Faculty of Pharmaceutical Sciences

Research Report

UCSI University

Volume 01

Editors

Anand Gaurav | Mogana Sundari Rajagopal

Contents

- 2 -

BC%'6"7%'! "6%920.':-"'1)'1-C.'1-0"'(&--0?'32'@)-.':-"'320'

1-0?.'D-0?'E%2'1-0?.'> "66&)F'G)%'E2-'H-0'

EF55"#,,.+#'N$$#&-'0$' *! "# "$%&'()'*($(+,&('O?'E##=,''''''''''''''''''''''''''''''*

7.3'.*'C' > 0F,#' > 0=#3'0$'C&F-#')*$3% 4 4 %-.0*''''''''''';Q:;;'''''''''''''''''''''''

<%&'A&2&0' I 20?.'G&"C'A&"2'1-0?.'

Preface

! "#$%#&' ()*&#+, -&*' .&'/, */, #, 0$1#2, 2*/&*3₊*. ',)"#), /(331$)/, #,)"$*4*. 5, 3$16'//*1., #. 2, #, 4*)#+, 7. 2(/)$8, *9'9:,)"', 3"#$%#&8, 3$16'//*1., #. 2,)"', 3"#$%#&' ()*&#+, *. 2(/)$89, ; &&1$2*. 5,)1, #, $'31$),$'₊'#/'2,08,)"',7<=7; ,7./)*)()',61$,>(%#., ?#)#, -&*' .&':, *),"#/,0'' . ,3$1ꟷ'&)'2,)"#),)"',5₊10#₊,/3'.2*.5,1.,%'2*&*.'/,A*₊₊, 5$1A, #), BꟷDE, F; GH,)"$1(5", IJIK:, $'#&"*. 5, #33$1L*%#)'+8, MN9D,)$*₊₊*1., 08, IJIK:, 'L&₊(2*. 5, /3'. 2*. 5, 1., FO=7? ꟷNP, 4#&&*.'/9,,

Q"', /&#₊', #. 2,)"', *%31$)#.&', 16,)"*/, *. 2(/)$$8, &₊'#$+8, %#R',)"*/, 1. ', 16, %1/), /*5.*6*&#.), *. 2(/)$$'/, 5₊10#₊₊8$,)"'(/:,)"', *. 2(/)$$8T/, /((/)#*. #0*₊*)8, #. 2, /(&&'//, #$', &$(&*#₊₊9, Q"', (. 3$'&'2'.)'2')2, $#)', 16, 5$1A)", #. 2,)"', $#3*2, *%&3₊'% '.)#)*1., 16, ₊#)'/),)'&". 1+158, %#R'/,),'L)$ '+8, *%&31$)#.)61$$#.),)"', 3₊#8'$ '$$/, *. 41₊4'2,)1, /)#8, '(*33'2, 2, *. 2, 6₊1($/*/"9, V*)",)"#):,)"', 6*'₊2, 16, #&#2'%*&*8, $' /'$ /#", $', 16, #$$', ,

3‍#8/‚#.‚(.2'.*#0‍8‚'//'.)*#‍‚#.2‚*.&$'2*0‍'‚$1‍'‚*.‚3$14*2*.5‚
(/'6(‍‚*./*5")/‚#.2‚R.1A‍'25'‚)1‚14'$&1%'‚&"#‍'.5'/‚#.2‚
#))#*.*.5‚/(&&'//9‚

    F1./*2'$*.5‚)"'‚$'/'#$&"‚*.)'./*4'‚.#)($'‚16‚3"#$%#&8‚
3$16'//*1.‚#.2‚)"'‚3"#$%#&'()*&#‍‚*.2(/)$8:‚)"'‚W#&(‍)8‚16‚
!"#$%#&'()*&#‍‚-&*'.&'/‚XW!-Y:‚ZF-7‚Z.*4'$/*)8:‚[#‍#8/*#‚
2'&*2'2‚)1‚3(0‍*/"‚)"'‚!"#$%#&'()*&#‍‚-&*'.&'/‚H'/'#$%"‚
H'31$)/:‚#‚0*C#..(#‚3(0‍*&#)*1.‚)"#)‚61&(/'/‚1.‚&1%3‍*.5‚#.2‚
3$1%1)*.5‚$'/'#$%"‚X&1.)#*.*.5‚0()‚.1)‚+*%*)'2)'2‚)1‚)"'1$')*&#‍:‚
'%3*$*&#‍‚#.2‚#33‍*'2‚$'/'#$%"Y‚1.‚)"'‚4#$*1(/‚#/3'&)/‚16‚
3"#$%#&'()*&#‍‚/&*'.&'/‚X*9'9:‚!"#$%#&'()*&#‍‚F"'%*/)$8:‚
!"#$%#&'()*&#‍‚Q'&".1‍158:!"#$%#&'#1‍158:‚F+*.&'#‍:‚!"#$%#&'#8:‚
W1$%(‍#)*1.‚-&*'.&'/:‚*1‚#.2‚F"'%1‚7.61‍15*%#‍)*&/‚#.2‚%#.8‚
%1$'Y‚

