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| 13. ABSTRACT (Maximum 200 Words)<br><br>The primary accomplishments of the previous funding period were: 1) cloning and expression of the mouse isoform of Scn10a gene product (SNS; TTX-resistant sodium channel); 2) functional heterologous expression and initial biophysical characterization of the mouse Scn10a gene product in sympathetic neurons; 3) cloning and sequencing of 4 Kbp of upstream genomic DNA; and 4) identification of BAC (bacterial artificial chromosome) clones harboring the mouse Scn10a gene. The nucleotide sequence of the mouse Scn10a cDNA obtained in these studies deviates significantly (170 discrepancies in 5874 bases) from a previously published cDNA sequence derived from genomic DNA (GenBank accession number Y09108) and thus represents new information. Heterologous expression of the Scn10a cDNA in sympathetic neurons revealed a significant depolarizing shift in the biophysical properties of the expressed channel when compared with natively expressed channels. These findings indicate that an accessory protein may influence the behavior of the channel. A candidate promoter region for the Scn10a channel has been cloned and identified in BAC clones. Taken together, these results provide the experimental foundation for our future studies aimed at identifying new potential therapeutic targets that modify the function and expression of sodium channels involved in pain transmission. |                                                             |                                                            |                                                     |                                                                   |
| 14. SUBJECT TERMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                            | 15. NUMBER OF PAGES<br>54                           |                                                                   |
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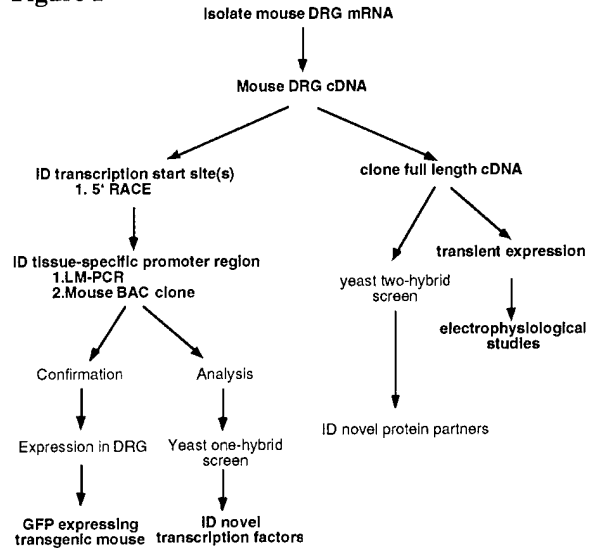
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## Introduction

The *Scn10a* gene product encodes a tetrodotoxin-resistant sodium channel (SNS/PN3) expressed exclusively in a subset of primary sensory neurons (e.g., dorsal root and nodose ganglia) believed to be involved in pain transmission (Akopian et al., 1996). Thus, it is important to understand mechanisms contributing to both the function of the protein and the exquisite specificity of gene expression. The overall research plan is detailed in the flowchart depicted to the right. During the last funding period, we have made significant progress on both the genomic (left branch) and proteomic (right branch) sections of the research plan.

**Figure 1**



Specifically, we have cloned and sequenced the full length mouse *Scn10a* cDNA. Moreover, we have demonstrated that the cDNA is functionally expressed in neurons and have initiated biophysical characterization of the expressed channels. With regard to progress toward better understanding the regulation of *Scn10a* transcription, the putative transcription start site has been identified using 5' rapid amplification of cDNA ends (RACE) and 4 Kbp of upstream genomic region has been sequenced using ligation-mediated PCR (LM-PCR). Finally, bacterial artificial chromosome (BAC) clones containing the full length mouse *Scn10a* gene have been identified.

## Body

### A. Cloning of mouse *Scn10a* cDNA

In order to obtain a murine *Scn10a* clone, dorsal root ganglion (DRG) neurons were enzymatically dissociated from adult CD1 mice and polyA mRNA isolated by standard techniques. A full length m*Scn10a* clone was amplified from this material by RT-PCR using oligonucleotide primers based on the genomic sequence data provided in Souslova et al. (1997). The open reading frame was subcloned into the mammalian expression vector pCI (Promega) and sequenced with an ABI 377 automated sequencer (Appendix A). The sequence of the *Scn10a* clone was verified by sequencing the PCR product from several different mRNA preparations.

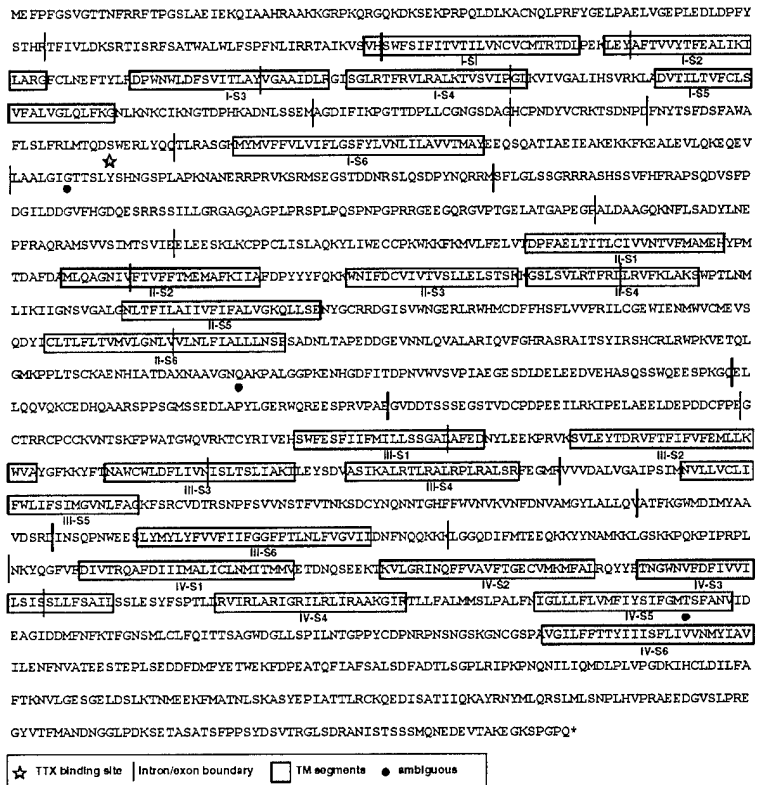
The nucleotide sequence of mouse *Scn10a* cDNA, when compared with sequence (#Y09108) derived from mouse genomic data (Souslova et al., 1997), revealed 170 discrepancies of 5874 total bp (Appendix B). About 50% of the changes do not alter the primary sequence (i.e., are silent mutations). About 1/3 of the "polymorphisms" are A to G changes (genomic to cDNA). An alignment of the primary amino acid sequence of our

clone compared with #Y09108 is shown in Appendix C. The reason for these discrepancies is unclear.

The derived primary sequence of mouse Scn10a is 93, 82, and 81% identical to the rat (X92184), human (AF117907), and dog (U60590) Scn10A sodium channel, respectively. When conserved substitutions are taken into account (ClustalW analysis), the sequence similarity is 95, 89, and 88%, respectively.

**Figure 2, Mouse Scn10a primary amino acid sequence**

Putative transmembrane segments are shown in shaded boxes with each color representing one of four homologous domains. The serine residue shown to be involved in TTX insensitivity in the rat ortholog (Sivilotti et al., 1997) is marked with a star. Putative intron/exon boundaries are from Souslova et al., 1997. Ambiguous residues are those not confirmed by sequencing of different clones.



## B. Expression of Scn10a cDNA clone in rat sympathetic neurons

Rat sympathetic neurons isolated from superior cervical ganglion (SCG) were used as a host for Scn10a expression. Previous studies have shown that natively expressed sodium channels in SCG neurons are completely suppressed by tetrodotoxin (Schofield & Ikeda, 1988). Scn10a (0.1–0.2 µg/µl) and EGFP (Clontech, 0.05 µg/µl) cDNAs were co-injected into the nucleus of SCG neurons using an Eppendorf microinjection system (Ikeda, 1996, 1997). Patch clamp recordings were made following 12–18 hours of incubation at 37 °C. Successfully injected cells were identified by EGFP fluorescence using an inverted microscope (Nikon) equipped with an epifluorescence unit.

Voltage-clamp recordings were made at room temperature (23–25 °C) using the whole-cell variant of the patch-clamp technique. Solutions designed to isolate tetrodotoxin resistant (TTX-R) currents were as follows: external (mM): TEA-Cl 120, NaCl 50, HEPES 10, MnCl<sub>2</sub> 2, and glucose 10. TTX (1 µM) was added to suppress sensitive

currents. The pH of the solution was adjusted to 7.4 with TEA-OH. The osmolality of the solution was 327 mosm/kg. Internal (mM): CsCl 115, NaCl 10, EGTA 11, CaCl<sub>2</sub> 1, HEPES 10, MgATP 4, GTP 0.1, and diTRIS phosphocreatine, 5. The pH of the solution was adjusted to 7.2 with TEA-OH. The osmolality of the solution was 303 mosm/kg. Current-voltage (I-V) and activation curves were derived from currents evoked by a 20 msec test pulse to various potentials from a holding potential of -80 mV. Conductance calculations were made using the chord conductance equation assuming a reversal potential of +40 mV. Inactivation was determined using a 1 sec conditioning pulse followed by a test pulse to 0 mV. Parameters for activation and inactivation curves were determined by fitting the normalized conductance curve to a Boltzmann function using a non-linear regression program. An example of currents and activation and inactivation analysis is shown in Figure 3.

**Figure 3. TTX-resistant sodium currents recorded from rat sympathetic neurons expressing Scn10a channels.**

*Upper right:* Family of currents evoked by depolarizing pulses. *Lower left:* Current voltage relationship. *Upper right:* Currents evoked with the inactivation voltage protocol. *Lower right:* Steady state activation and inactivation curves.

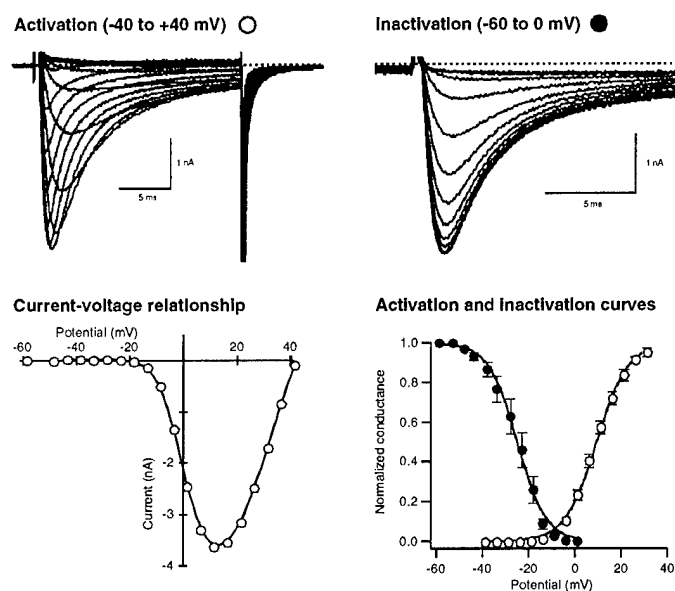
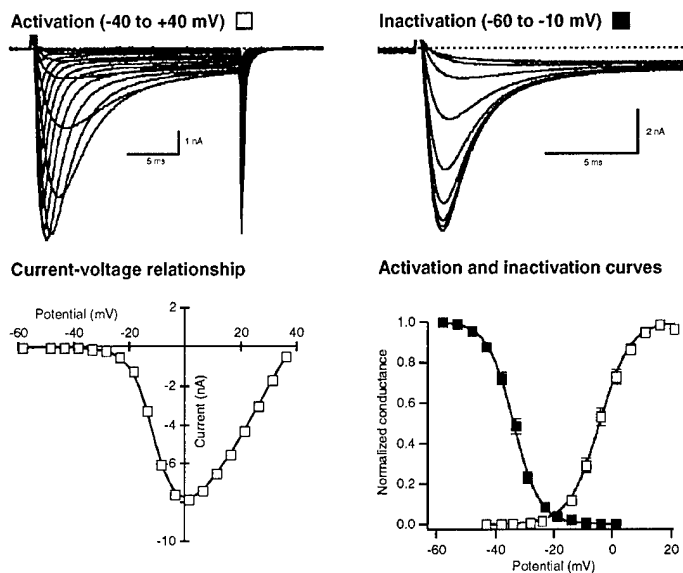


**Figure 4. TTX-resistant sodium currents recorded from mouse DRG neurons**

*Upper right:* Family of currents evoked by depolarizing pulses. *Lower left:* Current voltage relationship. *Upper right:* Currents evoked with the inactivation voltage protocol. *Lower right:* Steady state activation and inactivation curves.



