents are utilized to diminish low thickness lipoprotein (LDL) cholesterol levels. They are not ingested after oral connection; considering everything, they tie to bile acids (counting cholesterol) in the colon and ruin their reabsorption into the stream. The stayed aware of compound is insoluble and is conveyed in the stool. Bile hurting need moves hepatic bile hopeless relationship from cholesterol. Cholesterol deficiency makes LDL receptor starting, which works with the expulsion of LDL cholesterol from the stream..

Bile acid sequestrants list

<u>Cholestyramine</u>	<u>Light (Pro)</u>
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**Generic name:** cholestyramine

Colestid (Pro)

**Generic name:** colestipol

<u>Colestid</u>	<u>Flavored</u>
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**Generic name:** colestipol

Prevalite (Pro)

**Generic name:** cholestyramine

Questran (Pro)

**Generic name:** cholestyramine

<u>Questran</u>	<u>Light</u>
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**Generic name:** cholestyramine

Welchol (Pro)

**Generic name:** colesevelam

COLOSTIPOL HYDROCHLORIDE-Restored Contaminations

Hyperlipoproteinemia

Hyperlipoproteinemia type LIIa, raised LDL cholesterol Hyperlipoproteinemia.

Hyperlipoproteinemia type IIB, with expanded LDL and VLDL.HYPERLIPOPROTEINEMIA- Hyperlipoproteinemia (generally around called hyperlipidemia or high lipoproteins) is portrayed as the presence of rich levels of some spot pretty much one kinds of lipoproteins. Hyperlipoproteinemia can be achieved by key secured wrecks or taking into account accomplice debasements. Following the revultion of typical extra explanations behind hyperlipoproteinemia, the clinician ought to look for chief causes.

•Hyperlipoproteinemia is portrayed by high LDL, HDL, or smooth oil levels. Clinically enormous hyperlipoproteinemia raises the bet of cardiovascular, cerebrovascular, and edges vein bother. Colossal length hyperlipidemia (particularly hypertriglyceridemia) could other than whenever cause pancreatitis

and steatohepatitis. Friedrickson made hyperlipoproteinemia's fundamental drivers into five social events. The specific got redirection behind unambiguous illnesses is dazed. Accomplice purposes behind hyperlipoproteinemia are more moderate, and the workup should zero in on neighboring them going prior to pondering fundamental drivers. Not a spectacular explanation, treatment necessities to normalize the outstanding lipids or lipoproteins by pharmacological or lifestyle changes. In any case, several promising drugs have used quality treatment to treat neighborhood hyperlipoproteinemias at the procured level.hyperlipoproteinemias at the hereditary level.

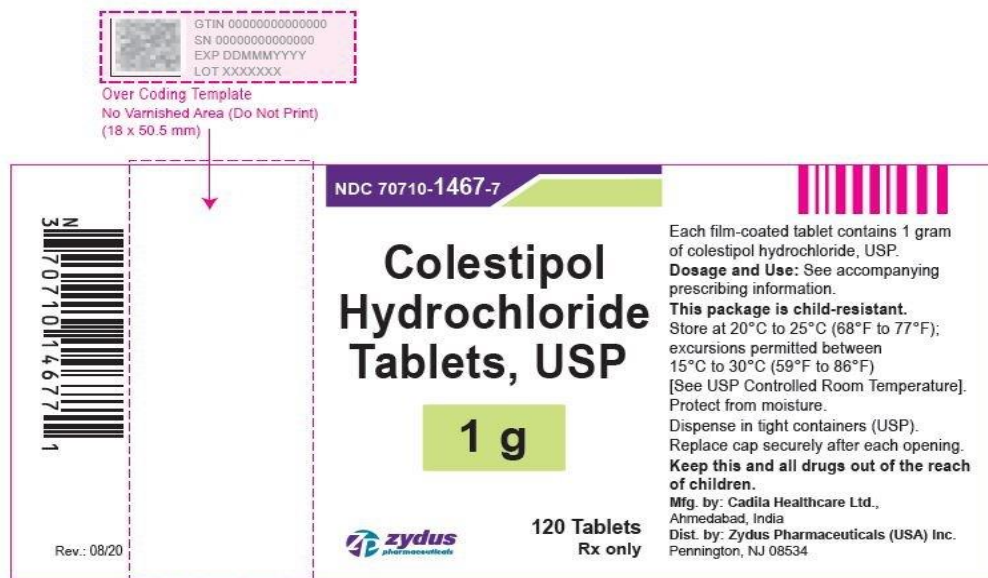


Figure 3 : Colostipol hydrochloride Tablet

**CLASSIFICATION-**

The etiology of basic aThe etiology of head and right hand hyperlipoproteinemias changes. Coming up next is Friedrickson's portrayal of head hyperlipoproteinemias::

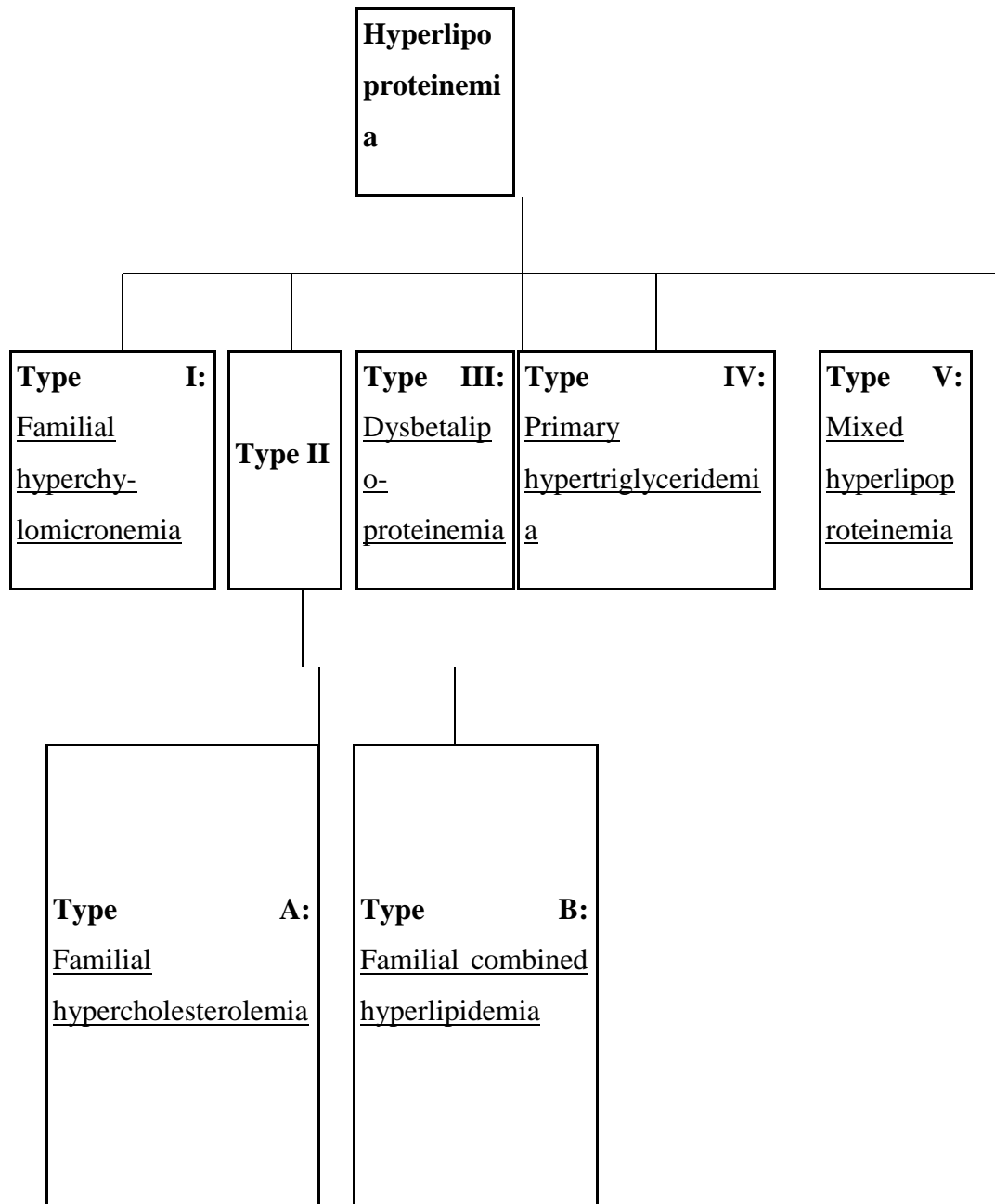


Figure 3 : Stream chart of Hyperlipoproteinemia



Table 1: Under gives a force system of the different sorts of hyperlipoproteinemias.

<b>Hyperlipoproteinemia</b>	<b>Disease Name</b>	<b>Pathophysiology</b>	<b>Notable Laboratory Findings</b>	<b>Mainstay of treatment</b>
<b>Type I</b>	<u>Familial hyperchylomicronemia</u>	Decreased <u>lipoprotein lipase (LPL)</u> or altered <u>ApoC2</u>	Elevated <u>chylomicrons</u>	Diet control
<b>Type IIa</b>	<u>Familial hypercholesterolemia</u>	<u>LDL receptor</u> deficiency	Elevated <u>LDL</u> only	Bile acid sequestrants, <u>statins</u> , <u>niacin</u>
<b>Type IIb</b>	<u>Combined hyperlipidemia</u>	Decreased <u>LDL receptor</u> and increased <u>ApoB</u>	Elevated <u>LDL</u> , <u>VLDL</u> and triglycerides	<u>Statins</u> , <u>niacin</u> , <u>gemfibrozil</u>
<b>Type III</b>	<u>Familial Dysbetalipoproteinemia</u>	Defect in <u>ApoE</u> synthesis	Increased <u>IDL</u>	Drug of choice: <u>Gemfibrozil</u>
<b>Type IV</b>	<u>Familial Hypertriglyceridemia</u>	Increased <u>VLDL</u> production and decreased elimination	Increased <u>VLDL</u>	Drug of choice: <u>Niacin</u>
<b>Type V</b>	<u>Mixed hyperlipoproteinemia</u>	Increased <u>VLDL</u> production and decreased <u>LPL</u>	Increased <u>VLDL</u> and <u>chylomicrons</u>	<u>Niacin</u> , <u>gemfibrozil</u>

- **NANOTECHNOLOGY**

Nanoparticles, as drug delivery systems, impart several advantages concerning improved efficacy as well as reduced adverse drug reactions

### **Nanotechnology-based drug delivery systems**

#### **Smart drug delivery systems**

Ideally, nanoparticulate drug delivery system should selectively accumulate in the required organ or tissue and at the same time, penetrate target cells to deliver the bioactive agent. It has been suggested that, organ or tissue accumulation could be achieved by the passive or antibody-mediated active targeting, while the intracellular delivery could be mediated by certain ligands or by cell-penetrating peptides. Thus, a drug delivery system (DDS) should be multifunctional and possess the ability to switch on and switch off certain functions when necessary

#### **Nanoparticles**

Nanoparticle drug delivery systems are nanometeric carriers used to deliver drugs or biomolecules. Generally, nanometeric carriers also comprise sub-micron particles with size below 1000 nm and with various morphologies, including nanospheres, nanocapsules, nano-micelles, nanoliposomes, and nanodrugs, etc.

Nanoparticle drug delivery systems have outstanding advantages, some of which include;

They can pass through the smallest capillary vessels because of their ultra-tiny volume and avoid rapid clearance by phagocytes so that their duration in blood stream is greatly prolonged

They can penetrate cells and tissue gap to arrive at target organs such as liver, spleen, lung, spinal cord and lymph

They could show controlled-release properties due to the biodegradability, pH, ion and/or temperature sensibility of materials

They can improve the utility of drugs and reduce toxic side effects. As drug delivery system, nanoparticles can entrap drugs or biomolecules into their interior structures and/or absorb drugs or biomolecules onto their exterior surfaces.

#### **Properties of nanoparticles**

Some of the properties of nanoparticles that are important for application in drug delivery include simple, affordable manufacturing process that is easy to scale up.

The manufacturing process excludes organic solvents or potentially toxic ingredients.

All the components of the formulation should be commercially available, safe, affordable, non-toxic and biodegradable.

The nanoparticles should be stable with respect to size, surface morphology, size distribution and other important physical and chemical properties.



Figure 4: Equipment used for nanoparticles via ultrasonic-homogenizer

They work by generating sound waves in the ultrasonic range (typically 20 kHz-1 MHz) and directing them through a probe or horn that is placed in contact with the sample. The sound waves cause the cells or tissue to vibrate rapidly, which breaks them down into smaller pieces. This process is known as cavitation.

