

Bi 2601a: Organismal Physiology

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)*A!#0!5#645/!"#\$%&'!+**("!\$/!"#\$%&'!+(*(!\$/!0065&/,65B!D9#5095!+**+E!,/5!/5F:#/5B?!

G0%511!' \$: !4, H5!5#645/!645/5F:#1#651!<\$/!64#1!9\$:/15!\$!/ ; /#6650!1859#, %!85/2#11#\$0!</\$2!' \$: /!

I5, OJ1! I51#&0, 65!K#?5?-! I58, /62506=3/\$&/, 2!L\$:015%%\$/1!, OB!D9#5095!@9, B52#9!L\$:015%%#0&M!6\$!

50/\$%%!#0!#6-' \$: !2, ' !N5!/52 \$H5B!</\$2!64#1!9\$:/15-!, OB!#6! ; %%#!N5!B5%565B!</\$2!' \$: /!/59\$/B?!O4#1!

B59#1#\$0!2, '!0\$6!N5!, 885, %5B?!P\$: ! ; %%!/595#H5!0\$!, BQ: 162506!6\$!' \$: /!<551!#0!645!5H506!64, 6!' \$: !
, /5!B/\$885B!</\$2!, !9\$:/15!<\$/!<, #!#0&!6\$!4, H5!645!059511, /' !8/5/5F:#1#651?!

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#28\$/6,06!,00\$:09525061!;##%N5!2,B5!\$0!..`1-!,OB!'\$:/,5!/518\$01#N%5!<\$/!\$N6,#0#0&!64#1!#0<\$/2,6#\$0?!
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5,94!\$645/?!O45!#016/:96\$/1!;##%2\$0#6\$/!64515!I#19:11#\$01!,OB!/518\$0B!6\$!9\$06506!F:516#\$01-!N:6!2\$16!
F:516#\$01!;##%N5!,01;5/5B!N'!\$645!/252N5/1!\$<!645!9%,11?!G15!\$<!1\$9#,%!25B#,!&/\$:8!1#651!<\$/!645!
14,/#0!\$<!9\$:/15!#0<\$/2,6#\$0!,OB!B#19:11#\$01!#1!05#645/1!,096#\$05B!0\$!/!59\$2250B5B?!
!
C<!16:B5061!055B!,11#16,095!;#64!..`1-!645'!9,0!155>!1:88\$/6!\$0!645!..`1!d5%8!8,&5?!@%65/0,6#H5%'-!645'!
9,0!9\$06,96!645!`5165/0!O5940\$!\$&'!D5/H#951!d5%8B51>?!O45!45%8B51>!9,0!N5!9\$06,965B!N'!84\$05!,6!J+k7
))+7\V**!\$/15c6?!V\V**?!
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☒!D6:B5061!14\$:%B!,%1\$!8,/6#9#8,65!N'!#065/,96#0&!#0!645!<\$/:21!;#64!645#/!855/1!,OB!#016/:96\$/1!
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D28%08A#8+J!\$;:8!!

@%64\$:&4!645!#06506!#1!<\$/!64#1!9\$:/15!6\$!N5!B5%#H5/5B!#0!85/1\$0-!14\$:%B!,0'!:0#H5/1#6'7B59%,/5B!
525/&509'!/5F:#/5!1\$25!\$/!,%%!\$<!645!9\$:/15!6\$!N5!B5%#H5/5B!\$0%#05-!5#645/!1'094/\$0\$:1%'!\$/
,1'094/\$0\$:1%'-!645!9\$:/15!;##%!,B,86!,99\$/B#0&%?!O45!&/,B#0&!194525!;##%182%!

C<!16:B5061!055B!,11#16,095! ;#6!645!9\$:/15! . ` 1!#65-!645'!9,0!155>!1:88\$/6!\$0!645! . ` 1!" /#&4618,95!
d5%8!8,&5?!@%65/0,6#H5% '-!645'!9,0!9\$06,96!645! ` 5165/0!O5940\$%\$&'!D5/H#951!d5%8B51>?!O45'!9,0!N5!
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! 1596:/51! ;###!#09%:B5!/5<5/50951!6\$!,BB#6#\$0,%!/5,B#0&1!6\$!&#H5!' \$: !N/\$,B5/!,OB!B5585/!#0<\$/2 ,6#\$0-!,OB!
;###,%!\$!&#H5!' \$:!,!B#<<5/506!<\$/2!\$<15c8%,0,6#\$0?!O45!2 ,65/#,%!8/515065B!#0!645!;#+%6(#!,OB!:110A8#C!
(#:C08A1!B5<#051!645!5c,2#0,N%5!2 ,65/#,%-!1\$!' \$:!,/5!,BH#15B!6\$!2 ,>5!0\$651!<#/16!</\$2!645!%596:/51-!,OB!
6450!:15!645!/5,B#0&1!6\$!9% ,/#<'!,OB!#09/5,15!' \$:/!>0\$;%5B&5!,OB!:OB5/16,OB#0&?!