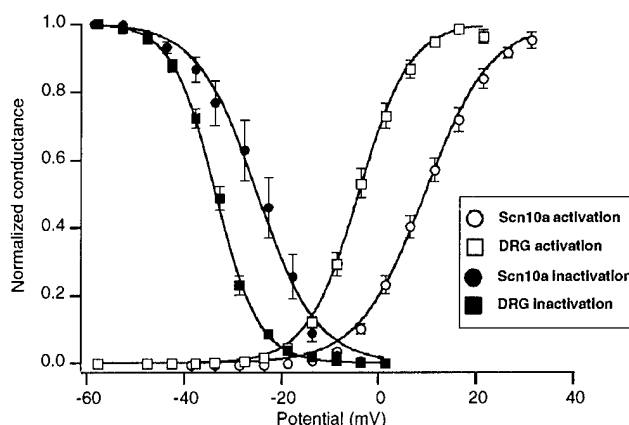
Tetrodotoxin-resistant sodium currents were also recorded from acutely isolated mouse DRG neurons. The goal of these studies was to compare the heterologously expressed channels with natively expressed channels. An example of such currents is shown above (Figure 4.)

Comparison of heterologously and natively expressed TTX-resistant sodium channels revealed that depolarizing shifts in both the activation and inactivation curves of the cloned channels. Analyses of individual neurons are included in the Appendix (D and E). Mean activation and inactivation curves are depicted in Figure 5.

**Figure 5. Mean activation and inactivation curves for natively and heterologously expressed TTX-R Na<sup>+</sup> channels.**

Activation and inactivation curves were fit to the following equation:

$$G(V) = \frac{G_{\max}}{1 + \exp[(V-V_h)/k]}$$



A summary of the mean activation and inactivation parameters derived from the nonlinear regression analyses is shown in Table 1.

**Table 1.**

|               | Activation                        |                       | Inactivation                        |                         |
|---------------|-----------------------------------|-----------------------|-------------------------------------|-------------------------|
|               | V <sub>h<sub>act</sub></sub> (mV) | k <sub>act</sub> (mV) | V <sub>h<sub>inact</sub></sub> (mV) | k <sub>inact</sub> (mV) |
| <b>DRG</b>    | -4.3 ± 0.9 (9)                    | 5.0 ± 0.2 (9)         | -34.0 ± 0.6 (9)                     | 4.3 ± 0.2 (9)           |
| <b>Scn10a</b> | 9.4 ± 1.1 (9)**                   | 6.4 ± 0.4 (9)**       | -25.2 ± 2.2 (4)                     | 5.6 ± 0.5 (4)           |

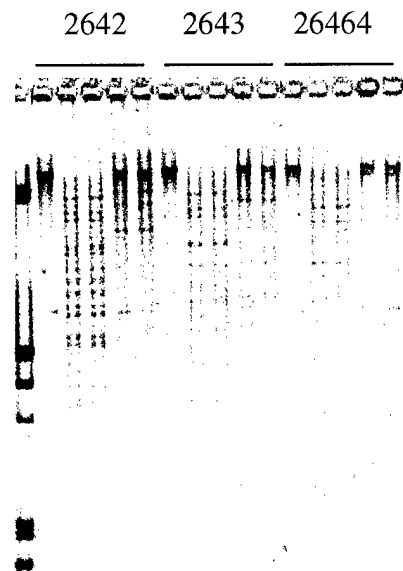
### C. Identification of BAC (bacterial artificial chromosome) clones harboring the Scn10a gene

The absolute size of the promoter for the Scn10a gene is unknown. Since other Na<sup>+</sup> channel genes are regulated by promoters that span greater than 50 kb of genomic DNA, we reasoned that the Scn10a gene promoter may also be very large. To increase the likelihood of isolating the entire promoter, we chose to screen a mouse genomic BAC library prepared by Incyte Genomics. BAC (Bacterial Artificial Chromosome) libraries

are constructed in specialized plasmid vectors that stably maintain greater than 125 kb of contiguous cloned genomic DNA, and are well-suited for cloning projects where large stretches of genomic DNA need to be examined. Three BAC clones (#26462, #26463, and #26464) were identified in a PCR-based screen using oligonucleotide primers specific to exon 1 of the *Scn10a* gene.

The clones are currently being analyzed to determine the extent of 5'-flanking DNA (which contains the promoter) carried on each. Preliminary analysis of the three BAC clones by restriction endonuclease analysis indicates that the clones contain contiguous overlapping stretches of mouse genomic DNA containing an undetermined amount of exonic/intronic DNA and 5'-flanking DNA of the *Scn10a* gene. Pulsed field gel electrophoresis (PFGE) of the clones shows that they are similar, but not identical, in size and are greater than 150 kb (Figure 6). To determine the extent of 5'-untranslated DNA carried on each BAC clone, we are in the process of modifying each clone to contain a unique restriction site, *Swa*I and/or *Ceu*I, just upstream of the ATG translation codon of the *Scn10a* gene. Digestion of the modified BAC clones at the unique *Not*I site in the pBeloBAC II cloning vector and the *Swa*I and/or *Ceu*I site will release a segment of the BAC DNA corresponding to the 5'-flanking DNA, which will then be sized by PFGE. Incorporation of the *Swa*I and *Ceu*I sites into each BAC clone is being done using a modified protocol first described in Yang et al. (1997).

**Figure 6. Restriction enzyme digestion of BAC DNA.** Digestion of the three BAC clones with *Bam*HI or *Sal*I is shown. Lane 1 contains high-molecular weight  $\lambda$  markers



The modification of the BAC clones will also allow us to examine the *Scn10a* gene promoter in transfected primary neurons as the coding sequence for the enhanced green fluorescent protein (EGFP) will simultaneously be placed immediately downstream of the 5'-flanking region. Expression of the EGFP gene under control of the *Scn10a* gene promoter is expected to provide a very sensitive read-out of this promoter's activity. In this protocol, a specialized shuttle vector is first constructed *in vitro* that carries a small segment of the 5'-flanking sequence of the *Scn10a* gene fused to the EGFP gene in the shuttle vector PLD53PA (Figure 7). The shuttle vector is next recombined *in vivo*

adjacent to the 5'-flanking sequence of the Scn10a gene on the BAC clone, creating a Scn10a promoter-IRES I EGFP fusion in the BAC clone. We have determined the DNA sequence of approximately 900 bp of the 5-flanking region of the Scn10a gene by direct sequence analysis of one of the BACs (Appendix F). We have constructed appropriate pairs of forward and reverse oligonucleotide primers that will be used to amplify by the PCR an approximately 600 bp subfragment (Figure 8). This 600 bp subfragment will be subcloned into the multiple cloning site of the shuttle vector PLD53PA via the NotI and SmaI sites incorporated into the forward and reverse primers. Recombination of the shuttle vector into the BAC DNA will occur at the second IRES I EGFP-PA sequence in PLD53PA. The SacB gene in this vector provides for sucrose-counterselection to select for BAC recombinants that have undergone a recombination event resulting in a final BAC clone containing a stably-integrated Scn10a promoter-EGFP fusion. The resulting BAC clones will retain whatever 5'-flanking DNA that was carried on the unmodified BACs, only fused to IRES I EGFP.

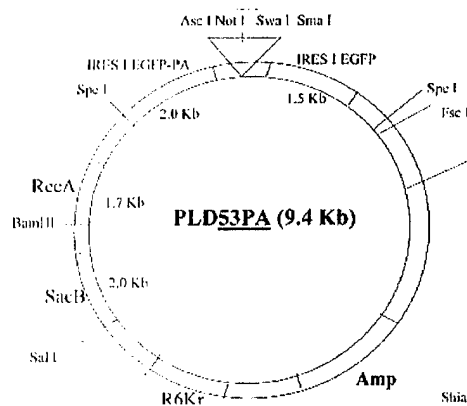
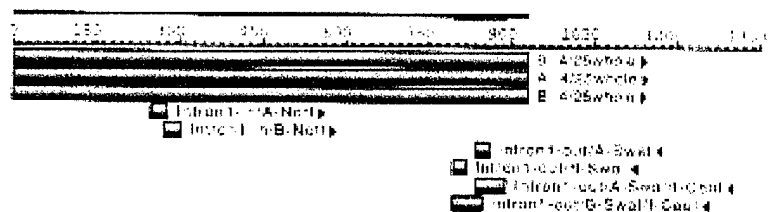


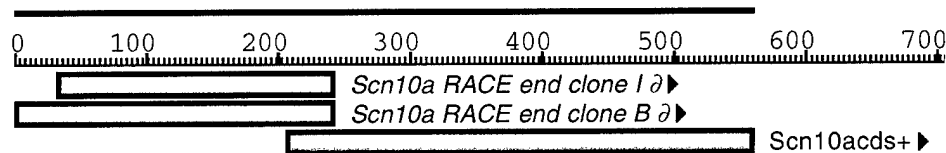
**Figure 8. Schematic of the 900 bp 5'-flanking DNA and location of PCR primers.** Sets of forward and reverse primers to amplify a 600 bp subregion for insertion into PLD53PA are shown. The specific restriction sites incorporated into each primer is indicated.



**5' RACE Analysis** was performed on mRNA isolated using the cellulose based SV total RNA and polyAtract® mRNA isolation systems from Promega. The mRNA was reverse transcribed to first strand cDNA using the Advantage™ RT for PCR kit from Clontech. The cDNA was then used in the SMART™ RACE cDNA Amplification kit (Clontech) in which the general first strand cDNA synthesis step was followed by a single round of PCR with a universal adaptor primer and a gene specific primer. The gene specific primer was designed to include a portion of the coding sequence for verification

of the authenticity of the product by sequence comparison. Products were visualized and fractionated from a 2.0 % agarose gel stained with ethidium bromide and cloned into the sequencing vector pGEM-T Easy™ (Promega) as per the manufacturer's directions. Sequencing was performed using an ABI 310 and 377 automated sequencer. The reactions produced a number of fragments possibly depending on the number of transcription start sites and the integrity of the cDNA or the mRNA from which it was constructed. The sequences of the resulting RACE products and primers are found in appendix G. A schematic of the two longest clones (B and I) aligned to the 5' end of the *Scn10a* coding sequence is shown in figure 9.

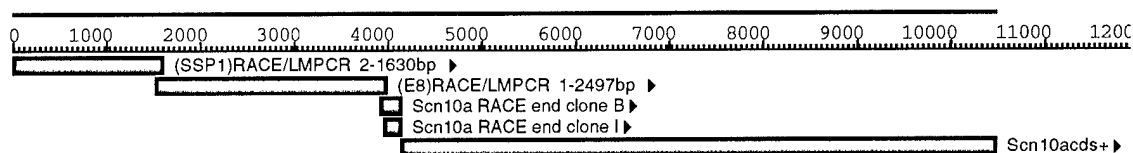
**Figure 9:** Alignment of the RACE products B and I to the 5' end of the *Scn10a* coding sequence



**LM-PCR** was performed with the use of the Genomewalking™ kit from Clontech. Primers (custom made by Gibco/BRL) were designed to extend into regions of genomic DNA in a 5' direction from the end of the *Scn10a* gene. The kit supplies genomic DNA cut with blunt end restriction enzymes to which an adaptor has been ligated. The kit supplies primers directed to that adaptor. The adaptor primers are used with gene specific primers in primary and nested PCR reactions. A polymerase mix consisting of *Tth* polymerase and a proofreading polymerase allow

for the high fidelity amplification of fragments up to 6 kb. PCR fragments from the library or libraries yielding a significant size and purity were further purified from agarose gels and cloned into a sequencing vector (pGEM-T easy™ vector (Promega)) as per the manufacturer's directions. Sequencing was performed using an ABI 310 and 377 automated sequencers. LM-PCR was performed outward from the first protein coding exon about 920 bp into an intron located upstream from this exon and from the upstream ends of the RACE reaction products about 4.0 kb into what we hope is the promoter region of the *Scn10a* gene. The resulting sequences and primers for the LM-PCR into the 5'UTR intron and the LM-PCR out from the RACE product sequences can be found in appendices H and I respectively. The 4.0 kb fragment was constructed in two steps as shown in figure 10 and is currently being cloned into the EGFP-N1 reporter vector (Clontech) for screening promoter activity. Figure 10 also shows orientation of the 4.0kb fragment with respect to the coding sequence and the 5' RACE products.

**Figure 10:** Schematic of RACE followed by 2 rounds of LM-PCR (upstream 5' UTR intron has been bypassed: LM-PCR = genomic sequence/RACE and *Scn10a* cds are mRNA based.)



**Genomic screening** was performed through Incyte Genomics (Palo Alto, CA). The screening was of a mouse genomic library constructed in bacterial artificial chromosomes. The method of screening was PCR based, and primers were designed to the 5' coding sequence (first coding exon) from previously reported sequence information on the mouse genomic sequence (Souslova *et al.*). The screening process identified three unique BAC clones. Many introns have been identified in the mouse genomic Scn10a clone. Introns, generally, are regions of DNA sequence that interrupt the protein-coding portion of a gene. They are spliced out following transcription to yield a continuous coding mRNA. Coding exons on the 5' and 3' ends of the Scn10a gene were used as separate templates for secondary screening of the positives clones we received. The identification of clones yielding positive results for each primer set indicated the presence of the intact coding portion of the gene plus any introns in all three clones. The primers used to PCR screen the mouse genomic library and the sequence of the resulting PCR product are shown in appendix J.

