



)XQFWLRQDO 5ROH RI D :HOO &KDUDJ SXU .KDUDJ SXU :HVW
RVWUOHVWQMD LQ 'ULYLQJ ,PPXQH 6WLPXODWLRQ

. 6DQMDQD 3 'HYL DQG 7DSDV . 0DLWL
'HSDUWPHQW RI %LRWHFKQRORJ\ ,QGLDQ ,QVWLWXWH RI 7HFKQRORJ\ .KDUDJ SXU .KDUDJ SXU :HVW
&RUUHVSROGLQJDSWKRUDLWL 'HSDUWPHQW RI %LRWHFKQRORJ\ ,QGLDQ ,QVWLWXWH RI 7HFKQRORJ\
)D\ (PDLO WNPDLWL#KLMOL LLWNJS HUQHW LQ
5HFHLYHG-QDWH \$FFHSWHG\$QDXHW 3XEOLVKHG6SWHPEHU
&RSULJKW 'HYL .63 HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WHUPV RI V
XVH GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXU

\$EVWUDFW
3RO\VDFFKDULGHV HURJO\FDQ LVRODWHG IURP IXQJDO VSHFLHV KDYH DWDLQHG
PRGXODWLRQ IXQFWLRQV +RZHYHU WKHUH H\LVWV D VLJQLILFDQW UHODWLRQVKL
PROHFXOH ,Q WKLV FRPPHQWU\ ZH IRFXV RQ D ZHOO FKDUDJWHURJ
RVWUOHVWQMD KDYH EHHQ VKRZQ WR GULYH LPPXH VWLPXODWLRQ LQ WXPUR EHDU
KLJK PROHFXODU ZHLJKW DQG ZDV SULPDULO\ FRPSRVHG RI JOXFRVH PDQQRVH D
OLQNDJHV LQ WKH UHSHDWLRQ FKDLQ 7KH PROHFXOH DOVR H\KLELWHG WULSOH K
GULYLQJ PROHFXOHV KDYH D VLJQLILFDQW LPSDFW LQ GHFUHDVLRQ WKH WXPUR Y
SOD\ D VLJQLILFDQW UROH LQ WKH SUROLIHUWLRQ DQG DFWLYDWLRQ RI O\PSKRF
RI WKH KHWHURJO\FDQ ZHUH DVVFLDWHG ZLWK LWV LPPXH VWLPXODWLRQ DEL
XWLOLJHG DV DGMXYDQWV LQ LPPXH EDVHG WKHUDSLHV

