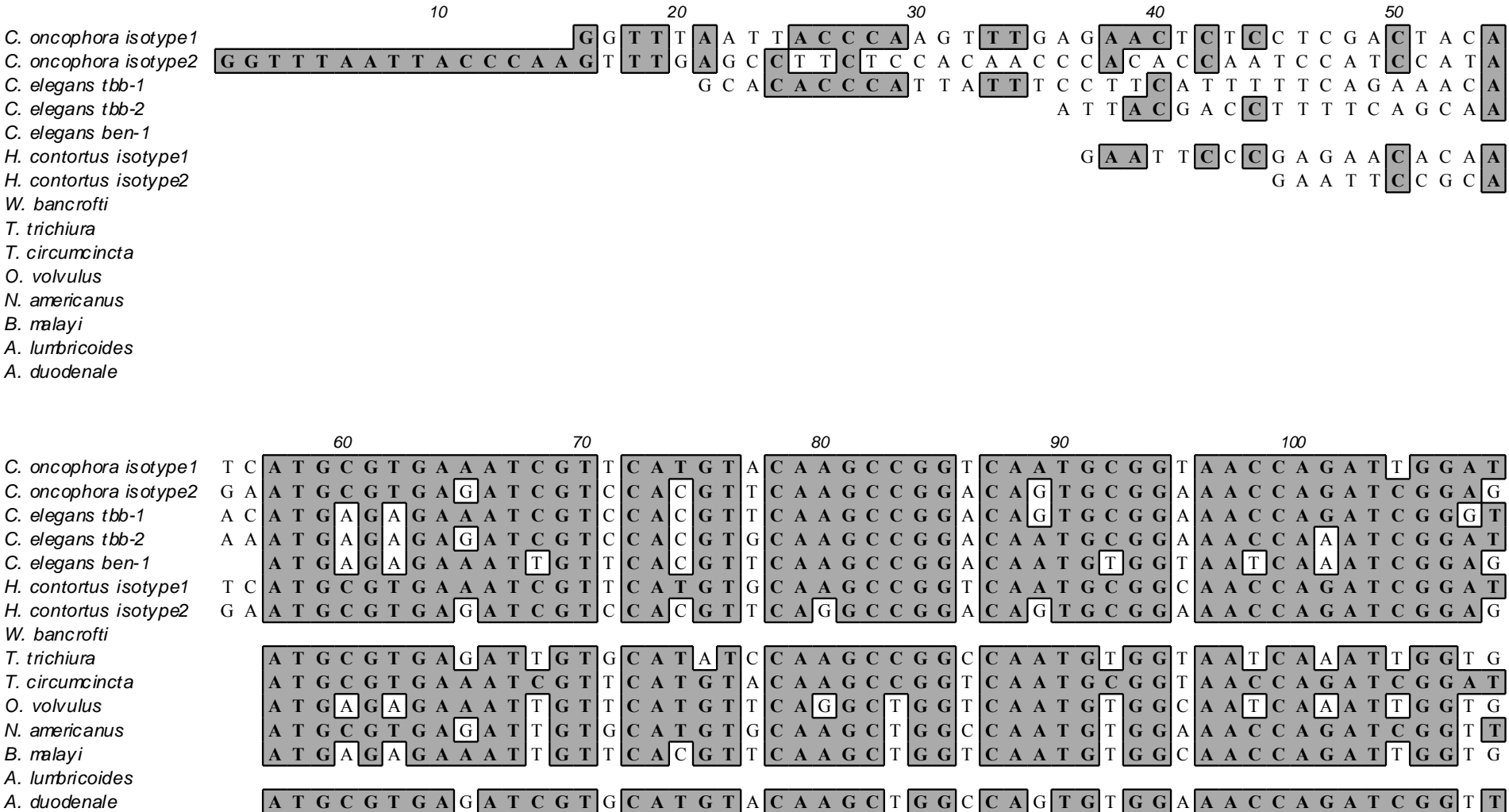


Alignment of beta tubulin cDNA sequences from 11 nematodes



110 120 130 140 150 160

C. oncophora isotype1 C A A A G T T C T G G G A A G T G A T C T C C G A T G A A C A C G G T A T C C A A C C C G A T G G A A C A T

C. oncophora isotype2 C A A A G T T C T G G G A G G T T A T C T C T G A C G A A C A C G G C A T C C A G C C C G A T G G A T C A T

C. elegans tbb-1 C C A A G T T C T G G G A A G T C A T C T C C G A T G A G C A C G G A A T C C A G C C C G A T G G A A C C T

C. elegans tbb-2 C C A A A T T T C T G G G A G G T C A T C T C C G A C G A G C A C G G A A T C C A G C C A G A C G G A A C C T

C. elegans ben-1 C C A A G T T C T G G G A A G T G A T A T C C G A T G A G C A T G G G A T C C A G C C T G A T G G A A C T T

H. contortus isotype1 C A A A G T T C T G G G A A G T G A T C T C T G A T G A G C A C G G T A T C C A G C C C G A T G G A A C A T

H. contortus isotype2 C C A A G T T C T G G G A G G T T A T C T C T G A C G A G C A T G G C A T C C A A C C C G A T G G A T C A T

W. bancrofti

T. trichiura C G A A G T T C T G G G A A G T C A T C T C G G A T G A A C A T G G T A T C G A T C C C A C A G G A A C T T

T. circumcincta C A A A G T T C T G G G A A G T G A T C T C T G A T G A G C A C G G T A T C C A G C C C G A T G G A A C T T

O. volvulus C C A A G T T C T G G G A A G T A A T A T C G G A T G A A C A T G G C A T T C A A C C T T G A T G G T A C T T

N. americanus C A A A G T T C T G G G A A G T G A T C T C T G A C G A A C A T G G T A T C A A G C C T G A T G G C A C A T

B. malayi C C A A G T T C T G G G A A G T A A T A T C G G A T G A A C A T G G T G T T C A A C C T G A T G G T A C A T

A. lumbricoides

A. duodenale C A A A G T T C T G G G A A G T G A T C T C T G A T G A G C A C G G C A T C A A G C C T G A C G G C A C C T

170 180 190 200 210

C. oncophora isotype1 A C A A A G G A G A A T C A G A C C T G C A A G T T A G A G A G A A T C A A T G T T T A C T A C A A T G A A G

C. oncophora isotype2 A C A A A G G A G A A T C A G T G A T C T T C A A T T A G A A C G A A T C A A T G T G T A C T A C A A C G A A G

C. elegans tbb-1 T C A A G G G A G A A G C T G A T C T C C A A G C T G G A G A G A A T C G A T G T C T A C T A C A A C G A G G

C. elegans tbb-2 T C A A G G G A G A G A C G G A T C T C C A G C T T G A G C G C A T T G A C G T C T A C T A C A A C G A A G

C. elegans ben-1 A T A A G G G A G A A G T G A T T T G C A A G T T G G A A G A A T C A A T G T C T A C T A T A A T G A G G

H. contortus isotype1 A C A A A G G A G A A T C A G A T C T G C A A T T A G A A A G G A T C A A T G T G T A C T A C A A T G A A G

H. contortus isotype2 A C A A A G G A G A G A G C G A T C T A C A A C T A G A A C G A A T C A A T G T T T A C T A C A A T G A G G

W. bancrofti

T. trichiura A C C A C G G T G A C T C G G A C C T G C A A C T T G A A C G C A T A A A T G T T T A C T A C A A C G A A G

T. circumcincta A C A A A G G A G A A T C G G C A C T G C A A T T A G A A A G A A T C A A T G T A T A C T A C A A T G A G G

O. volvulus A T A A A G G T G A T T C A G A T T T G C A A A T T G A G C G A A T C A A T G T C T A C T A T A A T G A A G

N. americanus A C A G T G G C G A G T C T G A T T T G C A G C T T G A G C G A A T C A A T G T A T A C T A T A A C G A A G

B. malayi A C A A A G G T G A T T C A G A C T T G C A A A T T G A A C G A A T C A A C G T C T A C T A T A A T G A A G

A. lumbricoides

A. duodenale A C A G T G G T G A A T C T G A T C T G C A A C T T G A A C G A A T C A A C G T G T A C T A T A A T G A A G

220 230 240 250 260 270
C. oncophora isotype1 C A C A T G G A G G C A A A T A T G T C C C A C G T G C T G T A C T T G T T G A T C T C G A G C C C G G A A
C. oncophora isotype2 C T A A T G G A G G A A A A T A T G T T C C A C G A G C A G T A C T T G T T G A C T T G G A A C C T G G A A
C. elegans tbb-1 C C A A C A A T G G C A A A T A C G T T C C A C G T G C A G T C C T C G T T G A T C T C G A G C C A G G A A
C. elegans tbb-2 C C A A C A A C G G A A A G T A T G T G C C A C G C G C C G T G T T G G T C G A T C T C G A A C C A G G A A
C. elegans ben-1 C T A A T G G C G G C A A A T A T G T C C C A C G C G C T G T T C T C G T C G A T C T T G A G C C A G G A A
H. contortus isotype1 C A C A T G G A G G C A A G T A T G T T C C A C G T G C T G T T C T T G T T G A T C T C G A G C C T G G A A
H. contortus isotype2 C T A A T G G A G G A A A G T A T G T T C C A C G G G C G G T A C T T G T T G A T C T G G A A C C C G G C A
W. bancrofti C T T C T G G T G G C G A A T A C G T T C C T A G G G C C A T A C T T G T T G A C C T C G A G C C T G G T A
T. trichiura C A C A T G G A G G C A A A T A T G T C C C A C G T G C T G T T C T T G T T G A T C T C G A G C C C G G A A
T. circumcincta C G A A T G G T G G C A A A T A T G T A C C A C G A G C A A T C C T T G T C G A T C T G G A A C C G G G T A
O. volvulus C C C A C G G A G G A A A G T A T G T G C C T C G T G C A G T T C T T G T T G A T C T C G A A C C C G G A A
N. americanus C G A A T G G G G G C A A A T A T G T G C C A C G A G C A G T C C T T G T T G A T C T C G A A C C A G G T A
B. malayi C A C A T G G A G G A A A A T A T G T C C C A C G T G C A G T T C T T G T T G A T C T C G A A C C C G G A A
A. lumbricoides C A C A T G G A G G A A A A T A T G T C C C A C G T G C A G T T C T T G T T G A T C T C G A A C C C G G A A
A. duodenale C A C A T G G A G G A A A A T A T G T C C C A C G T G C A G T T C T T G T T G A T C T C G A A C C C G G A A

