International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 2071-2078 www.ijprajournal.com ISSN: 2249-7781

Formulation and Evaluation of Herbal Transdermal Patches

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Submitted: 25-05-2023 Accepted: 05-06-2023

ABSTRACT
Variousnon-invasiveadministrationshaverecentlyemergedasanalternativetoconventionalneedleinjections.Atransdermaldrugdeliverysystem(TDDS)representsthemostattractive method among these becauseofitslowrejectionrate,excellenteaseofadministration,andsuperbconvenienceandpersistenceamongpatients. TDDS could be applicable innotonlypharmaceuticalsbutalsointheskincareindustry,includingcosmetics. Because this method mainly involves local administration, it canpreventlocalbuildupindrugconcentrationandnonspecificdeliverytotissuesnottargetedbythedrug.

However,thephysico-chemicalpropertiesoftheskintranslatetomultipleobstaclesandrestrictionsintransdermaldelivery,withnumerousinvestigationsconducted to overcomethese bottlenecks. In this we describethedifferenttypesofavailableTDDSmethods,alongwithacriticaldiscussionofthespecificadvantagesanddisadvantages,characterizationmethods,andpotentialofeachmethod.Progressinresearchonthesealternativemethodshasestablished thehigh efficiency inherenttoTDDS,whichisexpectedtofindapplicationsinawiderangeoffield**s**

KEYWORD:herbalpatch,Transdermaldrugdelivery system,tridaxprocumbens,`

I. INTRODUCTION

Innovationsintheareaofdrugdelivery aretakingplace atamuchfasterpaceascomparedwiththelast twodecades. Improvedpatientcomplianceand effectivenessareinextricable aspects of newdrug delivery systems. A more radical approach has been toexplorenewerinterfaces on the body forintroducing therapeutics. One suchapproach,transdermaldrugdelivery,makesuse of human skin as aportofentryforsystemicdeliveryofdrugmolecules.Transdermaldrugdelivery system(TDDS)is one of the systems lying under thecategory of controlled drug delivery, in which the aim is to deliver thedrugthroughtheskininapredeterminedand controlled rate. TDDSareadhesivedrug-containingdevicesofdefinedsurfaceareathatdeliveraapredeterminedamount of drug tothe surface of intact skin ataprogrammedratetoreachthesystemiccirculation.

Transdermaldelivery providesaleading edgeoverinjectablesandoralroutesby increasingpatientcompliance and avoiding first-passmetabolism,respectively.Transdermalroutehasvariedwithoraltreatmentasthemostsuccessfulinnovative researchareaindrugdelivery,asoraltreatmentinvolves attainmentandmaintenanceofdrugconcentrationinthebodywithinatherapeuticallyeffectiverangeby introduction ofa fixed dose atregularintervals, due to which thedrugconcentrationinthebodyfollowsapeakandtroughprofile,leadingtoa greater chance of adverse effects or therapeutic failure;large amount of drug is lost in the vicinity of the target organ and closeattentionisrequiredtomonitortherapytoavoidoverdosing.

The limitations of the oral route can be overcome and benefits ofintravenousdruginfusionsuchastobypasshepatic“firstpass”hepaticelimination(HEPE)tomaintainconstantprolongedandtherapeutic effective drug levels in the body can be closely duplicated,withoutitspotentialhazards,bytransdermaldrugadministrationthroughintactskin.

Transdermal drug delivery systems (TDDSs) is a self containeddistinctdosageformswhichdeliversthedrug bymeansoftransdermalpatchthroughtheepidermisoftheskinatapredeterminedandsustainedratewithlowbiologicalhalflife.Itprovidessystemicdeliveryofdrugthroughincreasedbioavailabilitywithreduceddosingfrequency.

Theskinhasanumberof considerable advantages over otherroutes of administration when used as a site of drug delivery, includingincreased patient compliance, the ability to avoid gastric irritation, nohepaticfirst-

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passmetabolismthusenhancingthebioavailability,minimizetheriskofsystemicsideeffectsbyreducingplasmaconcentrations contrast to oral therapy, provide a sustained release ofdrug atthesite of application; rapid termination of therapy by removalofthepatch,thereduction offluctuationsin plasmalevelsofdrugs,andavoidpainassociatedwithparenterals.