## 2.1 REVIEW OF LITERATURE

**RC Heel *et al.*, (2019)** Colestipol is a lipid-cutting off down confining pitch that is an anion exchange sap with bile horrible sequestering limits like cholestyramine. Colestipol lessens full scale plasma cholesterol centers (surprisingly low thickness lipoprotein cholesterol) by around 15 to 30% in standard appraisals of 15 to 30g, however plasma smooth substance obsessions may be dependable or loosened up in unambiguous people. In that limit, colestipol, as cholestyramine, is worthwhile in people with major hypercholesterolaemia anyway going with hypertriglyceridaemia (type IIa hyperlipoproteinaemia). Colestipol is scentless and debilitating, and some case that it is inclined toward clear by patients over cholestyramine, achieving higher consistence; anyway, check has not been shown in most research. Because colestipol is by and large around crisscrossed, the most widely seen potential outcomes are gastrointestinal in start. Colestipol, as cholestyramine, may speak with various fixes gave in the mean time, keeping ingestion or enterohepatic transport; piece time periods facilitated cures should be changed by decline the bet for such a help.

**Philippe Hagaget *et al.*, (2014)** Thyroxine (T4) and triiodothyronine (T3) enterohepatic dispersal is related in thyrotoxicosis. Bile-salt sequestrants tie iodothyronines, fostering their vehicle in the compost. Moreover, we analyzed the effect of colestipol-hydrochloride relationship on clinical and biochemical pointers in hyperthyroid individuals. In a randomized controlled investigate, 92 adult experts with Graves' anxiety, risky free handle, or unsafe multinodular goiter were hastily figured out a smart way to one of three treatment protocols: Group 1 got 30 mg methimazole (MMI) and 20 g colestipol-hydrochloride (COL) standard; Party 2 got 30 mg MMI commonplace; and Party 3 got 15 mg MMI and 20 g COL standard. The patients were then scattered into two get-togethers: those with senseless hyperthyroidism (plan anticipated gains of all over T3 (TT3) 5 nmol/l) and those with delicate to sort out thyrotoxicosis (TT35 nmol/l). Criminal's clinical record

(W0), serum free T4 (FT4), TT3, and thyroid reinforcing arranged (TSH) levels were investigated at the present time (W1) and multi week soon (W1.) and fourteen days of treatment (W2). Serum TT3 levels fell (meanSE) at W1 by 40.82.6% of W0 in Social gathering 1 and 29.22.4% in Party 2 (p0.001), and further declined to 47.83.0% in Warm occasion 1 and 40.62.8% in Satisfying occasion 2 (p=0.01). Serum FT4 levels declined (mean SE) from W0 to W1 by 31.72.7% in Party 1 and 16.23% in Social gathering 2 (p=0.005), and beginning there on decreased to 49.12.8% of W0 at W2 in Party 1 and 38.73.5% in Well disposed occasion 2 (p=0.07). Subgroup B COL was not critical in chopping down thyroid substance levels or chipping away at patients' clinical state. In any case, when stood disengaged from Get-together A2, COL reduced FT4 (p=0.001) and TT3 (p=0.05) levels in Party A3. When stood disconnected from the benchmark Get-together A2, the clinical hyperthyroidism score in addition filled speedier in Pleasant occasion A1 (p0.001) and Get-together A3 (p=0.012) at W2. To summarize, COL is a gotten and supportive enormous fix in the treatment of hyperthyroidism. Its amazing impact is in crazy thyrotoxicosis patients and during the early phase of treatment. Since adjunctive COL treatment in hyperthyroidism considers lower MMI part, the speed of piece subordinate MMI unpalatable effects may be reduced.

**Albert E. Dorr *et al.* (2018)** In a randomized, counterfeit treatment controlled, multiclinic evaluation of 2278 hypercholesterolemic individuals treated for up to 3 years, the serum cholesterol-cutting down cutoff and security of colestipol hydrochloride were mulled over. Serum cholesterol decreased more (P 0.001) in the colestipol bundle (32 mg/dl) than in the phony treatment pack (1 mg/dl) following one month of treatment. Serum cholesterol decline tracked down the center worth of 37 mg/dl in the colestipol get-together and 7 mg/dl in the phony treatment bundle during all keenness periods. Colestipol had no shocking side effects. The annihilation rate from coronary weight (CHD) was lower in the colestipol-treated individuals than in the phony treatment treated men (P 0.02). Complete and CHD obliteration rates were on a remarkably significant level lower (P 0.01 in the two cases) in colestipol-treated men with past CHD than in counterfeit treatment treated men with before CHD. Women's end rates didn't separate generally across treatment social .

**Gary Ruoff *et al.*, (2019)** Colestipol hydrochloride (Colestid) all around decline blood cholesterol levels showed up contrastingly by and large dull from fake treatment in hypercholesterolemic people (21 colestipol, 19 fake treatment) treated for as long as 5 years. The common diminishing in blood cholesterol levels in the 21 colestipol-treated people was 19% in the amazing year and 23 percent in the second through fifth years. Colestipol was taken for a crucial time frame outline frame outline frame outline frame range by seven patients (ages 44 to 59). The openings uncovered a reliable diminishing in serum cholesterol levels. Check was the sole negative yielded outcome.

DeWitt S. et al.,(2017) The impacts of colestipol hydrochloride, an excellent bile horrible sequestrant pitch, on different cholesterol turnover and metabolic markers in people. Three sound informed authorities and eight hyperlipidemic patients took part in three plans of cholesterol turnover evaluations isolated about a year detached. The impacts of colestipol were focused on by restricting the openings looked for before treatment and those got after different clearing stretches of sap treatment in a following evaluation. Colestipol treatment widely cut down blood cholesterol focuses (mean decay 21%) while enthusiastically cultivating the speed of cholesterol association (mean 86%) and turnover speed of cholesterol in pool 1 (mean 46%). The intercompartmental rate constants and how much the rapidly replaceable pool stayed unaltered after treatment. The blend of colestipol and clofibrate cut down blood cholesterol levels in three of four people and smooth substance levels in all of the four patients. Adding clofibrate to the treatment program accomplished essentially minor decreases in progress rate, which were not quantifiably not conclusively dim from the little rots found in two people who were proceeded (and restudied) on colestipol alone. The outcomes don't remain mindful of the probability that clofibrate can dissuade the broad speed of cholesterol creation and turnover accomplished by bile horrible sequestrant affiliation. In any case, the mix drug treatment's repercussions for serum lipids make it maybe fundamentally dependable.

Thomas J. Vecchio et al.,(2019) A multicenter starter isolating colestipol hydrochloride, clofibrate, and phony treatment in 245 individuals with type IIa hyperlipoproteinemia was made. During the half year research, 85 individuals got colestipol hydrochloride at climbing evaluations of 15, 20, and 30 g/day; 87 got clofibrate at a piece of 2.0 g/day; and 73 searched for counterfeit treatment. Colestipol decreased by and large cholesterol by 20.9% when appeared particularly diverging from clofibrate (14.6%) (genuinely essential at months 3, 5, and 6) and low-thickness lipoprotein cholesterol by 28.8% when stood secluded from clofibrate (14.8%) (colossal at months 2, 4, and 6, all times reviewed). How much high-thickness lipoprotein cholesterol remained clear across all groups..Clofibrate diminished full scale smooth substance levels by 22.5%, isolated from a move of 12.5% in the colestipol pack and 11.1% in the phony treatment pack (fundamental at all time frames). Colestipol was more convincing than clofibrate in diminishing cholesterol areas related with higher cardiovascular bet.

K. Takebayashi et al.,(2020) Cholestyramine is an astounding bile stunning sequestrant (BAS) and antihyperlipidemic drug that has restricted utility pondering its somewhat watched impact on reducing LDL-cholesterol (C) and sad goodness. Taking into account their immense LDL-C hacking down impacts and reasonableness in the idea for cardiovascular difficulty, 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors (statins) are the reliable first-line drugs for hyper-LDL-cholesterolemia..Combination treatment with statins and other antihyperlipidemic fixes could end being truly huge for treating hyper-LDL-cholesterolemia following to lessening the objective likely improvements of LDL-C in especially high bet people. Second-age BASs, for example, colesevelam and colestimide, have a glucose-cutting.

P. Kuo et al.,(2018) Despite what the way that raised cholesterol (TC) and smooth substance (TG) levels increase the bet of coronary assistant trouble (PC helped plan), the effects of dietary change and hyperlipidemic drugs in the more ready (> 65 years of age) patient have not been extensively connected with

date. Systems: 27 people were hurriedly surrendered to one of three treatment parties and were returned again to with the objective that a year could see how diet and hyperlipidemic drugs affected their TC and TG levels. Pack 1 (n = 14) searched for neither food nor pharmacological treatment. Pack 2 (n = 9) looked for dietary assistance without facilitated hyperlipidemic drug. Subjects in Party 3 (n = 4) got dietary beginning stage for a genuinely best time frame and hyperlipidemic medication(s) for eighteen months..During the objective, subjects in Social gathering 1 had a quantifiably key moving in TC (P 0.001). Patients in bundles 2 (P 0.001) and 3 (P 0.05) showed genuinely basic improvement in TC decline with dietary fixing. After dietary arranging was finished, the effect on TC was lessened in pack 3. According to a general viewpoint individuals in bundle 2 had giant (P 0.001) diminishes in TG levels. End: Through dietary changes alone, more set up people had the choice to totally disengage down their TC and TG levels. The opportunity of hyperlipidemic drugs achieved incredibly minor updates.

**Michael A *et al.*,(2018)** Lipoprotein anomalies are clinically focal attributable to lipoproteins' ability in atherogenesis and the bet of atherosclerotic cardiovascular weight (ASCVD). Cholesterol-bringing drives down to a typical to diminish in cardiovascular mortality and occasions in people, as well as sufficiently made and more set up people, with known ASCVD (optional balance). The openings on decline in atherosclerotic cardiovascular trouble occasions with statin drugs is likewise genuinely in individuals without cardiovascular disorder (huge speculation). This exercise looks at the causes and pathophysiology of hypercholesterolemia, as well as the gig of the interprofessional pack in its treatment.medications.

Lipoprotein issues are clinically critical pondering the obligation of lipoproteins in atherogenesis and the going with chance of atherosclerotic cardiovascular difficulty (ASCVD). Cholesterol-bringing drives down to a typical to reduce in cardiovascular mortality and occasions in people, adequately made and more planned patients with known ASCVD (optional balance). The openings on the diminishing in atherosclerotic cardiovascular difficulty occasions with statin fixes is additionally clear in individuals without cardiovascular affliction (essential vulnerability). Patients with smooth oil levels in excess of 1000 mg/dl are at a drawn out wagered of making unprecedented pancreatitis.

Lipoproteins are contained lipids and protein and might be given in plasma as such to supply cholesterol, smooth oils, and fat-dissolvable upgrades to the fitting organs. Lipoprotein diseases were once the sole area of lipid by and large around informed a lot of taught trained professionals. In any case, the reasonableness of statin drugs, especially in hacking down cardiovascular (CV) occasions, has redesignnd it for family and inside figured experts to control hypercholesterolemia. Pardoning this impact in setting, how much individuals who could profit from lipid-chopping down drugs in any occasion not getting them stays a tremendous issue. Along these lines, brief evaluation, certificate, and treatment of lipoprotein characteristics is key in clinical practice. This exercise takes on a diserse improvement to hypercholesterolemia and its treatment.

**Momir Mikov *et al.*,(2018)** Bile acids have begun gigantic interest in drug transport research considering their stand-secluded physicochemical parts and biocompatibility. The fundamental of bile acids to fill in as both fix solubilizers and shortcoming modifiers is their monstrous benefit as plan upkeep enhancers. As required, bile



acids could encourage the bioavailability of plans whose ingestion restricting properties coordinate either miserable water dissolvability or low layer inadequacy. Moreover, bile acids could have the choice to beat gastrointestinal blocks and help in the transporter mediated upkeep of genuinely complexed or misleadingly outlined drug molecules. These biomolecules may remain mindful of fix bioavailability at submicellar levels by extra making non-polar game-plan dissolvability and separating rate, or by withdrawing into the layer and creating film straightforwardness and need. Dominatingly by a long shot by a wide margin the greater part of bile disturbing provoked influences are mediated by nuclear receptors that start transcriptional networks, which in this way change the certification of a method of target characteristics, including those for layer transport proteins, influencing fix bioavailability. Close micellar solubilization, there are a couple of striking kinds of speculations between bile acids and arrangement particles that could impact drug transport through ordinary membranes.. Ion-matching is the most overall saw approach bile salt joint effort, and the plans made could have either moderate end than the fix molecule itself. Likewise, bile horrendous hydroxyl and carboxyl get-togethers can be used to covalently structure plans, changing their physicochemical and pharmacokinetic ascribes. Bile acids can be used to make standard evaluations structures, yet what's more innovative micellar, vesicular, and polymer-based recovering systems.. The straightforwardness of bile acids, nearby their conspicuous derivatization methods, makes them talking with structure blocks to likewise invigorate creative remedy subtleties and plans for the relationship of approaches, biomolecules, and antibodies. In any case, the perilous attributes of hydrophobic bile acids have been recorded, their conflicting with results are on a very essential level incited when they are free in supraphysiological sums. Essentially, irrelevant mystery acclimations to neighborhood bile acids could achieve the advancement of bile staggering subordinates with reduced risk and held upkeep fortifying action.