    Q"'‚!"#$%#&'()*&#‍‚-&*'.&'/‚H'/'#$%"‚H'31$)/‚*/‚#‚
(/'6(‍‚$'/1($&'‚61$‚3"#$%#&8‚3$16'//*1.#‍‚#.2‚)"'‚
3"#$%#&'()*&#‍‚*.2(/)$8‚)1‚##U'*5"‚R.1A‍'25'‚#.2‚

    - 5 -

)*+#,-./%-.0*'0$'-1#'!,2&1030/.&%3')45%&-'0$'

678)9:;<'!%*=#4.&'.*'>%3%2,.%''''''''''''''''''''''''''''''

*! "#$%$$"&'( )*&"+",#-⁰.'/+),0)**'1"2'32"0'32"0.'/-$))0'1"2'

4-0'3-.'/-$))0'5 "667'80"9':);$7.'<"0':-"'3-'

ᴾ! "Q2$67'%R'=&", C"Q)26-Q"$'DQ-)0Q)*.' SADT' S0-+),*-67.' 5%U'P.'

:"$"0' >)0", "' <"L-0?.' SADT' I)-?&6*' VG"C"0' A%00"2?&6W.'

A&),"*.'XYZZZ'(2"$"'12C;2,.'> "$"7*-"U'

0A%,,)*;%0L)0Q)['   ! "#$%$$"&'   ( )*&"+",#-\'   /C"-$['

R"#$%$$"&9] 7"&%%UQ%C\'R"#$%$$"&] 2Q*-20-+),*-67U)L2UC7'

X?；-- CINY9,Q"',U('/)*1..#*$'/,A'$',2'/*5.'2,1.,G115+',W1$%,
#.2,/"#$'2,A*)",31)'.)*#+,$'/31.2'.)/,4*#,2*66'$'.),/1&*#+,%'2*#,
3+#)61$%∕9,Q"',2#)#,&1+'&)*1.,3'$*12,A#/,#+%1/),)"$'',A''R/:,
6$1%,N,[#$&",IJIN,)1,IJ,[#$&",IJIN9,Q"',$'U(*$'2,/#%3+',/*`',
A#/,&#+&(+#)'2,)1,0', BPK9, -)#)*/)*&#+, !#&R#5', 61$,)"', -1&*#+,
-&*'.&'/,X-!--Y:,4'$/*1.,II,A#/,(/'2,61$,/)#)*/)*&#+,#.#+8/*/9,
Q"',&1.6*2'.&',+'4'+,16, PKE,A#/,&1./*2'$'2,61$,/)#)*/)*&#+,
/*5.*6*&#.&'9,

A#,F3-,'

O6, BPK, $'/31.2'.)/:, IB9BE, 2'+*.'#)'2, /'4'$', 3/8&"1+15*&#+,
*%3#&),16,)"',1()0$'#R:,a9DE:,K9BE,#.2,K9DE,$'31$)'2,/'4'$',
/)$'//:,#.L*')8:,#.2,2'3$'////*4',/8%3)1%/:,$'/3'&)*4'+89,>*5",
+'4'+,16,7_-CH,#.2,?;--.2,?;-;>*5",