280 290 300 310 320
C. oncophora isotype1 C A A T G G A T T C T G T T C G T T C T G G A C C A T A T G G A C A A C T A T T C C G T C C A G A T A A T T
C. oncophora isotype2 C G A T G G A C T C T G T T C G A T C A G G A C C T T T C G G A G C T T T A T T C C G T C C C G A C A A C T
C. elegans tbb-1 C G A T G G A T T C T G T G C G G T C C G G T C C T T T C G G A C A A C T C T T C A G A C C A G A C A A C T
C. elegans tbb-2 C C A T G G A T T C T G T C C G C T C T G G A C C A T T C G G C C A G C T G T T C C G T C C T G A C A A C T
C. elegans ben-1 C C A T G G A T T C T G T C C G C T C T G G A C C A T T C G G C C A G C T G T T C C G T C C A G A T A A C T
H. contortus isotype1 C G A T G G A C T C C T T T C G T T C T G G A C C G T A T G G A C A G C T T T T C C G T C C A G A T A A T T
H. contortus isotype2 C G A T G G A C T C A G T T C G C T C C G G A C C T T T T G G T G C T C T A T T C C G C C C G G A C A A C T
W. bancrofti C C A T G G A T T C T A T T C G A G G A G G T G A G T T C G G A C A A C T A T T T C G A C C G G A T A A T T
T. trichiura C T A T G G A C A G T G T G C G C G C A G G T C C G T T C G G A A C A C T T T T T C G A C C A G A T A G T T
T. circumcincta C A A T G G A C T C T G T T C G T T C T G G A C C G T A T G G A C A A C T T T T C C G T C C A G A T A A T T
O. volvulus C T A T G G A T T C C A T T C G A G G A G G T G G A T T T G G C C A A C T G T T C C G A C C G G A C A A T T
N. americanus C G A T G G A C T C G G T C T C T G G G C C A T A C G G G C A G C T G T T C C G A C C T G A T A A C T
B. malayi C A T G G A T T C T A T T C G A G G A G G T G A G T T C G G G C A A C T A T T C C G A C C T G A C A A T T
A. lumbricoides A T G G A C T C A A T C C G C G G G G G T G C T T T C G G A C A G C T C T T T C G T C C G G A T A A T T
A. duodenale C A A T G G A C T C G G T C C G T T C T G G G C C A T A C G G G C A A T T G T T C C G C C C T G A T A A C T

	330	340	350	360	370
<i>C. oncophora isotype1</i>	A C G T G	T T T G G C C A G T C A	G G A G C G G G T	A A C A A C T G G G C A	A A G G G C C A C T A T A C C G
<i>C. oncophora isotype2</i>	T T G T C	T T T G G A C A G T C T	G G A G C A G G A	A A T A A C T G G G C G	A A G G G A C A C T A C A C A G
<i>C. elegans tbb-1</i>	T T G T T	T T C G G A C A A T C T	G G A G C T G G A	A A C A A T T G G G C C	A A G G G A C A T T A C A C C G
<i>C. elegans tbb-2</i>	T T G T G	T T C G G A C A A A G C	G G A G C C G G A	A A C A A C T G G G C C	A A G G G T C A C T A C A C A G
<i>C. elegans ben-1</i>	T T G T G	T T C G G A C A A T C C	G G A G C C G G A	A A C A A C T G G G C C	A A G G G T C A C T A C A C C G
<i>H. contortus isotype1</i>	A C G T G	T T T G G C C A G T C A	G G A G C G G G T	A A C A A T T G G G C G	A A G G G C C A C T A T A C T G
<i>H. contortus isotype2</i>	T T G T C	T T C G G G C A A T C T	G G A G C C G G T	A A T A A C T G G G C A	A A A G G T C A C T A C A C A G
<i>W. bancrofti</i>	T T G T T	T T T G G A C A A A G T	G G A G C T G G C	A A C A A C T G G G C T	A A G G G A C A T T A T A C G G
<i>T. trichiura</i>	T T A T T	T T T G G G C A A A G T	G G C G C	A A T A A T T G G G C T	A A A G G G C C A C T A T A C G G
<i>T. circumcincta</i>	A C G T G	T T T G G C C A G T C A	G G A G C G G G T	A A C A A C T G G G C G	A A G G G C C A C T A T A C C G
<i>O. volvulus</i>	T T G T A	T T T G G A C A A A G T	G G A G C T A G C	A A C A A T T G G G C T	A A G G G A C A T T A C A C G G
<i>N. americanus</i>	A C G T G	T T T G G A C A G T C T	G G T G C T G G A	A A T A A T T G G G C G	A A G G G G C A C T A C A C T G
<i>B. malayi</i>	T T G T T	T T T G G A C A A A G T	G G A G C T G G C	A A C A A C T G G G C T	A A G G G A C A T T A T A C G G
<i>A. lumbricoides</i>	T C G T T	T T C G G C C A A A G T	G G A G C G G G A	A A C A A C T G G G C G	A A G G G C C A T T A T A C G G
<i>A. duodenale</i>	A C G T G	T T T G G A C A G T C C	G G T G C A G G A	A A C A A C T G G G C A	A A G G G A C A C T A C A C G

	380	390	400	410	420	430
<i>C. oncophora isotype1</i>	A G G G A G C T	G A A C T C G T C	G A C A A T G T C C T A	G A T G T T G T T C G T	A A A G A G G C T G A G G	A A G G
<i>C. oncophora isotype2</i>	A A G G A G C T	G A A C T T G T C	G A T A G C G T C T T G	G A T G T C G T T C G C A A G	G A G G C A G A A G	A A G G
<i>C. elegans tbb-1</i>	A G G G A G C A	G A A C T T G T T	G A C A A C G T G C T C	G A T G T G A T C C G C A A G	A G G C T G A A G	A A G G
<i>C. elegans tbb-2</i>	A A G G A G C T	G A G C T T G T C	G A C A A T G T G C T T	G A C G T G A T C C G C A A G	G A A G C C G A A G	A A G G
<i>C. elegans ben-1</i>	A A G G A G C C	G A A C T T G T C	G A T A A T G T G C T C	G A C G T A G T T C G A A A G	A G G C T G A A G	A A G G
<i>H. contortus isotype1</i>	A G G G A G C C	G A G C T A G T T	G A T A A C G T A T T A	G A C G T T G T C C G C A A A G	A A G A G C T G A A G	A A G G
<i>H. contortus isotype2</i>	A A G G A G C T	G A A C T T G T T	G A T A G T G T C C T T	G A T G T T G T T C G C A A A G	A G G C A G A A G	A A G G
<i>W. bancrofti</i>	A A G G T G C G	G A A C T A G T T	G A T A A T G T G T T G	G A C G T G A T A C G A A A A G	A G G C T G A A G	A A G G
<i>T. trichiura</i>	A A G G T G C C	G A A C T A G T T	G A C A A T G T G C T T	G A T G T A G T C C G C A A G	G A A T C G G A A A	A A G G
<i>T. circumcincta</i>	A G G G A G C T	G A G C T T G T T	G A C A A C G T C T T A	G A T G T T G T T C G T A A A G	A G G C A G A A G	A A G G
<i>O. volvulus</i>	A A G G T G C A	G A A T T G G T T	G A T A A T G T A T T G	G A T G T A A T A C G A A A A G	A G G C T G A A G	A A G G
<i>N. americanus</i>	A A G G A G C T	G A G C T A G T C	G A T A A T G T T C T T	G A T G T A G T T C G C A A A G	A A G A A G C T G A A G	A A G G
<i>B. malayi</i>	A A G G T G C G	G A A C T A G T T	G A T A A T G T G T T G	G A C G T G A T A C G A A A A G	A A G A A G C T G A A G	A A G G
<i>A. lumbricoides</i>	A G G G T G C A	G A G T T G	G T C G A T A A T G T G C T C	G A T G T G A T T C G C A A A G	A G G C C G A A G	A A G G
<i>A. duodenale</i>	A A G G A G C T	G A G C T C G T C	G A T A A C G T C C T T	G A T G T A G T T C G C A A A G	A G G C G G A A G	A A G G