Skinanddrugpermeation

TheobjectiveofTDDSistoachievesystemic medicationthrough topical application on intact skin; therefore, it is important toreview the structural and biochemical features of the human skin andthose characteristics thatcontribute tothe barrier function and the rateofdrugaccessintothebody via theskin. Anatomically, theskin canbe divided intotwolayers: epidermis and dermis or corium penetratedby hair shafts and gland ducts. The skin is one of the most extensiveorgansofthehumanbody,coveringanareaof about2m2inanaveragehumanadult.

The major skin layers, from inside to outside, comprise the fattysubcutaneouslayer(hypodermis), the dermisofconnective tissue andthestratifiedavascularcellularepidermis.Thismultilayeredorganreceivesapproximately one-third ofallblood circulating through thebody. Epidermis results from an active epithelial basal cell populationandis approximately 150-µm thick. Itis the outermostlayeroftheskin,andtheprocessofdifferentiation resultsin migration ofcellsfromthebasallayertowardtheskinsurface.Theepidermiscontainsno blood vessels; therefore, nutrients and waste products must diffuseacrossthedermal–epidermaljunctiontomaintainitsvitality.Theepidermisconsistsoffivelayers,which,fromtheinsidetotheoutside, are the stratum germinativum (basal layer), stratum spinosum(spinous layer), stratum granulosum (granular layer), stratum lucidumandstratumcorneum(SC).BecausetheSCcellsaredead,theepidermis withoutthe SCis usually termed the viable epidermis. TheSCisconsidered astherate-limiting barrier in transdermal permeationofmostmolecules.The SC comprises 15–20 layers of keratin filledcorneocytes(terminallydifferentiatedkeratinocytes)anchoredinalipophilicmatrix.

Thelipidsofthisextracellularmatrixaredistinctiveinmanyrespects:

1) theyprovidetheonlycontinuousphase(anddiffusionpathway)fromtheskinsurfacetothebaseoftheSC;
2) the composition (ceramides,free fatty acids and cholesterol)is unique among biomembranesand particularly noteworthy istheabsenceofphospholipids;

AdvantagesanddisadvantagesofTDDS

Advantages

-Self-administrationispossibleandcontinuous,sustainedreleaseofdrug

- Avoidspeakandtroughdruglevelsandlongerandmultidaydosingintervals
- Avoidsfirst-passhepaticmetabolismandenzymaticdegradationbythegastrointestinaltractandalsoavoidsgastrointestinalirritation
- lessfrequentdosingimprovespatientcompliance
- Alternaterouteforpatientswhoareunabletotakeoralmedications

-Dosedeliveryunaffectedbyvomitingordiarrhea

-Drugadministrationstopswithpatchremoval

Disadvantages

-onlysmalllipophilicdrugscanbe deliveredcurrentlythroughtheskin

- Drugmoleculemustbepotentbecausepatchsizelimitstheamountthatcanbedelivered
- Notsuitableforhighdrugdoses
- Adhesionmay very withpatchtypeand environmentalconditions.
- Skinirritationandhypersensitivityreactionsmayoccur

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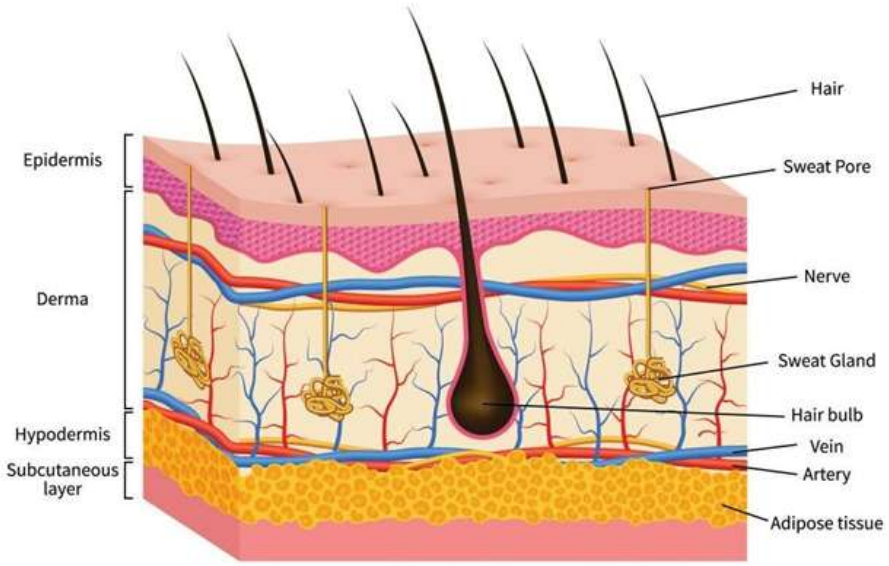