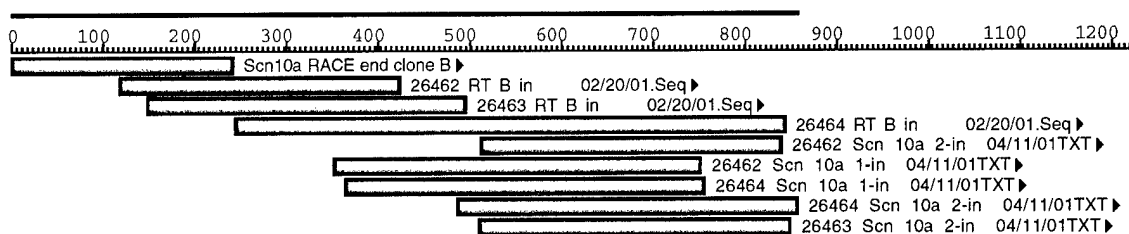
**Genomic sequencing** was performed on the three clones upon arrival. Clones were supplied as glycerol stocks. The stocks were plated and individual clones were selected with the primers used for the screening protocol to ensure a homogeneous population for future work. We have found that extensive sequencing of the BAC clones is possible with only minor modifications to the protocol supplied with the Perkin Elmer Sequencing kit designed for the ABI 310 and 377 sequence analyzer. The modification involves an increase (10 fold) of DNA template concentration. Initial sequencing with primers directed toward distant regions of the gene such as the 3' and 5' ends were performed as mentioned above to establish the extent of the gene contained in the insert. We have also identified the ends of our RACE reaction and LM-PCR from the RACE reaction products in all three clones indicating that a fair amount of genomic sequence is present beyond the coding exons. Restriction mapping of the BAC clones is also currently underway using a combination of blotting and PCR. Figure 11 contains primer information (A) and alignments of the various regions upon which we have focused in characterizing how intact our BAC clones are with respect to the Scn10a gene. Figure 11 B and C shows sequencing into the 5'UTR intron from both downstream and upstream directions. Figure 11 D shows the direct sequencing of the 3' end of the coding sequence and 11 E shows the direct sequencing of the 5' end of the LM-PCR from RACE products. These figures combined show the presence of the entire coding region of the gene on our BAC clones as well as at least ~4.0 kb above the RACE ends or putative transcriptional start site.

**Figure 11:** Direct sequencing of BAC clones 26462/26463/26464:

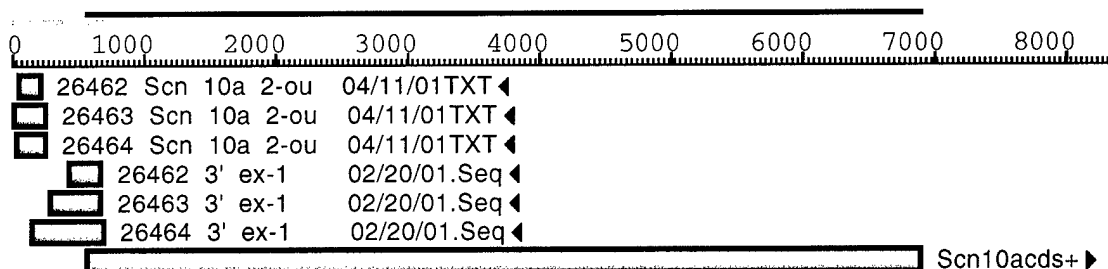
**A: Primers:**

GTGTAAGTTTCGCAGAGCTGGGGTC-RT B in  
 TCATGGACAAAGCGTAAGTGC- Scn10a Intron-in1  
 CCTGCATGCTCTACCAAGTCG- Scn10a Intron-in2  
 GGTGACAGCCTGACCACTGC- Scn10a Intron-out1  
 GCTTTGTAAGAAGCTCCATCC- Scn10a Intron-out2  
 CCTGTGTGTGCTGTAAAAAGGATC - 3' EX-1

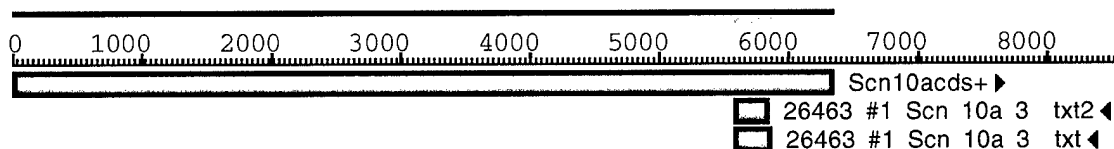
**B: Sequencing direct in into 5'UTR intron**



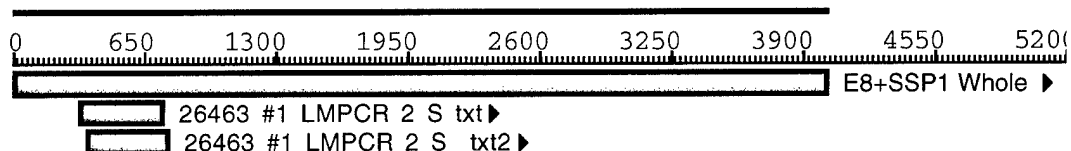
**C: Sequencing direct out into 5'UTR intron**



**D: 3' end of coding sequence found in all three BAC clones (only BAC clone #26463 shown-sequenced twice txt and txt2)**



**E: 5' end of combined LM-PCR from RACE products (only BAC clone #26463 shown-sequenced twice txt and txt2)**



## **Key Research Accomplishments**

- **Cloning and sequencing of the mouse Scn10a cDNA**
- **Functional heterologous expression of mouse Scn10a cDNA in sympathetic neurons**
- **Biophysical characterization of sodium currents arising from Scn10a expression**
- **Cloning and sequencing of 4 Kbp of upstream genomic DNA containing putative promoter elements**
- **Identification of BAC (bacterial artificial chromosome) clones harboring the Scn10a gene**

## Reportable Outcomes

### Abstracts:

1. Ikeda, S.R., King, M.M., Aronstam, R.S. and Puhl, H.L. Cloning and expression of cDNA encoding a tetrodotoxin-resistant (TTX-R) sodium channel (Scn10a) from mouse dorsal root ganglion neurons. *Experimental Biology Meeting*, 2001.
2. Puhl, H.L., King, M.M., Aronstam, R.S. and Ikeda, S.R. Cloning and functional characterization of mouse cDNA encoding a tetrodotoxin-resistant (TTX-R) sodium channel (Scn10a). *Soc. Neurosci. Abstr.*, 2001.

## Conclusions

- a. A murine ortholog of the TTX-resistant sodium channel Scn10a (SNS/PN3) was cloned from mouse DRG neuron mRNA using the PCR.
- b. The predicted protein sequence is highly homologous to the rat, dog, and human Scn10a gene product. Surprisingly, the nucleotide sequence deviates significantly from a published mouse genomic sequence perhaps suggesting a gene duplication.
- c. Intranuclear injection of the cloned cDNA into rat sympathetic neurons results in robust TTX-R sodium currents with kinetics characteristic of TTX-R sodium currents recorded from mouse DRG neurons.
- d. Steady-state inactivation and activation curves for the heterologously expressed Scn10a sodium current were shifted toward more positive potentials when compared with native DRG TTX-R sodium currents. This suggests that accessory proteins or post-translational modifications may be required to recapitulate the native phenotype.

## References

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## Appendix A

### Mouse Scn10a cDNA nucleotide sequence

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      10      20      30      40      50      60
ATG GAG TTC CCC TTT GGG TCC GTG GGA ACT ACC AAC TTC AGA CGG TTC ACT CCA GGG TCG
M   E   F   P   F   G   S   V   G   T   T   N   F   R   R   F   T   P   G   S>

      70      80      90     100     110     120
CTG GCA GAG ATC GAG AAG CAG ATC GCT GCC CAC CGC GCC GCC AAG AAG GGC AGA CCT AAG
L   A   E   I   E   K   Q   I   A   A   H   R   A   A   K   K   G   R   P   K>

     130     140     150     160     170     180
CAA AGA GGA CAG AAG GAC AAG AGT GAG AAG CCC AGG CCT CAG TTG GAC TTG AAG GCC TGT
Q   R   G   Q   K   D   K   S   E   K   P   R   P   Q   L   D   L   K   A   C>

     190     200     210     220     230     240
AAC CAG CTG CCC AGG TTC TAT GGC GAG CTC CCA GCA GAG CTG GTC GGG GAG CCC CTG GAG
N   Q   L   P   R   F   Y   G   E   L   P   A   E   L   V   G   E   P   L   E>

     250     260     270     280     290     300
GAC CTG GAT CCT TTC TAC AGC ACA CAC CGG ACA TTC ATA GTG TTG GAT AAA AGC AGG ACC
D   L   D   P   F   Y   S   T   H   R   T   F   I   V   L   D   K   S   R   T>

     310     320     330     340     350     360
ATT TCC AGA TTC AGT GCC ACT TGG GCT CTG TGG CTC TTC AGT CCC TTC AAC CTG ATC AGA
I   S   R   F   S   A   T   W   A   L   W   L   F   S   P   F   N   L   I   R>

     370     380     390     400     410     420
AGA ACA GCC ATC AAA GTG TCC GTC CAC TCC TGG TTC TCC ATA TTT ATC ACT GTC ACT ATT
R   T   A   I   K   V   S   V   H   S   W   F   S   I   F   I   T   V   T   I>

     430     440     450     460     470     480
TTG GTC AAC TGT GTG TGC ATG ACC CGA ACT GAT CTT CCA GAG AAA CTC GAG TAT GCC TTC
L   V   N   C   V   C   M   T   R   T   D   L   P   E   K   L   E   Y   A   F>

     490     500     510     520     530     540
ACT GTT GTT TAC ACC TTC GAG GCT CTG ATA AAG ATA CTG GCA AGA GGG TTT TGT CTA AAT
T   V   V   Y   T   F   E   A   L   I   K   I   L   A   R   G   F   C   L   N>

     550     560     570     580     590     600
GAA TTC ACT TAT CTT CGA GAT CCC TGG AAC TGG CTG GAC TTC AGT GTC ATT ACC CTG GCG
E   F   T   Y   L   R   D   P   W   N   W   L   D   F   S   V   I   T   L   A>

     610     620     630     640     650     660
TAT GTG GGT GCA GCG ATA GAC CTC CGA GGA ATC TCA GGC CTG CGG ACA TTC CGA GTT CTC
Y   V   G   A   A   I   D   L   R   G   I   S   G   L   R   T   F   R   V   L>

     670     680     690     700     710     720
AGG GCC CTG AAG ACT GTT TCT GTG ATC CCA GGA CTG AAG GTC ATC GTG GGA GCC CTG ATC
R   A   L   K   T   V   S   V   I   P   G   L   K   V   I   V   G   A   L   I>

     730     740     750     760     770     780
CAC TCA GTG AGG AAG CTG GCC GAC GTG ACC ATC CTC ACA GTC TTC TGC CTG AGT GTC TTT
H   S   V   R   K   L   A   D   V   T   I   L   T   V   F   C   L   S   V   F>

     790     800     810     820     830     840
GCC TTG GTG GGC CTG CAG CTC TTC AAG GGG AAC CTC AAG AAT AAA TGC ATT AAG AAC GGC
A   L   V   G   L   Q   L   F   K   G   N   L   K   N   K   C   I   K   N   G>

     850     860     870     880     890     900
ACA GAT CCG CAC AAG GCT GAC AAT CTC TCA TCT GAA ATG GCA GGA GAC ATC TTC ATC AAG
T   D   P   H   K   A   D   N   L   S   S   E   M   A   G   D   I   F   I   K>

     910     920     930     940     950     960
CCC GGT ACT ACG GAT CCC TTG TTG TGT GGC AAT GGA TCT GAT GCT GGC CAC TGC CCT AAT
P   G   T   T   D   P   L   L   C   G   N   G   S   D   A   G   H   C   P   N>

     970     980     990    1000    1010    1020
GAT TAT GTC TGC CGG AAA ACT TCT GAC AAC CCG GAT TTT AAC TAC ACC AGC TTT GAT TCC
D   Y   V   C   R   K   T   S   D   N   P   D   F   N   Y   T   S   F   D   S>

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1030            1040            1050            1060            1070            1080  
TTC GCG TGG GCG TTC CTC TCA CTG TTC CGT CTC ATG ACG CAG GAC TCC TGG GAA CGG CTG  
F A W A F L S L F R L M T Q D S W E R L>  
  