! **F#+=80+.;!K#560(#%!**
! g :#hh51! ;###!N5!,B2#0#165/5B!64/\$:&4! . ` 1!" /#&4618,95?!CO!,BB#6#\$0-!#<645!9\$:/15!055B1!6\$!2 \$H5!\$07
%#05-!' \$:!,;###!055B!,!16,N%5!#065/056!9\$00596#\$0!,OB!,!9\$28:65/! ;#64!,! ;\$/>#0&!2#9/\$84\$05!,OB! ;5N9,2?!

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! **N(:C08A!" +=#&#!:8C!O11#11%!* :%#1!**
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! ` 55>% '!g :#hh51!kpM! ! +] A! K645!6\$8!)!\$<!k!F:#hh51! ;###!9\$:06M!
R#B65/2!O516!+! ! (*A! KN,15B!\$0!%596:/51!(7+*M!
R#B65/2!O516!(! ! (*A! KN,15B!\$0!%596:/51!+\7(JM!
Y#0,%!ec,2! ! ! U] A! K9:2:%,6#H5! ;#64!5284,1#1!\$0!%596:/51!(V7\WM!

! P\$:/!2 ,/>1! ;###!N5!/5&:%,/% '!:8B,65B!:OB5!/q [/,B51J!#0! . ` 1?!P\$:!2 ,!F:5/'!,0'!,88,/506!
#09\$0!#16509\$51!N56 ;550! ;4,6!' \$:!64\$:&46!' \$:!/595#H5B!,OB! ;4,6!#1!\$0! . ` 1?! ` 450!,11511#0&!64515!
2 ,/>1-!>558!#0!2#OB!' \$:!,;###!0\$6!4,H5!&/,B51!<\$/!64#0&1!64,6!4,H5!0\$6!'56!N550!2 ,/>5B?!

! O45!<#0,%!&/,B5!<\$/!645!9\$:/15! ;###!N5!9,%9:%,65B!,1!645!1:2!\$<!645!2 ,/>1!<\$/15,94!\$<!645!9\$28\$05061?!
O4#1!2 ,/>1! ;###!6450!N5!/\$:OB5B!6\$!645!05,/516!#065&5/?!T\$!2 ,/>1! ;###!N5!, ; ,/B5B!<\$/!,/N#6/,/'!/5,1\$01-!
,OB!645/5! ;###!N5!0\$!,<65/76457<,96!94,0&51!K5?&?-!\$<!)k!6\$!W*AM?!

! **?##T;J!U600Q#1G:**g :#hh51! ;###!N5!,H,#,N%5!H#,! . ` 1!" /#&4618,95!,6!645!50B!645!O4:/1B,!'!%596:/5!\$<
5,94!0\$072#B65/2! ;55>-!,OB! ;###!N5!N,15B!\$0!645!/5,B#0&1!,OB!%596:/5!9\$06506!</\$2!64,6! ;55>!K155!
N5%\$;M?!e,94!F:#h!#1! ;\$/64!(?)A!\$<!645!<#0,%!&/,B5!<\$/!,!6\$6,%!\$<+!A?!F=#(#!:(#!82!&:T#V6\$!5600Q#1M!
g :#h!,99511!9%\$151!,6!645!16,/6!\$<!645!05c6!B,'J1!%596:/5!,OB! ;###!N5!/5H#5 ;5B!,6!645!16,/6!\$<!64,6!%596:/5?!

! **H0CV#(&!9W:&1G!O45/5!,/5!6 ;\$!2#B765/2!5c,2!1?!R#B765/2!5c,2!+!9\$H5/1!2 ,65/#,%!</\$2!1596:/5!(!
64/\$:&4!1596:/5!+*!-!#09%:1#H5?!R#B765/2!5c,2!(!9\$H5/1!2 ,65/#,%!</\$2!1596:/5!+\!64/\$:&4!1596:/5!(]!
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8\$9>56!9,%9:%,6\$/1-!6,N%561-!#3\$B1-!95%%:%,/!84\$051-!%,86\$8!9\$ 2 8:65/1!\$/!,0'!\$645/!5%596/\$0#9!B5H#951!#1!
0\$6!,%%\$; 5B!B:/#0&!5c, 2 1!:0%511!B#/5965B!\$/!,88/\$H5B!N'!645!#016/:96\$/1?!

L%#9>! 45/5! <\$/! ,! B56,#%5B! ,OB! 9\$ 2 8/54501#H5! 156! \$<! 8\$%#9#51! ,OB! /5&:%,6#\$01! 9\$095/0#0&!

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'\$:/!Y,9:%6'!\$<!i5/,6#\$0!,1!\$0!,1!'\$:/,5!,N%5!6\$!B\$!1\$?!!O45'!;##%,11511!'\$:/!5%&#N%#6'!6\$!;/#65!
645!D859#,%!ec,2#0,6#\$0!K

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CO!,99\$/B,095! ; #64!8\$%#9' -