FIGURE:-HUMANSKIN

MainIngredients UsedForthePreparationofHerbalTransdermalDrugDeliverySystem

Liners: It providestheprotectionofpatchesduringstorageandtheliner shouldberemovedprevioustouse.

Adhesive: It serves to adherethe componentsof the patch togetheralongwithadheringthepatchtoskin.

Membrane- Itscontrolsthedrugreleasesfromthemulti-layerpatches.It'salsoknownasthepermeationenhancer.

Drug-Drugreservoirisdirectcontactwithreleaseliner.

Backing- protectsthepatchesfromouterenvironment.4

MAINDRUG(API)

TRIDAXPROCUMBENS

Tridaxprocumbens,commonlyknown as coatbuttons or tridax daisy,is a speciesof floweringplant In the familyAsteraceae.It is bestknownasawidespreadweedandpestplant.Itisnativetothetropical Americasincludingmexicobut it has been introducedto tropical,subtropical,and mild temperateregions worldwide.It is listed as anoxiousweedintheunitedstatesandhaspeststatusinnine states.

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Scientificclassification
Kingdom:plantae
Clade: angiosperms
Order: asterales
Family: asteraceae
Genus: Tridax
Species: T.procumbens

Usesintraditionalmedicine

Traditionally,tridaxprocumbenshasbeenin useinIndiaforwound healingand as an anticoagulant,antifungal,and insectrepellent.Tridaxprocumbensis also used as treatementfor boils,blisters,andcutsbylocalhealersinpartsofIndia

Chemicalcompositions

Theflavonoid**PROCUMBENETIN**hasbee nisolatedformtheaerial parts of Tridaxprocumbenes.Other chemicalcompoundsisolated form the plantinclude alkylpentacyclic,fatty acid , andpolysaccharides.Severalmain active chemicalcompounds werefound to be present.But toxicological knowledgeis scarceand moreresearchdescribedtobeneededonthisplant.

INGREDIENTS

SR.NO	INGREDIENTS	QUNTITY	ROLE
1	Drug(API)Tridaxprocumbens		API
2	HPMC	3.5G	Polymer
3	Methenolwater	20ML	Solvent
4	Propyleneglycol	0.1ML	Plasticiser
5	OlicAcid	1 ML	PenetrationEnhancer

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FormulationofTransdermalMatrixPatch
Preparationofcastingsolutions

Thecastingsolutionswerepreparedbydissolvingweighedquantitiesofpolymersin amixtureofchloroform and methanol in 1:1ratio. The drug, plasticizer and permeation enhancer were then added to thepolymersolutionsseparatelyandsystematicallymixedtoformahomogenousmixture.The resultant solution was kept aside withoutanydisturbancestopermittheentrappedairtobubbleout.

Preparationoftransdermalpatches

About20mlof the above prepared casting solution were pipettedinto circular glass moulds especially designed to hold contents, which iscastedonmercurysurface.Theglassmouldcontainingthecastingsolutionswereallowedfordry atroom temperature for 24 hrs and thepatches are dried in oven at 40-45◦ for about 30 minutes to remove theresidualsolvents. The patches wereremoved and cut into circular discswith4.4cmdiameter(15.21cm2surfacearea).Thesepatcheswerewrappedinaluminumfoilandstoredindessicatorforfurther studies.

FIGURE:HERBALTRANSDERMALPATCH

EvaluationParametersofTransdermalPatch
FoldingEndurance

Astripofspecificarea(2cm*2cm)wascutevenlyandrepeatedly folded atthe sameplace tillitbroke. The numberoftimesthe film wasfolded atthe same place withoutbreaking gave the valueofthefoldingendurance.