	330	340	350	360	370
<i>C. oncophora isotype1</i>	A C G T G	T T T G G C C A G T C A	G G A G C G G G T	A A C A A C T G G G C A	A A G G G C C A C T A T A C C G
<i>C. oncophora isotype2</i>	T T G T C	T T T G G A C A G T C T	G G A G C A G G A	A A T A A C T G G G C G	A A G G G A C A C T A C A C A G
<i>C. elegans tbb-1</i>	T T G T T	T T C G G A C A A T C T	G G A G C T G G A	A A C A A T T G G G C C	A A G G G A C A T T A C A C C G
<i>C. elegans tbb-2</i>	T T G T G	T T C G G A C A A A G C	G G A G C C G G A	A A C A A C T G G G C C	A A G G G T C A C T A C A C A G
<i>C. elegans ben-1</i>	T T G T G	T T C G G A C A A T C C	G G A G C C G G A	A A C A A C T G G G C C	A A G G G T C A C T A C A C C G
<i>H. contortus isotype1</i>	A C G T G	T T T G G C C A G T C A	G G A G C G G G T	A A C A A T T G G G C G	A A G G G C C A C T A T A C T G
<i>H. contortus isotype2</i>	T T G T C	T T C G G G C A A T C T	G G A G C C G G T	A A T A A C T G G G C A	A A A G G T C A C T A C A C A G
<i>W. bancrofti</i>	T T G T T	T T T G G A C A A A G T	G G A G C T G G C	A A C A A C T G G G C T	A A G G G A C A T T A T A C G G
<i>T. trichiura</i>	T T A T T	T T T G G G C A A A G T	G G C G C	A A T A A T T G G G C T	A A A G G G C C A C T A T A C G G
<i>T. circumcincta</i>	A C G T G	T T T G G C C A G T C A	G G A G C G G G T	A A C A A C T G G G C G	A A G G G C C A C T A T A C C G
<i>O. volvulus</i>	T T G T A	T T T G G A C A A A G T	G G A G C T A G C	A A C A A T T G G G C T	A A G G G A C A T T A C A C G G
<i>N. americanus</i>	A C G T G	T T T G G A C A G T C T	G G T G C T G G A	A A T A A T T G G G C G	A A G G G G C A C T A C A C T G
<i>B. malayi</i>	T T G T T	T T T G G A C A A A G T	G G A G C T G G C	A A C A A C T G G G C T	A A G G G A C A T T A T A C G G
<i>A. lumbricoides</i>	T C G T T	T T C G G C C A A A G T	G G A G C G G G A	A A C A A C T G G G C G	A A G G G C C A T T A T A C G G
<i>A. duodenale</i>	A C G T G	T T T G G A C A G T C C	G G T G C A G G A	A A C A A C T G G G C A	A A G G G A C A C T A C A C G

	380	390	400	410	420	430
<i>C. oncophora isotype1</i>	A G G G A G C T	G A A C T C G T C	G A C A A T G T C C T A	G A T G T T G T T C G T	A A A G A G G C T G A G G	A G G
<i>C. oncophora isotype2</i>	A A G G A G C T	G A A C T T G T C	G A T A G C G T C T T G	G A T G T C G T T C G C A A G	G A G G C A G A A G	A G A A G
<i>C. elegans tbb-1</i>	A G G G A G C A	G A A C T T G T T	G A C A A C G T G C T C	G A T G T G A T C C G C A A G	A G G C T G A A G	A G A A G
<i>C. elegans tbb-2</i>	A A G G A G C T	G A G C T T G T C	G A C A A T G T G C T T	G A C G T G A T C C G C A A G	G A A G C G A A G	A G A A G
<i>C. elegans ben-1</i>	A A G G A G C C	G A A C T T G T C	G A T A A T G T G C T C	G A C G T A G T T C G A A A G	A G G C T G A A G	A G A A G
<i>H. contortus isotype1</i>	A G G G A G C C	G A G C T A G T T	G A T A A C G T A T T A	G A C G T T G T C C G C A A A G	A A G C T G A A G	A G A A G
<i>H. contortus isotype2</i>	A A G G A G C T	G A A C T T G T T	G A T A G T G T C C T T	G A T G T T G T T C G C A A A G	A G G C A G A A G	A G A A G
<i>W. bancrofti</i>	A A G G T G C G	G A A C T A G T T	G A T A A T G T G T T G	G A C G T G A T A C G A A A A G	A G G C T G A A G	A G A A G
<i>T. trichiura</i>	A A G G T G C C	G A A C T A G T T	G A C A A T G T G C T T	G A T G T A G T C C G C A A G	G A A T C G G A A A	A G A A A
<i>T. circumcincta</i>	A G G G A G C T	G A G C T T G T T	G A C A A C G T C T T A	G A T G T T G T T C G T A A A G	A G G C A G A A G	A G A G G
<i>O. volvulus</i>	A A G G T G C A	G A A T T G G T T	G A T A A T G T A T T G	G A T G T A A T A C G A A A A G	A G G C T G A A G	A G A A G
<i>N. americanus</i>	A A G G A G C T	G A G C T A G T C	G A T A A T G T T C T T	G A T G T A G T T C G C A A A G	A A G C T G A A G	A G A A G
<i>B. malayi</i>	A A G G T G C G	G A A C T A G T T	G A T A A T G T G T T G	G A C G T G A T A C G A A A A G	A A G C T G A A G	A G A A G
<i>A. lumbricoides</i>	A G G G T G C A	G A G T T G G T C	G A T A A T G T G C T C	G A T G T G A T T C G C A A A G	A G G C C G A A G	A G A G G
<i>A. duodenale</i>	A A G G A G C T	G A G C T C G T C	G A T A A C G T C C T T	G A T G T A G T T C G C A A A G	A G G C G G A A G	A G A A G

	440	450	460	470	480
<i>C. oncophora isotype1</i>	G C T G C G A T T G C C T T C A G G G C	T T C C A A C T T A C G C A T T C T	C T T G G A G G A G G T	A C C G	
<i>C. oncophora isotype2</i>	G A T G C G A T T G C C T T C A G G G T	T T C C C A C T C A C G C A C T C G	C T T G G A G G A G G C	A C C T G	
<i>C. elegans tbb-1</i>	G A T G C G A T T G T C T T C A A G G A	T T C C A G C T C A C A C A C T C T	C T T G G A G G T G G A	A C C G	
<i>C. elegans tbb-2</i>	G A T G C G A T T G T C T T C A A G G A	T T C C A A C T C A C T C A C T C T	C T C G G A G G A G G A	A C C G	
<i>C. elegans ben-1</i>	G A T G T G A T T G T C T T C A A G G A	T T C C A G T T G A C T C A T T C A	C T T G G A G G A G G A	A C C T G	
<i>H. contortus isotype1</i>	G T T G T G A T T G C C T T C A G G G C	T T C C A A T T G A C G C A T T C A	C T T G G A G G A G G C	A C C T G	
<i>H. contortus isotype2</i>	G G T G C G A T T G T C T T C A G G G T	T T C C A A C T C A C G C A C T C G	C T T G G A G G A G G C	A C C A G	
<i>W. bancrofti</i>	G A T G C G A T T G T C T T C A G G G A	T T T C A A C T A A C G C A T T C A	C T T G G T G G C G G T	A C C G	
<i>T. trichiura</i>	G C T G C G A C T G C C T G C A A G G G	T T T C A G T T G A C T C A T T C C	C T C G G C G G C G G A	A C C T G	
<i>T. circumcincta</i>	G T T G C G A T T G C C T T C A G G G C	T T C C A A C T G A C G C A T T C T	T T G G G A G G A G G T	A C C T G	
<i>O. volvulus</i>	G A T G C G A C T G T C T T C A G G G A	T T T C A A T T G A C T C A T T C A	C T T G G C G G T G G T	A C C G	
<i>N. americanus</i>	G A T G T G A C T G T C T C A G G G C	T T C C A A T T G A C C C A C T C T	C T T G G A G G A G G T	A C C G	
<i>B. malayi</i>	G A T G C G A T T G T C T T C A G G G A	T T T C A A C T A A C G C A T T C A	C T T G G T G G T G G T	A C C G	
<i>A. lumbricoides</i>	G T T G C G A C T G C C T C A G G G T	T T C C A G C T G A C G C A C T C G	C T T G G T G G A G G C	A C C A G	
<i>A. duodenale</i>	G A T G C G A C T G T C T T C A G G G C	T T C C A A T T G A C T C A C T C A	C T T G G A G G A G G T	A C C G	

	490	500	510	520	530	540
<i>C. oncophora isotype1</i>	G A T C C G G T A T G G G C A C T T T G C T	T A T T T C A	A A A A T T C G T G A G	G A G T A C C C T	G A C A	
<i>C. oncophora isotype2</i>	G A T C A G G A A T G G G A A C T T T A T T	G A T T G C T	A A G A T C C G T G A A	G A G T A C C C T	G A T A	
<i>C. elegans tbb-1</i>	G A T C C G G A A T G G G A A C C C T T C T	C A T C T C C	A A G A T T C G C G A G	G A A T T C C C A	G A T C	
<i>C. elegans tbb-2</i>	G A T C T G G A A T G G G A A C A C T T C T	C A T C T C C	A A A A T C C G C G A A	G A G T A C C C A	G A C A	
<i>C. elegans ben-1</i>	G A T C T G G A A T G G G A A C T C T T C T	C A T T T C G	A A A A T C C G T G A A	G A G T A T C C A	G A T A	
<i>H. contortus isotype1</i>	G A T C T G G A A T G G G C A C T T T G T T	A A T T T C A	A A A A T T C G T G A A	G A G T A C C C T	G A T A	
<i>H. contortus isotype2</i>	G A T C A G G A A T G G G A A C T C T G T T	G A T T G C T	A A G A T C C G T G A A	G A A T A T C C T	G A T A	
<i>W. bancrofti</i>	G T T C C G G T A T G G G A A C A T T G C T	G A T C T C G	A A A A T C C G T G A G	G A G T A T C C G	G A T C	
<i>T. trichiura</i>	G G A G T G G A A T G G G T A C G C T T C T	G A T A T C T	A A A A T T C G G G A A	G A G T A T C C T	G A C C	
<i>T. circumcincta</i>	G T T C G G G T A T G G G C A C T T T G C T	C A T C T C C	A A A A T T C G C G A G	G A G T A T C C G	G A T A	
<i>O. volvulus</i>	G T T C T G G T A T G G G A A C A T T G T T	G A T C T C G	A A A A T T C G T G A G	G A A T A T C C G	G A T C	
<i>N. americanus</i>	G A T C A G G A A T G G G A A C A C T T C T	T A T T T C T	A A A A T T C G G G A A	G A A T A C C C T	G A T A	
<i>B. malayi</i>	G T T C C G G C A T G G G A A C A T T G C T	G A T C T C G	A A A A T T C G T G A G	G A G T A T C C A	G A T C	
<i>A. lumbricoides</i>	G A T C T G G C A T G G G A A C G T T G C T	T A T T T C G	A A G A T C C G T G A A	G A A T A C C C C	G A C A	
<i>A. duodenale</i>	G A T C G G G T A T G G G A A C T C T C C T	C A T C T C T	A A A A T C C G C G A G	G A G T A C C C T	G A T A	