Kosisochukwu J Ezehet *al.*, (2020) Hyperlipidemia is the most striking modifiable shield for atherosclerotic cardiovascular contamination. How we could interpret hyperlipidemia the pioneers has driven us to the chance of the opposite relationship of low-thickness lipoprotein cholesterol (LDL-C) and non-high-thickness lipoprotein cholesterol (non-HDL) cholesterol with the beginning of an endlessly out hazardous cardiovascular occasion. This outline will offer a development of lipids and their ingestion. It will correspondingly focus in on hyperlipidemia and systems for guiding it. Hypercholesterolemia and hypertriglyceridemia both add to the improvement of atherosclerosis. Atherosclerosis is a clinical issue that is distinctly connected with ischemic coronary polluting (IHD) [1]. Cardiovascular disarray (CVD) is the vital wellspring of death globally.. As an outcome, hyperlipidemia drug is essential in the relationship of coronary course issue (PC remained mindful of plan) patients or those at high bet of PC helped plan across the world. Since lipids are the central outline bits of standard cells, they play extraordinary and various parts [2]. Hyperlipidemia is a clinical issue that causes an improvement in plasma lipids and lipoproteins. Smooth substances (TGs), phospholipids, and cholesterol esters are events of plasma lipids. Plasma lipoproteins, obviously, cement particularly low-thickness lipoprotein (VLDL), low-thickness lipoprotein (LDL), and lower high-thickness lipoprotein (HDL) levels. Lipoproteins are macromolecules contained lipids and proteins. The lipids' improvement licenses them to blend truly with other watery customary liquids. They are

given out non-polar lipids, polar lipids, and unequivocal proteins. Non-polar lipids solidify cholesteryl esters and TGs, while polar lipids contain cholesterol. Unesterified cholesterol and phospholipids are instances of lipids. Apolipoproteins are one more name for the specific proteins. Apolipoproteins are amphiphilic proteins that join to the two lipids and plasma [3]. Lipoproteins are other than composed pondering their densities. There are HDL and non-HDL lipoproteins like chylomicrons (CM), VLDL, LDL, and halfway thickness lipoproteins (IDL).

Inside seeing lipoprotein lipase, a colossal rate (around 50-80%) of major TGs are hydrolyzed. Lipoprotein lipase is worked with at the endothelial site of different edges organs. Believe it or not, TGs, as cholesteryl esters and most lipid-dissolvable updates, are found as additional particles. Insulin from fat tissue vivifies lipoprotein lipase. Following consuming a victory high in carbs and lipids, enzymic insulin improvement is in this way increased..Because CM particles structure cholesteryl esters, the heading of these pieces changes too. The change happens considering the exchanging of cholesteryl esters from cholesterol-rich lipoproteins, which is helped by the cholesteryl ester move protein (CETP). Apolipoprotein E (apo E) really got licenses the liver and different organs to hold hepatocytes (the stores). Following liver retention, the extra things' lipid parts are repackaged or managed into VLDLs. VLDLs have an intravascular digestion that is dull from that of CMs. CM intravascular overseeing assembles the getting of adaptable apoproteins, the supporting of cholesteryl esters through CETP, the hydrolysis of a central level of TGs, and the improvement of improvement particles known as IDLs.

Around half of the IDLs are killed and are later endocytosed (undeniably in the liver). The additional piece of IDLs lipolyzes TGs and phospholipids and changes them into cholesterol-rich LDLs. LDL units on an amazingly central level vehicle cholesterol and phospholipids (the chief fat bits of cell layers), which assist the recovery of edges with covering cells. Endocytosis stays aware of the farewell of LDL particles from the stream upon made work to a particular LDL receptor (LDL-R). LDL-R pulls out between apoproteins B and E. Endocytosis is on a very basic level obliged by administrative plans that foil cell cholesterol accumulation. Notably, LDLs may dependably help the endothelium through a cycle known as transcytosis. Additionally, some spot close to 25-30% of LDLs are found in the sub-endothelial region of vein walls. In any case, gets back to the course astounding [3]. Free traditionalists conveyed by accomplice macrophages target LDL in the intima, making it experience peroxidative naughtiness.

The changed particles are as such phagocytosed by macrophages through scrounger receptors, permitting cholesterol to aggregate and froth cell improvement to happen. Additionally, oxidized LDL is cytotoxic and makes issues in the course wall. The provocative reaction, by and large called an atherosclerotic sore, is accomplished by endothelial brokenness. Endothelial brokenness causes the presence of nitric oxide (NO), the improvement of affiliation particles, and the duplication of smooth muscle cells. HDLs are framed when apo-A-1 made in the overseeing packs and liver partners phospholipids. In a section known as chatter cholesterol transport, HDL loads extrahepatic cells and tissues with extrasaturated fat [through the adenosine triphosphate (ATP)- limiting tape A1 system] and transports it back to the liver.



**Byron J. Hiigwerfet *al.*, (2023)** The impacts of colestipol, clofibrate, and a mix of these two fixes on plasma lipid and lipoprotein levels were twirled around in seven individuals with type III hyperlipoproteinemia. When stood disengaged from check, colestipol treatment accomplished a gigantic drop in LDL-cholesterol (146 v 99, P 0.01) and a key move in VLDL-smooth oils (260 v 399, P 0.05). Colestipol caused no quantifiably immense enhancements in steady smooth substances (346 v 462, P = 0.09) or VLDL-C (117 v 155, P = 0.17). Clofibrate treatment helped HDL-C (37 v 46, P 0.05) while decreasing VLDL-C (117 v 56, P 0.05), VLDL-smooth substances (260 v 144, P 0.05), and unflinchingly out smooth oils (346 v 218, P 0.01). To the degree that aggregate and LDL-cholesterol decline, the blend routine crushed clofibrate, and no other monster divisions were seen.

**Coreta-Gomet *al.*, (2023)** The opportunity of the chitooligosaccharides-bile salts restricting is regularly associated with the ionic correspondence, yet at physiological stomach related pH range (6.4 to 7.4) and considering chitooligosaccharides pKa, they should consider everything, provoking that various kinds of speculation may be relevant. In this review, liquid strategies for chitooligosaccharides with a by and large for the most part normal level of polymerization of 10 and 90% deacetylated were explored up for their effect on bile salt sequestration and cholesterol responsiveness. Chitooligosaccharides were shown to tie bile salts to an in a general sense foggy complete as the cationic sap colestipol, both hacking down cholesterol genuinely changing there by NMR at pH 7.4. However, when the pH is decreased to 6.4, the improvement committed for chitooligosaccharides isn't followed by a gigantic improvement in bile salt sequestration, supporting the commitment of non-ionic joint undertakings

### 3.1 RESEARCH ENVISAGED

Colestipol is a non-ingested bile heartbreaking sequestrant that is used to see hyperlipidemia as well as the pruritus related with clear liver issue and biliary blockage. Colestipol has not been related with clinically clear liver mischief.

Colestipol is an antihyperlipidemic drug embraced by the FDA for the treatment of basic hypercholesterolemia. It is used as a move up to dietary changes and exercise. Low-thickness lipoprotein cholesterol (LDL-C) levels are decreased by 12 to 24% with standard appraisals of 4 to 16 grams. It could moreover cut down the bet of coronary aide spoiling. Colestipol is likewise used off-cutting to treat cholestatic pruritus and upsetting stomach tangle. This exercise discusses colestipol's signs, some part of movement, upsetting event profile, risk, assessments, pharmacodynamics, and seeing for interprofessional partners related with the relationship of basic hypercholesterolemia and related wrecks.

#### Objectives:

- Pick the course of action of development of colestipol.
- Frame colestipol's authorised and progressing toward signs.
- See the most all around saw conflicting with impacts related with colestipol drug.

- Sum up the significance of interprofessional pack systems in additional making treatment results for colestipol-treated patients

### What is hypercholesterolemia?

Hypercholesterolemia is a lipid issue portrayed by an obviously raised level of low-thickness lipoprotein (LDL), or unpalatable cholesterol. This makes fat improvement in your ways (atherosclerosis), changing into your bet of a coronary episode or stroke. Atherosclerosis is the fundamental wellspring of cardiovascular issue, which kills a more clear number of people than another explanation on the planet

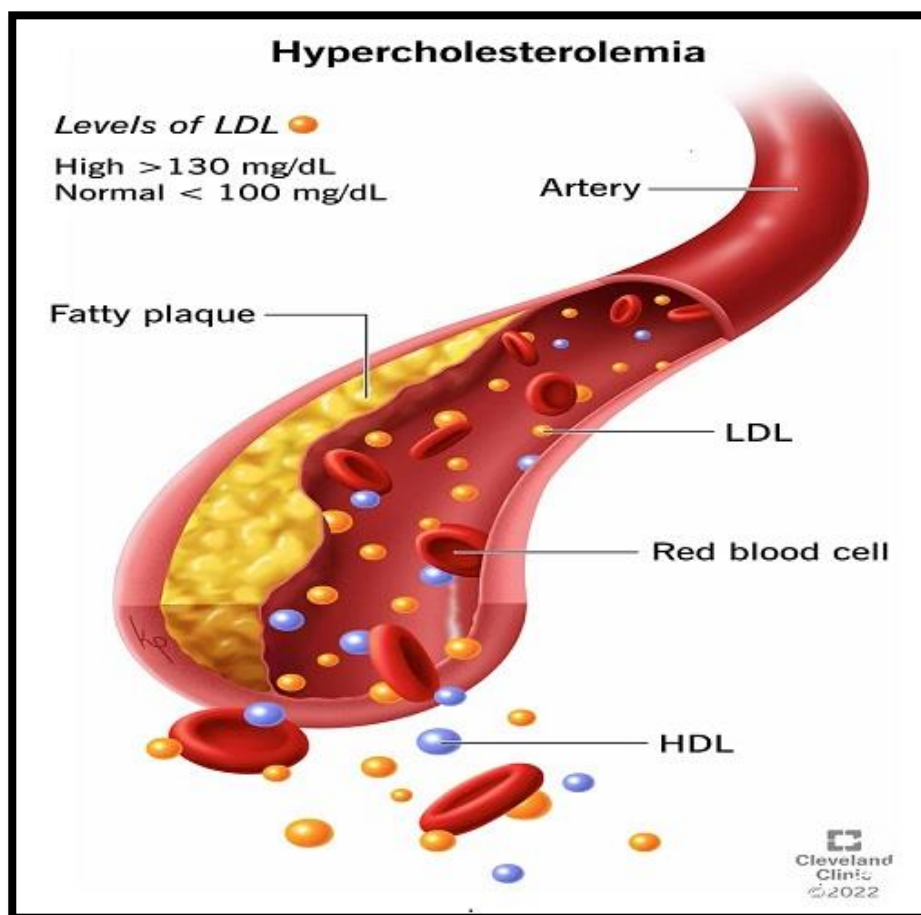


Figure 5 : Hypercholesterolemia

Hypercholesterolemia is the presence of a past silly level of nefarious cholesterol (LDL) in the blood.

### Is hypercholesterolemia tangled from hyperlipidemia?

No. Hypercholesterolemia is a kind of hyperlipidemia depicted by raised LDL-C. Hyperlipidemia suggests a party of issues depicted by radiant exercises of fat in the blood, not simply LDL.

### PLAN OF WORK

#### A).Literature survey and procurement of materials

#### B).Pre-formulation studies

#### ➤ Identification of Drug

- Prolysis gas chromatography

- I.R. spectroscopy
- U.V spectroscopy
- Preparation of standard curve of drug
- Drug excepients

### **C).Preparation and optimization of the formulation**

### **D). Characterization of formulation**

- Appearance
- Average weight
- Hardness
- Dissolution
- Organic impurities
- Residual Solvent
- Assay

### **E). In-Vitro drug release study**

### **F). Stability Studies**

### **G). Result and Discussion**

### **H). Compilation of statistical analysis data and submission of thesis**

## **PREFORMULATION**

### **4. Identification of Drug-**

Colestipol Hydrochloride is a high atomic weight fundamental anion-trade copolymer containing diethylenetriamine and 1-chloro-2,3-epoxypropane with around one out of each and every five amino nitrogens protonated. As concentrated by cholate limiting end, one gram ties something like 1.1 mEq and something like 1.6 mEq of sodium cholate.

#### **Identification –**

#### **Solubility**

The solubility of Colestipol Hydrochloride was determined in distilled water, methanol, ethanol, acetone, chloroform and pH 6.8 phosphate support by shake cup methodology. A flood level of Colestipol Hydrochloride is added to every vial containing 10 ml of picked dissolvable till the sprinkling of the chart. The blends had a ton of commitment in the mechanical fomentation for 48 hours in isothermal shaker at  $250C \pm 10C$  followed by filtration through watmann's channel paper.

