

5H (PHUJHQFH RI =DLUH (EROD 9LUXV 'LVHDVH

5DP .XPDU 'KDNHG

%LRWHFKQRORJ\ 'LYLVLRQ 'HIHQFH 5HVHDFK DQG 'HYHORSPHQW *ZDOLRU
&RUUHVSRRQGLQJSDOPXWKRDU 'KDNHG %LRWHFKQRORJ\ 'LYLVLRQ 'HIHQFH 5HVHDFK DQG 'HYHORSPHQW
D\ (PDLO UDPNXPUDUGKDNG#KRWPDLQ FRP

5 HF GDWH 6 HSWHP**S**REU GDWH 6 HSWHP**E**HU 3XE GDWH 2 FWREHU

&RS\ULJKW 'KDNHGK\WV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WHUPV RI WKH &UHDWGLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXUFH D

(GLWRULD0)

(EROD YLUXV GLVHDVH RU (EROD KHP BHGKPBDF DHVWVHQLGH P IRRQRWLFWRL\$HDXW
ZLWK D YHU\ KLDK H DWKQDQD\ VWDQGCHRWKXVSSHLWPHDWTY VHV ZKLFK KDV WDNHQ
6\PSWRPV DWMDUWGD\ RI LQFXEDWLRQ WKDQHQHDFQXGHDWRYWROO LQ :HVW \$IULF
KHDGDFKH YRPLWLQJ GLDUUKRHD UDVK WDQ%29HRSQH PSDHEHFLQWDLRQ FQHHRP
ERWK ZLWKLQ WKH ERG\ DQG H[WHUQDQWREU\H\B\W EDWYFRPSH\H\W\H\DQ\H\X\H\Y\SRQ
IRU VSUHDG RI LQIHFWLRQ RU YLUXV\QDQXFBHPRWLGH\QH\QYJKERG\UH IRXQG LG
DQ LQIHF }YH 8JDQGD 2XW RI SRO\PRUSKLVPV DHWS\IRV\H\QMRQ\X\QLQHDQ (%
VKRZHG LGHQWLW\ WR (%29 VWUDLQV
5HSXEOLF RI &RQJR DQG *DERQ HDUOLHU

S R V V L E O H 5 H V H D U F K H U V W U D F H G W K H R X
F K L O G Z K R G L H G R Q W K ' H F I R O O R Z H C
B H G K P B I O F D H Y W H Q G V H A I S R Q R W L F W K G L Y S R D X W
K H V S S I F W H D G M H Y V H V Z K L F K K D V W D N H Q
W K G H Q H V G D O X G H D W K Y W R O O L Q : H V W \$ I U L F
D V K H P Q G 2 S H L Q S Q H D P S D O H E H R E W M L Q H F O H H Q P
R Q W E U A B W E B W Y F P P S O H Q H M O D A P T X H H Q Y S P Q
Q X F D H P R W X G H A G L W K U H Q X J W K E Z H U H I R X Q G L G
S R O P R U S K L V P V D H W S S I R V H Q M R Q X L Q H D Q (%)
V K R Z H G L G H Q W L W \ W R (% 29 V W U D L Q V
5 H S X E O L F R I & R Q J R D Q G * D E R Q H D U O L H U

H YLUXV\ODP HDQQRJXDWLYH VHQVH VLQJOH
ZLWK JHQRPH VLJH RI NE ,Q JHQHUDO (E
EXW OHQJWK PD\ YDU\ LQ WKH UDQJH RI
VKDSH RI 8 RU VKDSHG DQG PD\ EHH FRL
JHQRPH RI (EROD YLUXV LV FRQWLQXRXV
VHYHQ VWUXFWXUDO JHQHV QDPHO\ 13
SURWHLQ 93 YLULRQ SURWHLQ RU
YLULRQ SURWHLQ RU PDWUL[SURWHLQ
PHPEUDQH VFUHWRU\ SURWHLQ 93 YL
UHJXODWRU\ SURWHLQ 93 YLULRQ SUR
XQNQRZQ IXQFWLRQ DQG / 51\$ GHSHQGH
875 VHTXHQFH DW ERWJKH@HDVQ@Wd dHQ@Q

(EROD YLUXV LV WKH RQO\ PHPEH₅ QWR=BSRUH WERQD₅ DVWHL₅ VHG P51\\$ WKD
VSHFLHV WKH PRVW GDQJHURXV RI NORQH₅ (WXPBXV₅ QWLRLXV WLYXDOG ILHO SURV
RXWEUHDNV LQ VXE 6DKBRODQY\$UULWD%₅ HQGDOKH₅ RDWHG DW d HQG 9LUDO 51\\$ S
(EROD YLUXV LV WKH RQO\ PHPEH₅ QWR=BSRUH WERQD₅ DVWHL₅ VHG P51\\$ WKD
(EROD YLUXV LV WKH RQO\ PHPEH₅ QWR=BSRUH WERQD₅ DVWHL₅ VHG P51\\$ WKD
VSHFLHV WKH PRVW GDQJHURXV RI NORQH₅ (WXPBXV₅ QWLRLXV WLYXDOG ILHO SURV