	550				560				570				580				590																																							
<i>C. oncophora isotype1</i>	G	A	A	T	T	A	T	G	G	C	T	T	C	G	T	T	C	T	C	T	G	T	T	G	T	T	C	C	T	T	C	A	C	C	A	A	A	G	G	T	C	T	C	C	G	A	C	A	C	C	G	T	T	G		
<i>C. oncophora isotype2</i>	G	G	A	T	C	A	T	G	T	C	T	T	C	T	T	T	C	T	C	A	G	T	G	G	T	G	C	C	T	T	C	A	C	C	C	A	A	A	G	G	T	T	T	C	C	G	A	T	A	C	C	G	T	A	G	
<i>C. elegans tbb-1</i>	G	A	A	T	T	A	T	G	T	C	T	T	C	T	C	T	T	C	T	C	G	G	T	T	G	T	T	C	C	A	T	C	A	C	C	A	A	A	G	G	T	T	T	T	C	C	G	A	T	A	C	C	G	T	C	G
<i>C. elegans tbb-2</i>	G	A	A	T	C	A	T	G	A	G	C	T	C	A	T	T	C	T	C	G	G	T	T	G	T	A	C	C	A	T	C	G	C	C	A	A	A	G	G	T	G	T	T	C	C	G	A	C	A	C	A	G	T	G	T	
<i>C. elegans ben-1</i>	G	A	A	T	T	A	T	G	A	G	T	T	C	T	T	T	C	T	C	G	G	T	T	G	T	T	C	C	G	T	C	G	C	C	A	A	A	G	G	T	C	T	T	C	C	G	A	C	A	C	A	G	T	C	G	
<i>H. contortus isotype1</i>	G	A	A	T	T	A	T	G	G	C	T	T	C	G	T	T	C	T	C	C	G	T	T	G	T	T	C	C	A	T	C	A	C	C	C	A	A	A	G	G	T	A	T	C	C	G	A	C	A	C	T	G	T	C	G	
<i>H. contortus isotype2</i>	G	A	A	T	T	A	T	G	T	C	A	T	C	C	T	T	T	C	T	C	A	G	T	G	G	T	A	C	C	T	T	C	A	C	C	A	A	A	G	G	T	T	T	T	T	C	C	G	A	T	A	C	T	G	T	C
<i>W. bancrofti</i>	G	A	A	T	T	A	T	G	A	G	C	T	C	T	T	T	T	T	C	G	G	T	T	G	T	G	C	C	G	T	C	G	C	C	A	A	A	G	T	A	T	C	T	C	A	G	A	T	A	C	T	G	T	G	T	
<i>T. trichiura</i>	G	A	A	T	T	A	T	G	A	C	A	A	C	T	T	T	T	A	G	T	G	T	C	G	T	T	C	C	G	T	C	C	G	A	A	G	G	T	A	T	C	A	T	C	A	G	A	T	A	C	A	G	T	T	G	
<i>T. circumcincta</i>	G	A	A	T	C	A	T	G	G	C	T	T	C	A	T	T	T	C	T	C	C	G	T	T	G	T	T	C	C	A	T	C	A	C	T	A	A	G	G	T	A	T	C	T	C	C	G	A	C	A	C	C	G	T	T	G
<i>O. volvulus</i>	G	A	A	T	T	A	T	G	A	G	C	T	C	T	T	T	T	T	C	G	G	T	T	G	T	A	C	C	A	T	C	A	C	C	C	A	A	A	G	T	A	T	T	C	A	G	A	T	G	T	T	G	T	A	T	
<i>N. americanus</i>	G	A	A	T	C	A	T	G	T	C	C	T	C	G	T	T	T	T	C	C	G	T	T	G	T	A	C	C	C	T	C	G	C	C	A	A	A	G	G	T	T	T	T	C	C	G	A	C	A	C	T	G	T	G	G	
<i>B. malayi</i>	G	A	A	T	T	A	T	G	A	G	C	T	C	T	T	T	T	T	C	G	G	T	T	G	T	G	C	C	A	T	C	G	C	C	A	A	A	G	T	A	T	C	T	A	G	A	T	G	T	T	G	T	G	T	G	
<i>A. lumbricoides</i>	G	A	A	T	C	A	T	G	A	G	C	T	C	G	T	T	C	T	C	A	G	T	T	G	T	T	C	C	A	T	C	T	C	C	A	A	A	G	G	T	T	T	T	C	T	G	A	T	G	T	G	G	T	G	T	
<i>A. duodenale</i>	G	G	A	T	T	A	T	G	T	C	C	T	C	G	T	T	C	T	C	T	G	T	T	G	T	C	C	C	T	C	A	C	C	A	A	A	G	G	T	T	T	T	C	C	G	A	C	A	C	C	G	T	G	G		

	600				610				620				630				640																																				
<i>C. oncophora isotype1</i>	T	G	G	A	A	C	C	T	T	A	C	A	A	T	G	C	T	A	C	T	T	T	C	T	G	T	T	C	A	C	C	A	A	C	T	G	G	T	A	G	A	A	A	T	A	C	C	G	A	T	G		
<i>C. oncophora isotype2</i>	T	T	G	A	A	C	C	T	T	A	C	A	A	T	G	C	A	C	G	C	T	T	T	C	T	G	T	G	C	A	C	C	A	A	C	T	T	G	T	G	G	A	A	C	A	C	C	G	A	T	G		
<i>C. elegans tbb-1</i>	T	C	G	A	G	C	C	G	T	A	C	A	A	T	G	C	A	C	C	C	T	C	T	C	T	G	T	C	C	A	C	C	A	G	C	T	T	G	T	T	G	A	G	A	A	C	A	C	C	G	A	T	G
<i>C. elegans tbb-2</i>	T	A	G	A	A	C	C	A	T	A	C	A	A	T	G	C	A	C	C	C	T	C	T	C	C	G	T	C	C	A	C	C	A	G	C	T	T	G	T	T	G	A	G	A	A	C	A	C	C	G	A	T	G
<i>C. elegans ben-1</i>	T	C	G	A	G	C	C	A	T	A	C	A	A	C	G	C	T	A	C	T	C	T	T	T	C	T	G	T	C	A	C	C	A	G	C	T	C	G	T	T	G	A	A	A	T	A	C	C	G	A	T	G	
<i>H. contortus isotype1</i>	T	A	G	A	A	C	C	C	T	A	C	A	A	T	G	C	T	A	C	C	T	T	T	C	C	G	T	C	C	A	T	C	A	A	C	T	G	G	T	A	G	A	A	A	C	A	C	C	G	A	T	G	
<i>H. contortus isotype2</i>	T	G	G	A	A	C	C	T	T	A	C	A	A	T	G	C	A	C	C	T	A	T	C	T	G	T	C	C	A	T	C	A	A	C	T	G	G	T	G	A	A	A	T	A	C	T	G	A	C	G			
<i>W. bancrofti</i>	T	G	G	A	A	C	C	C	T	A	C	A	A	T	G	C	A	C	A	T	A	T	C	A	G	T	C	C	A	C	C	A	A	C	T	A	G	T	T	G	A	A	A	C	A	C	A	C	G	A	T	G	
<i>T. trichiura</i>	T	A	G	A	A	C	C	A	T	A	T	A	A	T	G	C	A	A	C	T	G	T	C	A	G	T	C	C	A	C	C	A	G	T	T	G	G	T	A	G	A	A	A	C	A	C	G	A	C	G			
<i>T. circumcincta</i>	T	G	G	A	A	C	C	T	T	A	C	A	A	T	G	C	A	A	C	T	T	T	C	T	G	T	A	C	A	C	C	A	A	T	T	G	G	T	A	G	A	A	A	C	A	C	C	G	A	T	G		
<i>O. volvulus</i>	T	G	G	A	A	C	C	T	T	A	T	A	A	C	G	C	A	A	C	A	T	T	A	T	C	A	G	T	G	C	A	T	C	A	A	T	A	G	T	T	G	A	A	A	C	A	C	T	G	A	C	G	
<i>N. americanus</i>	T	T	G	A	G	C	C	A	T	A	C	A	A	T	G	C	A	A	C	T	C	T	C	T	G	T	T	C	A	C	C	A	G	T	T	A	G	T	T	G	A	G	A	A	T	A	C	A	G	A	T	G	
<i>B. malayi</i>	T	G	G	A	A	C	C	C	T	A	C	A	A	T	G	C	A	A	C	T	A	T	C	A	G	T	C	C	A	C	C	A	A	C	T	A	G	T	T	G	A	A	A	C	A	C	T	G	A	C	G		
<i>A. lumbricoides</i>	T	G	G	A	G	C	C	T	T	A	C	A	A	C	G	C	A	A	C	T	G	T	C	C	G	T	T	C	A	T	C	A	G	T	T	G	G	T	T	G	A	G	A	A	C	A	C	C	G	A	T	G	
<i>A. duodenale</i>	T	G	G	A	G	C	C	A	T	A	C	A	A	T	G	C	A	A	C	T	C	T	C	T	G	T	G	C	A	C	C	A	G	C	T	G	G	T	T	G	A	G	A	A	T	A	C	A	G	A	T	G	