          1090            1100            1110            1120            1130            1140  
TAC CAG CAG ACA CTC CGG GCT TCC GGG AAA ATG TAC ATG GTC TTT TTT GTG CTG GTC ATC  
Y Q Q T L R A S G K M Y M V F F V L V I>  
  
          1150            1160            1170            1180            1190            1200  
TTC CTT GGA TCA TTC TAC CTG GTC AAT TTG ATC TTG GCT GTG GTC ACC ATG GCA TAT GAG  
F L G S F Y L V N L I L A V V T M A Y E>  
  
          1210            1220            1230            1240            1250            1260  
GAA CAG AGC CAG GCA ACA ATT GCA GAA ATC GAA GCC AAG CAG AAG AAG TTC AAG GAA TCG  
E Q S Q A T I A E I E A K E K K K F K E A>  
  
          1270            1280            1290            1300            1310            1320  
CTC GAG GTG CTG CAG AAA GAA CAG GAG GTG CTG GCA GCG CTG GGC ATT GGC ACA ACC TCG  
L E V L Q K A E Q E V L A A L G I G T T S>  
  
          1330            1340            1350            1360            1370            1380  
CTC TAT TCC CAC AAC GGA TCA CCC TTA GCC CCC AAA AAC GCC AAT GAG AGA AGA CCC AGG  
L Y S H N G A S P L A P K N A N E R R P R>  
  
          1390            1400            1410            1420            1430            1440  
GTG AAA TCA AGG ATG TCA GAA GGC TCG ACA GAT GAC AAC AGA TCA CTA CAA TCC GAC CCT  
V K S R M S E G S T D D N R S L Q S D P>  
  
          1450            1460            1470            1480            1490            1500  
TAC AAC CAG CGC AGG ATG TCT TTC CTA GGC CTT TCT TCT GGA AGA CGC AGG GCT AGC CAC  
Y N Q R R M S F L G L S S G R R R A S H>  
  
          1510            1520            1530            1540            1550            1560  
AGC AGT GTG TTC CAC TTC CGA GCA CCC AGC CAA GAC GTC TCA TTT CCT GAT GGG ATC TTG  
S S V F H F R A P S Q D V S F P D G I L>  
  
          1570            1580            1590            1600            1610            1620  
GAT GAC GGG GTC TTT CAT GGA GAT CAG GAA AGC CGT CGA AGT TCC ATA TTG CTG GGC AGG  
D D G V F H G D Q E S R R S S I L L G R>  
  
          1630            1640            1650            1660            1670            1680  
GGT GCC GGG CAG GCA GGT CCT CTC CCC AGG AGT CCA CTG CCT CAG TCC CCC AAC CCT GGC  
G A G Q A G P L P R S P L P Q S P N P G>  
  
          1690            1700            1710            1720            1730            1740  
CCT AGA CGT GGA GAA GAG GGA CAG CGT GGA GTG CCC ACT GGT GAG CTT GCC ACT GGA GCG  
P R R G E E G Q R G V P T G E L A T G A>  
  
          1750            1760            1770            1780            1790            1800  
CCT GAA GGC CCG GCA CTC GAT GCT GCA GGA CAG AAG AAC TTC CTG TCT GCA GAC TAC TTG  
P E G P A L D A A G Q K N F L S A D Y L>  
  
          1810            1820            1830            1840            1850            1860  
AAT GAA CCT TTC CGA GCA CAG AGG GCA ATG AGT GTT GTC AGT ATT ATG ACT TCT GTC ATT  
N E P F R A Q R A M S V V S I M T S V I>  
  
          1870            1880            1890            1900            1910            1920  
GAG GAG CTG GAA GAG TCT AAG CTG AAG TGC CCA CCC TGC TTG ATC AGC TTA GCC CAG AAG  
E E L E E S K L K C P P C L I S L A Q K>  
  
          1930            1940            1950            1960            1970            1980  
TAC CTG ATA TGG GAG TGC TGC CCC AAG TGG AAG AAA TTC AAG ATG GTG CTC TTC GAG CTG  
Y L I W E C C P K W K K F K M V L F E L>  
  
          1990            2000            2010            2020            2030            2040  
GTG ACT GAC CCC TTC GCA GAG CTC ACC ATC ACC CTG TGC ATT GTG GTG AAT ACC GTC TTC  
V T D P F A E L T I T L C I V V N T V F>  
  
          2050            2060            2070            2080            2090            2100  
ATG GCC ATG GAA CAC TAC CCC ATG ACT GAT GCC TTC GAT GCC ATG CTC CAA GCC GGC AAC  
M A M E H Y P M T D A F D A M L Q A G N>