A*)",''*5''\'\$,7_-CH,)''#.,1)''\'\$,/8%3)1%'/9,Q''\'\$',A#/,#,&1\$\$'+#)*1.,

0')A''., 3\$#&)*&*.5, 3\$1)'&)*4', %'#/(\$'/, /(&", #/, 6\$'U('.),

A#/''*.5,#.2,2*/*.6'&)*.5,''#.2/,A*)",+1A'\$,/)\$'//:,#.L*')8:,#.2,

2'3\$'//*1., /8%3)1%'/9, O4'\$, aJE, 16,)''', \$'/31.2'.)/,

2'%1./)\$#)'2, #, 5112, R.1A+'25', #01(),)''', %12'/, 16,

)\$#./%*//*1., 16,)''', 4*\$(/:, A''\'\$', KNE, /(55'/)'2, #, %12'\$#)',

&''#.&',16,\$'&14'\$8,*6,)''8,#\$',2*#5.1/'2,A*)'',FO=7?CNP9,

60*&3F,.0*''

[1\$',)''#.,#,U(#\$)'\$,16,\$'/31.2'.)/,\$'31\$)'2,%12'\$#)',),)1,/'4'\$',

3/8&''1+15*&#+, *%3##&), 16, FO=7?CNP9, Q''', *.2*&#)1\$/, 16,

2'3\$'//*1.:,#.L*')8,#.2, /)\$'//, /''1A, #, %1\$', &\$*)*&#+, &1.2*)*1.,

#%1.5,A1%'.:,81(.5/)'\$/:,''#+)''&#\$',/)#66,#.2,)''1/',A*)'',+1A'\$,

'2(&#)*1.#+,+'4'+/9,!'\$/*/)'.&',16,)''',3#.2'%*&,%#8,&#(/',%1\$'\$,

/1&*#+,5\$1(3/, #.2, *.2*4*2(#+,)1, 0',)''', 4*&)*%/, 16, /'4'\$',

3/8&''1+15*&#+, 2*/1\$2'\$\$'/9, Q''', /1+()*1./, *., 01)'', /1&*#+, #.2,

*.2*4*2(#+(#+,+'4'+/,#\$',(\$5'.)8,.''2'29,

- 10 -

)*-"0=F&-.0*

#.2,/($4'8,$'/31./'/,A'$',#.1.8%1(/9,Q"',U('/)*1..#*$',A#/,

#213)'2,6$1%,3$'4*1(/,/)(2*'/,Xb*,'),#₊9,IJIJY9,Q"',6*$/),/'&)*1.,

16,)"',U('/)*1..#*$',A#/,#01(),)"',2'%15$#3"*&,2#)#,16,)"',

3#$)*&*3#.)/:,61₊1A'2,08,)"',/'&1.2,/'&)*1.,)"#),&1.)#*.'2,

U('/)*1./,#01(),/₊''3,2*/)($0#.&',#.2,/(*&*2#*₊,)"1(5")/,*.,#,cℂ

31*.),b*R'$),/&#₊',61$%#)9,!#$)*&*3#.)/,A"1,$#)'2,)"',*,*)'%/,16,

/₊''3,2*/)($0#.&',#.2,/(*&*2#*₊,)"1(5")/,d,J,A'$',&₊#//*6*'2,#/,

"#4*.5,/₊''3,2*/)($0#.&',1$,/(*&*2#*₊,)"1(5")/:,$'/3'&)*'&)4'+89,

A#,F3-,'

Q"',U('/)*1..#*$',A#/,6*₊+'2,*.,08,III,%#₊',#.2,NIa,6'%#₊',

$'/31.2'.)/9,\#/'2,1.,1($,6*.2*.5/:,IeK,Xea9DEY,3#$)*)#*3#.)/,

$'31$)')'2,/₊''3,2,2

3$10+'%/, &#., 'L)'.2, 6($)"'$,)"', #33+*&#)*1., 16, 6*.2*.5/, *.,
&($$'.),/)(28⁹,

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! FG3.&' 8 .#D'0$' 6 0 4 4 F*.-2' ! 1%'' 4 %&.,-,Ḱ'

A03#,'=F''.*/'6 7 8) 9 : ; <' ! %*=# 4 .&L'C'

6 ''0,,:E#&-.0*%3'E-F=2'.*' > %3%2,.%''''''''''''''''''''''''''''''''

BC%6''7%' ! ''6%920⁰

3₊#)61$%9,Q"',/)(28,A#/,&1.2(&)'2,0')A''., [#$&",#.2, ; 3$*₊,

IJIN9-)#)*/)*&#₊, ,

5'.2'$:,#5':,#.2,$#&'Y,/(55'/)/,)"#),&'$)#*.,2'%15$#3"*&,5$1(3/,

%#8,.1),"#4',#,5'.'$#+8,31/*)*4',#))*)(2',)1A#$2/,&1%%(.*)8,

3"#$%#&*/)/9,Q"',$'#/1./,61$,)"*/,%#8,0',6($)"'$,/)(2*'2,#.2,

/)$#)'5*'/,&#.,0',3(),*.,3+#&',)1,3$1%1)',)'$',$1+',16,&1%%(.*)8,

EF55"#,,.+#'N$$#&-'0$' *! "# "$%&' ()'*($(+,&('OP'