Codon 200

	650	660	670	680	690	700
<i>C. oncophora isotype1</i>	A A A C G	T T C T G T A T T G A T A A T	G A A G C T C T G T A T G A T A T C T G C T T C C G C A C A	T T G A		
<i>C. oncophora isotype2</i>	A G A C A	T T C T G C A T T G A C	A A C G A A G C A C T T T A C G A T C T T G C T T C C G A G A C A C T C A			
<i>C. elegans tbb-1</i>	A G A C T	T A C T G T A T C G A T A A C G A	G G C T C T C T A C G A T A T C T G C T A C A G A A C T C T A			
<i>C. elegans tbb-2</i>	A G A C C	T A C T G C A T T G A C	A A C G A G G C C C T C T A C G A C A T C T G C T A C C G T A C C T C A			
<i>C. elegans ben-1</i>	A G A C T	T T C T G C A T T G A C	A A C G A G G C T C T T T A T G A T A T C T G C T T C A G A A C C C T C A			
<i>H. contortus isotype1</i>	A A A C A	T T C T G T A T T G A C	A A C G A A G C T C T G T A T G A T A T C T G C T T C C G C A C T T T G A			
<i>H. contortus isotype2</i>	A A A C G	T T C T G T A T T G A T A A C G A A G C A C T C T A C G A C A T T T G C T T C C G T A C A C T G A				
<i>W. bancrofti</i>	A A A C T	T T C T G C A T T G A T A A C G A G G C T T T G T A T G A C A T C T G C T T C C G A A C G T T G A				
<i>T. trichiura</i>	A A A C A	T T C T G C A T A G A T A A T G A A G C G C T T T A C G A T A T T T G T T T C C G A A C T T T G A				
<i>T. circumcincta</i>	A A A C A	T T C T G C A T C G A T A A T G A A G C T C T G T A C G A T A T C T G C T T C C G C A C C T T G A				
<i>O. volvulus</i>	A A A C T	T T C T G C A T T G A T A A C G A A G C T T T A T A T G A C A T C T G C T T C C G A A C A T T G A				
<i>N. americanus</i>	A G A C C	T T C T G T A T T G A T A A T G A A G C T T T G T A T G A T A T C T G C T T C C G A A C A T T G A				
<i>B. malayi</i>	A A A C T	T T C T G C A T T G A T A A C G A G G C T T T T G T A T G A C A T C T G C T T C C G A A C G T T G A				
<i>A. lumbricoides</i>	A A A C C	T T C T G C A T T G A C A A T G A G G C T T T G T A C G A C A T C T G C T T C A G G A C C C T G A				
<i>A. duodenale</i>	A G A C C	T T C T G T A T C G A T A A C G A G G C T C T G T A T G A T A T T T G C T T C C G A A C T T T G A				

	710	720	730	740	750
<i>C. oncophora isotype1</i>	A G C T C	A C A A A C C C A A C T T A T G G A G A T C T C A A C C A C C T A	G T G T C T G T C A C A A T G T		
<i>C. oncophora isotype2</i>	A G C T T	A C T A A C C C T A C T T A C G G A G A T C T T A A C C A T C T T	G T A T C T G T G A C T A T G T		
<i>C. elegans tbb-1</i>	A G C T C	A C C A A C C C A A C A T A C G G A G A C C T G A A C C A T C T C	G T G T C T C T C A C A A T G T		
<i>C. elegans tbb-2</i>	A A C T C	A C C A A C C C A A C C T A C G G T G A T T T G A A C C A T C T T	G T A T C C C T C A C C A T G T		
<i>C. elegans ben-1</i>	A G C T T	T C A A A T C C A A C T T A T G G A G A T C T C A A T C A T C T T	G T T T C C G T T A C A A T G T		
<i>H. contortus isotype1</i>	A A C T C	A C A A A T C C A A C C T A T G G A G A T C T C A A C C A C C T T	G T G T C T G T C A C A A T G T		
<i>H. contortus isotype2</i>	A A C T T	A C T A A C C C A A C T T A T G G A G A T C T C A A C C A T C T G	G T A T C C G T G A C T A T G T		
<i>W. bancrofti</i>	A G T T G	G C A A A T C C A A C T T A C G G C G A C C T C A A C C A C T T G	G T G T C T G T G A C A A T G T		
<i>T. trichiura</i>	A G T T A	A C A A C A C C A A C T T A C G G A G A C T T A A A T C A T T T G	G T T T C G G C A A C C A T G T		
<i>T. circumcincta</i>	A A C T C	A C A A A T C C A A C T T A T G G C G A T C T C A A T C A C T T A	G T G T C T G T C A C A A T G T		
<i>O. volvulus</i>	A A T T G	A C G A A T C C A A C T T A T G G C G A T C T C A A T C A T T T G	G T A T C T G T G A C A A T G T		
<i>N. americanus</i>	A G C T T	A C G A A C C C A A C A T A T G G A G A T C T G A A T C A T C T T	G T G T C T G T A A C A A T G T		
<i>B. malayi</i>	A G T T G	G C A A A T C C A A C T T A C G G T G A C C T C A A C C A T T T G	G T G T C T G T G A C A A T G T		
<i>A. lumbricoides</i>	A G C T T	A C A A A T C C C A C A T A C G G A G A C C T C A A C C A T T T G	G T T T C T G T G A C T A T G T		
<i>A. duodenale</i>	A A C T C	A C A A A T C C A A C C T A T G G A G A T C T G A A C C A C C T C	G T G T C T G T A A C A A T G T		

	760	770	780	790	800	810	
<i>C. oncophora isotype1</i>	C C G G A G T	C A C G A C T	T G C C T	C C G A	T T C C C T G G A C A	A C T A A A T G C T G A T C T	T C G C A
<i>C. oncophora isotype2</i>	C T G G A G T	A A C A A C G	T G C T	A C G T	T T C C C T G G A C A	A C T G A A T G C T G A T C T	A C G T
<i>C. elegans tbb-1</i>	C T G G A G T	G A C T A C C	T G C C T	C C G C	T T C C C T G G A C A	G C T G A A C G C T G A T C T	T C G C A
<i>C. elegans tbb-2</i>	C C G G A G T	T A C C A C C	T G T C T	C C G A	T T C C C A G G A C A	G C T C A A T G C C G A T C T	C C G C A
<i>C. elegans ben-1</i>	C C G G A G T	C A C C A C G	T G C C T	C C G C	T T C C C A G G A C A	A C T C A A T G C T G A T C T	C C G C A
<i>H. contortus isotype1</i>	C T G G T G T	C A C G A C C	T G C C T	T C G A	T T C C C T G G A C A	G C T G A A T G C T G A T C T	T C G C A
<i>H. contortus isotype2</i>	C T G G A G T	A A C A A C A	T G C T	T G C G A	T T C C C T G G A C A	A C T A A A T G C T G A T C T	A C G T A
<i>W. bancrofti</i>	C T G G A G T	A A C A A C T	T G C T	T A C G T	T T T C C T G G A C A	G T T G	
<i>T. trichiura</i>	C T G G A G T	A A C G A C A	T G C C T	A C G C	T T T C C T G G T	C A G T T G A A T G C T G A T C T	T T G C G G A
<i>T. circumcincta</i>	C T G G A G T	G A C G A C C	T G C C T	T C G A	T T C C C T G G A C A	G C T G A A T G C T G A T C T	T C G C A
<i>O. volvulus</i>	C T G G A G T	C A C A A C A	T G C T	T G C G T	T T T C C T G G A C A	G T T A A A T G C C G A T C T	T C G T A
<i>N. americanus</i>	C T G G T G T	T A C T A C C	T G T C T	T C G C	T T C C C C G G T	C A G T T G A A T G C T G A T C T	T C G T A
<i>B. malayi</i>	C G G G A G T	A A C A A C T	T G C T	T A C G T	T T C C C T G G A C A	G T T G A A C G C C G A T C T	C C G T A
<i>A. lumbricoides</i>	C T G G C G T	C A C A A C G	T G C C T	G C G C	T T C C C T G G C	C A G C T G A A T G C A G A C T	T G C G C A
<i>A. duodenale</i>	C C G G T G T	C A C T A C C	T G C C T	T C G C	T T C C C T G G C	C A G T T G A A T G C T G A T C T	C C G C A

	820	830	840	850	860	
<i>C. oncophora isotype1</i>	A G T T G G C	C G T G A A C A T G G T	T C C A T T C C C	T C G T C T T C A C T T C T T	T A T G C C	C G G T T
<i>C. oncophora isotype2</i>	A A C T G G C	T G T C A A C A T G G T	G C C G T T C C C	T C G C T T G C A T	T T C T T C A T G C C	T G G A T
<i>C. elegans tbb-1</i>	A G T T G G C	T G T C A A C A T G G T	T C C A T T C C C	A C G T C T T C A T	T T C T T C A T G C C	T G G A T
<i>C. elegans tbb-2</i>	A G C T T G C	C G T C A A C A T G G T	T C C A T T C C C	A C G T C T T C A C T T C T T	C A T G C C	A G G A T
<i>C. elegans ben-1</i>	A A C T T G C	A G T C A A C A T G G T	T C C A T T C C C	A C G T C T T C A C T T C T T	T A T G C C	A G G A T
<i>H. contortus isotype1</i>	A G T T A G C	C G T G A A C A T G G T	T C C A T T C C C	T C G T C T T C A C T T C T T	C A T G C C	C G G T T
<i>H. contortus isotype2</i>	A A C T G G C	T G T C A A C A T G G T	G C C C T T C C C	T C G G C T A C A T	T T C T T C A T G C C	T G G A T
<i>W. bancrofti</i>						
<i>T. trichiura</i>	A G C T G G C	A G T C A A T A T G G T	G C C T T T T C C A C G T	T T G C A T	T T C T T T A T G C C	T G G C T
<i>T. circumcincta</i>	A G T T A G C	C G T G A A C A T G G T	T C C A T T C C C	T C G T C T T C A C T T C T T	C A T G C C	A G G T T
<i>O. volvulus</i>	A G C T C G C	T G T T A A T A T G G T	A C C A T T C C C	A C G A T T G C A T	T T C T T C A T G C C	A G G A T
<i>N. americanus</i>	A G T T G G C	T G T C A A C A T G G T	T C C A T T C C C	A C G T C T T C A C T T C T T	C A T G C C	T G G T T
<i>B. malayi</i>	A A C T T G C	C G T C A A T A T G G T	A C C A T T T C C A C G	G T T G C A T	T T C T T T A T G C C	A G G A T
<i>A. lumbricoides</i>	A A T T G G C	A G T C A A T A T G G T	G C C C T T C C C	A C G T C T T C A C T T C T T	C A T G C C	A G G T T
<i>A. duodenale</i>	A A T T G G C	T G T A A A C A T G G T	T C C A T T C C C	A C G T C T T C A C T T C T T	C A T G C C	T G G A T