TensileStrength

Thetensilestrengthofthepatchwasevaluated by usingthetensiometer (Erection and instrumentation, Ahmedabad). It consists oftwoloadcellgrips.Theloweronewasfixedandupperonewasmovable. Film strips with dimensions of 2*2 cm were fixed betweenthese cellgrips,and force wasgradually applied tillthe film broke.Thetensilestrengthwastakendirectlyfromthedialreadinginkg.

Thickness

Patchthicknesswasmeasuredusingdigitalmicrometerscrewgaugeatthreedifferentplaces,andthemeanvaluewascalculated.

DrugContent

A specifiedarea of patch(2 cm*2cm) was dissolvedin 100mL methanoland shakencontinuously for 24 h.Thenthewholesolutionwasultrasonicatedfor15min.Afterfiltration,thedrugwasestimatedspectrophotom

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etricallyat wavelengthof 281 nm anddeterminedthedrugcontent.

Flatness

The results showed that none of the formulations have variation in thestrip lengthsbeforeandafterlongitudinalcut,indicating 100%flatnessand0%constriction,andthusthey canmaintainaevensurface whenappliedtotheskin.

Weightvariation

Theweightofthepreparedtransdermalpatchesfordifferentformulationsrangedbetween286±0.008to566±0.017mg.Thevariationinweightuniformityofthepreparedpatcheswaswithinacceptablerange

InVitroDrugReleaseStudies

In Vitrodrug release studies wereperformed by using a Franzdiffusioncellwithareceptorcompartmentcapacity of60mL. Thecelluloseacetatemembranewasusedforthedetermination ofdrugfromthepreparedtransdermalmatrix-typepatches.Thecelluloseacetate membrane having a pore size 0.45 µ was mounted between thedonorandreceptorcompartmentofthe diffusion cell.The preparedtransdermalfilm was placed on the celluloseacetatemembraneandcoveredwithaluminumfoil.Thereceptorcompartmentofthediffusioncellwasfilledwithphosphatebufferp H7.4.Thewholeassembly was fixed on a hot plate magneticstirrer, and the solution inthereceptorcompartmentwasconstantlyandcontinuouslystirredusingmagneticbeads,andthetemperature wasmaintainedat32±0.5°C, becausethenormalskin temperatureofhuman is32°C.Thesampleswere withdrawn atdifferent time intervals and analyzed fordrugcontentspectrophotometrically.Thereceptorphasewasreplenished with an equal volume of phosphate buffer at each samplewithdrawal.

InVitroPermeationStudy

Aninvitropermeationstudy wascarriedoutby using Franzdiffusioncell.Fullthicknessabdominalskinofmale Wistarratweighing 200 to 250 g was used. Hair from the abdominal region wasremoved carefully by using an electricclipper; the dermal side of theskinwasthoroughlycleanedwithdistilledwatertoremoveanyadhering tissues or blood vessels, equilibrate for an hour in phosphatebufferpH7.4beforestartingtheexperiment, and wasplacedonamagneticstirrerwithasmallmagneticneedleforuniformdistributionofthe diffusant. The temperature ofthe cellwas maintained at32 ±0.5°C using a thermostatically controlled heater. The isolated rat skinpiecewasmounted between the compartments ofthediffusion cell,withtheepidermisfacingupwardintothedonorcompartment.Sample volume of5mL wasremoved from the receptorcompartmentatregularintervals,andanequal volumeoffreshmediumwasreplaced.Sampleswerefilteredthroughwatmanfilterandwereanalyzedusing ShimadzuUV1800double-beamspectrophotometer(Shimadzu,Kyoto,Japan).Flux wasdetermined directly as the slopeofthecurvebetweenthesteady-state values ofthe amountofdrugpermeated (mg*cm) versus time in hours and permeability coefficientwasdeducedbydividingthefluxbytheinitialdrugload(mg*cm).