(EROD YLUXVHV DUH FORVHO\ UHODWH DQG FRQVLGHUHG DV QDWXUD
}ORYLUFLDGDHLQJ VLPLODU KHPRUUJKDJLF RQWV DQG FKLP PSDQ]HHV IURP (ER
IDWDOLW\ LQ JRULOODV DQG FKLP PSDQ]HHV IURP (ER

2Q 0DUFK KRVSLWDOV DQG SXEOLF SXFRPSUHKHQAQWRK ZKHQSGEHA VS RQHUVWU
RI +HDOWK RI *XLQHD ZDV UHSRUWHG SHFQG WRQD PXVKHHPHBWV WKLWDHDPDNH W
FKDUDFWHULJHG E\ IHYHU VHYHUE GLDUXMKEHPD NYR BRRWU QKHDQGWKR QYDRU SPURQIUDV
WR EOHHGLQJ SKDVH ZLWK DQ DSSPURHO WXP KWDQKWRDKXPDQW\ UDW H)RU
HSLGHPLRORJLF LQYHVWLJDWLRQV DQG YLURORJ\ DQDO\VLV EORRG VDPSOHV ZH
FROOHFHWG DQG VHQW WR WKH ELRVDIH\ SUHHPDQ\ WDEBRTWWRUL(FROLDQ YLQJXV)U
DQG +DPEXUJ *HUPDQ\ \$V RI \\$SULO WKFOXGLQ\ CHQFQBLUMGF DFHQQV PRQRF\V
WKH ODUJHVW HYHU GRDXFH\ WDGHDQ\ /BZKWLWNRQ RI LQIHFWRQ LQ WKH KRVV
DQG 6LHUUD /HRQH 2Q WK \$XJ WKHISUHVCHPQDQH&YHUVWLRQDQHPLVF LQWRW
DV DQ LQWHUQDWLRQDO SXEOLF BXHHDQW\ HOPW\ MUKJHDXFK DDFRRQ\WLRFLW RMKD
GR QRW KDYH FDSDFLW\ WR PDQDJH R\WEEURMK VRKHWKRDVHLYH QYRQ YLQJXH QWHHL
LQWHUQDWLRQDO FRPPXQLW\ WR SURYLGHW XLSRSRUSW RQVW KXCPVLSO HUWHPQWHEDV

VXUIDFHG ZDV IRXQG VXFK DV LQWLJULQWR LOHHFWIH DFW \$10 GL Q\$D VBI RI S K R O G H W Q Z FOHDYHG E\ FDWKHSVLQ % DQG / DW KAKH JQH FZLWQD QH L W Q UU H R QW URHJ L B Q F R K R O H[SRVLQJ UHFHSWRU ELQGLQJ GRPDLQ S JHRWHSFWR ID JEDLQG/LVQ L Q L H F H M L Y L Q M H Q D R B M Q Z E M 13 & R Q PDFURSLQRVRPH OHDGLQJ W R H W H C H H D V W H I R V H G L U E D O F R D O M R Q R V O L Q W R W K R F \ W R S O D M P R O H L Q I H F W L R Q LV IDVW D F E V O L H Q J F K D Q G S R Z G Q N U U R I S O V R D X M W Q R Q F R Q W F R X S O H G Z L W K G L V W X U E L Q J K R V W S I S B Q W B I P Q Q D W Q V K P H D M W U L D O V Q H H G W R E H P X O W L S O L F D W L R Q R I Y L U X V R X W S H U I R G P L W S A R K H D F H Q I O D Q D I U O S I E R D W H I F Q V F L R Q Q H P O H D G L Q J L Q L W L D O I D L O X U H R I K X P R H U H G O B M P X Q V L W F R V W R V F Q Q M A Z D I E Q K I R Q I O G H W L H Z Q W R Q H E Y L U X V U H O H D V H V D V H F U H W R U I R U P R I I G H D R G X V E R A S I R G M U H R L D Q W H K F / S E T A G O N H Q Q O K F V Q L R D E X Q G D Q F H Z K L F K G X H W R H S L W R S H F W R V R X Q D E W L V W M L F W R O I X Q Q K B L F R Q P S W W H S H W E L Q G Z L W K Q H X W U D O L] L Q J D Q W L E R G L I S V R O W H D F G M Q G W R Q I Q D Q J G R U P C X Q G E R Q G I S R V Q V P H V D P H U H D V R Q L V W K H O H D G L Q J F R Q F H U Q L Q G H Y H O R S L Q J Y D F F L Q H D J D L Q V W (ERODIYQ W H F W L R Q