870 880 890 900 910

C. oncophora isotype1 T T G C C C C A T T G T C T G C T A A G G G T G C T C A A G C A T A T C G C G C T T C A A C T G T C G C T G

C. oncophora isotype2 T T G C A C C A C T G T C A G C A A A A G G A G C T C A A G C C T A C C G T G C A C T T A C C G T T C T G

C. elegans tbb-1 T C G C T C C A C T C T C C G C C A A G G G A G C T C A G G C T T A C C G T G C A T T G A C T G T C G C C G

C. elegans tbb-2 T C G C A C C A C T T T C C G C C A A G G G A A C C C A G G C T T A C C G T G C C C T T A C C G T C G C C G

C. elegans ben-1 T T G C T C C A T T G T C A G C T A A A G G A G C A C A A G C G T A C C G T G C A C T T A C G G T C G C C G

H. contortus isotype1 T T G C T C C A C T G T C T G C A A A G G G T G C T C A A G C A T A T C G C G C T T C G A C A G T T G C T G

H. contortus isotype2 T C G C A C C A C T A T C A G C A A A G G G A G C T C A A G C C T A C C G A G C A C T A A C T G T T C T G

W. bancrofti

T. trichiura T T G C G C C T C T A A C T T C A A G A G G A A G T C A G G G T T A T C G T G C T C T G A C G G T T C C T G

T. circumcincta T C G C C C A C T G T C T G C T A A G G G T G C T C A A G C G T A T C G C G C T T C A A C T G T C G C T G

O. volvulus T T G C T C C T C T C T C T G C T C G T G G T G C T G C T G C T T A T C G G G C A C T T A A T G T T G C T G

N. americanus T C G C T C C A C T C T C A G C G A A G G G T G C T C A A G C T A C C G T G C C T T A C T G T A G C T G

B. malayi T T G C T C C T C T C T C T G C T C G T G A T G C T G C T G C T T A T C G A G C T C C T C A A T G T T G C T G

A. lumbricoides T C G C T C C G T T G T C T G C T C G A G G A G C G G C T G C A T A C A G G C G C T C A A C G T C G C T G

A. duodenale T T G C T C C A C T T T C G G C T A A G G G T G C T C A G G C T T A C C G T G C T C T T A C T G T T G C C G

920 930 940 950 960 970

C. oncophora isotype1 A G C T T A C A C A G C A A A A T G T T C G A T G C C A A G A A C A T G A T G G C T G C C T G T G A T C C T C

C. oncophora isotype2 A G C T T A C A C A A C A G A T G T T C G A T G C T A A G A A C A T G A T G G C A G C T T G T G A T C C A C

C. elegans tbb-1 A G C T T A C T C A A C A A A T G T T C G A C G C C A A G A A C A T G A T G G C T G C T T G C G A T C C A A

C. elegans tbb-2 A G C T C A C C A A C A A A T G T T C G A T G C C A A G A A C A T G A T G G C T G C C T G T G A C C C A A

C. elegans ben-1 A G C T T A C C C A G C A G A T G T T T G A C G C C A A G A A T A T G A T G G C T G C C T G T G A T C C G A

H. contortus isotype1 A G C T T A C A C A G C A A A A T G T T C G A T G C A A A G A A C A T G A T G G C T G C C T G T G A T C C T C

H. contortus isotype2 A G C T C A C G C A G C A G A T G T T C G A C G C A A A T A A C A T G A T G G C C G C T T G T G A T C C A C

W. bancrofti

T. trichiura A G C T T A C T C A G C A A A A T G T T C G A C G C A A A G A A C A T G A T G G C T G C T T G T G A T C C T C

T. circumcincta A G C T T A C A C A G C A A A A T G T T C G A T G C C A A G A A C A T G A T G G C T G C T T G T G A T C C T C

O. volvulus A G C T T A C T C A A C A G A T G T T T G A C G C C A A A A A T A T G A T G G C A G C A T G T G A T C C A C

N. americanus A A C T T A C T C A G C A G A T G T T C G A C G C A A A G A A C A T G A T G G C T G C G A T G C G A T C C A C

B. malayi A A C T T A C T C A A C A G A T G T T T G A T G C C A A A A A T A T G A T G G C A G C A T G T G A T C C G C

A. lumbricoides A A C T C A C T C A G C A G A T G T T C G A C G C C A A A A A C A T G A T G G C C G C T T G C G A T C C G C

A. duodenale A G C T C A C T C A G C A G A T G T T C G A T G C C A A G A A C A T G A T G G C C G C T T G T G A T C C T C

	980	990	1000	1010	1020
<i>C. oncophora isotype1</i>	G C C A T G G A C G C T A T C T T A C G G T G G C T G C C A T G T T C C G T G G T C G C A T G A G C A T G C				
<i>C. oncophora isotype2</i>	G A C A T G G C C G T T A T C T C A C C G T T G C G G C T A T G T T C A G A G G C C G T A T G A G C A T G C				
<i>C. elegans tbb-1</i>	G A C A C G G A A G A T A C C T C A C C G T T G C T G C T A T G T T C C G T G G A C G C A T G T C C A T G A				
<i>C. elegans tbb-2</i>	G A C A C G G A C G T T A C C T G A C C G T G G C C G C T A T G T T C C G T G G A C G C A T G T C G A T G A				
<i>C. elegans ben-1</i>	G A C A C G G A C G T T A C C T G A C T G T A G C T G C A A T G T T C C G T G G A C G T A T G T C A A T G A				
<i>H. contortus isotype1</i>	G C C A T G G A C G T T A T C T T A C G G T A G C T G C T A T G T T C C G T G G A C G T A T G A G C A T G C				
<i>H. contortus isotype2</i>	G A C A C G G G C G C T A T C T T A C T G T T G C G G C A A T G T T C C G T G G T C G T A T G A G C A T G C				
<i>W. bancrofti</i>					
<i>T. trichiura</i>	G T C A C G G G C G T T A C T T T A A C T G T A G C T G C A A T T T T C C G T G G G C G T A T G T C T A T G A				
<i>T. circumcincta</i>	G C C A C G G A C G C T A T C T G A C G G T G G C G G C C A T G T T C C G T G G T C G C A T G A G C A T G C				
<i>O. volvulus</i>	G T C A T G G C C G T T A C T T A A C C G T A G C C G C T A T G T T C C G A G G C A G A A T G T C G A T G C				
<i>N. americanus</i>	G A C A C G G G C G C T A T C T T A C C G T C G C T G C G A T G T T C C G C G G A A G A A T G A G C A T G C				
<i>B. malayi</i>	G T C A T G G T C G T T A C C T A A C C G T A G C T G C C A T G T T C C G A G G T A G A A T G T C G A T G C				
<i>A. lumbricoides</i>	G G C A C G G T C G T T A C C T T A C T G T G G C A G C C A T G T T C C G C G G A C G G A T G T C A A T G C				
<i>A. duodenale</i>	G A C A T G G A C G C T A C C T C A C T G T T G C T G C T A T G T T C C G T G G A C G C A T G A G C A T G A				

	1030	1040	1050	1060	1070	1080
<i>C. oncophora isotype1</i>	G G G A A G T A G A C G A C C A G A T G A T G T C T G T A C A G A A C A A G A A C T C G T C A T A T T T C G					
<i>C. oncophora isotype2</i>	G C G A G G T C G A T G A T C A G A T G A T G T C T G T A C A A A C A A G A A C T C A T C A T A C T T C G					
<i>C. elegans tbb-1</i>	G A G A G G T T G A C G A G C A G A T G C T C A A G T G T C C A G A A C A A G A A C T C C T C G T A C T T C G					
<i>C. elegans tbb-2</i>	G A G A G G T C G A C G A G C A A A T G C T C A A C G T T C A G A A C A A G A A C T C G T T C G T A C T T C G					
<i>C. elegans ben-1</i>	G A G A A G T C G A T G A T C A A A T G A T G A A T G T G C A G A A T A A G A A C T C T T C G T A T T T T G					
<i>H. contortus isotype1</i>	G A G A A G T A G A T G A T C A G A T G A T G T C C G T G C A G A A C A A G A A C T C A T C A T A T T T C G					
<i>H. contortus isotype2</i>	G T G A G G T T G A T G A C C A G A T G A T G T C T G T G C A A A A T A A G A A T T C G T C C T A C T T G					
<i>W. bancrofti</i>						
<i>T. trichiura</i>	A G G A A G T T G A C G A G C A A A A T G C T G A A C G T T C A G A A C A A A A A C A A T G C C T A T T T T G					
<i>T. circumcincta</i>	G G G A A G T G G A C G A C C A A A A T G A T G T C C G T G C A G A A C A A G A A C T C G T C A T A C T T C G					
<i>O. volvulus</i>	G A G A A G T G G A T G A G C A A A A T G A T G C A A G T G C A G A A T A A G A A T T C A T C G T A C T T T G					
<i>N. americanus</i>	G G G A A G T C G A T G A C C A G A T G A T G T C A G T G C A A A C A A G A A T T C G T C T T A C T T T G					
<i>B. malayi</i>	G G G A A G T A G A C G A G C A A A A T G A T G C A A G T A C A G A A T A A G A A T T C A T C G T A T T T C G					
<i>A. lumbricoides</i>	G C G A A G T G G A C G A G C A G A T G A T G C A G G T G C A G A A C A A G A A C T C G T C G T A C T T C G					
<i>A. duodenale</i>	G G G A A G T T G A C G A C C A G A T G A C G T C A G T G C A G A A C A A G A A C T C G T C C T A C T T C G					