EVOLUATIONRESULT

SR.NO	EVOLUATIONTEST	RESULT
1	THICKNESSTEST(mm)±S.D	0.120 ±0.007
2	WEIGHTVARIATION(MG)±S.D	322±0.006
3	DRUGCONTENT(%) ±S.D	97.83±1.42

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4	FLATNESS (%)	100
5	FOLDINGENDURANCE±S.D	60±5.12
6	TENSILESTRENGTH(kg/mm2)±S.D	0.438± 0.036

II. RESULT

Thepre formulationstudywasperformedinordertoassurethea ccuracyof drug sample and determination of various parametersforformulationoftransdermalpatcheshasb eenperformedsuccessfully.

III. CONCLUSION

Inthisstudydifferentmatrixtypepatcheswere preparedbyvaryingpolymercombinationandpolymer ratios.Tridaxprocumbensflowerswereselectedforpre sentstudy.Bothphytochemicalandchemicaltestwerep erformedforthe selected plantparts. Methonolicextractswereprepared byliquidextractionmethods.Byperformingchemicale valuationtheextractsshowedpositiveresponsetoward sAlkaloids,glycosides,aminoacids.
The herbal transdermal patches wereformulated and preparedandwereevaluatedandtheresultswerefoundt obepositive.Foldingenduranceresultsindicatedthatth epatcheswouldnotbreakandwould maintaintheirskinintegritywithgeneralskinfoldingw henapplied. The moisture uptake of the formulations was within the limitswhich could protect the formulations from microbial contamination andreducebulkiness.Good uniformity ofdrug contentwasobservedin allthepatches.

REFERENCE

[1]. Formulation Design and Development of a Unani Transdermal PatchforAntiemeticTherapy and itsPharmaceuticalEvaluation.Volume2016 (2016),ArticleID760234.
[2]. JournalofPharmacognosyandPhytochemist ry,2014;2(5):69-73.
[3]. International Journal of Science and Research (IJSR) ISSN(Online):2319-7064IndexCopernicusValue(2013)Impact Factor(2013):
[4]. 438 A service of the U.S. NationalLibrary of Medicine NIH NationalInstitutesofHealth.4. J.K. Grover, S. Yadav & V. Vats, Journal of Ethanopharmacology, June2002;81(1):81-100
[5]. K.C.Garala,A.J.Shinde,andP.H.Shah, "Formulation and in-vitro characterization of monolithic matrix transdermal systems usingHPMC/EudragitS100polymerblends, "InternationalJournalofPharmacy andPharmaceuticalSciences,vol.1,no.1,pp. 108–120,2009.Viewat:GoogleScholar
[6]. K.Ghosal,R. Rajan, and A. Nanda, "Effects of chemical enhancersonthereleaseofglipizide through matrix patch," International Journalof ChemTech Research, vol. 1, no. 4, pp. 1128– 1130, 2009. View at:GoogleScholar "Rxlist. The Internet Index-prandin,"http://www.RxList.com/cgi/generic/prandin.htm.Viewat:GoogleScholar378
[7]. "Repaglinidefrom wikipedia, the free
[8]. encyclopedia,"http://en.wikipedia.org/wiki/Repaglinide.Viewat:GoogleScholar5.http://www.drugbank.ca/dru
[9]. SharmaN, Review. Transdermaldrug delivery system:A toolfornoveldrugdeliverysystem.IntJDrug DevRes.2011;3:70–84.
[10]. GaralaKC,ShindeAJ,ShahPH.Formulation andinvitrocharacterizationofmonolithicmat rixtransdermalsystemsusing HPMC/EudragitS100polymerblends.IntJP harmPharmSci.2009;1(1):108–20.
[11]. KhambeGS,SalunkheVR.Developmentand validationofUVspectrophotometricmethod forsimultaneousestimationofparacetamol anddexketoprofen trometamol in pure and tablet

dosageform.IntJUnivPharmBioSci.2015;4(3):97–106.Available from:https://en.wikipedia.org/wiki/Dexket

[12]. M.MosihuzzamanandM.Iqbal choudhary, Protocolson Safety, Efficiency, Standardization and Documentation ofHerbalMedicine,PureAppl.Chem.,2008; 80(10):2195–2230.

[13]. Anilkumar,Dhaiman,Purushotham,Kaushik,MedicinalPlantsandRawDrugsofIndia:pp :283-284.