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| ATT | GTC | TTT | ACT | GTG | TTT | TTT | ACA | ATG | GAG | ATG | GCC | TTC | AAG | ATC | ATT | GCC | TTC | GAC | CCC | 2160 |
| I   | V   | F   | T   | V   | F   | F   | T   | M   | E   | M   | A   | F   | K   | I   | I   | A   | F   | D   | P   | >    |
| TAC | TAC | TAC | TTC | CAG | AAG | AAG | TGG | AAC | ATC | TTC | GAC | TGT | GTC | ATC | GTC | ACC | GTG | AGC | CTG | 2220 |
| Y   | Y   | Y   | F   | Q   | K   | K   | W   | N   | I   | F   | D   | C   | V   | I   | V   | T   | V   | S   | L   | >    |
| CTG | GAG | CTG | AGC | ACA | TCC | AAG | AAG | GGC | AGC | TTG | TCT | GTG | CTC | CGC | ACC | TTC | CGC | TTG | CTT | 2280 |
| L   | E   | L   | S   | T   | S   | K   | K   | G   | S   | L   | S   | V   | L   | R   | T   | F   | R   | L   | T   | >    |
| CGG | GTC | TTC | AAG | CTG | GCC | AAG | TCC | TGG | CCC | ACC | CTG | AAC | ATG | CTC | ATC | AAG | ATC | ATC | TTC | 2340 |
| R   | V   | F   | K   | L   | A   | K   | S   | W   | P   | T   | L   | N   | M   | L   | I   | K   | I   | I   | G   | >    |
| AAC | TCT | GTG | GGG | GCC | CTG | GGC | AAC | CTG | ACC | TTC | ATC | CTG | GCC | ATC | ATC | GTG | TTT | ATC | TTC | 2400 |
| N   | S   | V   | G   | A   | L   | G   | N   | L   | T   | F   | I   | L   | A   | I   | I   | V   | F   | I   | F   | >    |
| GCC | CTG | GTG | GGA | AAG | CAG | CTC | CTC | TCA | GAG | AAC | TAT | GGG | TGC | CGC | AGG | GAT | GGC | ATC | TCC | 2460 |
| A   | L   | V   | G   | K   | Q   | L   | L   | S   | E   | N   | Y   | G   | C   | R   | R   | D   | G   | I   | S   | >    |
| GTG | TGG | AAT | GGT | GAG | AGG | CTG | CGC | TGG | CAC | ATG | TGT | GAC | TTC | TTC | CAT | TCC | TTC | CTC | GTC | 2520 |
| V   | W   | N   | G   | E   | R   | L   | R   | W   | H   | M   | C   | D   | F   | F   | H   | S   | F   | L   | V   | >    |
| GTC | TTC | CGG | ATC | CTC | TGC | GGG | GAG | TGG | ATC | GAG | AAC | ATG | TGG | GTC | TGC | ATG | GAG | GTC | AGC | 2580 |
| V   | F   | R   | I   | L   | C   | G   | E   | W   | I   | E   | N   | M   | W   | V   | C   | M   | E   | V   | S   | >    |
| CAG | GAC | TAC | ATC | TGC | CTC | ACC | CTC | TTC | TTG | ACA | GTG | ATG | GTG | CTA | GGC | AAC | CTG | GTG | GTG | 2640 |
| Q   | D   | Y   | I   | C   | L   | T   | L   | F   | L   | T   | V   | M   | V   | L   | G   | N   | L   | V   | V   | >    |
| CTC | AAC | CTA | TTC | ATC | GCT | TTA | CTG | CTG | AAC | TCC | TTC | AGT | GCG | GAC | AAC | CTC | ACA | GCC | CCA | 2700 |
| L   | N   | L   | F   | I   | A   | L   | L   | L   | N   | S   | F   | S   | A   | D   | N   | L   | T   | A   | P   | >    |
| GAG | GAT | GAC | GGG | GAG | GTG | AAC | AAC | TTG | CAG | GTA | GCA | CTG | GCC | CGG | ATT | CAG | GTA | TTT | GGC | 2760 |
| E   | D   | D   | G   | E   | V   | N   | N   | L   | Q   | V   | A   | L   | A   | R   | I   | Q   | V   | F   | G   | >    |
| CAT | CGG | GCC | AGT | CGG | GCC | ATT | ACC | AGT | TAC | ATC | AGA | AGC | CAC | TGC | CGG | CTC | CGC | TGG | CCC | 2820 |
| H   | R   | A   | S   | R   | A   | I   | T   | S   | Y   | I   | R   | S   | H   | C   | R   | L   | R   | W   | P   | >    |
| AAG | GTG | GAG | ACC | CAG | CTG | GGG | ATG | AAA | CCC | CCA | CTC | ACC | AGC | TGC | AAA | GCT | GAG | AAC | CAC | 2880 |
| K   | V   | E   | T   | Q   | L   | G   | M   | K   | P   | P   | L   | T   | S   | C   | K   | A   | E   | N   | H   | >    |
| ATT | GCT | ACT | GAT | GCT | GNC | AAT | GCT | GCA | GTG | GGG | AAC | CAG | GCA | AAG | CCA | GCT | CTT | GGT | GGC | 2940 |
| I   | A   | T   | D   | A   | X   | N   | A   | A   | V   | G   | N   | Q   | A   | K   | P   | A   | L   | G   | G   | >    |
| CCC | AAG | GAG | AAC | CAC | GGG | GAC | TTC | ATC | ACT | GAT | CCT | AAC | GTG | TGG | GTC | TCT | GTG | CCC | ATT | 3000 |
| P   | K   | E   | N   | H   | G   | D   | F   | I   | T   | D   | P   | N   | V   | W   | V   | S   | V   | P   | I   | >    |
| GCT | GAG | GGG | GAG | TCC | GAC | CTT | GAT | GAG | CTC | GAG | GAA | GAT | GTG | GAG | CAT | GCT | TCT | CAG | AGC | 3060 |
| A   | E   | G   | E   | S   | D   | L   | D   | E   | L   | E   | E   | D   | V   | E   | H   | A   | S   | Q   | S   | >    |
| TCC | TGG | CAG | GAA | GAG | AGC | CCC | AAA | GGG | CAG | GAG | CTG | CTG | CAG | CAA | GTC | CAA | AAG | TGT | GAA | 3120 |
| S   | W   | Q   | E   | E   | S   | P   | K   | G   | Q   | E   | L   | L   | Q   | Q   | V   | Q   | K   | C   | E   | >    |
| GAT | CAC | CAG | GCA | GCC | CGA | AGC | CCA | CCC | TCC | GGG | ATG | TCC | TCT | GAG | GAC | CTG | GCT | CCA | TAC | 3180 |
| D   | H   | Q   | A   | A   | R   | S   | P   | P   | S   | G   | M   | S   | S   | E   | D   | L   | A   | P   | Y   | >    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CTG | GGG | GAG | AGA | TGG | CAG | AGG | GAG | GAG | AGC | CCT | CGG | GTC | CCT | GCC | GAG | GGA | GTG | GAT | GAC |
| L   | G   | E   | R   | W   | Q   | R   | E   | E   | S   | P   | R   | V   | P   | A   | E   | G   | V   | D   | D>  |
| ACA | AGC | TCC | TCC | GAG | GGC | AGC | ACG | GTG | GAC | TGC | CCG | GAC | CCA | GAG | GAG | ATC | CTG | AGG | AAG |
| T   | S   | S   | S   | E   | G   | S   | T   | V   | D   | C   | P   | D   | P   | E   | E   | I   | L   | R   | K>  |
| ATC | CCT | GAG | CTG | GCG | GAG | GAG | CTG | GAC | GAG | CCC | GAT | GAC | TGT | TTC | CCA | GAA | GGC | TGC | ACT |
| I   | P   | E   | L   | A   | E   | E   | L   | D   | E   | P   | D   | D   | C   | F   | P   | E   | G   | C   | T>  |
| CGC | CGC | TGT | CCC | TGC | TGC | AAA | GTG | AAC | ACC | AGT | AAG | TTT | CCT | TGG | GCC | ACG | GGC | TGG | CAG |
| R   | R   | C   | P   | C   | C   | K   | V   | N   | T   | S   | K   | F   | P   | W   | A   | T   | G   | W   | Q>  |
| GTG | CGC | AAA | ACC | TGT | TAC | CGC | ATT | GTG | GAG | CAC | AGC | TGG | TTT | GAG | AGT | TTT | ATT | ATC | TTC |
| V   | R   | K   | T   | C   | Y   | R   | I   | V   | E   | H   | S   | W   | F   | E   | S   | F   | I   | I   | F>  |
| ATG | ATC | CTG | CTC | AGC | AGT | GGA | GCG | CTG | GCC | TTT | GAG | GAT | AAC | TAC | CTG | GAA | GAA | AAG | CCC |
| M   | I   | L   | L   | S   | S   | G   | A   | L   | A   | F   | E   | D   | N   | Y   | L   | E   | E   | K   | P>  |
| CGA | GTG | AAG | TCT | GTG | CTG | GAG | TAC | ACT | GAC | AGA | GTG | TTC | ACT | TTC | ATC | TTT | GTA | TTC | GAG |
| R   | V   | K   | S   | V   | L   | E   | Y   | T   | D   | R   | V   | F   | T   | F   | I   | F   | V   | F   | E>  |
| ATG | TTG | CTC | AAG | TGG | GTA | GCT | TAT | GGC | TTT | AAA | AAA | TAT | TTT | ACC | AAT | GCC | TGG | TGC | TGG |
| M   | L   | L   | K   | W   | V   | A   | Y   | G   | F   | K   | K   | Y   | F   | T   | N   | A   | W   | C   | W>  |
| CTG | GAC | TTC | CTC | ATC | GTG | AAT | ATC | TCC | CTC | ACA | AGC | CTC | ATA | GCC | AAG | ATC | CTC | GAG | TAT |
| L   | D   | F   | L   | I   | V   | N   | I   | S   | L   | T   | S   | L   | I   | A   | K   | I   | L   | E   | Y>  |
| TCA | GAC | GTG | GCG | TCC | ATC | AAA | GCC | CTT | CGG | ACT | CTC | CGT | GCC | CTC | CGG | CCG | CTG | CGG | GCT |
| S   | D   | V   | A   | S   | I   | K   | A   | L   | R   | T   | L   | R   | A   | L   | R   | P   | L   | R   | A>  |
| CTG | TCT | CGA | TTC | GAA | GGC | ATG | AGG | GTA | GTG | GTG | GAT | GCC | TTG | GTG | GGC | GCC | ATT | CCC | TCC |
| L   | S   | R   | F   | E   | G   | M   | R   | V   | V   | V   | D   | A   | L   | V   | G   | A   | I   | P   | S>  |
| ATC | ATG | AAC | GTC | CTC | CTC | GTC | TGC | CTC | ATC | TTC | TGG | CTC | ATC | TTC | AGC | ATC | ATG | GGT | GTG |
| I   | M   | N   | V   | L   | L   | V   | C   | L   | I   | F   | W   | L   | I   | F   | S   | I   | M   | G   | V>  |
| AAC | CTC | TTC | GCC | GGG | AAA | TTT | TCG | AGA | TGT | GTC | GAC | ACC | AGA | AGC | AAC | CCA | TTT | TCC | GTC |
| N   | L   | F   | A   | G   | K   | F   | S   | R   | C   | V   | D   | T   | R   | S   | N   | P   | F   | S   | V>  |
| GTG | AAT | TCG | ACA | TTC | GTG | ACT | AAC | AAG | TCT | GAC | TGT | TAC | AAT | CAA | AAC | AAT | ACT | GGC | CAC |
| V   | N   | S   | T   | F   | V   | T   | N   | K   | S   | D   | C   | Y   | N   | Q   | N   | N   | T   | G   | H>  |
| TTC | TTC | TGG | GTT | AAC | GTC | AAA | GTC | AAC | TTC | GAC | AAC | GTT | GCT | ATG | GGC | TAC | CTC | GCG | CTT |
| F   | F   | W   | V   | N   | V   | K   | V   | N   | F   | D   | N   | V   | A   | M   | G   | Y   | L   | A   | L>  |
| CTC | CAG | GTG | GCA | ACC | TTC | AAA | GGC | TGG | ATG | GAC | ATT | ATG | TAT | GCA | GCT | GTC | GAT | TCT | CGA |
| L   | Q   | V   | A   | T   | F   | K   | G   | W   | M   | D   | I   | M   | Y   | A   | A   | V   | D   | S   | R>  |
| GAT | ATC | AAC | AGT | CAG | CCC | AAT | TGG | GAG | GAG | AGC | CTG | TAC | ATG | TAC | CTA | TAC | TTC | GTC | GTC |
| D   | I   | N   | S   | Q   | P   | N   | W   | E   | E   | S   | L   | Y   | M   | Y   | L   | Y   | F   | V   | V>  |
| TTC | ATC | ATT | TTC | GGT | GGC | TTC | TTC | ACG | CTG | AAT | CTC | TTT | GTC | GGG | GTC | ATC | ATT | GAC | AAC |
| F   | I   | I   | F   | G   | G   | F   | F   | T   | L   | N   | L   | F   | V   | G   | V   | I   | I   | D   | N>  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TTC | AAT | CAA | CAG | AAA | AAA | AAG | CTA | GGG | GGC | CAG | GAC | ATC | TTC | ATG | ACA | GAG | GAG | CAG | AAG |
| F   | N   | Q   | Q   | K   | K   | K   | L   | G   | G   | Q   | D   | I   | F   | M   | T   | E   | E   | Q   | K>  |
| AAG | TAC | TAC | AAT | GCC | ATG | AAG | AAG | CTG | GGC | TCC | AAG | AAA | CCC | CAG | AAG | CCC | ATC | CCA | CGG |
| K   | Y   | Y   | N   | A   | M   | K   | K   | L   | G   | S   | K   | K   | P   | Q   | K   | P   | I   | P   | R>  |
| CCT | TTG | AAT | AAG | TAC | CAG | GGC | TTC | GTG | TTT | GAC | ATT | GTG | ACC | AGG | CAA | GCA | TTT | GAC | ATC |
| P   | L   | N   | K   | Y   | Q   | G   | F   | V   | F   | D   | I   | V   | T   | R   | Q   | A   | F   | D   | I>  |
| ATC | ATC | ATG | GCT | CTC | ATC | TGC | CTC | AAC | ATG | ATC | ACC | ATG | ATG | GTG | GAG | ACC | GAC | AAT | CAG |
| I   | I   | M   | A   | L   | I   | C   | L   | N   | M   | I   | T   | M   | M   | V   | E   | T   | D   | N   | Q>  |
| AGC | GAG | GAG | AAG | ACG | AAG | GTC | CTG | GGC | AGA | ATC | AAC | CAG | TTC | TTC | GTG | GCC | GTC | TTC | ACG |
| S   | E   | E   | K   | T   | K   | V   | L   | G   | R   | I   | N   | Q   | F   | F   | V   | A   | V   | F   | T>  |
| GGC | GAG | TGT | GTG | ATG | AAG | ATG | TTC | GCC | CTT | CGG | CAG | TAT | TAC | TTC | ACC | AAC | GGC | TGG | AAT |
| G   | E   | C   | V   | M   | K   | M   | F   | A   | L   | R   | Q   | Y   | Y   | F   | T   | N   | G   | W   | N>  |
| GTG | TTC | GAC | TTC | ATT | GTG | GTG | ATT | CTG | TCC | ATT | TCT | AGT | CTG | TTG | TTT | TCT | GCG | ATC | CTT |
| V   | F   | D   | F   | I   | V   | V   | I   | L   | S   | I   | S   | S   | L   | L   | F   | S   | A   | I   | L>  |
| AGC | TCA | CTA | GAA | AGT | TAC | TTC | TCC | CCC | ACG | CTC | TTA | CGC | GTC | ATC | CGT | CTG | GCC | AGG | ATC |
| S   | S   | L   | E   | S   | Y   | F   | S   | P   | T   | L   | L   | R   | V   | I   | R   | L   | A   | R   | I>  |
| GGC | CGC | ATC | CTC | AGG | CTG | ATT | CGA | GCA | GCC | AAG | GGG | ATT | CGC | ACG | CTG | CTC | TTC | GCC | CTC |
| G   | R   | I   | L   | R   | L   | I   | R   | A   | A   | K   | G   | I   | R   | T   | L   | L   | F   | A   | L>  |
| ATG | ATG | TCC | CTG | CCC | GCC | CTC | TTC | AAC | ATC | GGC | CTC | CTC | CTC | TTC | CTC | GTC | ATG | TTC | ATC |
| M   | M   | S   | L   | P   | A   | L   | F   | N   | I   | G   | L   | L   | L   | F   | L   | V   | M   | F   | I>  |
| TAC | TCC | ATC | TTC | GGC | ATG | ACC | AGC | TTC | GCT | AAT | GTC | ATA | GAT | GAG | GCT | GGC | ATC | GAC | GAC |
| Y   | S   | I   | F   | G   | M   | T   | S   | F   | A   | N   | V   | I   | D   | E   | A   | G   | I   | D   | D>  |
| ATG | TTC | AAC | TTC | AAG | ACC | TTT | GGC | AAC | AGC | ATG | CTG | TGC | CTT | TTC | CAG | ATC | ACC | ACG | TCG |
| M   | F   | N   | F   | K   | T   | F   | G   | N   | S   | M   | L   | C   | L   | F   | Q   | I   | T   | T   | S>  |
| GCT | GGC | TGG | GAT | GGC | CTC | CTC | AGC | CCC | ATC | CTC | AAC | ACA | GGA | CCC | CCC | TAC | TGC | GAC | CCC |
| A   | G   | W   | D   | G   | L   | L   | S   | P   | I   | L   | N   | T   | G   | P   | P   | Y   | C   | D   | P>  |
| AAC | CGG | CCC | AAC | AGC | AAT | GGC | TCC | AAG | GGG | AAT | TGT | GGA | AGC | CCA | GCG | GTG | GGC | ATC | CTC |
| N   | R   | P   | N   | S   | N   | G   | S   | K   | G   | N   | C   | G   | S   | P   | A   | V   | G   | I   | L>  |
| TTC | TTC | ACC | ACC | TAC | ATC | ATC | ATC | TCC | TTC | CTC | ATC | GTG | GTC | AAC | ATG | TAC | ATT | GCA | GTG |
| F   | F   | T   | T   | Y   | I   | I   | I   | S   | F   | L   | I   | V   | V   | N   | M   | Y   | I   | A   | V>  |
| ATT | CTG | GAG | AAC | TTC | AAT | GTG | GCC | ACA | GAA | GAG | AGC | ACG | GAG | CCC | CTG | AGC | GAG | GAC | GAC |
| I   | L   | E   | N   | F   | N   | V   | A   | T   | E   | E   | S   | T   | E   | P   | L   | S   | E   | D   | D>  |
| TTT | GAC | ATG | TTC | TAT | GAG | ACC | TGG | GAG | AAG | TTT | GAC | CCG | GAG | GCC | ACC | CAG | TTC | ATT | GCC |
| F   | D   | M   | F   | Y   | E   | T   | W   | E   | K   | F   | D   | P   | E   | A   | T   | Q   | F   | I   | A>  |
| TTT | TCT | GCC | CTC | TCA | GAC | TTT | GCA | GAC | ACA | CTC | TCT | GGC | CCT | CTT | AGA | ATC | CCA | AAA | CCT |
| F   | S   | A   | L   | S   | D   | F   | A   | D   | T   | L   | S   | G   | P   | L   | R   | I   | P   | K   | P>  |