C. oncophora isotype1
C. oncophora isotype2
C. elegans tbb-1
C. elegans tbb-2
C. elegans ben-1
H. contortus isotype1
H. contortus isotype2
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi
A. lumbricoides
A. duodenale

1090 1100 1110 1120 1130

T T G A A T G G A T T C C A A A C A A C G T G A A A A A C T G C C G T T T G T G A T A T T C C T C C T C G T G
 T T G A A T G G A T C C C T A A C A A T G T T A A A A C A G C C G T G T G C G A C A T C C C A C C G C G C G
 T T G A A T G G A T T C C A A A C A A C G T C A A G A C T G C T G T G T G C G A C A T C C C A C C A C G T G
 T C G A A T G G A T C C C G A A C A A C G T C A A G A C C G C C G T T T G T G A C A T C C C A C C A A G A G
 T T G A A T G G A T T C C G A A T A A T G T G A A G A C T G C G G T C T G T G A T A T T C C A C C A C G T G
 T G G A A T G G A T T C C A A A C A A C G T T A A G A C T G C C G T T T G T G A C A T T C C T C C T C G T G
 T C G A A T G G A T T C C C A A C A A T G T A A A A A C A G C A G T A T G C G A T A T T C C A C C A C G C G

T G G A A T G G A T T C C A A A T A A C G T G A A G A C A G C T G T C T G T G A C A T A C C A C C C C G T G
 T G G A A T G G A T T C C A A A C A A C G T A A A A A C C G C T G T T T G T G A C A T T C C T C C T C G T G
 T T G A A T G G A T T C C A A A T A A C G T A A A A A C A G C A G T T T G C G A T A T T C C A C C A C G T G
 T G G A A T G G A T T C C A A A C A A C G T T A A G A C A G C A G T G T G C G A T A T T C C T C C A A G A G
 T T G A A T G G A T T C C A A A T A A C G T G A A G A C A A C T G T T T G C G A C A T T C C A C C A C G T G
 T G G A G T G G A T C C C G A A C A A C G T T A A A A C T G C A G T C T G T G A C A T T C C G C G A G A G
 T G G A A T G G A T T C C T A A C A A C G T A A A G A C C G C T G T G G A T A T T C C T C C A A G A G

C. oncophora isotype1
C. oncophora isotype2
C. elegans tbb-1
C. elegans tbb-2
C. elegans ben-1
H. contortus isotype1
H. contortus isotype2
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi
A. lumbricoides
A. duodenale

1140 1150 1160 1170 1180

G A C T G A A G A T G G C T G C T A C T T T C G T T G G T A A C T C G A C T G C G A T C C A A G A G C T G T
 G A T T G A A A A T G G C T G C T A C T T T C G T T G G A A A C T C G A C A G C A A T C C A A G A A C T G T
 G A C T C A A G A T G G C T G C C A C C T T C G T C G G A A A C T C C A C T G C T A T C C A G G A G C T C T
 G A C T C A A G A T G G C T G C C A C C T T C G T T G G A A A C T C G A C C G C T A T C C A A G A G C T T T
 G G C T C A A G A T G T C G G C C A C T T T T A T T G G A A A C T C G A C A G C T A T T C A G G A G T T G T
 G A C T G A A A A T G G C G G C T A C C T T T C A T T G G T A A C T C G A C T G C T A T C C A G G A G C T G T
 G T T T G A A A A T G G C T G C C A C C T T T T G T T G G A A A C T C G A C A G C A A T C C A A G A A C T G T

G A C T G A A G A T G T C G G C T A C G T T C A T T G G A A A T T C A A C T G C T A T T C A A G A A T T G T
 G A T T G A A A A T G G C T G C T A C C T T T T G T T G G T A A C T C A A C T G C C A T C C A A G A G C T G T
 G G T T G A A G A T G A G C G C A A C A T T C A T C G G A A A T A C A A C A G C C A T A C A A G A A C T T T
 G T C T G A A A A T G G C C G C T A C A T T T G T T G G A A A C T C T A C T G C C A T T C A G G A G T T G T
 G A T T A A A G A T G A G C G C A C A T T T A T T G G A A A T A C A A C A G C T A T A C A A G A A C T T T
 G G T T G A A G A T G A G C G C G A C C T T C A T C G G A A A T A C A A C A G C C A T C C A A G A A C T T T
 G A T T G A A A A T G G C C G C C A C C T T C G T T G G A A A C T C G A C T G C C A T C C A A G A G C T G T

1190 1200 1210 1220 1230 1240
C. oncophora isotype1 T C A A G C G T A T T T C G G A G C A G T T C A C A G C T A T G T T C C G A C G C A A A G C T T T C C T T C
C. oncophora isotype2 T C A A G C G C A T C T C A G A A C A A T T C A C T G C C A T G T T C C G T C G C A A A G C T T T C T T A C
C. elegans tbb-1 T C A A G C G T A T C T C G G A G C A A T T C A C C G C C A T G T T C C G C A G A A A G G C C T T C C T T C
C. elegans tbb-2 T C A A G C G T A T C T C A G A G C A G T T C A C T G C T A T G T T C C G C C G C A A A G G C T T T C C T C C
C. elegans ben-1 T C A A G A G A A T C T C T G A A C A A T T T A C A G C A A T G T T C C G C C G C A A A G G C T T T C C T C C
H. contortus isotype1 T C A A G C G T A T T T C G G A G C A A T T C A C T G C C A T G T T C C G A C G C A A A G C T T T C C T T C
H. contortus isotype2 T C A A G C G T A T A T C A G A G C A G T T T A C T G C T A T G T T C C G T C G T A A A G C C T T T C T T A C
W. bancrofti
T. trichiura T T A A A C G C A T A T C T G A A C A A T T C A C A G C G A T G T T T C G C C G T A A A G C T T T T C T C C
T. circumcincta T C A A G C G T A T T T C G G A G C A G T T C A C A G C T A T G T T C C G G C G C A A A G G C T T T C C T C C
O. volvulus T C A A A C G C A T T T C T G A G C A G T T C A C T G C C A T G T T C C G A C G T A A A G C A T T C T T G C
N. americanus T C A A G C G T A T T T C G G A G C A G T T T A C T G C C A T G T T C C G C C G C A A A G C C T T C T T A C
B. malayi T C A A G C G A A T T T C G A A C A A T T T A C T G C C A T G T T C C G A C G T A A A G C A T T C T T G C
A. lumbricoides T C A A A C G A A T C T C G G A G C A G T T T A C T G C C A T G T T C C G C C G C A A A G C G T T T T T G C
A. duodenale T C A A G C G T A T C T C C G A G C A A T T C A C C G C T A T G T T C C G C C G C A A A G C C T T C T T G C

1250 1260 1270 1280 1290
C. oncophora isotype1 A T T G G T A C A C T G G T G A G G G T A T G G A C G A A A T G G A G T T C A C T G A A G C T G A G T C G A
C. oncophora isotype2 A T T G G T A C A C T G G T G A G G G T A T G G A C G A A A T G G A A T T C A C T G A A G C C G A A T C G A
C. elegans tbb-1 A T T G G T A C A C T G G T G A G G G T A T G G A C G A G A T G G A G T T C A C C G A G G C T G A A A G C A
C. elegans tbb-2 A T T G G T A C A C T G G A G A A G G A A T G G A C G A G A T G G A G T T C A C C G A A G C C G A G A G C A
C. elegans ben-1 A T T G G T A T A C T G G C G A A G G A A T G G A C G A G A T G G A A T T C A C T G A A G C T G A G A G T A
H. contortus isotype1 A T T G G T A C A C T G G T G A G G G T A T G G A C G A A A T G G A G T T C A C A G A A G C T G A G T C G A
H. contortus isotype2 A T T G G T A C A C T G G C C A A G G T A T G G A C G A A A T G G A A T T C A C T G A A G C C G A A T C G A
W. bancrofti
T. trichiura A T T G G T A T A C G G G G A G G G T A T G G A C G A A A T G G A G T T T A C A G A A G C A G A A A G T A
T. circumcincta A T T G G T A C A C T G G T G A G G G T A T G G A C G A A A T G G A A T T C A C A G A A G C T G A G T C G A
O. volvulus A T T G G T A T A C T G G A G A A G G T A T G G A T G A A A T G G A A T T C A C T G A A G C A G A A A G T A
N. americanus A T T G G T A C A C C G G T G A A G G A A T G G A T G A G A T G G A A T T C A C G G A G G C A G A G T C T A
B. malayi A T T G G T A T A C T G G C G A A G G T A T G G A T G A A A T G G A A T T C A C G G A A G C G G A G A G T A
A. lumbricoides A C T G G T A C A C C G G A G A A G G A A T G G A C G A G A T G G A A T T C A C A G A A G C G G A G A G C A
A. duodenale A T T G G T A C A C T G G T G A G G G T A T G G A T G A G A T G G A G T T C A C T G A A G C C G A A T C C A