&RPPHQWU\ DELOLW\ > @ 3RO\VDFFKDULGHV /GHWLYHQ
)XQJXV VXFK DV PXXKURRPV KDV HVWUOHVWQMD LQ 'ULYLQJ
PHGLFLQHV SDUWLFXODUO\ LQ RULJLQDO\ WXPURV DQG DFWLYDWLRQ
LPPXQRPRGXODWRUV DQG DQWLFDQFHUW RULJLQDO\ WXPURV DQG DFWLYDWLRQ
SURWHLQV SHSWLGHV OHFWLRQV SRO\VDFFKDULGHV SURWHLQV SRO\VDFFKDULGHV
DQG SRO\VDFFKDULGHV SURWHLQV SRO\VDFFKDULGHV SRO\VDFFKDULGHV
FRPSRXQGV KDYH EHHQ LVRODWHG IURP PXXKURRP
GHWLYHQ FRPSRXQGV SRVVHV KLJK SURWHLQV RULJLQDO\ WXPURV DQG DFWLYDWLRQ
PD\ UHGXFH WXPUR SURJUHVVLRQ \$PRQGLDQ ,QVWLWXWH RI 7HFKQRORJ\
LQ IUXLWLQJ ERGLHV RU P\FHOLD KDYH EHHQ LVRODWHG IURP PXXKURRP
LPPXQRORJLFDQO\ DFWLYH FRPSRXQGV WXPURV DQG DFWLYDWLRQ
DQG YDULDWLRQV LQ WKHLU VWUXFWXUDL DOVR FRPSOHQW DFWLYDWLRQ
IXQFWLRQDO\ FRPSRXQGV DUH DOVR UHFRYHODWLRQV DFWLYDWLRQ
UHSRRO\}W\ DV WKH\ PDLQWDLQ YLDFKOLN RIVWDLRXV DFWLYDWLRQ
LPPXQH VWLPXODWLRQ LQVHIDQGLDQ GHWLYHQ O\NRZQ DV RIVWU PXXKURRP LV
SRO\VDFFKDULGHV H\HUW WKHLU DQWLWXPURV RULJLQDO\ WXPURV DQG DFWLYDWLRQ
RQRJHQHVLV E\ LQWUDSHULWRQDQXQFWLRQDO *ODQGLDQ ,QVWLWXWH RI 7HFKQRORJ\
SRO\VDFFKDULGHV LVRODWHG IURP PXXKURRP DFWLYDWLRQ PHWK
SUHYHQWLQJ DFWLYLW\ HQKDQFHUW PXXKURRP DFWLYDWLRQ PHWK
WXPURV ,PPXQR HQKDQFLQJ DFWLYLW\ > @Q\$V WKHFWLQV DFWLYDWLRQ
E\ LQGFLQJ WKH DSRSWRVLV RI WXPURV DFWLYDWLRQ PHWK
DFWLYLW\ > @ ,Q PDQ\ FDVHV WKHIXQFWLRQDO\ WXPURV DQG DFWLYDWLRQ
PHGLFLQDO PXXKURRPV KDYH VKRZQ DFWLYDWLRQ PHWK
LPPXQH VWLPXODWLRQ DOWKRXJK IHZ DFWLYDWLRQ PHWK
DFWLYLW\ EH FDXVHG E\ SKVLRORJLDO R\HQ

ORVW RI WKH PXXKURRP SRO\VDFFKDULGHV RULJLQDO\ WXPURV DQG DFWLYDWLRQ
JO\FRVLGLF OLQNDJHV VXFK DV N'D *DQGLDQ ,QVWLWXWH RI 7HFKQRORJ\
ZKLOH IHZ RWKHUV DUH WUXH KHWHURJ SRO\VDFFKDULGHV RULJLQDO\ WXPURV DQG DFWLYDWLRQ
RU SHSWLGHV WXPURV FRQVLGHUDEOH YLDFKOLN RIVWDLRXV DFWLYDWLRQ PHWK
ZHLJKW DV ZHOO DV PROHFXODU VLJH RULJLQDO\ WXPURV DQG DFWLYDWLRQ
• JO\FDQV KDV EHHQ UHSRUWHG WR EH PROHFXODU\ WXPURV DQG DFWLYDWLRQ
VLJH FKHPDQ VWUXFWXUH VXFK DV ZLWK WKHLU DFWLYDWLRQ PHWK
EUDQFLQJ WULSOH KHOLFDO FRQIRUPWLRQV DFWLYDWLRQ PHWK