|      |     |     |     |     |      |     |     |     |     |      |     |     |     |     |      |     |     |     |     |      |  |  |  |  |      |  |  |  |  |
|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|--|--|--|--|------|--|--|--|--|
| 5350 |     |     |     |     | 5360 |     |     |     |     | 5370 |     |     |     |     | 5380 |     |     |     |     | 5390 |  |  |  |  | 5400 |  |  |  |  |
| AAT  | CAG | AAT | ATA | TTA | ATC  | CAG | ATG | GAC | CTG | CCG  | TTG | GTC | CCC | GGA | GAT  | AAG | ATC | CAC | TGT |      |  |  |  |  |      |  |  |  |  |
| N    | Q   | N   | I   | L   | I    | Q   | M   | D   | L   | P    | L   | V   | P   | G   | D    | K   | I   | H   | C   |      |  |  |  |  |      |  |  |  |  |
| 5410 |     |     |     |     | 5420 |     |     |     |     | 5430 |     |     |     |     | 5440 |     |     |     |     | 5450 |  |  |  |  | 5460 |  |  |  |  |
| TTG  | GAC | ATC | CTC | TTT | GCC  | TTC | ACA | AAG | AAT | GTC  | TTG | GGA | GAA | TCT | GGG  | GAG | TTG | GAT | TCT |      |  |  |  |  |      |  |  |  |  |
| L    | D   | I   | L   | F   | A    | F   | T   | K   | N   | V    | L   | G   | E   | S   | G    | E   | L   | D   | S   |      |  |  |  |  |      |  |  |  |  |
| 5470 |     |     |     |     | 5480 |     |     |     |     | 5490 |     |     |     |     | 5500 |     |     |     |     | 5510 |  |  |  |  | 5520 |  |  |  |  |
| CTG  | AAG | ACT | AAT | ATG | GAA  | GAG | AAG | TTT | ATG | GCA  | ACT | AAT | CTT | TCC | AAA  | GCA | TCC | TAT | GAA |      |  |  |  |  |      |  |  |  |  |
| L    | K   | T   | N   | M   | E    | E   | K   | F   | M   | A    | T   | N   | L   | S   | K    | A   | S   | Y   | E   |      |  |  |  |  |      |  |  |  |  |
| 5530 |     |     |     |     | 5540 |     |     |     |     | 5550 |     |     |     |     | 5560 |     |     |     |     | 5570 |  |  |  |  | 5580 |  |  |  |  |
| CCA  | ATA | GCA | ACC | ACC | CTC  | CGG | TGC | AAG | CAG | GAA  | GAC | ATC | TCA | GCC | ACC  | ATT | ATT | CAA | AAG |      |  |  |  |  |      |  |  |  |  |
| P    | I   | A   | T   | T   | L    | R   | C   | K   | Q   | E    | D   | I   | S   | A   | T    | I   | I   | Q   | K   |      |  |  |  |  |      |  |  |  |  |
| 5590 |     |     |     |     | 5600 |     |     |     |     | 5610 |     |     |     |     | 5620 |     |     |     |     | 5630 |  |  |  |  | 5640 |  |  |  |  |
| GCC  | TAT | CGG | AAC | TAC | ATG  | TTG | CAA | CGC | TCC | TTG  | ATG | CTC | TCC | AAC | CCC  | CTG | CAT | GTG | CCC |      |  |  |  |  |      |  |  |  |  |
| A    | Y   | R   | N   | Y   | M    | L   | Q   | R   | S   | L    | M   | L   | S   | N   | P    | L   | H   | V   | P   |      |  |  |  |  |      |  |  |  |  |
| 5650 |     |     |     |     | 5660 |     |     |     |     | 5670 |     |     |     |     | 5680 |     |     |     |     | 5690 |  |  |  |  | 5700 |  |  |  |  |
| AGG  | GCT | GAG | GAG | GAT | GGC  | GTG | TCA | CTC | CCC | AGG  | GAA | GGC | TAT | GTT | ACA  | TTC | ATG | GCA | AAT |      |  |  |  |  |      |  |  |  |  |
| R    | A   | E   | E   | D   | G    | V   | S   | L   | P   | R    | E   | G   | Y   | V   | T    | F   | M   | A   | N   |      |  |  |  |  |      |  |  |  |  |
| 5710 |     |     |     |     | 5720 |     |     |     |     | 5730 |     |     |     |     | 5740 |     |     |     |     | 5750 |  |  |  |  | 5760 |  |  |  |  |
| GAC  | AAC | GGT | GGG | CTC | CCA  | GAC | AAA | TCG | GAA | ACT  | GCT | TCT | GCT | ACG | TCT  | TTC | CCA | CCA | TCC |      |  |  |  |  |      |  |  |  |  |
| D    | N   | G   | G   | L   | P    | D   | K   | S   | E   | T    | A   | S   | A   | T   | S    | F   | P   | P   | S   |      |  |  |  |  |      |  |  |  |  |
| 5770 |     |     |     |     | 5780 |     |     |     |     | 5790 |     |     |     |     | 5800 |     |     |     |     | 5810 |  |  |  |  | 5820 |  |  |  |  |
| TAT  | GAC | AGC | GTC | ACC | AGG  | GGC | CTG | AGT | GAC | AGG  | GCC | AAC | ATT | AGC | ACA  | TCT | AGC | TCA | ATG |      |  |  |  |  |      |  |  |  |  |
| Y    | D   | S   | V   | T   | R    | G   | L   | S   | D   | R    | A   | N   | I   | S   | T    | S   | S   | S   | M   |      |  |  |  |  |      |  |  |  |  |
| 5830 |     |     |     |     | 5840 |     |     |     |     | 5850 |     |     |     |     | 5860 |     |     |     |     | 5870 |  |  |  |  |      |  |  |  |  |
| CAA  | AAT | GAA | GAT | GAA | GTC  | ACT | GCT | AAG | GAA | GGG  | AAG | AGC | CCT | GGA | CCT  | CAG | TGA |     |     |      |  |  |  |  |      |  |  |  |  |
| Q    | N   | E   | D   | E   | V    | T   | A   | K   | E   | G    | K   | S   | P   | G   | P    | Q   | *   |     |     |      |  |  |  |  |      |  |  |  |  |

## Appendix B

|                   |                                                                                 |    |    |    |
|-------------------|---------------------------------------------------------------------------------|----|----|----|
|                   | 10                                                                              | 20 | 30 | 40 |
| Y09108-cds        | A T G G A G T T C C C C T T T G G G T C C G T G G G A A C T A C C A A C T T C A |    |    |    |
| mScn10a cds (GRI) | A T G G A G T T C C C C T T T G G G T C C G T G G G A A C T A C C A A C T T C A |    |    |    |

|                   |                                                                                 |    |    |    |
|-------------------|---------------------------------------------------------------------------------|----|----|----|
|                   | 50                                                                              | 60 | 70 | 80 |
| Y09108-cds        | G A C G G T T C A C T C C A G A G T C G C T G G C A G A G A T C G A G A A G C A |    |    |    |
| mScn10a cds (GRI) | G A C G G T T C A C T C C A G A G T C G C T G G C A G A G A T C G A G A A G C A |    |    |    |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 90                                                                              | 100 | 110 | 120 |
| Y09108-cds        | G A T C G C T G C C C A C C G C G C C G C C A A G A A G G G C A G A A C T A A G |     |     |     |
| mScn10a cds (GRI) | G A T C G C T G C C C A C C G C G C C G C C A A G A A G G G C A G A A C T A A G |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 130                                                                             | 140 | 150 | 160 |
| Y09108-cds        | C A A A G A G G A C A G A A G G A C A A G A G T G A G A A G C C C A G G C C T C |     |     |     |
| mScn10a cds (GRI) | C A A A G A G G A C A G A A G G A C A A G A G T G A G A A G C C C A G G C C T C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 170                                                                             | 180 | 190 | 200 |
| Y09108-cds        | A G T T G G A C T T G A A G G C C T G T A A C C A G C T G C C C A G G T T C T A |     |     |     |
| mScn10a cds (GRI) | A G T T G G A C T T G A A G G C C T G T A A C C A G C T G C C C A G G T T C T A |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 210                                                                             | 220 | 230 | 240 |
| Y09108-cds        | T G G C G A G C T C C C A G C A G A G C T G G T C G G G G A G C C C C T G G A G |     |     |     |
| mScn10a cds (GRI) | T G G C G A G C T C C C A G C A G A G C T G G T C G G G G A G C C C C T G G A G |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 250                                                                             | 260 | 270 | 280 |
| Y09108-cds        | G A C C T G G A T C C T T T T T A C A G C A C A C A C A G G A C A T T C A T A C |     |     |     |
| mScn10a cds (GRI) | G A C C T G G A T C C T T T T T A C A G C A C A C A C A G G A C A T T C A T A C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 290                                                                             | 300 | 310 | 320 |
| Y09108-cds        | T G T T G A A T A A A A G C A G G A C C A T T T C C A G A T T C A G T G C C A C |     |     |     |
| mScn10a cds (GRI) | T G T T G A A T A A A A G C A G G A C C A T T T C C A G A T T C A G T G C C A C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 330                                                                             | 340 | 350 | 360 |
| Y09108-cds        | T T G G G C T C T G T G G C T C T T C A G T C C C T T C A A C C T G A T C A G A |     |     |     |
| mScn10a cds (GRI) | T T G G G C T C T G T G G C T C T T C A G T C C C T T C A A C C T G A T C A G A |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 370                                                                             | 380 | 390 | 400 |
| Y09108-cds        | A G A A C A G C C A T C A A A G T G T C C G T C C A C T C C T G G T T C T C C A |     |     |     |
| mScn10a cds (GRI) | A G A A C A G C C A T C A A A G T G T C C G T C C A C T C C T G G T T C T C C A |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 410                                                                             | 420 | 430 | 440 |
| Y09108-cds        | T A T T T A T C A C T G T C A C T A T T T T G G T C A A C T G T G T G T G C A T |     |     |     |
| mScn10a cds (GRI) | T A T T T A T C A C T G T C A C T A T T T T G G T C A A C T G T G T G T G C A T |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 490                                                                             | 500 | 510 | 520 |
| Y09108-cds        | A C T G T T G T T T A C A C C T T C G A G G C T C T G A T A A A G A T A C T G G |     |     |     |
| mScn10a cds (GRI) | A C T G T T G T T T A C A C C T T C G A G G C T C T G A T A A A G A T A C T G G |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 530                                                                             | 540 | 550 | 560 |
| Y09108-cds        | C A A G A G G G T T T T G T C T A A A T G A A T T C A C T T A T C T T C G A G A |     |     |     |
| mScn10a cds (GRI) | C A A G A G G G T T T T G T C T A A A T G A A T T C A C T T A T C T T C G A G A |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 570                                                                             | 580 | 590 | 600 |
| Y09108-cds        | T C C C T G G A A C T G G C T G G A C T T C A G T G T C A T T A C C T T G G C A |     |     |     |
| mScn10a cds (GRI) | T C C C T G G A A C T G G C T G G A C T T C A G T G T C A T T A C C C T G G C A |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 610                                                                             | 620 | 630 | 640 |
| Y09108-cds        | T A C G T G G G T G C A G C G G T A G A C C T C C G A G G A A T C T C A G G C C |     |     |     |
| mScn10a cds (GRI) | T A T G T G G G T G C A G C G A T A G A C C T C C G A G G A A T C T C A G G C C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 650                                                                             | 660 | 670 | 680 |
| Y09108-cds        | T G C G G A C A T T C C G A G T T C T C A G G G C C C T G A A G A C T G T T T C |     |     |     |
| mScn10a cds (GRI) | T G C G G A C A T T C C G A G T T C T C A G G G C C C T G A A G A C T G T T T C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 690                                                                             | 700 | 710 | 720 |
| Y09108-cds        | T G T G A T C C C A G G A C T G A A G G T C A T C G T G G G A G C C C T G A T C |     |     |     |
| mScn10a cds (GRI) | T G T G A T C C C A G G A C T G A A G G T C A T C G T G G G A G C C C T G A T C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 730                                                                             | 740 | 750 | 760 |
| Y09108-cds        | C A C T C A G T G A G G A A G C T G G C C G A C G T G A C C A T C C T C A C A G |     |     |     |
| mScn10a cds (GRI) | C A C T C A G T G A G G A A G C T G G C C G A C G T G A C C A T C C T C A C A G |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 770                                                                             | 780 | 790 | 800 |
| Y09108-cds        | T C T T C T G C C T G A G T G T C T T T G C C T T G G T G G G C C T G C A G C T |     |     |     |
| mScn10a cds (GRI) | T C T T C T G C C T G A G T G T C T T T G C C T T G G T G G G C C T G C A G C T |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 810                                                                             | 820 | 830 | 840 |
| Y09108-cds        | C T T C A A G G G G A A C C T C A A G A A T A A A T G C A T T A A G A A C G G C |     |     |     |
| mScn10a cds (GRI) | C T T C A A G G G G A A C C T C A A G A A T A A A T G C A T T A A G A A C G G C |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 850                                                                             | 860 | 870 | 880 |
| Y09108-cds        | A C A G A T C C G C A C A A G G C T G A C A A T C T C T C A T C T G A A A T G G |     |     |     |
| mScn10a cds (GRI) | A C A G A T C C G C A C A A G G C T G A C A A T C T C T C A T C T G A A A T G G |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 890                                                                             | 900 | 910 | 920 |
| Y09108-cds        | C A G A A G A C A T C T T C A T C A A G C C C G G T A C T A C G G A T C C C T T |     |     |     |
| mScn10a cds (GRI) | C A G G A G A C A T C T T C A T C A A G C C C G G T A C T A C G G A T C C C T T |     |     |     |

|                   |                                                                                 |     |     |     |
|-------------------|---------------------------------------------------------------------------------|-----|-----|-----|
|                   | 930                                                                             | 940 | 950 | 960 |
| Y09108-cds        | G T T G T G T G G C A A T G G G T C T G A T G C T G G C C A C T G C C C T A A T |     |     |     |
| mScn10a cds (GRI) | G T T G T G T G G C A A T G G A T C T G A T G C T G G C C A C T G C C C T A A T |     |     |     |