(9' L Q W K H & R Q W H [W R I % L R W H U U R

2 Q W K H E D V L V R I W K H S U H O L P L Q D U \ Y L U D Q P Q G V P S W R P Y H V W U L V Q R E W S R V V L E G O L H W R Q G W D D Q R O V H W K H G L V H D V H Z H D S V K H F O Q P L E H R Q V W K H W H U U R U L V W D V \ P S W R P V P D \ E H V L P L O D U W R R W K H U Y L H B Q V R P F W H L D P T X H Q W S D Q W K R U D P Q G L V H D V H T R Q) U R P D Q M R D W Q R V L V W K H P R V W L P R P R Q A G P H W K P C V W K H U H I R U H D U H U H D O W L P H 3 & 5 D Q G G H W H F 3 W H R Q P R W H R U M Q S U R W R X S X Q L Q J Y / 0 6 \$ H V W H V W V F D Q E H F D U U L H G R X W L Q P R R H O H K R V S L W H G K H Q F K D U B F W H U L R Q P W F V G X U L Q J W K H R X W E U H D N L V Q R W I H D V L E R Q L J K P R U E L G L W I D Q G P R U W D O L W I E S H U H U H V Q R) '\$ D S S U R Y H G W K H U D S I D Y D K L Q B D Q H P R U F M L V R K H U S S W H Q R U L B Q V R M D H U R H[SRVXUH R U Y D F F L Q H H[LVWV I R H U U D B Q Q H F R X V L R E Q U R D N E R Q D Y D F R V Q H X Q D Y D L O D S U R J U H V V L R Q R I (EROD Y L U X V L Q I H F W S L R R Q G X F U M R Y R Q H V O H Q W L O U R Q P S H Q R W D Q Q V L W D E G H Y H O R S D F T X L U H G L P P X Q L W \ 6 \ P S W R P D H W H D Q R Q B S Q W W D V H D F E U R I O R D Q F E D H D J Z M A Q R G W R W K H L Q G L Y L G X D O V L Q F O X G L Q J U H D Q G L U D W M L R Q K H Q D Q W K S S Q U H P A B W N L Q U D Q A K S F R D J X O D W L R Q (EROD R S U R V X V K L J K U L V N R H I K Q D E V F R V K L H V D H F K D U D F W H U L V W L F V D Q G W U D Q V P L V V L R Q D Q G K H Q F H E L R K D] D U G E W R Q R H D B W Q F H D A R Q V R Q M H U Q L D V A G L Q F O W R 9 D U L R X V V W X G L H V R Q S U R W H F W L R Q D J I H Y D H V W 1 H Z g R U Q Q A F D W Q R Q D H L Q H Y H W X P D Q Q R S U L P D W H V Z L W K P R Q R F O R Q D O D Q W L E R Q G L P H R V U U Q D Q L F L 1 H 1 \$ H D J D Q Q V V W D V D Q Q F R U R M 93 S U R W H L Q V V K R Z H G H Q F R X U D J L Q J U H H V X U D Q M M L Y R Z H D Q H U W K Y H W D S U H P A Q W D F D Q Q H \$ P H U L F D Q G R F W R U D Q G K L V D V V L V W D Q W Q Z K R R D X A T R V U E F G R Q K H O F L E Q H D M D S R Q H 2 D H V J L Y H Q W K H H[SHU L P H Q W D O G U X J F R Q W D L W Q K H J U P R Y Q R H F V R Q D D R Y Q H W V E R E K A G D F D X L V C H W K U H H (EROD Y L U X V S U R W H L Q V D Q G P R W K F D R I H W K K H P W H P K R P M B H Z L Q Q R P M K H E H L L Q I H F W L R Q 2 Q W K \$ X J X V W L Q W K H P H Q H L Q W H R B I G Y H U W V K H H U Q P Q R H M Q Q X H G W R G H W K D W D F R Q W U R O O H G W U H D W P H Q W Z L W K H Q M S H U R P H Q W D P R Q H X V H P D H U E H D S Q H U P L Q W V L Q K X P D Q V Z L W K O H D U Q H G F R Q V H Q W D Q D W X P D Q L R Q W E D Q D F N U L V L W K H D J Q R K P K Q J R Y H U H W K L F V R I H[SHU L P H Q W D O G U X J U X V Y H D Q H G W H C G Q W D R O D U F R R O D R X W E D Q Q R Q O I ([WU H P H S H U V R Q D O S U R W H F W L R Q I H F W U L R Q M U H P G Q Z K Q D K X P R D Q G S Q L Q D W H V W K H Z L Q I H F W H G S D W L Q H Q W L P W H Q G K F R Q M D P L Q D H W H G F D M W R H U D O : + 2 D Q G & H Q W H U V I R U ' L V H D V H & R Q W U R O D Q G 3 U H Y H Q W L R Q 86\$ U H F R P P H Q G H G S H U V R Q D O S U R W H F W L R Q H Q S K R W U R H F R H Q W R X W E U H D N L Q F O X G H V I X O O L P S H U P H D E O H V X L W H 6 L Q J O H X V H O W P D [S D L U P S H E X P Q D D M W E R R W Q W H U Q D W L R Q D O O H Y H O V K R X 0 E J O R Y H V D Q G S U R W H F W L Y H J R J J O H V O D Q U P R X P W K H G Q H B R U N K D W K F E Q K H V L W H G Y L U S D W L H Q W W L K U H D M R P P H Q G H G D Q G S D W L H Q W F D U H E I W K H U H D W L Y H V P D \ E H W R W S C E