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Date :

Place : *(Gayasuddin Khan)*

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List of Abbreviations & Symbols

%	:	Percentage
°	:	Degree
µg	:	Microgram
AFM	:	Atomic force microscopy
ANOVA	:	Analysis of variance
AUC	:	Area under the curve
C	:	Celsius
CH	:	Chitosan
cm	:	Centimeter
C_{max}	:	Peak plasma concentration
CLSM	:	Confocal laser scanning microscopy
DoE	:	Design of Experiment
DSC	:	Differential scanning calorimetry
DW	:	Distilled water
EE	:	Entrapment Efficieny
FT-IR	:	Fourier transform infrared spectroscopy
GE	:	Gelatin
hr	:	Hour
KBr	:	Potassium bromide
kV	:	Kilo volt
LOD	:	Limit of detection
LOQ	:	Limit of quantification
ml	:	Milliliter
min	:	Minute
mm	:	Millimeter
mg	:	Milligram
PCL	:	Poly (ϵ-caprolactone)
pKa	:	Acid dissociation Constant
OVAT	:	One variable at a time
PXRD	:	Podwder X-Ray Diffraction
R^2	:	Correlation coefficient
RSD	:	Relative standard deviation

RSM	:	Response surface methodology
RPM	:	Rotation per minute
RH	:	Relative humidity
SD	:	Standard deviation
SEM	:	Standard error mean
SRP	:	Scaling & Root Planing
TNZ	:	Tinidazole
TNZ-PCLNF	:	Tinidazole loaded Poly (ϵ-caprolactone) Nanofiber
TNZ-PGHNF	:	Tinidazole loaded Poly (ϵ-caprolactone) Gelatin hybrid Nanofiber
TNZ-PCHNF	:	Tinidazole loaded Poly (ϵ-caprolactone) Chitosan hybrid Nanofiber
Tg	:	Glass transition temperature
T_{max}	:	Time for Peak Concentration
$t_{1/2}$	:	Half life
PXRD	:	Powder X-ray diffraction
UV	:	Ultraviolet
λ_{max}	:	Wavelength maxima
w/w	:	weight/weight
w/v	:	weight/volume
v/v	:	volume/volume

Preface

According to the WHO report, dental caries was the most prevalent condition (affecting 35% of the population), whereas severe periodontitis and severe tooth loss were the 6th and 36th most pervasive conditions affecting 11% and 2% of the population, respectively. This problem is particularly grave and alarming owing to the proximate relationship that exists between oral health and systemic health. It has also been reported that periodontal issues may aggravate cardiovascular diseases, diabetes mellitus and low birth weight or even preterm birth of children. Therefore, timely treatment of periodontal disease is essential.

The aim of present study was to alleviate existing shortcomings in treatment of periodontitis related to systemic administration of Tinidazole (TNZ) by using a more competent approach for the drug to reach the site of infection deep inside the periodontal pockets. So, in the present research work, an attempt has been made to formulate TNZ loaded electrospun nanofiber membrane which deliver TNZ with slow rate locally in the periodontal pocket and maintain therapeutic drug concentration for treatment duration and thus, to reduce dose size and dosing frequency as well as improve patient compliance. In this context, rigorous literature survey was accomplished with special emphasis on nanofiber based drug delivery systems. Additional efforts was attempted to collect details of drug, polymers, solvent and other excipients.

TNZ is one of the most pervasively used antimicrobial agents against anaerobic periodontal pathogens. It is a 5-nitroimidazole derivative with a half-life of 12–14 hr. It has a longer half-life and higher bioavailability which makes it a promising antimicrobial agent for periodontitis treatment. Although majority of the TNZ formulations are available as oral dosage forms, these formulations not only result in a low concentration of TNZ in gingival crevicular fluid (GCF) but also causes undesired side effects.

The entire research work has been carried out systematically in three steps. First; TNZ loaded poly (ε-caprolactone) nanofiber (TNZ-PCLNF), second; TNZ loaded gelatin-poly (ε-caprolactone) hybrid nanofiber (TNZ-PGHNF) and lastly; TNZ loaded chitosan-poly (ε-caprolactone) hybrid nanofiber (TNZ-PCHNF) were prepared and optimized by using Box-Behnken experimental design tool. Moreover, the optimized formulations were extensively evaluated for solid state characterization, *in vitro* and *in vivo* evaluation, and the results were discussed profoundly.

The goals of the present study were achieved successfully by design and development of novel biodegradable nanofiber membranes of TNZ. The developed formulations were subjected to various preclinical and clinical studies and their outcomes suggested the potential of developed drug delivery systems for the better treatment of periodontitis.