Y09108-cds  
mScn10a cds (GRI)

|                                             |                                     |      |      |
|---------------------------------------------|-------------------------------------|------|------|
| 1010                                        | 1020                                | 1030 | 1040 |
| A C T A C A C C A G C T T T G A T T C C T T | T G C G T G G G C G T T C C T C T C |      |      |
| A C T A C A C C A G C T T T G A T T C C T T | C G C G T G G G C G T T C C T C T C |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1050                                                                            | 1060 | 1070 | 1080 |
| A C T G T T C C G T C T C A T G A C G C A G G A C T C C T G G G A A C G G C T G |      |      |      |
| A C T G T T C C G T C T C A T G A C G C A G G A C T C C T G G G A A C G G C T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1090                                                                            | 1100 | 1110 | 1120 |
| T A C C A G C A G A C A C T C C G G G C T T C C G G G A A A A T G T A C A T G G |      |      |      |
| T A C C A G C A G A C A C T C C G G G C T T C C G G G A A A A T G T A C A T G G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                         |                                           |      |      |
|-----------------------------------------|-------------------------------------------|------|------|
| 1130                                    | 1140                                      | 1150 | 1160 |
| T C T T T T T T G T G C T G G T C A T T | T T C C T T G G A T C A T T C T A C C T   |      |      |
| T C T T T T T T G T G C T G G T C A T   | C T T C C T T G G A T C A T T C T A C C T |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1170                                                                            | 1180 | 1190 | 1200 |
| G G T C A A T T T G A T C T T G G C T G T G G T C A C C A T G G C A T A T G A G |      |      |      |
| G G T C A A T T T G A T C T T G G C T G T G G T C A C C A T G G C A T A T G A G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1210                                                                            | 1220 | 1230 | 1240 |
| G A A C A G A G C C A G G C A A C A A T T G C A G A A A T C G A A G C C A A G G |      |      |      |
| G A A C A G A G C C A G G C A A C A A T T G C A G A A A T C G A A G C C A A G G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1250                                                                            | 1260 | 1270 | 1280 |
| A A A A A A A G T T C C A G G A A G C C C T C G A G G T G C T G C A A A A G A   |      |      |      |
| A G A A G A A G T T C A A G G A A G C C C T C G A G G T G C T G C A G A A A G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                   |      |      |      |
|-----------------------------------------------------------------------------------|------|------|------|
| 1290                                                                              | 1300 | 1310 | 1320 |
| A C A G G A G G T G T T G G C A G C G C T G G G A A A T T G A C A C A A C T T C G |      |      |      |
| A C A G G A G G T G C T G G C A G C G C T G G G A A T T G A C A C A A C C T C G   |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1330                                                                            | 1340 | 1350 | 1360 |
| T T T T A T T C C C A C A G C G G A T C A C C C T T A G C C T C C A A A A A C G |      |      |      |
| C T C T A T T C C C A C A A C G G A T C A C C C T T A G C C C C C A A A A A C G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1370                                                                            | 1380 | 1390 | 1400 |
| C C A A T G A G A G A A G A C C C A G G G T G A A A T C A A G G G T G T C A G A |      |      |      |
| C C A A T G A G A G A A G A C C C A G G G T G A A A T C A A G G A T G T C A G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1410                                                                            | 1420 | 1430 | 1440 |
| A G G C T C C A C A G A T G A C A A C A G A T C A C C A C A A T C C G A C C C T |      |      |      |
| A G G C T C G A C A G A T G A C A A C A G A T C A C T A C A A T C C G A C C C T |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1450                                                                            | 1460 | 1470 | 1480 |
| T A C A A C C A G C G C A G G A T G T C C T T C C T A G G C C T T T C T T C T G |      |      |      |
| T A C A A C C A G C G C A G G A T G T C T T T C C T A G G C C T T T C T T C T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1530                                                                            | 1540 | 1550 | 1560 |
| A G C A C C C A G C C A A G A C G T C T C A T T T C C T G A T G G G A T C T T G |      |      |      |
| A G C A C C C A G C C A A G A C G T C T C A T T T C C T G A T G G G A T C T T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1570                                                                            | 1580 | 1590 | 1600 |
| G A C G A T G G G G T C T T T C A T G G A G A T C A G G A A A G C C G T C G A A |      |      |      |
| G A T G A C G G G G T C T T T C A T G G A G A T C A G G A A A G C C G T C G A A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1610                                                                            | 1620 | 1630 | 1640 |
| A T T C C A T A T T G C T G G G C A G G G G T G C C G G C C A G G C A G G T C C |      |      |      |
| G T T C C A T A T T G C T G G G C A G G G G T G C C G G G C A G G C A G G T C C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1650                                                                            | 1660 | 1670 | 1680 |
| T C T C C C C A G A A G T C C A C T G C C T C A G T C C C C C A A C C C T G G C |      |      |      |
| T C T C C C C A G G A G T C C A C T G C C T C A G T C C C C C A A C C C T G G C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1690                                                                            | 1700 | 1710 | 1720 |
| C G T A A A C A T G G A A A A G A G G G A C A G C T T G G A A T G C C C A C T G |      |      |      |
| C C T A G A C G T G G A G A A G A G G G A C A G C G T G G A G T G C C C A C T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1730                                                                            | 1740 | 1750 | 1760 |
| G T G A A C T T G C C G C T G G A A C G C C T G A A G G C C C G G C A C T C G A |      |      |      |
| G T G A G C T T G C C A C T G G A G C G C C T G A A G G C C C G G C A C T C G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1770                                                                            | 1780 | 1790 | 1800 |
| T G C T G C A G G A C A G A A G A A C T T C C T G T C T G C A G G C T A C T T G |      |      |      |
| T G C T G C A G G A C A G A A G A A C T T C C T G T C T G C A G A C T A C T T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1810                                                                            | 1820 | 1830 | 1840 |
| A A T G A A C C T T T C C G A G C A C A G A G G G C A A T G A G T G T T G T C A |      |      |      |
| A A T G A A C C T T T C C G A G C A C A G A G G G C A A T G A G T G T T G T C A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1850                                                                            | 1860 | 1870 | 1880 |
| G T A T C A T G A C T T C T G T C A T T G A G G A A C T G G A A G A T C T A A   |      |      |      |
| G T A T T A T G A C T T C T G T C A T T G A G G A G C T G G A A G A G T C T A A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1890                                                                            | 1900 | 1910 | 1920 |
| G C T G A A G T G C C C A C C C T G C T T G A T C A G C T T C G C C C A A A A   |      |      |      |
| G C T G A A G T G C C C A C C C T G C T T G A T C A G C T T A G C C C A G A A G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 1930                                                                            | 1940 | 1950 | 1960 |
| T A T C T G A T A T G G G A A T G C T G C C C C A A G T G G A G A A A A T T C A |      |      |      |
| T A C C T G A T A T G G G A G T G C T G C C C C A A G T G G A A G A A A T T C A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                               |      |      |      |
|-------------------------------------------------------------------------------|------|------|------|
| 1970                                                                          | 1980 | 1990 | 2000 |
| A A A T G G T G C T C T C G A A C T G G T G A C T G A C C C C T T C G C A G A |      |      |      |
| A G A T G G T G C T C T C G A G C T G G T G A C T G A C C C C T T C G C A G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                 |                   |      |      |
|-----------------------------------------------------------------|-------------------|------|------|
| 2050                                                            | 2060              | 2070 | 2080 |
| A T G G C C A T G G A A C A C T A C C C C A T G A C T G A T G C | T T T C G A T G   |      |      |
| A T G G C C A T G G A A C A C T A C C C C A T G A C T G A T G C | C T T T C G A T G |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                         |                         |      |      |
|---------------------------------------------------------|-------------------------|------|------|
| 2090                                                    | 2100                    | 2110 | 2120 |
| C C A T G C T C C A A G C C G G C A A C A T T G T C T T | C A C T G T G T T T T T |      |      |
| C C A T G C T C C A A G C C G G C A A C A T T G T C T T | T A C T G T G T T T T T |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                             |                   |      |      |
|-------------------------------------------------------------|-------------------|------|------|
| 2130                                                        | 2140              | 2150 | 2160 |
| T A C A A T G G A G A T G G C C T T C A A G A T C A T T G C | T T T C G A C C C | G    |      |
| T A C A A T G G A G A T G G C C T T C A A G A T C A T T G C | C T T C G A C C C | C    |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2170                                                                            | 2180 | 2190 | 2200 |
| T A C T A C T A C T T C C A G A A G A A G T G G A A C A T C T T C G A C T G T G |      |      |      |
| T A C T A C T A C T T C C A G A A G A A G T G G A A C A T C T T C G A C T G T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|           |                                                     |                   |      |
|-----------|-----------------------------------------------------|-------------------|------|
| 2210      | 2220                                                | 2230              | 2240 |
| T C A T T | G T C A C C G T G A G C C T G C T G G A G C T G A G | T G C A T C C A A |      |
| T C A T C | G T C A C C G T G A G C C T G C T G G A G C T G A G | C A C A T C C A A |      |

Y09108-cds  
mScn10a cds (GRI)

|                     |                             |             |                     |
|---------------------|-----------------------------|-------------|---------------------|
| 2250                | 2260                        | 2270        | 2280                |
| A A A G G G C A G C | C T A T C T G T G C T C C G | T T C C T T | A C G C T T G C T T |
| G A A G G G C A G C | T T G T C T G T G C T C C G | C A C C T T | C C G C T T G C T T |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2290                                                                            | 2300 | 2310 | 2320 |
| C G G G T C T T C A A G C T G G C C A A G T C C T G G C C C A C C C T G A A C A |      |      |      |
| C G G G T C T T C A A G C T G G C C A A G T C C T G G C C C A C C C T G A A C A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2330                                                                            | 2340 | 2350 | 2360 |
| T G C T C A T C A A G A T C A T C G G G A A C T C T G T G G G G G C C C T G G G |      |      |      |
| T G C T C A T C A A G A T C A T C G G G A A C T C T G T G G G G G C C C T G G G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                   |             |      |      |
|-------------------------------------------------------------------|-------------|------|------|
| 2370                                                              | 2380        | 2390 | 2400 |
| C A A C C T G A C C T T C A T C C T G G C C A T C A T C G T C T T | C A T C T T | T    |      |
| C A A C C T G A C C T T C A T C C T G G C C A T C A T C G T C T T | T A T C T T | C    |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2410                                                                            | 2420 | 2430 | 2440 |
| G C C C T G G T G G G A A A G C A G C T C C T C T C A G A G A A C T A T G G G T |      |      |      |
| G C C C T G G T G G G A A A G C A G C T C C T C T C A G A G A A C T A T G G G T |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                             |                                             |         |      |
|-----------------------------|---------------------------------------------|---------|------|
| 2450                        | 2460                                        | 2470    | 2480 |
| G C C G C A G G G A T G G C | G T C T C C G T G T G G A A T G G T G A G A | A G C T |      |
| G C C G C A G G G A T G G C | A T C T C C G T G T G G A A T G G T G A G A | G G C T |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2490                                                                            | 2500 | 2510 | 2520 |
| G C G C T G G C A C A T G T G T G A C T T C T T C C A T T C C T T C C T C G T C |      |      |      |
| G C G C T G G C A C A T G T G T G A C T T C T T C C A T T C C T T C C T C G T C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                               |                                   |      |      |
|-----------------------------------------------|-----------------------------------|------|------|
| 2570                                          | 2580                              | 2590 | 2600 |
| G G G T C T G C A T G G A G G T C A G C C A G | A A C T A C A T C T G C C T C A C |      |      |
| G G G T C T G C A T G G A G G T C A G C C A G | G A C T A C A T C T G C C T C A C |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2610                                                                            | 2620 | 2630 | 2640 |
| C C T C T T C T T G A C A G T G A T G G T G C T A G G C A A C C T G G T G G T G |      |      |      |
| C C T C T T C T T G A C A G T G A T G G T G C T A G G C A A C C T G G T G G T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                   |      |      |      |
|-----------------------------------------------------------------------------------|------|------|------|
| 2650                                                                              | 2660 | 2670 | 2680 |
| C T C A A C C T T T T T A T C G C T T T A C T G C T G A A T T C C T T T A G T G   |      |      |      |
| C T C A A C C T A T T T C A T C G C T T T A C T G C T G A A C T C C T T C A G T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                               |      |      |      |
|-------------------------------------------------------------------------------|------|------|------|
| 2690                                                                          | 2700 | 2710 | 2720 |
| C G G A C A A C C T C A C G G C C C A G A G G A T G A C G G G G A G G T G A A |      |      |      |
| C G G A C A A C C T C A C A G C C C A G A G G A T G A C G G G G A G G T G A A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2730                                                                            | 2740 | 2750 | 2760 |
| C A A C T T G C A G T T A G C A C T G G C C A G G A T T C A G G T A T T T G G C |      |      |      |
| C A A C T T G C A G G T A G C A C T G G C C C G G A T T C A G G T A T T T G G C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2770                                                                            | 2780 | 2790 | 2800 |
| C A T C G G G C C A G T C G G G C C A T T A C C A G T T A C A T C A G A A G C C |      |      |      |
| C A T C G G G C C A G T C G G G C C A T T A C C A G T T A C A T C A G A A G C C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2810                                                                            | 2820 | 2830 | 2840 |
| A T T G C C G G T T C C G T T G G C C C A A G G T G G A G A C C C A G C T G G G |      |      |      |
| A C T G C C G G C T C C G C T G G C C C A A G G T G G A G A C C C A G C T G G G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2850                                                                            | 2860 | 2870 | 2880 |
| G A T G A A A C C C C C A C T C A C C A G C T G C A A A G T T G A G A A C C A C |      |      |      |
| G A T G A A A C C C C C A C T C A C C A G C T G C A A A G C T G A G A A C C A C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                   |      |      |      |
|-----------------------------------------------------------------------------------|------|------|------|
| 2890                                                                              | 2900 | 2910 | 2920 |
| A T T G C T A C T G A T G C T G T C A A T G C T G C A G T G G G G A A C C T G A   |      |      |      |
| A T T G C T A C T G A T G C T G T N C A A T G C T G C A G T G G G G A A C C A G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2930                                                                            | 2940 | 2950 | 2960 |
| C A A A G C C A G C T C T T A G T G G C C C C A A G G A G A A T C A C G G G G A |      |      |      |
| C A A A G C C A G C T C T T G G T G G C C C C A A G G A G A A C C A C G G G G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 2970                                                                            | 2980 | 2990 | 3000 |
| C T T C A T C A C T G A T C C T A A C G T G T G G G T C T C T G T G C C C A T T |      |      |      |
| C T T C A T C A C T G A T C C T A A C G T G T G G G T C T C T G T G C C C A T T |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 3010                                                                            | 3020 | 3030 | 3040 |
| G C T G A G G G G G A G T C C G A C C T T G A T G A G C T C G A G G A A G A T G |      |      |      |
| G C T G A G G G G G A G T C C G A C C T T G A T G A G C T C G A G G A A G A T G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                     |       |      |                     |     |      |                               |      |
|------|---------------------|-------|------|---------------------|-----|------|-------------------------------|------|
| 3090 | C A A A G G G C A G | C A G | 3100 | G A G C T G C T G C | C A | 3110 | C A A G T C C A A A A G T G T | 3120 |
|      | C A A A G G G C A G | N N N |      | G A G C T G C T G C | A G |      | C A A G T C C A A A A G T G T |      |