E##=,' 7.3' .*' C' > 0F,#' > 0=#3' 0$' C&F-#'

)*$3% 4 4 %-.0*''''''''''''''''''''''''''''''

A&2&0' I 20?' <%&P.' A&"2' 1-0?' G&"C^.' <"J,-)$' 897-,)C'
89%F2"&P.'>-0?'G"66'1))P.0''''

[P] *! "Q2$67'%R'=&", C"Q)26-Q"$'DQ-)0Q)*.' SADT' S0-+),*-67.' 5%U'P.'*
:"$"0' >)0", "' <"L-0?.' SADT' I)-?&6' VG"C"0' A%00"2?&6W.'*
A&),".'   XYZZZ'   (2"$"'   12C;2,.'   > "$"7*-"U,,,,,,,,,,,,,,,,,,,*
^M);",6C)06'%R'K-%C)L-Q"$'DQ-)0Q).'! "Q2$67'%R'>)L-Q-0)'"0L'*
I)"$6&'DQ-)0Q).' S0-+),*-6-'=26,"'> "$"7*-".'_`` ZZ'D),L"0?.'*
D)$"0?%,U'

0A%,,);%0L)0Q)['   >-0?'   G"66'   1))\'   /C"-$['*
$))C6] 2Q-20-+),*-67U)L2UC7''*

'

[F - O, A#/, 'L)$#&)'2, 6$1%, #*$C2$*'2, >%C%,L-Q"'Q&", "O6-", b9,
/''2/,)"$1(5",""L#. ', 'L)$#&)*1.9,Q"',1*+,'L)$#&),A#/,)'/)'2,A*)",
; QH,WQC7H,61$,3$'+*%*.#$8,&"'%*&#+,5$1(3,/&$'' .*.59,O.,)"',
1)"'$,"#.2:, [F - O, A#/,#2%*.*/)'$'2,)1,#2(+),%#+',7FH,%*&',
.&$'#/.5,21/'/,XB:,NJ:,BJ,#.2,NJJ,%5iR5:,3919Y:,A*)",/#+*.',XNJ,
%+iR5Y,#.2,#/3*$*.,XNJJ,%5iR5:,3919Y,#/,.'5#)*4',#.2,31/*)*4',
&1.)$1+/,$'/3'&)*4'+89,O.',"1($,#6)'$,)$'#)%'.):,)"',%*&',A'$',
&"#++'.5'2,A*)",J9IK,%+,16,NE,&#$$#5''.#.,*.@'&)*1.,#),)"',
3'$*)1.'.#,&#4*)89,)1,*.2(&',3'$*)1.*)*/9,Q"',%*&',A'$,/#&$*6*&'2,
c,"1($($/,+#)'$,$:,#.2,)"',3'$*)1.'#+,A#/,A#/"'2,A*)",B%+,16,
&'C&1+2,!\-,)1,&1++'&),)"',3'$*)1.'#+,4+(*2,16,)"',3'$)1.'#+,
&1++'&)'2,A#/,28'2,A*)",A*)",)$83"#.,0+(',/1+()*1.,#.2,4*'A,(.2'$$,
+*5")",%*&$1/&13'3,#.2,"'%#)1+89)1%')$9,$,)1,&1(.),)"',.(%0'$,16,
+'(R1&8)'/,3$'/'.,*.,)"',3'$*)1.'#+,6+(*29,,,

'

9#+#305 4#*-'0$'EF*,&''##*'6''#% 4'R%,#'