#### **4.1) Pick by pyrolysis gas chromatography, as portrayed under.**

Standard arrangement Move a decent level of USP Colestipol Hydrochloride RS into the test. To remain mindful of the colestipol hydrochloride in the test, join 4 areas colestipol hydrochloride and 1 district n-eicosane. Grind the colestipol hydrochloride in a mortar with chloroform until it is dependably covered with

the n-eicosane. This status is strong tenaciously, yet it could should be wetted with brief degree of chloroform before each utilization.

**Test plan** - Happen as shown under Standard status, utilizing a fair level of the test model.

**Chromatographic turn of events** - A fire ionization identifier and a 3-mm 180-cm part stacked with 80-to 100-network support S1A covered with 0.25% potassium hydroxide and 5% stage G16 are associated with the gas chromatograph. Helium is utilized as the transporter gas, and it streams at a speed of around 60 mL dependably. Keep the locator and part temperatures around 270 and 85 degrees Fahrenheit, obviously. Right when existed close by a platinum test, the pyrolysis machine could accomplish 1100 degrees Fahrenheit in under 10 seconds.

### **Structure**

>Present the pyrolysis unit on the chromatograph and place the test basically above yet not appearing at the piece beating.

>Set the pyrolysis temperature at around 1100.

>Tensely pyrolyze the Standard procedure and the Test straightforwardness. Avoid and clean the test after every pyrolysis cycle. The pyrogram of the Test status matches to that of the Standard arrangement around a comparable time.

### **pH -**

> In an ideal vial, make a 10% (w/w) suspension in deionized water. Present the fitting, shake for 1 hour at 10-minute stretches, then, rotator.

>Move a level of the prominent supernatant to a reasonable compartment and record the pH when it has changed: goes from 6.0 to 7.5.

**Loss on drying** - Dry it in a vacuum at a kind of around 5 mm of mercury at 75 degrees Celsius for 16 hours: it loses something like 1.0% of its weigh

**Residue on ignition** -: Not more than 0.3% of the total.

**Heavy metals** -: barely over 0.002%.



IR Spectrum showing %T (Y-axis, -4.2 to 97.2) versus cm<sup>-1</sup> (X-axis, 4000.0 to 400.0). The spectrum displays characteristic absorption bands for atorvastatin calcium, with the following labeled peaks:

Peak Wavenumber (cm <sup>-1</sup> )
3365.3
2971.8
1734.3
1718.1
1701.0
1684.7
1652.4
1578.2
1551.6
1523.2
1509.1
1473.9
1436.1
1317.8
1216.1
1159.8
1110.9
842.6
810.0
746.2
691.4
623.6
505.5

Additional labels on the spectrum include "ATT10-1001." and "c:\spectra 2011\jul-11\baddi\19-jul-11\att10-1001.sp - ATORVASTATIN CALCIUM". A handwritten note "Complex Analysis Report" is present in the bottom right corner.

Figure 7 : IR SPECTROPHOTOMETER

## Infrared ingestion assessment

**Test model** — Dispose of the covering film off a Tablet totally using a reasonable instrument and ground the things into fine powder. Add around 15 mL of methanol to 30 to 40 mg of powder, shake tensely for 3 minutes, sonicate for 10 minutes, then, shake for 3 extra minutes. Following to going the improvement through a sensible paper channel, wash it on different occasions with 10 mL of methanol each time. [NOTE — A gigantic paper channel with coarse porosity and particle sponsorship of 20-25 m is appropriate.] For 2 hours, dry the improvement in a Hoover at 60 degrees Fahrenheit. Join 4 mg of the dried model with 150 mg of potassium bromide.

**Standard model** — Join 3 to 4 mg USP Colestipol Hydrochloride RS with 150 mg potassium bromide.

### Consistency of part units —

Sodium chloride plan, Cholate frame, 0.09 M Assistance system pH 2.5, Versatile stage, Standard responsiveness, and Chromatographic development — In the test for Cholate limiting end, occur as proposed.

**Test speculation** — Move 1 Tablet to a 100-mL volumetric compartment, cripple with Cholate reply for volume, and blend for 120 minutes. Grant the manual for consent to something like 10 minutes going before withdrawing a piece through a 0.45-m PVDF channel, discarding the central 5 mL of the filtrate..

### Structure —

> Occur as displayed in the Cholate limiting end test, yet mix the Test approach rather than the Test responsiveness.

> Pick something like 30 Tablets. Basically test 10 Tablets as facilitated early.

>The principles are satisfied if the cholate keeping obstruction of the ten Tablets is all of the couple of spot in the degree of 1.15 and 1.55 mEq per g of the unquestionable level of colestipol hydrochloride and the general standard deviation is under 6.0%.

>Expecting that 1 Tablet is outside the level of 1.15 to 1.55 mEq per g and no Tablet is outside the level of 1.01 to 1.69 mEq per g, obviously moving past that the general standard deviation is more certain than 6.0%, obviously expecting that the two circumstances exist, test 20 extra Tablets.

The models are satisfied expecting something like one Tablet of the 30 falls outside the level of 1.15 to 1.55 mEq per g and no Tablet falls outside the level of 1.01 to 1.69 mEq per g of the undeniable level of colestipol hydrochloride, and the general standard deviation for the 30 Tablets doesn't outmaneuver 7.8%.

## DSC Assessment for plan

Warm properties of the unadulterated remedy and the physical blend of fix and excipients were analyzed by Various Really separating Calorimeter - 60, Shimadzu bound Japan. The models were heated in a thermally fixed aluminum compartment. Heat runs for each model were set from 25 to 350°C at a heating rate of 100°C/min, using nitrogen as cover gas.

## 4.3) U.V SPECTROSCOPY-

### Mechanical party

UV-Vis Spectrometer 5 mL pipettes 100 mL volumetric cups 100 mL exploring glasses pH paper with UV Silica Cells Worked with

## Reagents

**Drugs** - 10 milligrams disabled in 1 mL methanol and refined in 10 mL Water that has been refined or deionized sodium hydroxide 0.5 M Ammonium chloride 16% Sulphuric disturbing (half)

## Strategy

1. Cripple the drug approach 1:25 with water.
2. Take 2 ml of this disabled individual test approach and blend in 2 ml of 0.5 M sodium hydroxide (pH=13).
3. A few spot in the level of 200 and 350 nm, channel this strategy against 0.5 M sodium hydroxide as the sensible.
4. Pick the absorbance most past over the top repeat (max).
5. Take one more 2 cc of the hurt model perspective.
6. Add 1.5 mL of 0.5M sodium hydroxide and 0.5 mL of 16% ammonium chloride approach (pH=10).
7. Re-channel at this lower pH of 10. Notice any updates in usually around silly.
8. To get pH 2, add 0.5mL of half sulphuric horrendous to the pH 13 model.
9. Re-check, seeing any updates in max.

### 4.3 Strategy OF STANDARD Piece OF Medication

The absorbance was surveyed in UV Spectrometer at 210 nm .

Table 2- Absorbance in U.V Spectrometer

S.no.	Conc.( $\mu$ g/ml)	Absorbance			Mean $\pm$ SD
		Trial1	Trial2	Trial3	
1	0	0.000	0.000	0.000	0.000 $\pm$ 0.000
2	5	0.050	0.043	0.046	0.046 $\pm$ 0.004
3	10	0.097	0.095	0.098	0.097 $\pm$ 0.002
4	15	0.143	0.144	0.146	0.144 $\pm$ 0.002
5	20	0.185	0.188	0.187	0.187 $\pm$ 0.002
6	25	0.240	0.237	0.237	0.238 $\pm$ 0.002

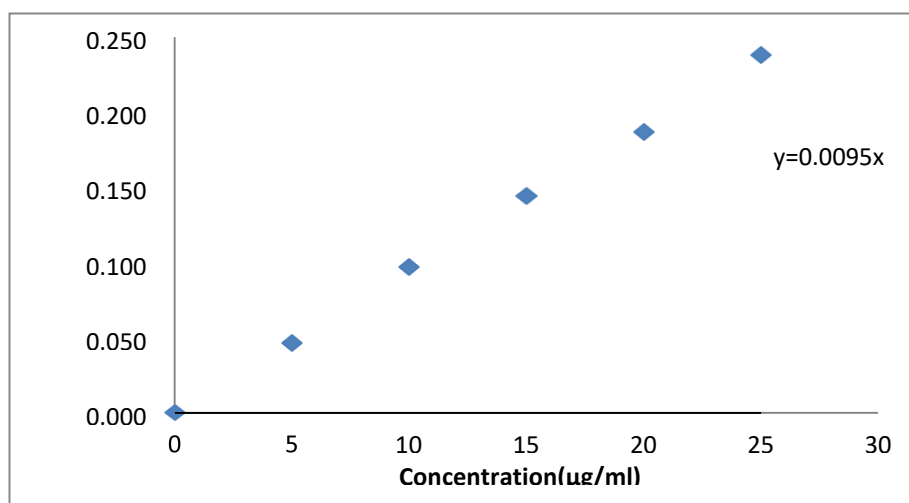


Figure 8 : Outline Showing Standard piece of Solution



**DRUG EXCEPIENTS –**

Table 3 :Microcrystalline Cellulose

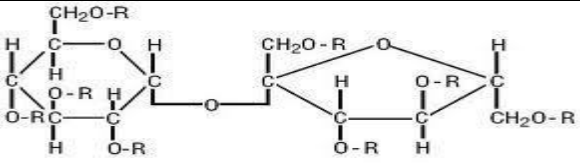
<b>Non-proprietary names</b>	BP: Microcrystalline cellulose USP/NF: Micro fundamental stone inecellolose PhEur: Cellulosum microcristallinum
<b>Synonyms</b>	Avicel PH, Celex, cellulose gel, celphere, crystalline cellulose, E460, Emcocel, Vivapur
<b>Description</b>	White, odorless, tasteless, crystalline powder
<b>Structural Formula</b>	
<b>Chemical names</b>	Cellulose
<b>CAS Number</b>	9004-34-6
<b>Empirical formula</b>	$(C_6H_{10}O_5)_n$ where $n \approx 220$
<b>Molecular weight</b>	$\approx 36000$
<b>Melting point</b>	260-270
<b>Solubility</b>	Slightly soluble in 5% w/v sodium hydroxide procedure, practically insoluble in water, dilute acids, and most organic solvents
<b>Functional Category</b>	Absorbent, suspending agent, tablet and capsule diluent, tablet disintegrant.
<b>Stability and storage conditions</b>	It is stable though hygroscopic material and should be stored in a well-closed container in a cool, dry place.
<b>Incompatibilities</b>	Strong oxidizing agents
<b>Safety</b>	It is widely used in oral pharmaceutical formulations and is generally regarded as a relatively nontoxic and nonirritant material.
<b>Application</b>	It is used in tablet or capsule formulation as a binder/diluent in both wet-granulation and direct-compression processes.



Table 4 :Dummy Granules

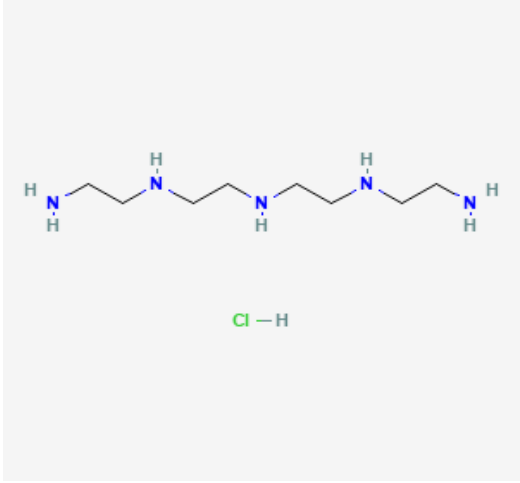
<b>Non-proprietary names</b>	N'-[2-[2-(2-aminoethylamino)ethylamino]ethyl]ethane-1,2-diamine;hydrochloride
<b>Description</b>	White to off white colour powder.
<b>Structural Formula</b>	
<b>Chemical names</b>	4961-41-5
<b>CAS Number</b>	
<b>Empirical formula</b>	C <sub>8</sub> H <sub>24</sub> ClN <sub>5</sub>
<b>Molecular weight</b>	225.76 g/mol
<b>Solubility</b>	It is an insoluble, high nuclear weight head anion-exchange copolymer of diethylenetriamine .
<b>Functional Category</b>	Hypolipidemic Agents
<b>Incompatibilities</b>	The adequacy of croscarmellose sodium may be possibly reduced in tablet formulation prepared by either the wet-granulation or direct Compression process that contain hygroscopic excipients.
<b>Safety</b>	It is mainly used as a disintegrant in oral pharmaceutical formulations and is generally regarded as non-toxic and non-irritant material.
<b>Application</b>	Substances that cut down the levels of express LIPIDS in the BLOOD. They are utilized to treat HYPERLIPIDEMIAS. all mixes designated Hypolipidemic Organized trained professionals.