&LWDWLRQL .63 0DLWL 7.)XQFWLRQDO 5ROH RI D :HOO &KIDHURWALYH IDFWHMDH URJ QNIEY
,PPXQH 6WLPXODWLRQ - &\WRNLQH %LRO

3DJH RI

FRRUGLQDWHROROHXOH DOVR H[KLELWHGRKD -WU%80HDOKHWO-LFDXODQVceDV ELRORJLF
FRQIRUPDWLRQ LQ VROXWLRQV > @ 2Q ELRORJLHYFDYWHZVWLQJWVFXVXPHXQDFWLRQ
LVRODWHG IURP WXPRU LQMHFHWHG PLFH &LWZKVGURERQVYHG WKDW FHOOV WUHD
ZLWK WKH KHWHURJO\FDQ LVRHOXDMHWHGUDRFXWKH&P:EFKHLDV R+- 6DY\$HOWRKO-DPQWRU
VKRZHG LQFUHDVHG O\PSKRFIWH SUROLIHUWLRQ DV ZHOO DV GHFUHDVHG WXPRU
YROXPH LQ PLFHWHRGHIOVXVJH@VW WKDW FKDUDFWHULVWLFV
VXFK DV OLQDJHV DQG WULSOH KHOLFENEDQEDY\GHRW SOHXUDQ EHWD JOXFD
SOD\ D FRQWULEXWLQJ UROH WR WKH LPBYWUHDWV RRDWLRKH DQW)RILGDQW VWD
LVRODWHG KHWHURJO\FDQ OROHFXODU ZHRRKH 6DQG VLJH DOVR FRQWULEXWH
VLJQL}FDQWVGH GHJUHH RI LPPXQH UHVSROVH SURGXFHG, E&WKHJ3&FDRL 9(&
PROHFXOH ,W ZDV QRWHG WKDW LQFUHDWLRQXPROHFXQDUWVRIJHWRH ZOVFDVRO
FKHPLFDOO\ FRQMXJDWLQJ ZLWK ELRFRPSDMLDOH RROHFXODU WXFKWPHQW IUR
K\SHUEUDQFKHG GHQGULPHUV LQFUHDVHGHWKHXLV WRPXQH HPLXOXODUFRQJGU 3ROV
IXQFWLRQV WZR IROG WLPHV > @ 3K\LVLDOLIDFWLRQVXFHULV, VZHNRDRGHFXODU
ZHLJKW GHJUHH RI EUDQFKLQJ DQG FRQIRUPDWLHVWLRROXWLRG URXNHUSODYD
VLJQL}FDQW LQ UHJXODWLQJ WKH ELRORJL SROVDFKDLGHV RHLWDFWHG IWRPFOHXU
VXFK ELRORJLFDQO\ SRWHQW JO\FDQ PROHFXOH DUTQRZDGDV WDUJHWHG IRE
XVH DV DGMXYDQWV DORQJ ZLWK FKHPRWKHU\$ENRYD GUXQWYRD \$PHGLQVNO,
EHQH}WV OXFDQV IURP IUXLW ERGLHV RI FXOWLYDWI
DQG 3OHXURWXV HUIQJLL 6WUXFWXUH DG
&DUERK\GU 3RO\P

5HIHUHQFHV

=KDQJ 0 &XL 6: &KHXQJ 3& :DQJ 4
SRO\VDFFKDULGHV IURP PXVKURRPV D UHYLHZ RQ WKHULVRODWLRO SURFHVY
VWUXFWXUDO FKDUDFWHULVWLF6DLQZHQORQXPURU DFWLWLVW ZUHQGV 6WUXFWXUDO ED
UHFRJQLWLRQ \$QQX 5HY %LRFKH
'HYL .63 5BWWD 3 6DKRR % ,VODP 66 HW D
DQG OHEWLO PLFURDUUD\ RI DQ LPPXQRPR
3OHXURWXV RRDWLRKH DQW)RILGDQW VWD
UHFRJQLWLRQ \$QQX 5HY %LRFKH
'HYL .63 %HKHUD % 6DKRR % 0DLWL 7.
JO\FRFRMXJDWH \$PREGORRWHG FRQVWUX
UHVSROVHV DQG VLJQDOLQJ SKHQRPHQD %
:DVVH 0 OHGLFLQDO PXVKURRPV DV D VHUDEFRI DQWLRXPRU DQG
LPPXQRPRGXODWLQJ SRO\VDFFKDULGHV \$SOFRFRMXJDWH \$PREGORRWHG FRQVWUX
UHVSROVHV DQG VLJQDOLQJ SKHQRPHQD %
0LJXQR 0 1LVKLWDQL < ,PPXQRPRGXODWLQJ FRPSRXQGV LQ
%DVLGLRP\FHWHV - &OLQ %LRFKHQ 1XWU
6DUDQJLKRVK ' %KXWLD 6. 0DOOLFN 6. 0DLWL 7. \$QWL WXPRU
DQG LPPXQRPRGXODWLQJ URWXV RVWUHDWXY P\FHOLD GHULYHG
SURWHRJO\FDQV ,QW ,PPXQRSKDUPDFRO