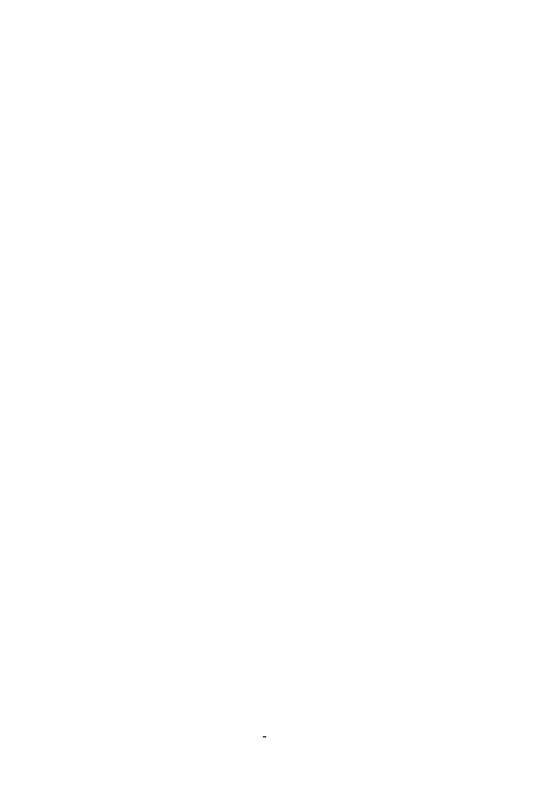**F,.*/'S%-F''%3'NT&.5.#*-,'''**

K,-''0'8$+-0'! ''C'(''-'D&)0?ᴾ.'D&-)9'8JL2$'(''L&'',' >%&''C)L'

*/J,''&-C'I ''J-J2,'E''&C''0ᴾ.'D-0%2+''**''0)'MN)'',''C''0)^.'8*&%9'*

(2C'',':''0''9-,''C''0ᴾ·⁰''''''

ᴾ! ''Q2$67'%R'=&'',C''Q)26-Q''$'DQ-)0Q).' SADT' SO-+),*-67.'5%U'P.'*

:''$''0' >)0'',''' <''L-0?.' SADT' I)-?&6' VG''C''0' A%00''2?&6W.'*

A&),''.'   XYZZZ'   (2''$''   12C;2,.'   >''$''7*-''U,,,,,,,,,,,,,,,,,*

^! ''Q2$67'%R'DQ-)0Q).' SO-+),*-6-'G2092'8JL2$'E''&C''0.'(''C;'','

`PaZZ'=),''9.'>''$''7-''U*

0A%,,);%0L)0Q)['8*&%9'(2C'',':''0''9-,''C''0\'/C''-$['*

''9;&'',C] ?C''-$UQ%C\'''&%9] 2Q*-20-+),*-67U)L2UC7'*

'

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Q"', /(./&$''., &$'#%, 0#/', A#/, 3$12(&'2, 08,)"', jA'), 5(%T, '%(+/*6*&#)*1., %')"12,&1(3+'2,A*)","*5",/"'#$,"1%15'.*`#)*1.9, Q"',&1%31/*)*1.,#.2,&1.&'.)$#)*1.,16,'#&",'L&*3*'.),"#4',0''., 4#$*'2,)1,10)#*.,)"',13)*%*`'2,&"#$#&)'$*/)*&/9,Q"',61$%(+#)'2, &$'#%/, A'$', '4#+(#)'2, 61$, 4#$*1(/, 3#$#%')'$/'$/, /(&", #/, 1$5#.1+'3)*&, &"#$#&)'$/'$/)*&/:, /(.C3$1)'&)*4', 6#&)1$/, X-!WY:, /3$'#2#0*+*)8:, 1&&+(/*4*)8:,)"'$%#+, /)#0*+*)8:, `')#, 31)'.)*#+:, %*&$$1/&13*/&,#.#+8/*/:,3>:,#.)*%*&$$10*#+,#&)*4*)8'*'/9,,

F*..#%1., 1*+, #.2, +#.1+*., /"1A'2, 3$1%**/*.5, /(.C3$1)'&)*4''&)*4', #&)*4')*8,08,'+'4#)*.5,-!W,A*)","*/''61+2,16,c,#.2,B9a,$'/3'&)*4'+89, ;,&$'#%,&1.)#*.)*.2,&1+&#+,0()')'$,/,/"1+21+2,)"',/5"/''/)*09, 6#&)*1$/16,Ke,#%*1.5,#++,61$%(+#)*+/'/*.$/''9,Q"',&$'#%,'L"*0*)'/2,`)#, 31)'.)*#+,$#.5'1/,6$1%,CBc9De,)1,CID9D,%=9,Q"',3>,16,)"', 61$%(+#)*+)*1./,A#//*.,)"',$#.5',16,c9aK,a,)1,c9aP9,Q"',/3$'#2#0*+*)8,

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