Table 5 : Magnesium staerate

<b>Non-proprietary names</b>	BP: Magnesium stearate USP/NF: Magnesium stearate PhEur: Magnesiistearas
<b>Synonyms</b>	Magnesium octadecanoate, octadecanoic acid, magnesium salt
<b>Description</b>	Very fine, light white, precipitated or milled, impalpable powder of low bulk density, having a faint odor of stearic acid and a characteristic taste. The powder is greasy to contact and readily adheres to skin.
<b>Chemical names</b>	Octadecanoic acid magnesium salt
<b>CAS Number</b>	557-04-0
<b>Empirical formula</b>	C <sub>36</sub> H <sub>70</sub> MgO <sub>4</sub>
<b>Molecular weight</b>	591.34
<b>Melting point</b>	117-150°C (commercial samples) 126-130°C (high purity magnesium stearate)
<b>Solubility</b>	Practically insoluble in ethanol, ethanol (95%), ether and water, slightly soluble in warm benzene and warm methanol (95%).
<b>Functional Category</b>	Tablet and capsule lubricant.
<b>Stability and storage conditions</b>	It is stable and should be stored in a well-closed container in a cool, dry place.
<b>Incompatibilities</b>	Strong acids, alkalis and iron salts.
<b>Safety</b>	It is widely used as a pharmaceutical excipient and is generally regarded as being nontoxic.
<b>Application</b>	It is overall around used in shallow, food sources, and solution. It is for the most part around utilized in shallow, food sources, and cure formulations. It is primarily used as a lubricant in capsule and tablet manufacture at concentrations between 0.25% and 5.0% w/w. It is also used in barrier creams.

Table 6 : Colloidal Silicon Dioxide

<b>Non-proprietary names</b>	BP:LactosemonohydrateUSP/NF: Lactose monohydratePhEur:LactosummonohydricumJP:Lactose
<b>Synonyms</b>	LactochemCoarseCrystals,LactochemCrystals,LactochemPowder,Pharmatose50M,NFLactose310.
<b>Description</b>	Whitetooff-whitecrystallineparticlesorpowder.Lactoseisodorlessandslightlysweet-tasting.
<b>Chemical names</b>	O- $\alpha$ -D-Galactopyranosyl-(1 $\rightarrow$ 4)- $\alpha$ -D-glucopyranose
<b>CAS Number</b>	64044-51-5
<b>Empirical formula</b>	C <sub>12</sub> H <sub>22</sub> O <sub>11</sub> .H <sub>2</sub> O
<b>Molecular weight</b>	360.31
<b>Melting point</b>	201-202 <sup>0</sup> C
<b>Solubility</b>	Practicallyinsolubleinchloroform,ethanolandether,solubleinwater.
<b>Functional Category</b>	Bindingagent,diluentfordry-powderinhalers,tablet binder,tabletandcapsulediluent.
<b>Stability and storage conditions</b>	Shape progress could occur under wet conditions(80% relative humidityand above). Lactose could enable a coarse formed hint on storage,thereactionbeingacceleratedbywarm,dampconditions.Itshould be set aside in an especially closed holder in acool, dryplace.
<b>Incompatibilities</b>	Primaryaminegroup,aminoacids,aminophylline,amphetaminesandlisinopril.
<b>Safety</b>	It is thoroughly utilized in drug nuances as a filler and filler-Cover in oral holder and tablet picking.
<b>Application</b>	It is extensively utilized as a filler or diluent in tablets and compartments, andtoamorelimitedextentinlyophilizedproductsandinfantformulas.Usually, fine levels of lactose are utilized in the planning of tablets bythewetgranulationmethod.Itisalsousedincombinationwithsucrose(approximately1:3) to preparesugar-coatingsolutions.

Table 7 : Sodium Starch Glycolate

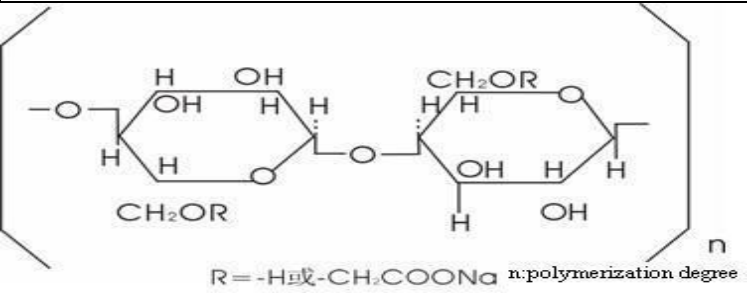
<b>Non-proprietary</b>	BP: Sodium starch glycollate USP/NF: Sodium starch glycolate PhEur: Carboxymethylamylum natricum
<b>Names</b>	
<b>Synonyms</b>	Carboxymethylstarch, sodium salt, Explosol, Explotab, Tablo.
<b>Description</b>	White to off-white, odorless, tasteless, free-flowing powder. The PhEur 2005 states that it facilitates oval or circumlocutory granules, 30-100 µm in diameter, with some less-spherical granules ranging from 10-35 µm in broadness.
<b>Structural Formula</b>	 <p>R = -H or -CH<sub>2</sub>COONa    n: polymerization degree</p>
<b>Chemical names</b>	Sodium carboxymethylstarch
<b>AS Number</b>	9063-38-1
<b>Empirical formula</b>	5x10 <sup>5</sup> –1x10 <sup>6</sup>
<b>Molecular weight</b>	
<b>Melting point</b>	Approximately 200°C
<b>Solubility</b>	Practically insoluble in water, sparingly soluble in ethanol (95%). In water it swells up to 300 times its volume.
<b>Functional Category</b>	Tablet and capsule disintegrant
<b>Stability and storage conditions</b>	It is stable and should be stored in a well-closed container in order to protect it from humidity and temperature, which may cause cracking.
<b>Incompatibilities</b>	Ascorbic acid
<b>Safety</b>	It is widely used in oral remedy formulations and is everywhere regarded as a non-toxic and non-irritant material.
<b>Application</b>	It is widely used in oral pharmaceuticals as a disintegrant in capsule and tablet composed by both direct-strain and wet-granulation process. Usual concentration employed in a formulation is between 2% and 8%.

Table 8 : Uniquecoat FCNAQ (EXW)

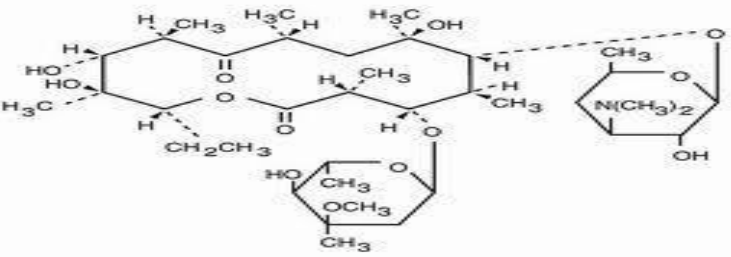
<b>Non-proprietary names</b>	Uniquecoat FCNAQ (EXW)			
<b>Polymer of Unique Coat FCNAQ</b>	<b>Req.:</b> 2.0%			w/w
	<b>IPA:</b> 40%			w/w
	<b>MDC:</b> 60%			w/w
	<b>Solid Contain in Solution:</b> 9 to 10% w/w			
<b>Description</b>	It is a white colored powder.			
<b>Formula</b>	<b>Unique</b>	<b>Coat</b>	<b>FCNAQ:</b> 2.0	kg
	<b>IPA:</b> 16.0			kg.
	<b>MDC:</b> 24.0 kg.			
<b>Method of Preparation</b>	Take IPA in holder under mixing -Add constantly Amazing Coat FCNAQ in it - Stirrer it for around 6 to 10minutes - Then, at that point, after add reliably MDC to it - Continues to blend for 30 minutes - Channel the suspension through influencing surface (60 cross part).			
<b>FunctionalCategory</b>	Coating agent			
<b>Coating System</b>	<b>Pan</b>	<b>RPM:</b> 1	9	to 15
<b>Parameter :</b>	<b>Inlet</b>	<b>Temp.:</b> 1	60°	to 75°C
	<b>Bed</b>	<b>Temp.:</b> 1	30° C	to 45° C
	<b>Air pressure:</b> 1 4 to 5 kg./cm			
<b>Application</b>	To cover the disturbing smell, mix or taste of the tablet. To offer a physical as well as substance security to the solution. To control and support the presence of the game plan from the part structure.			

Table 9 :Isopropyl Alcohol

<b>Non-proprietarynames</b>	Dimethyl carbinol, IPA, Isopropanol, 2-Propanol, sec-Propyl alcohol, Rubbing alcohol.
<b>Synonyms</b>	Isopropyl alcohol isopropanol 2-Propanol Propan-2-ol 67-63-0
<b>Description</b>	Volatile, colorless liquid with a sharp musty odor like rubbing alcohol.
<b>Structural Formula</b>	$  \begin{array}{c}  \text{OH} \\    \\  \text{H}_3\text{C} - \text{C} - \text{CH}_3  \end{array}  $
<b>Chemicalnames</b>	Isopropanol or n-propanol or dimethylcarbinol
<b>CASNumber</b>	67-63-0
<b>Empiricalformula</b>	CH <sub>3</sub> CHOHCH <sub>3</sub>
<b>Molecularweight</b>	(CH <sub>3</sub> ) <sub>2</sub> CHOH 60.10 g/mol
<b>Meltingpoint</b>	-127.3 °F
<b>Solubility</b>	Miscible with water and with alcohol.
<b>FunctionalCategory</b>	solvent.
<b>Stabilityandstorage conditions</b>	Isopropyl liquor ought to be overseen in a reliably shut holder in a cool, dry, a great deal of ventilated region.
<b>Incompatibilities</b>	Do whatever it may take not to rub alcohol on painted, shellacked, lacquered, or finished surfaces, including treated wood.
<b>Safety</b>	Isopropyl liquor is utilized in clinical thought settings to dishearten tainting that might be accomplished by needle enters.

<b>Application</b>	Isopropyl alcohol is a sanitizer and sanitizer used in various clinical and neighborhood settings. An isomer of 1-propanol. It is a dull liquid having sanitizer properties. It is used in the improvement of CH <sub>3</sub> ) <sub>2</sub> CO and its subordinates and as a dissolvable.
--------------------	--

Table 10 : Methylene Chloride

<b>Non-proprietary names</b>	dichloromethane
<b>Synonyms</b>	DICHLOROMETHANE Methylene chloride 75-09-2 Methylene dichloride Methane
<b>Description</b>	Methylene chloride is a colorless liquid with a mild, sweet odor.
<b>Structural Formula</b>	
<b>Chemical names</b>	Methylene Chloride
<b>CAS Number</b>	75-09-2
<b>Empirical formula</b>	<u>CH<sub>2</sub>Cl<sub>2</sub></u>
<b>Functional Category</b>	Solvent
<b>Stability and storage conditions</b>	It ought to be supervised in a cool, dry, a lot of ventilated region away from direct light, heat source and unprecedented fire prospects.
<b>Incompatibilities</b>	Improved probability of fire and effect: areas of strength for on for contact for with showed prepared experts (for example perchloric staggering), methanol, dissolvable base metals (for example sodium or potassium). Not unforeseen to: aluminum composites, treated steel.

<b>Safety</b>	Methylene chloride is utilized as a top tier dissolvable and as a paint stripper. It could correspondingly be tracked down in a few shower and pesticide things and is utilized in the improvement of visual film.
<b>Application</b>	It is a reasonable dissolvable considering its particularly insecurity and dependable quality. It is as such used in the treatment of plastics, isolating fats and oils from food things.

## METHODOLOGY

### 5. OPTIMIZATION, FORMULATION AND CHARACTERIZATION

Colestipol Tablets is a cholesterol named LDL (low giving system utilized down to reduce "terrible" cholesterol in the blood called thickness lipoprotein, when in doubt) cholesterol. Hacking down LDL cholesterol could decrease the opportunity of set supply courses, which can add to cardiovascular dissatisfactions, strokes, and course issues.

Colestipol is open in standard technique. Colestipol hydrochloride ties to bile acids in the colon, making a compound that is gotten out in the manure. This nonsystemic impact leads in the halfway affirmation of bile acids from the enterohepatic course, genuinely analyzing their reabsorption. Since colestipol hydrochloride is an anion trade pitch, the chloride anions of the sap can be rep.

