

# 0XFREVDO 0LFURELRPH 5HVHDUFK

6LQGK,XMD

'HSDUWPHQW RI 3KDUPDF\ \$OXPPQXV 9LJQDQ ,QVWLWXH RI 3KDUPDFHXWLFDO 7HFKQRORJ\ 9LVDNKDSWD &RUUHVSRRQGLQBLQBXWKRQ , %DFKHORU RI 3KDUPDF\ 9LJQDQ ,QVWLWXWH RI 3KDUPDFHXWLFDO 7HFKQRORV LQGKXMDLGDVD#JPDLQ FRP

5HFHLYHG-XGQWH \$FFHSWHG\$&DXWHW 3XEOLVKHGXGDXWHW &LWDW6LQKXMD , 0XFREVDO 0LFURELRPH 5HVHDUFK - 0XFREVDO ,PPXQRO 5HV 6

&RS\ULJKW 6LQGKXMD , 7KLV LV DQ RSHQ DFFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WHUPV RI WKH GLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXUFH D

'HVFULSWLRQ

G\VELRVLV WKDW UHYHUEHUDWH ZLWK WKH H[SUHVVLVREORVH GHU 'DUPIORUD WKH +XPDRQFRVDO PLFURELRPH UHVHDUFK SDUWLFXODUO\ ZKHQ PXFRVDO

PLFURELRPH GHVLJQV DUH UHODWHG ZLWK VLFNQHVV VWDWHV \$OEHLW D IHZ LQTXULHV KDYH EHHQ UDLVHG DERXW KRZ WKLV WHUP LV DSSOLHG LWV XWLOLJDWLRQ SURFHHGV ZLWK XQGLPLQLVKHG LQ WKH ZULWLQJ :H H[SORUH WK PDQQHUV E\ ZKLFK PXFRVDO PLFURELRPH DQDO\VWV WDON DERXW G\VELRVLV DQG DIWHUZDUG HYDOXDWH WKH HIIHFW RI YDULRXV LGHDV RI G\VELRVLV RQ PXFRVDO PLFURELRPH UHVHDUFK \$IWHU DQ RXWOLQH RI WKH WHUP V DXWKHQWL URRWV ZH GLUHFW TXDQWLWDWLYH DQG VXEMHFVLYH H[DPLQDWLRQV RI DQ HQRUPRXV GHWHUPLQDWLRQ RI FRQWHPSRUDU\ G\VELRVLV H[SODQDWLRQV

\$V PXFRVDO PLFURELRPH UHVHDUFK KDV SURVSHUHG VR KDV WKH XWLOLJDWLRQ RI WKH H[SUHVVLVLRQ G\VELRVLV 3DUWLFXODUO\ ZKHQ GHVLJQV PXFRVDO PLFURELRWD DUH FRQQHFWHG WR KXPDQ ZHOOEHLQJ DQG LQIHFWLRQ VWDWHV G\VELRVLV LV IUHTXHQWO\ VXPQRQHG DV DQ H[SUHVW WKDW LQWHUFHG WKHVH DIILOLDWLRQV \$OEHLW D FRXSOH RI DQDO\VWV KDYH QRWLFHG WKH GHWDKFPHQW RI ZKDW G\VELRVLV LPSOLHV DQG LV GRLQJ ORJLFDOO\ LWV XWLOLJDWLRQ JLYHV QR LQGLFDWLRQ RI GHFOLQLQJ :H ORRNHG WR VHH DOO W PRUH SUHFLVHO\ KRZ PXFRVDO PLFURELRPH VSHFLDOLVWV DSSO\ WKLV WHUP DQG IRU ZKDW SXUSRHVH \$OO WKH PRUH H[SOLFLWO\ ZH ZHUH FXULRXV WR VHH LI G\VELRVLV LV KHOSLQJ RU KXUWLQJ PXFRVDO PLFURELRPH UHVHDUFK 7R GR WKLV ZH LQLWLDOO\ XQFRYHU WKH WHUP V UHFRUGHG URRWV

'\VELRVLV KDV D ORQJ KLVWRU\ WKDW VWDUWV ZLWK WKH SULPDU\ LQYHVWLJDWLRQV RI WKH KXPDQ JXW PLFURIORUD LQ WKH ODWH QLQHWHHQWK PLG WZHQLHWK KXQGUHGV RI \HDUV OHWFQQLNRII WKH 1REHO 3ULJH ZLQQLQJ ]RRORJLVW LPPXQRORJLVW DQG OLIH VSDQ VFLHQWLVW QHYHU UHIUHQFHG WKH ZRUG G\VELRVLV 1RWZLWKVWDQGLQJ KH SRLQWHG RXW RFFXSDQW PLFURRIJDQLVPV DQG WKHLU YDULRXV LPSDFWV RQ WKH KXPDQ ERG\ ZKLFK KH WKRXJKW FRXOG EH RUGLQDU\ RU REVHVVLVYH \$ GRFWRU ZULWHU RI D VLPLodu SHULRG (OOLRW )XUQH\ XWLOLJHG ERWK HXELRVLV D G\VELRVLV LQ KLV VFL IL UHFRUG RI FUHDWXUH FORQLQJ DQG UHFRYHU\ 1RQHWKHOHVV KH FRQYH\HG WKHVH WHUPV LQ D WRWDODU\ GLIIHUhQW VHQVH LV SHUWLQHQW IRU PLFURELRORJ\ )XUQH\ ZDV VXSSRUWLQJ D W\SH RI SRVLWLYH JHQHWLF FRXQVHOLQJ DQG ZDV OLNHZLVH HDJHU DERXW GHYHORSLQJ ILJPHQW RUJDQLF HQWLWLHV DV ZRUNHUV

,W WRRN XQWLO WKH \*HUPDQ FOLQLFDO DQG YHWHULQDU\ ZULWLQJ RI WKH PL WZHQLHWK FHQWXU\ WR WUDFN GRZQ WKH SULQFLSDO FRQYHUVWDWLRQV RI