1300 1310 1320 1330 1340 1350
C. oncophora isotype1 A C A T G A A C G A T C T T A T C T C C G A A T A C C A A C A A G T A C C A G G A A G C C A C C G C T G A C G
C. oncophora isotype2 A T A T G A A T G A T C T T G T G T C T G A A T A T C A A C A A T A C C A A G A A G C G A C T G C T G A T G
C. elegans tbb-1 A C A T G A A C G A C T T G A T C T C G G A G T A C C A A C A A T A C C A G G A A G C T A C C G C C G A A G
C. elegans tbb-2 A C A T G A A C G A T C T C A T C T C A G A A T A C C A A C A A T A C C A A G A A G C A A C T G C C G A A G
C. elegans ben-1 A T A T G A A C G A T C T T G T C T C A G A A T A C C A G C A A T A C C A G G A A G C A A C T G C A G A G G
H. contortus isotype1 A C A T G A A T G A C C T T A T C T C C G A A T A C C A G C A G T A C C A G G A A G C T A C C G C T G A C G
H. contortus isotype2 A T A T G A A T G A T C T T G G T A T C T G A G T A C C A A C A A T A T C A A G A G G C A A C T G C T G A T G
W. bancrofti
T. trichiura A C A T G A A C G A T C T A G T T A G C G A A T A T C A A C A A T A T T C A G G A G G C C A C A G T T G A A G
T. circumcincta A C A T G A A T G A T C T T A T C T C T G A G T A C C A A C A A G T A C C A G G A G G C C A C C G C T G A C G
O. volvulus A C A T G A A T G A T T T G G T T T C T G A A T A T C A G C A G T A T C A A G A T G C A A C G G C T G A T G
N. americanus A C A T G A A T G A T C T C A T T T C G G A A T A C C A G C A A T A T C A G G A A G C T A C C G C T G A T G
B. malayi A T A T G A A T G A C T T G G T G T C C G A A T A T C A A C A A T A T C A A G A T G C G A C G G C T G A T G
A. lumbricoides A C A T G A A T G A T G T G G T C T C C G A G T A C C A G C A G T A T C A A G A C G C C A C T G C T G A A G
A. duodenale A C A T G A A T G A T C T C A T C T C G G A A T A T C A G C A A C A T C A G G A G G C T A C C G C C G A C G

1360 1370 1380 1390 1400
C. oncophora isotype1 A T A T G G G C G A T C T C G A T G C A G A A G G C G C A G A A G A G C C G T A C C C C G A G G A G T A G T
C. oncophora isotype2 A T G A T G G C G A A G T A G A A G G A A C C G T T G A G A A C G A C A C C T A C G C A G A G G A G T A G A
C. elegans tbb-1 A C G A G C C A C T - - - C G A C G A G T T C G C C G G A G A A G - - - G G G A G A C A T A C G A G T C T G
C. elegans tbb-2 A C G A C G T C G A - - - C G G A T A C G C T G A G G G A G A A G C T G G A G A G A C T T A C G A A T C G G
C. elegans ben-1 A A G A T G G A G A A C T T G A T G G A A C T G A T G G A G A T G C T G A A T A G
H. contortus isotype1 A T A T G G G C G A T C T C G A T G C A G A A G G T G G A G A A G A G G C A T A T C C C G A G G A G T A A T
H. contortus isotype2 A T G A G G G T G A A A T G G A A G G T G C C G T T G A A A A C G A C A C G T A T G C A G A G G A G T A A A
W. bancrofti
T. trichiura A T G A A G A C T T - - - C G A A G A A G A A G A A G G C G A T T A C G A A C G T G A A T G A
T. circumcincta A T A T G G G C G A T C T C G A T G C A G A A G G T G C A G A A G A G C C G T A C C C C G A G G A G T A A
O. volvulus A T G A A G C T G A T C T - - - T C A G G A A G G T G A A T C G G A A T A C A T T G A A C A G G A A G A G T
N. americanus A C A T G G G C G A T C T C G A T G C G G A A G G T G G C G A G G A G G C C T A C C C A G A G G A G T A G
B. malayi A A G A A G G T G A T C T - - - T C A G G A A G G T G A A T C G G A A T A C A T T G A A C A G G A A G A G T
A. lumbricoides A T G A G G G T G A A T T G G A C C A C G A A G G C G A G G C C G A G T A T A C C G A G C A A G A G G A G G
A. duodenale A C A T G G G T G A T C T C G A T G C G G A A G G C G G C G A G G A G G C T T A C C C C G A G G A G T A G

C. oncophora isotype1 G - A T C T **A** C C C **G** T G T T G C G **C T** G **T** - - - T T T **T** T C T G **T** G **T** C A A **T G C** G A A A **T A C** A C **A T T**
C. oncophora isotype2 **A** - A A G **C A A** T T **G** C C C A **A T** T **C A C** T - **A T** G C **A T** C T C A **T T T T** T T **T G C** A G **C** T A T C A **T A C** T
C. elegans tbb-1 **A** G C A A T **A A** T C T G T G T **A T** C A A T C A C T A A **A T** T A T C C T G C C C C **G** T T T **C** G **T A A** T T T C C
C. elegans tbb-2 **A** G C A A T **A A** A T **G** C A A G **A T** C **C T** T **T** C **A** A G C **A T** T C C C **T T** C **T** T C **T** C T A T **C** A C T C T **T** C **T T**
C. elegans ben-1
H. contortus isotype1 G - A T C **C A** C A A A - G T T G **T** G **C T** C **T** - - - T T T **T** C C T G **T** G **T** C A A **T G C** G A A A **T A C** A C **A T T**
H. contortus isotype2 G **G** A A G **C A** T C T **G** C C C A **A** C T **C** A T **T** **A T** G C **A T** C T C A **T T** C **T** T - - **G C** G G **C** T A T T G **T A T T**
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus **A** A
N. americanus
B. malayi G A G C A **C A A** A G T G T C A G C T T **T** G **T** G **A** A A A **A** A G A A C **T T T T** A C A **G** T A T T T **T A** T T **T A T T** C
A. luntricoides **A** G T G A
A. duodenale

C. oncophora isotype1 **G** G **T T** G C G T **T**
C. oncophora isotype2 **G** C A **T** A C G T **T G T** A A **A** A G **T T T C** T C T G A **A** C G G C **T** G T **T** C T C A A A G C A C T **T T** C **T A** T **T** T G
C. elegans tbb-1 T G **T A C A** - A **T G** A T C **T T** T **T** **C T T T** C G C C C **A C** **T C C C A A T A** **T T T T T** A **T** G A C **T** C G A **A** T G A
C. elegans tbb-2 T C **T T** T T T G **T** C A A A **A** A A **T T** C **T** C T C G C T **A A** **T T T** A T **T T** G C **T T T T** T **T** A A **T G T** **T A** T **T A** T
C. elegans ben-1
H. contortus isotype1 **G** G **T T** G C G T **T G T** G T **A T** G G **T** G **T T** A T T A **A A** G C **T T** G C **T** A A **T T** G A **T** A A A G **T T** A A T G A A G
H. contortus isotype2 **G** C G C G T A C **T G**
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi **G** T C **T** T T T C C A **T** G T T **T** **T A** **T G** **T** T G T T **A** C A **T T T** T A **T T T** T **T G** **T T** A C **T** C G C **T** T **T** C G A C A
A. luntricoides
A. duodenale

1520 1530 1540 1550 1560
C. oncophora isotype1
C. oncophora isotype2 T G A T T T T A T T A T G A T C T A T T C T T G C T G C T A A T T A T T T C T T C G C G A G C T T C C C G A
C. elegans tbb-1 A C G A T G A T T A A T T T
C. elegans tbb-2 T T T A T G A C T T T T T A T A G T C A C T G A A A A G T T T G C A T C T G A G T G A A G T G A A T G C T A
C. elegans ben-1
H. contortus isotype1 T T T A A A A A A A A A A A A G A A
H. contortus isotype2
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi T A T A T T A G C A A A T T T A A A G A A T T A T A G C G A C A A A T C T C A T T G T T G T A C T T C T C
A. lumbricoides
A. duodenale

1570 1580 1590 1600 1610 1620
C. oncophora isotype1
C. oncophora isotype2 T G A G T T T G A T A A A G C G A A T G A T C A G G C T G A
C. elegans tbb-1
C. elegans tbb-2 T C A A A A T G T G A T T C T G T C T G A T G T A C T T T C A C A A T C T C T T C A A T T C C A T T T T
C. elegans ben-1
H. contortus isotype1
H. contortus isotype2
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi A A T A A A T T A C
A. lumbricoides
A. duodenale

1630 1640 1650 1660 1670

C. oncophora isotype1
C. oncophora isotype2
C. elegans tbb-1
C. elegans tbb-2
C. elegans ben-1
H. contortus isotype1
H. contortus isotype2
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi
A. lumbricoides
A. duodenale

G A A G T G C T T T A A A C C C G A A A G G T T G A G A A A A A T G C G A G C G C T C A A A T A T T T G T A

1680 1690 1700 1710 1720

C. oncophora isotype1
C. oncophora isotype2
C. elegans tbb-1
C. elegans tbb-2
C. elegans ben-1
H. contortus isotype1
H. contortus isotype2
W. bancrofti
T. trichiura
T. circumcincta
O. volvulus
N. americanus
B. malayi
A. lumbricoides
A. duodenale

T T G T G T T C G T T G A G T G A C C C A A C A A A A A G A G G A A A

The alignment shows a high conservation in all beta-tubulin cDNA sequences. The square shows codon 200 where “TTC” is present in all sequences except for *C. elegans tbb-1* and *tbb-2*