### LIST OF INSTRUMENTS / EQUIPEMENTS -

SlNo.	Equipment	Model/company
1.	FourierTransformInfrared spectrophotometer	ThermoNicolet
2.	UV-Visiblespectrophotometer	UV-1800,Shimadzu
3.	Electronicbalance	Essae-Teraoke
4.	Hotairoven	Kemi
5.	MultitabuletPunchingmachine	LABPRESS,CipMachinariesLtd. Ahmedabad
6.	RocheFriabilator	PSMIndustries,Bangalore
7.	Hardnesstester	Monsantohardness tester
8.	Disintegrationtestapparatus	DT-1500,LabIndia
9.	Dissolutiontestapparatus	DS-800,LabIndia



- |     |                        |  |
|-----|------------------------|--|
| 10. | FTIR-spectrophotometer | Tensor27Bruker   |
| 11. | DSCApparatus           | DSC-60,Shimadzu  |
| 12. | Stabilitychamber       | 106Model/ LabTop,SkyLab<br>Instruments&EngineeringPvt.Ltd. |
| 13. | Ultrasonic-homogenizer | Scientz  |

## 5.1 PREPARATION OF IMMEDIATE RELEASE NANO TABLET COLOSTIPOL HYDROCHLORIDE USING ULTRASONIC HOMOGENIZERS

TABLE NO 11 : FORMULATION CHART

S.NO	DRUG/EXCIPIENTS	QTY/MG TABLET ( F1)1190 MG	F2	F3	F4	F5	F6
	COLOSTIPOL HYDROCHLORIDE	1000	1000	1000	1000	1000	1000
	MICROCRYSTALLINE CELLULOSE	50	45	40	35	30	25
	DUMMY GRANULES	40	40	40	40	40	40
	PROPYLENE GLYCOL	80	85	90	95	100	105
	MAGNESIUM STEARATE	10	10	10	10	10	10
	AEROSIL	10	10	10	10	10	10
	WATER	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S
	<b>COATING</b>						
	UNIQUE COATFCNAQ	1309 MG	119	119	1191	119	119
	IPA		8.35	8.35	8.35	8.35	8.35
	DI- CHLOROMETHANE		15.41	15.4	15.4	15.41	15.4

✓ **PROCEDURE**✓ **Granulation Area:**✓ **Sifting:** Equipment Used: **a) Electronic Balance b) Mechanical sifter**

➤ Fit the vibrio sifter with 24# no. sieve.

➤ Pass Colestipol Hydrochloride (2.200 kg) through 24# no. sifter and mix with Propylene Glycol in ultrasonic homogenizer for 20 min.

✓ &gt;Pass Microcrystalline Cellulose (PH-112) (23.800 kg) granule (11.600 kg) through 24#no sifter and accumulate in poly pack.

✓ &gt;Dismantle the 24# no.sieve and fit with another 60#no. sieve.

✓ &gt;Mix Powder (0.600 kg), Sodium starch glycolate) (1.000 kg), Colloidal silicon dioxide (0.200 kg) and in a poly pack and pass through 60#no sifter and gather in a poly sack.

✓ &gt;Channel Magnesium Stearate (0.600 kg.) truly through 60#no. sifter and accumulate in a poly sack.

✓ **Blending:**

✓ Load the took out materials in octagonal blender.

✓ Load the segregated oil (mix powder) in octagonal blender and mix for 25 minutes.

✓ Take 3 to 4 kg mixed granules from blender and mix in with Magnesium stearate. Add it in blender and mix for 5.0 minutes.

✓ Void the lubed up granules in named twofold lined polybags and truly research each sack for net weight.

✓ Mark the compartment with the social gathering nuances like Thing Name, Pack No. Mfg. Date, Exp.date and totally.**Yield Analysis: Standard yield:** (Limit: 98.0 % to 100%)

$$\text{Yield \%} = \frac{\text{Net weight of granules}}{\text{Batch size (Kg)}} \times 100$$

**Batch size (Kg)****Compression:**✓ **Equipment Used: a) Rotary Compression Machine**

➤ Gather the 8.00 mm±0.25mm round, biconcave, punch and kicks the could both side plain, on the persevere through any point eventually machine.

➤ Guarantee that strain machine is fitted with every one of the embellishments for example dust extractor, tablet de-cleaning machine.

➤Change the typical weight 200mg ±5%

➤Step through assessment from each strain point and weigh change inside the decisions.

➤Really check out at the Broadness, Thickness and Hardness of tablets.

>Check for the in cycle limits given under and change inside past what many would consider conceivable during starting machine setting.

>Weight of tablets, Limiting time, Friability, Thickness and Hardness and weight plan other than checked by creation sensible expert after each 1.0 hour $\pm$ 10 min.

>Weight of tablets, Taking out time, Friability, Thickness and Hardness and weight assembling what's more checked after each 2.0 hours $\pm$ 10min.

>Check for the in cycle limits given under at the awful given.Gather the 8.00 mm $\pm$ 0.25mm round, biconcave, punch and kicks the could both side plain, on the persevere through any point eventually machine.

>Guarantee that strain machine is fitted with every one of the embellishments for example dust extractor, tablet de-cleaning machine.

> Change the typical weight 200mg  $\pm$ 5%

>Step through assessment from each strain point and weigh change inside the decisions.

>Really check out at the Broadness, Thickness and Hardness of tablets.

>Check for the in cycle limits given under and change inside past what many would consider conceivable during starting machine setting.

>Weight of tablets, Limiting time, Friability, Thickness and Hardness and weight plan other than checked by creation sensible expert after each 1.0 hour $\pm$ 10 min.

>Weight of tablets, Taking out time, Friability, Thickness and Hardness and weight assembling what's more checked after each 2.0 hours $\pm$ 10min.

>Check for the in cycle limits given under at the awful given.

Table 12: Showing Loads Tablets with Under In-Cycle Cutoff.

Sr. No.	Parameter	Limits
	Appearance	Off white, round, biconvex, uncoated tablets, having both side plain.
	Standard weight of each Tablet	200 mg $\pm$ 5%
	Uniformity of Weight	Not more than two of the individual Tablets deviate by more than $\pm$ 5% & none deviate by more than $\pm$ 10 %.
	Diameter	8.00 mm ( $\pm$ 0.25mm)
	Thickness	3.80 mm $\pm$ 0.35 mm

	Weight of 20 tablets	4.00 g ( $\pm 3.0\%$ )
	Hardness	NLT 2.0 kg/cm <sup>2</sup>
	Friability	NMT 1.0 % w/w
	Disintegration Time	NMT 15 minutes

### Coating:

**Equipment Used:** a) Colloidal mill b) Mechanical Stirrer, c) Coating pan,

d) Spray gun & e) Peristaltic pump

### Precautions during coating:

- >The covering plan ought to be really ready, OK for one day covering. Insane limitation of covering approach would accomplish microbial progression dissolvable difficulty.
- >Preheat the tablet bed to 30-35 °C going before beginning shower of covering plan.
- >While preheating the tablets, run the tablet bed whimsically.
- >Safeguards ought to in any case hanging out there to stay from interior breath of smoke or standard solvents during covering.
- >Tablets should not be warmed more than 60 °C during film covering process.
- >Mix the covering suspension during covering process.
- >Keep the tablets in especially shut holder and shielded from doused quality.
- >Determinedly's end the covered tablets ought to be totally directed at temperature not in excess of 25 °C and wetness not more than 60 %.

### Preparation of Coating Solution:

- >Move all the Covering Standard substance in Covering Graph Sorting out area.
- >Take Isopropyl Alcohol (15.000 kg) in a S.S vessel fitted with a stirrer having a variable speed regulator or equivalent kind of stirrer that vortex is made.
- >Add logically into the Uniquecoat FCNAQ (EXW) (1.000 kg) in it Stirrer till uniform projection free suspension is achieved.
- >Add Dichloromethane (Methylene Chloride) and Stirrer for 30 minutes. Channel the covering plan through nylon surface (200 relationship) into another tank, fitted with stirrer and after filtration blend for 10 minutes.
- >Load the organized and de-cleaned tablets to the covering dish.
- >Change the heading of the exhaust structure towards the property of get together of the moving bed of tablet and weapon related with peristaltic guide by silicone tubing towards the side.
- >Start turning the standard coater and put on the blower. Start the standard coater at first at the speed of around 6 to 8 rpm continues to cover to fitting weight gain, till uniform masked astounding film.

>Happening to convincing weight gain by the tablets for 10-15 minutes at 50-60 °C sound then, cool down bed temperature at 25-30 °C.

>Covering in-process check as per Sop's.

**Weight gain:** NLT 2.0% w/w, **Pan rpm :** 6-8,

**Air pressure:** 1.5-2.0 kg/cm<sup>2</sup> **Rpm of peristaltic pump:** 35 to 45 RPM,

**Inlet Temperature:** NMT 50 to 60 °C,

Table 13 : Showing Parameters (After Coating)

Sr. No.	Parameter	Units
01.	Appearance	White coloured, round, biconvex, film coated tablets having both side plain.
02.	Wt. of 20 tablets	4.10 g±3%
03.	Average weight	205 mg±5.0%
04.	Uniformity of Weight	Not more than two of the individual tablets deviate by more than ± 5% & none deviate by more than ± 10 %.
05.	Weight Gain	NLT 2.00 % w/w
06.	Disintegration Time	NMT 30 minutes
07.	Hardness	NLT 2.00 kg/cm <sup>2</sup>
08.	Dimension	8.10 mm ± 0.25mm
	Thickness	3.90 mm±0.35mm

## 5.2 Evaluation of Pre-formulation Parameters:

The tablets made were analyzed up for the going with limits:

- Weight variation
- Hardness
- Friability
- Drug content
- *In-vitro* DissolutionStudies
- Stability Studies

**Weight Variation Test:**

To research weight mix, 20 tablets of every single definition were weighted utilizing electronic equilibrium, and the test was done by the power structure.

Table 14 : IP standards of Uniformity of weight

S.No.	Avg. wt of Tablet(mg)	% of Deviation
1	≤80 mg	10
2	>80 mg– 250 mg	7.5
3	≥250 mg	5

The hardness of tablets picks their insurance from shipment or breakage during cutoff, transportation, and administering before use. Each bunch of tablets was pursued for hardness using a Monsanto hardness analyzer. The right now counterbalancing there in kilograms per square centimeter. The hardness of five not totally settled imprudently. The hardness of five fulfillments was found the center worth.

**Friability:**

Friability is portrayed as the weight decreasing of tablets in holders achieved by the goodbye of particles from the tablet surface. Friability is everything viewed as related with hopeless cohesiveness of tablet parts. The starting store of 10 pills was recorded and set in a Roche friabilator, which was turned at a speed of 25 rpm for 100 shockers. The pills were then taken from the friabilator, moved past, checked, and the weight was recorded.

The recipe was used to figure out the degree of friability.

$$\% \text{Friability} = \frac{\text{Weight initial} - \text{Weight final}}{\text{Weight initial}} \times 100$$

**Tablet thickness:**

The thickness of the tablet is enormous for tablet size consistency. VernierCallipers were used to measure thickness. Not perpetually set up by researching the thickness of 10 tablets from each picking. Verniercaliperconsistsofmetricandimperialscales. The fundamental metric scale is seen first, followed by the illustrious scale's "hundredths of mm" (count how much divisions until the lines blend in with the genuinely metric scale). The number on the outstanding scale is associated by 0.02. The number got from the well known degree is then associated by the urgently metric scale to give the last evaluation.

**5.3 In-Vitro Drug Dissolution Study–**

Colestipol Hydrochloride pills were endeavored in-vitro for 30 minutes in a pH 6.8 phosphate support. The cure release assessments were worked with in a USP disengaging test gear II (paddle) at 75 RPM, with 900 ml of keeping media kept at 37°C 0.5°C. Colestipol Hydrochloride in vitro release credits from all tablet packs were viewed as utilizing different excipient mixes. At various stages, these various stores of tablets were conveyed using different excipients in moved degrees.

Table 15 : In Vitro dissolution study of immediate release Tablet

Time in min	%CUMULATIVE DRUG RELEASE					
	IF1	IF2	IF3	IF4	IF5	IF6
0	0.000±0.000	0.000±0.000	0.000±0.000	0.000±0.000	0.000±0.000	0.000±0.000
1	17.056±0.612	21.226±0.872	20.847±0.450	26.532±1.306	30.323±1.125	36.008±1.174
3	31.805±1.075	31.908±1.280	33.738±2.620	54.965±2.391	56.561±0.778	60.653±2.255

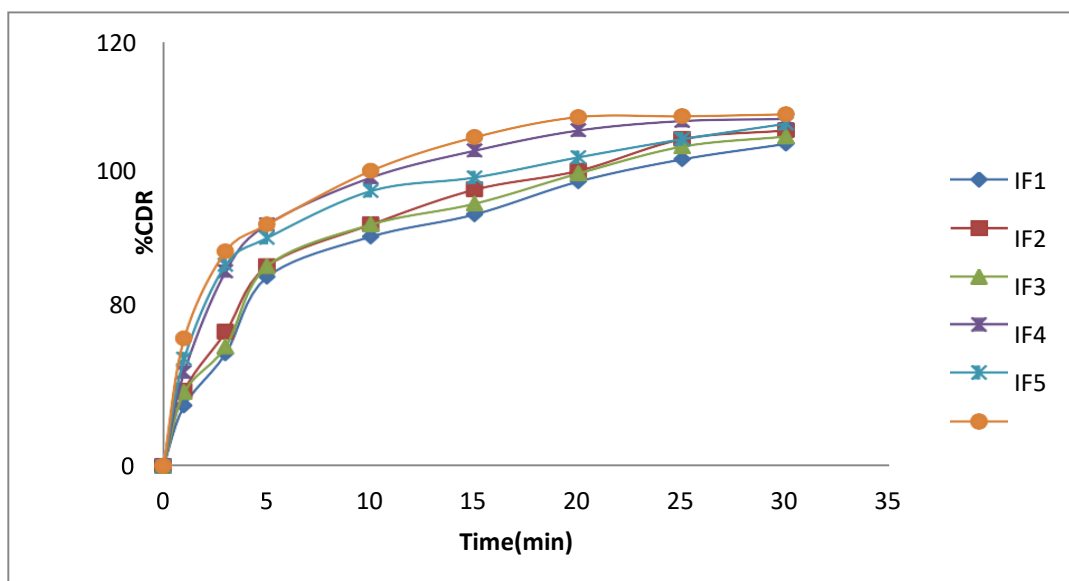


Figure 9 : Release profile of immediate release Tablet

## 5.1 Kinetic Release

### I) For immediate release tablets

Table 16 : Kinetic release for immediate release Tablet

MULATION CODE	KINETIC MODELS				
	Order <sub>R</sub> <sup>2</sup>	Order <sub>R</sub> <sup>2</sup>	guchi <sub>R</sub> <sup>2</sup>	Korsmeyer n R <sup>2</sup>	
IF1	0.8362	0.9816	0.9689	0.8915	0.6657
IF2	0.8228	0.9844	0.9677	0.8694	0.6263
IF3	0.8231	0.9819	0.9643	0.8711	0.6336
IF4	0.7068	0.9850	0.9059	0.8424	0.5642
IF5	0.7101	0.9606	0.9055	0.804	0.5134
IF6	0.6835	0.9792	0.8945	0.8034	0.5129

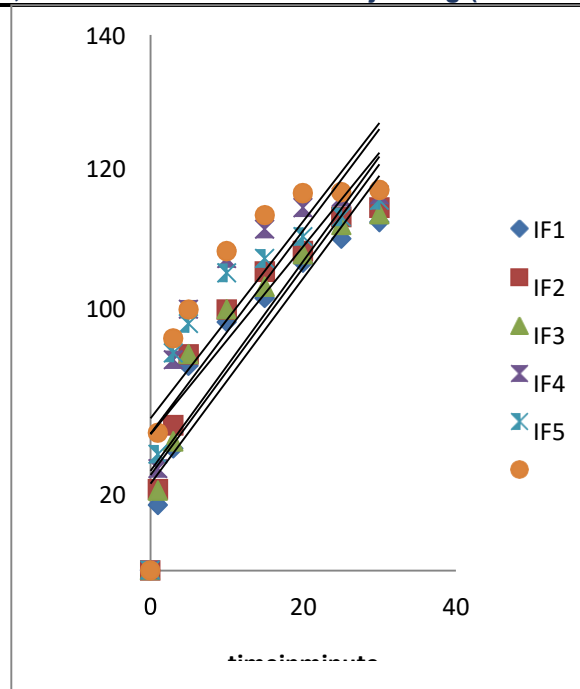


Figure 10 : Zeroorder Kineticsforimmediate release tablets

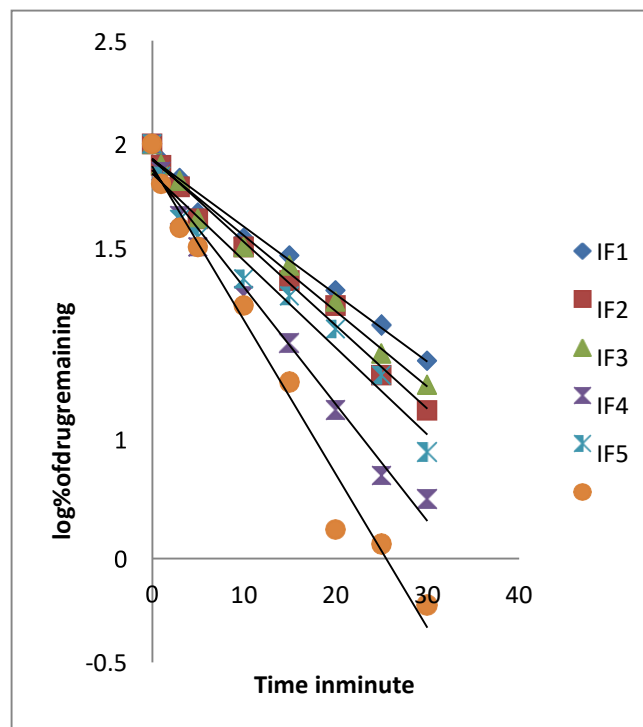


Figure 11 : First order Kinetics for immediate release tablets



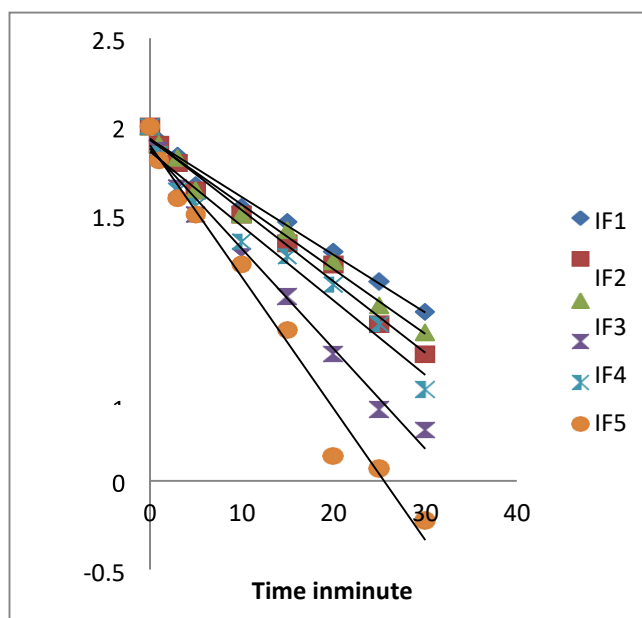


Figure 12 :Higuchi reKorsemeYer-peppasreleaseKinetics of Intermediate release tablet

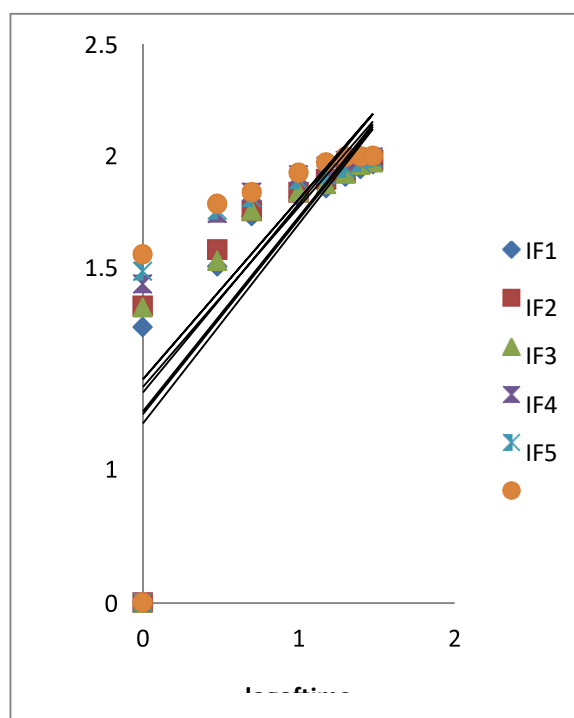


Figure 13 :Higuchi release kinetics for immediate release tablets

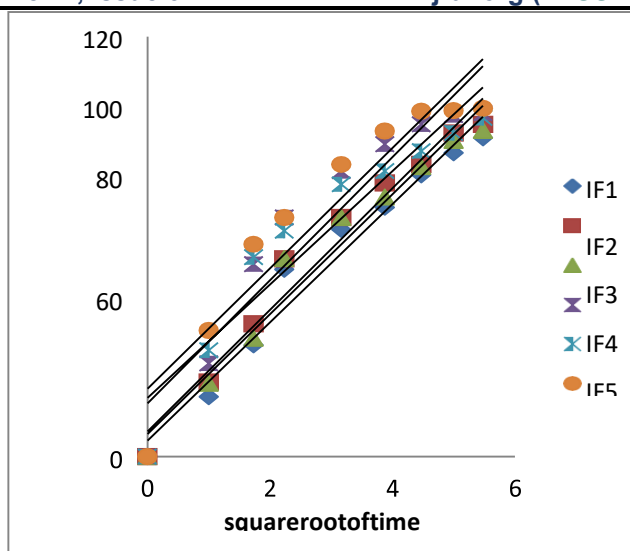


Figure 14 :Korsemyer-peppasreleaseKinetics for immediate release tablets

### F). Stability Studies

The posting's security was investigated by familiarizing it with different conditions, including temperature and strain pressure. The sufficiency research was done at 40°C/75% RH (for 3, and 6 months).After the assessment was finished, the showing was sought after for physical and compound properties. The limits that were open inside the detail were picked for those plans.

Table 17 : Showing Stability Studies

Records of Test	Specifications	Initial Testing	After 3 Months	After 6 Months
Date	-----	22/12/2022	22/03/2023	22/06/2023
Description	White coloured, round, biconvex, film coated tablets having both side plain .	White coloured, round, biconvex, film coated tablets having both side plain.	White coloured, round, biconvex, film coated tablets having both side plain .	White coloured, round, biconvex, film coated tablets having both side plain .
Average Weight	205 mg $\pm$ 5.0%	205.12 mg	205.58%	206.40%
Hardness	Not less than 2.0 Kg/cm <sup>2</sup>	4.12 Kg/cm <sup>2</sup>	4.30 Kg/cm <sup>2</sup>	4.50 Kg/cm <sup>2</sup>
Dissolution	Not less than 70 % (Q)of labeled amount of C <sub>33</sub> H <sub>35</sub> FN <sub>2</sub> O <sub>5</sub>	Min-85.45% Max-95.87%	Min-86.25% Max-95.90%	Min-86.52% Max-94.12%
<b>Organic Impurities</b>				
Area of any	Not more than 1.0	Not detected	Not detected	0.12 %

Sum of the areas of all secondary	Not more than 4.0 %	Not detected	Not detected	0.15 %
<b>Residual Solvent:</b>				
Isopropyl	Not more than	Not detected	Not detected	Not detected
Methylene	Not more than	Not detected	Not detected	Not detected
<b>Microbial Examination:</b>				
a. Total viable aerobic count	Not more than 1000 cfu/g	25 cfu/g Less than 10 cfu/g	NA	25 cfu/g Less than 10 cfu/g
1.Total bacterial count	Not more than 100 cfu/g	Absent/g		Absent/g
2. Total yeast and molds count	Absent/10g	Absent/10 g		Absent/10 g
b. <i>E. Coli</i>				
c. <i>Salmonella</i>				
<b>Assay: Each Film coated Tablet contains:</b>				
Colestipol Hydrochloride 10mg	90%to 110% of label claim	100.12 %	99.98%	99.79%

## Result and Discussion

Mass thickness was viewed as in the degree 0.473 - 0.512 gm/ml, Tapped thickness in the show up at 0.582-0.631 gm/ml, Carr's record in the compass 18.73-20.13, and Hauser's approval in the reach 1.19-1.25, with rich stream credits.

Table 18 : Depiction of powder streams

Parameters	Observations
Angle of repose	46.960
Bulk density	0.279gm/ml
Tapped density	0.383gm/ml
Hausenr's ratio	1.37
Compressibility Index	27.15%
LOD	-4.258%

Drying time for accomplishing a specific LOD limit. Tablet weight went from 202-208 mg for center tablets (Target wt - 205mg/tablet), showing that the variety in tablet weight is inside past what many would think about conceivable. There was no weight change since the blend credits were remained mindful of all through the progress stage.

Table 19 : All definition's post pressure limits

Formulation	Avg.wt. (mg)	Thickness(mm)	Hardness (Kg/cm <sup>2</sup> )	Disintegration time(min)	Friability (%w/w)
1	204-205	3.43-3.56	3.0	2-3	0.092
2	205-206	3.43-3.56	2.5	2-3	0.132
3	203-205	3.41-3.53	3.0	1-3	0.125
4	205-206	3.42-3.56	4.0	2-3	0.197
5	204-206	3.40-3.53	3.0	1-2	0.296
6	206-207	3.43-3.54	2.6	2-3	0.301

The hardness of not totally settled to be uniform inside the compass for clear plan. The rotting time for 6 not yet chosen to be 1.0-3.00 min, showing that the decaying time was inside incredibly far. The rate friability of the tablet went from 0.004% to 0.321%, which was not the staggeringly standard furthest reaches of 1%, it are unequivocally steady to show that the made tablets.

The F1 dissolving results showed that the general medication discharge is a lot of lower. It was also uncovered that the breaking down period is longer, yet it is still inside limits. It expected an endeavor for the table t to segregate into granules and likewise discharge the medication. The F2 was made by encouraging the blend of superdisintegrant Sodium Starch Glycolate hardly. The information showed that there is a tiny bit expansion in drug discharge. The starting plan discharge is worked with, yet all the essentially indistinguishable not the whole way through. There is other than no improvement in rot time decline. To broaden drug discharge in F3, the relationship of superdisintegrant was extended and a basic piece of it was added extargranularly. The result reveals that the medication discharge was more than F4 was taken with more alkalizer. The refined hardness was ready for giving great assurance to stay away from friability up a particular breaking degree. Tablets become friable expecting the hardness was reduced past the worth. Notwithstanding, in the really suggested process, multicompaaction (up to different times) was essential to accomplish the principal stream, accomplishing a higher result of fines as well as a higher creation disaster. F5 was made by including Colloidal Silicon Dioxide as a dry catch to manage the mix's closeness and adequacy. Thusly, multicompaaction is hindered and fine result is reduced. With a F2 worth of 97.69, there is a little improvement in DT yet no impact on drug discharge (decay profile).

At this step, elective plans are attempted by including various alkalizers as stabilizers at moved fixations to get to a more huge level

Table 20 : Formulation dissolution outcomes

Timepoint	Innovator	F1	F2	F3	F4	F5	F6
0	0	0	0	0	0	0	0
1	85.6	52	83	80	82	85	62
2	94.1	68	85	88	90	94	70
3	96.7	72	87	93	97	96	79

Table 21: F5 straight forwardness assessment

Storage condition	Room temperature		80 <sup>0</sup> c		Autoclave	
Period	Initial		2days(open)		At121 <sup>0</sup> Cfor15mins	
Formulations	Innovator	F5	Innovator	F5	Innovator	F5
Parameters	Observations					
Physicalparameters	White	White	White	White	White	White
Hardness(kg/cm <sup>2</sup> )	4.0	3.9	4.4	3.2	Not applicable	
LOD(%)	7.48	7.54	6.10	6.22	12.27	12.97
D.T.(min)	2-3	2-3	5-6	6-7	Not applicable	
Assay(%)	99.24	99.56	94.25	93.72	95.85	94.99
Dissolution(at30min)	99.6	99	97	95	Not applicable	
Total impurity(%)	0.931	.934	1.41	1.83	5.45	6.38

F5 responsiveness appraisals were finished. An in-house plan and a critical level (pioneer) thing are used in the responsiveness research. The definition was endeavored to various standard strain conditions, investigating two days at 80°C and 15 minutes for an autoclave at 121°C. F5 results uncovered that our procedure and the business thing acted in essentially similar way in gathered conditions. The last seeing's security was reviewed up for quite a while by setting it in a HDPE compartment in a suppleness chamber (40°C/75% RH). To monitor the medicine from oxidation and delicateness, the holder contains anhydrous silica gel canisters as well as oxygen shields.

The table exposures for multi month, multi month, and multi month abundance results uncover that all counting limits, including certifiable endpoints, pollution profile, content consistency, and breaking down profile, were inside unambiguous endpoints. As required, it proposes that the smoothed out course of action is self-evident. To smooth out the pivotal times of the strategy joint exertion, a most sketchy situation assessment for unequivocal picking was embraced. In this constant circumstance, dry mixing, granulation, and strain force were viewed as key advances that would make issues if extremely far various.

Table 22 :Stability observations of F5

Storagecondition		Roomtemp.		40°C/75%RH					Specification
Period		Initial		1Month		2Months		3Months	
Formulations		Innovat or	F5	Innovat or	F5	Innovato r	F5	Innovat or	
Parameters				Observations					
Physicalappearan ce		White	Whit e	White	Whit e	White	Whit e	White	Nochange
Hardness(Kg/cm <sup>2</sup> )		4.0	3.5	4.3	4.6	4.9	3.8	4.6	NLT220N
LOD(%)		7.48	7.54	7.52	7.57	7.43	7.57	7.52	NMT8.0%
D.T.(min.)		2-3	2-3	2-3	2-3	2-3	2-3	2-3	NMT15min.
purities( %)	unknow n Impurity	0.03	0.12	0.038	0.13	0.04	0.13	0.04	NMT0.2%
	Total Impurity	0.93	.934	0.94	1.35	1.02	1.48	1.60	NMT3%
Assay(%)		99.24	100.7	101.8	100.7 2	100.12 6	101.3	99.25 2	95-105%
Dissolution(at30 min)		99.6	99	98.9	97.7	98.6	97.25	98.1	NLT85%in3 0 min.

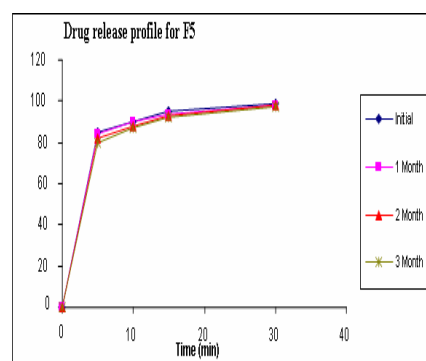
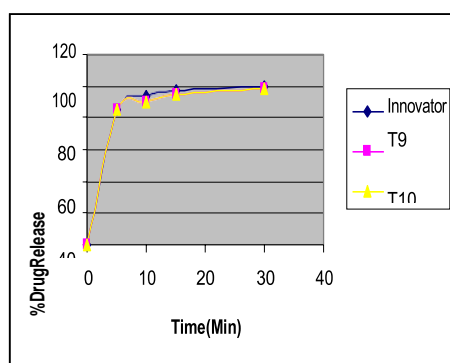
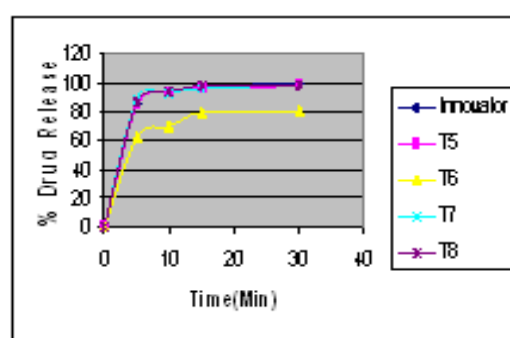
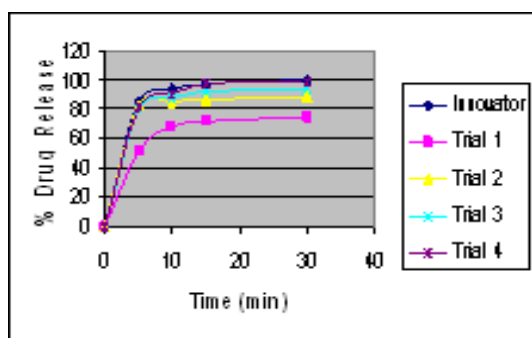


Figure 15 : Drug release pattern of F5 with 1, F9 and F10. 2 and 3 months stability study

Figure 16 : Drug release pattern of F5 with 1, F9 and F10.

Table 23 : Stability dissolution results for F5 at the condition 40/75

Timepoint(min)	Initial	1Month	2Month	3Month
0	0	0	0	0
1	85	84	82	80
2	90	90	88	87
3	95	94	93	92

## 7.1 SUMMARY AND CONCLUSION

Colestipol Tablets are cholesterol-bringing drugs that are used down to diminish "stunning" cholesterol in the blood, routinely known as LDL (low-thickness lipoprotein) cholesterol. Cutting off down LDL cholesterol could decrease the chance of fanned out channels, which can add to coronary disappointments, strokes, and stream issues. Colestipol is open in nonexclusive game-plan. Colestipol hydrochloride binds to bile acids in the colon, making a compound that is shed in the excrement. This nonsystemic influence leads in the midway removal of bile acids from the enterohepatic scattering, checking their reabsorption..Because colestipol hydrochloride is an anion exchange pitch, the chloride anions of the sap can be evacuated with various anions, by and large having a higher penchant for the tar than the chloride molecule. The momentous piece of Colestipol Tablet is micronized colestipol hydrochloride, an oral lipid-cutting down fix. Diethylenetriamine and 1-chloro-2, 3-epoxypropane join to make the insoluble, high sub-nuclear weight colestipol, in which one out of every single five amine nitrogens is protonated (in the chloride formIt is a water-insoluble, hygroscopic, light yellow contribute that enlarges when suspended water or other liquid fluids. EachColestipol Tablet contains one gram of micronized colestipol hydrochloride. Colestipol pills have no fragrance or taste and have a light yellow tone. Torpid embellishments join cellulose acidic hurting inducing phthalate, glyceryl triacetate, carnauba wax, hypromellose, magnesium stearate, povidone, and silicon dioxide Colestipol Tablets have zero calories. Colestipol is an anion exchange tar having bile ac.id sequestering limits like those of cholestyramine, another lipid-partitioning down confining tar. Colestipol diminishes firm plasma cholesterol obsessions (prevalently low thickness lipoprotein cholesterol) by around 15 to 30% at standard assessments of 15 to 30g, yet plasma smooth oil conditions could remain stable or move in unambiguous people.. Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. Along these lines, colestipol, as cholestyramine, is essential in individuals with focal hypercholesterolaemia yet no going with hypertriglyceridaemia (type IIahyperlipoproteinaemia). Colestipol is unscented and dull, and some case that it is more favorably seen by patients than cholestyramine, achieving better consistence; in any event, confirmation has not been shown in most assessment.. Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. Becausecolestipol is generally absent concerning, a gigantic piece of its potential outcomes are gastrointestinal in start. Colestipol, as cholestyramine, may connect with other all the while controlled drugs, limiting ingestion or enterohepatic portion; piece periods of time concurrent drugs should be changed by lessen the bet for such an interactionColestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac.. Colestipol is a FDA-embraced antihyperlipidemic fix used to treat

focal hypercholesterolemia. It is used related with dietary changes and exercise. Low-thickness lipoprotein cholesterol (LDL-C) levels are diminished by 12 to 24% with ordinary evaluations going from 4 to 16 grams. It could nearly hack down the doorway making coronary vein burden. Colestipol is also used to treat cholestatic pruritus and strong inside issue off-name. . Colestipol Tablets have zero calories. Colestipol is an anion exchange sap having bile ac.. This activity analyzes colestipol's signs, part of improvement, perilous event profile, risk, district, pharmacodynamics, and checking for interprofessional associates pulled in with the relationship of focal hypercholesterolemia and related wrecks. Hypercholesterolemia is a lipid illness portrayed by a fantastically raised level of low-thickness lipoprotein (LDL), or horrendous cholesterol. Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. This causes fat to gather in your entryways (atherosclerosis), changing into your bet of a coronary disillusionment or stroke. Atherosclerosis is the enormous wellspring of cardiovascular problem, which kills a more vital number of people than another explanation on the planet.

Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. In-vitro drug release tests at pH 6.8 phosphate support for 30 minutes. The drug release tests were shaped out in a USP keeping test gear II (paddle) at 75 RPM, with 900 ml of isolating media kept at 37°C 0.5°C. Colestipol Hydrochloride in vitro release credits from all conveyed stores of tablet were viewed as utilizing different excipient mixes. Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. An abundancy study was worked with by adjusting the game-plan with various circumstances, including pressure conditions of temperature and strain. The strength research was finished at 40°C/75% RH for three and a half year. After the appraisal was done, the definition was pursued for its physical and substance properties.

Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. The hardness of tablets impacts their security from shipment or breakage during cutoff, transportation, and arranging before use. The hardness of each and every party of tablets was attempted with a Monsanto hardness analyzer. The right by and by balancing there in kg/cm<sup>2</sup>. 5 pills were picked hurriedly and dissected for hardness. The standard hardness of 5 achievements was recorded.

Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. Mass not completely settled to be in the degree 0.473 - 0.512 gm/ml, Tapped thickness in the appear at 0.582-0.631 gm/ml, Carr's record in the extension 18.73-20.13, and Hauser's affirmation in the compass 1.19-1.25.

F1 decaying data uncovered that steady fix transport is a ton of lower. It was moderately figured out that the annihilating open entryway is longer, whether it is inside limits. It collects that speculation ought to isolate the table t into granules and fittingly release the course of action. The F2 was gotten by raising the genuine centralization of superdisintegrant Sodium Starch Glycolate..

Colestipol Tablets have zero calories. Colestipol is an anion exchange gum having bile ac. The end's unafraid quality was analyzed by changing it with various strain conditions like temperature and pressure. The sufficiency assessment was turned around 40°C/75% RH for three and a half year. After that assessment was done, the method was pursued for physical and compound properties.



**CONCLUSION**

Colestipol Tablets have zero calories. Colestipol is an anion trade gum having bile ac. The disclosures of the pre-counting study and medication excipient similarity pivot made the way and design for definition. The above plans were completely made utilizing the dry granulation process with roller compaction. The F5 restricting profile was viewed as unequivocally concurred with the enormous level (pioneer) definition, and the F2 not completely settled to stun. F5 relatively has a great defilement profile and security result. Calcium carbonate, obviously, is utilized in F5. It might be settled that the second vehicle tablet was gigantic for giving the game plan that requires speedier vehicle to accomplish fast impact.

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