Y09108-cds  
mScn10a cds (GRI)

|      |       |   |                             |   |      |                 |   |      |                         |      |
|------|-------|---|-----------------------------|---|------|-----------------|---|------|-------------------------|------|
| 3130 | G A A | A | A T C A C C A G G C A G C C | A | 3140 | G A A G C C C A | A | 3150 | C C T C C G G G A T G T | 3160 |
|      | G A A | G | A T C A C C A G G C A G C C | C |      | G A A G C C C A | C |      | C C T C C G G G A T G T |      |

Y09108-cds  
mScn10a cds (GRI)

|      |               |   |                                                             |   |      |                                                             |   |      |                         |      |
|------|---------------|---|-------------------------------------------------------------|---|------|-------------------------------------------------------------|---|------|-------------------------|------|
| 3170 | C C T C T G A | A | G A C C T G G C T C C A T A C C T G G G G G A G A G A T G G | A | 3180 | G A C C T G G C T C C A T A C C T G G G G G A G A G A T G G | A | 3190 | C C T C C G G G A T G T | 3200 |
|      | C C T C T G A | G | G A C C T G G C T C C A T A C C T G G G G G A G A G A T G G | C |      | G A C C T G G C T C C A T A C C T G G G G G A G A G A T G G | C |      | C C T C C G G G A T G T |      |

Y09108-cds  
mScn10a cds (GRI)

|      |   |       |   |         |   |   |   |           |   |      |                                             |      |                                             |      |
|------|---|-------|---|---------|---|---|---|-----------|---|------|---------------------------------------------|------|---------------------------------------------|------|
| 3210 | A | A G G | A | A G G A | T | A | A | C C C T C | A | 3220 | G G T C C C T G C C G A G G G A G T G G A T | 3230 | G G T C C C T G C C G A G G G A G T G G A T | 3240 |
|      | G | A G G | G | A G G A | G | A | G | C C C T C | G |      | G G T C C C T G C C G A G G G A G T G G A T |      | G G T C C C T G C C G A G G G A G T G G A T |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                                                                                 |      |                                                                                 |      |                                                                                 |      |
|------|---------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------|------|
| 3250 | G A C A C A A G C T C C T C C G A G G G C A G C A C G G T G G A C T G C C C G G | 3260 | G A C A C A A G C T C C T C C G A G G G C A G C A C G G T G G A C T G C C C G G | 3270 | G A C A C A A G C T C C T C C G A G G G C A G C A C G G T G G A C T G C C C G G | 3280 |
|      | G A C A C A A G C T C C T C C G A G G G C A G C A C G G T G G A C T G C C C G G |      | G A C A C A A G C T C C T C C G A G G G C A G C A C G G T G G A C T G C C C G G |      | G A C A C A A G C T C C T C C G A G G G C A G C A C G G T G G A C T G C C C G G |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                                                                                 |      |                                                                                 |      |                                                                                 |      |
|------|---------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------|------|
| 3290 | A C C C A G A G G A G A T C C T G A G G A A G A T C C C T G A G C T G G C G G A | 3300 | A C C C A G A G G A G A T C C T G A G G A A G A T C C C T G A G C T G G C G G A | 3310 | A C C C A G A G G A G A T C C T G A G G A A G A T C C C T G A G C T G G C G G A | 3320 |
|      | A C C C A G A G G A G A T C C T G A G G A A G A T C C C T G A G C T G G C G G A |      | A C C C A G A G G A G A T C C T G A G G A A G A T C C C T G A G C T G G C G G A |      | A C C C A G A G G A G A T C C T G A G G A A G A T C C C T G A G C T G G C G G A |      |

Y09108-cds  
mScn10a cds (GRI)

|      |       |   |                                                 |   |      |                       |      |                       |      |
|------|-------|---|-------------------------------------------------|---|------|-----------------------|------|-----------------------|------|
| 3330 | G G A | T | C T G G A C G A G C C C G A T G A C T G T T T C | A | 3340 | C A G A A G G C T G C | 3350 | C A G A A G G C T G C | 3360 |
|      | G G A | G | C T G G A C G A G C C C G A T G A C T G T T T C | C |      | C A G A A G G C T G C |      | C A G A A G G C T G C |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                                                                                 |      |                                                                                 |      |                                                                                 |      |
|------|---------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------|------|
| 3370 | A C T C G C C G C T G T C C C T G C T G C A A A G T G A A C A C C A G T A A G T | 3380 | A C T C G C C G C T G T C C C T G C T G C A A A G T G A A C A C C A G T A A G T | 3390 | A C T C G C C G C T G T C C C T G C T G C A A A G T G A A C A C C A G T A A G T | 3400 |
|      | A C T C G C C G C T G T C C C T G C T G C A A A G T G A A C A C C A G T A A G T |      | A C T C G C C G C T G T C C C T G C T G C A A A G T G A A C A C C A G T A A G T |      | A C T C G C C G C T G T C C C T G C T G C A A A G T G A A C A C C A G T A A G T |      |

Y09108-cds  
mScn10a cds (GRI)

|      |   |                         |   |      |                                                     |      |                                                     |      |
|------|---|-------------------------|---|------|-----------------------------------------------------|------|-----------------------------------------------------|------|
| 3410 | C | T C C T T G G G C C A C | A | 3420 | G G C T G G C A G G T G C G C A A A A C C T G T T A | 3430 | G G C T G G C A G G T G C G C A A A A C C T G T T A | 3440 |
|      | T | T C C T T G G G C C A C | G |      | G G C T G G C A G G T G C G C A A A A C C T G T T A |      | G G C T G G C A G G T G C G C A A A A C C T G T T A |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                                                                   |      |                                                                   |      |                                                                   |      |
|------|-------------------------------------------------------------------|------|-------------------------------------------------------------------|------|-------------------------------------------------------------------|------|
| 3450 | C C G C A T T G T G G A G C A C A G C T G G T T T G A G A G T T T | 3460 | C C G C A T T G T G G A G C A C A G C T G G T T T G A G A G T T T | 3470 | C C G C A T T G T G G A G C A C A G C T G G T T T G A G A G T T T | 3480 |
|      | C C G C A T T G T G G A G C A C A G C T G G T T T G A G A G T T T |      | C C G C A T T G T G G A G C A C A G C T G G T T T G A G A G T T T |      | C C G C A T T G T G G A G C A C A G C T G G T T T G A G A G T T T |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                                                 |      |                                                 |      |                               |      |
|------|-------------------------------------------------|------|-------------------------------------------------|------|-------------------------------|------|
| 3490 | T T C A T G A T C C T G C T C A G C A G T G G A | 3500 | T T C A T G A T C C T G C T C A G C A G T G G A | 3510 | C G C T G G C C T T T G A G G | 3520 |
|      | T T C A T G A T C C T G C T C A G C A G T G G A |      | T T C A T G A T C C T G C T C A G C A G T G G A |      | C G C T G G C C T T T G A G G |      |

Y09108-cds  
mScn10a cds (GRI)

|      |                                 |      |                                 |      |                                         |      |
|------|---------------------------------|------|---------------------------------|------|-----------------------------------------|------|
| 3530 | A T A A C T A C C T G G A A G A | 3540 | A T A A C T A C C T G G A A G A | 3550 | C C C C G A G T G A A G T C T G T G C T | 3560 |
|      | A T A A C T A C C T G G A A G A |      | A T A A C T A C C T G G A A G A |      | C C C C G A G T G A A G T C T G T G C T |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3610                                                                            | 3620 | 3630 | 3640 |
| Y09108-cds        | G A G A T G T T G C T C A A G T G G G T A G C C T A T G G C T T C A A A A A A T |      |      |      |
| mScn10a cds (GRI) | G A G A T G T T G C T C A A G T G G G T A G C T T A T G G C T T C A A A A A A T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3650                                                                            | 3660 | 3670 | 3680 |
| Y09108-cds        | A T T T C A C C A A T G C C T G G T G C T G G C T G G A C T T C C T C A T C G T |      |      |      |
| mScn10a cds (GRI) | A T T T C A C C A A T G C C T G G T G C T G G C T G G A C T T C C T C A T C G T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3690                                                                            | 3700 | 3710 | 3720 |
| Y09108-cds        | G A A C A T C T C C C T C A C A A G C C T C A T A G C C A A G A T C C T C G A G |      |      |      |
| mScn10a cds (GRI) | G A A T A T C T C C C T C A C A A G C C T C A T A G C C A A G A T C C T C G A G |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3730                                                                            | 3740 | 3750 | 3760 |
| Y09108-cds        | T A T T C A G A C G T G G C G T C C A T C A A A G C C C T T C G G A C T C T C C |      |      |      |
| mScn10a cds (GRI) | T A T T C A G A C G T G G C G T C C A T C A A A G C C C T T C G G A C T C T C C |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3770                                                                            | 3780 | 3790 | 3800 |
| Y09108-cds        | G T G C C C T C C G G C C G C T G C G G G C T C T G T C T C G A T T C G A A G G |      |      |      |
| mScn10a cds (GRI) | G T G C C C T C C G G C C G C T G C G G G C T C T G T C T C G A T T C G A A G G |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3810                                                                            | 3820 | 3830 | 3840 |
| Y09108-cds        | C A T G A G G G T A G T G G T G G A T G C C T T G G T G G G C G C C A T C C C   |      |      |      |
| mScn10a cds (GRI) | C A T G A G G G T A G T G G T G G A T G C C T T G G T G G G C G C C A T T C C C |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3850                                                                            | 3860 | 3870 | 3880 |
| Y09108-cds        | T C C A T C A T G A A C G T C C T C C T C G T C T G C C T C A T C T T C T G G C |      |      |      |
| mScn10a cds (GRI) | T C C A T C A T G A A C G T C C T C C T C G T C T G C C T C A T C T T C T G G C |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3890                                                                            | 3900 | 3910 | 3920 |
| Y09108-cds        | T C A T C T T C A G C A T C A T G G G T G T G A A C C T C T T C G C C G G G A A |      |      |      |
| mScn10a cds (GRI) | T C A T C T T C A G C A T C A T G G G T G T G A A C C T C T T C G C C G G G A A |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3930                                                                            | 3940 | 3950 | 3960 |
| Y09108-cds        | A T T T T C G A G A T G T G T C G A C A C C A G A A G C A A C C C A T T T T C C |      |      |      |
| mScn10a cds (GRI) | A T T T T C G A G A T G T G T C G A C A C C A G A A G C A A C C C A T T T T C C |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 3970                                                                            | 3980 | 3990 | 4000 |
| Y09108-cds        | G T C G T G A A T T C G A C A T T C G T G A A T A A C A A G T C T G A C T G T C |      |      |      |
| mScn10a cds (GRI) | G T C G T G A A T T C G A C A T T C G T G A C T A A C A A G T C T G A C T G T T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 4010                                                                            | 4020 | 4030 | 4040 |
| Y09108-cds        | A C A A T C A A A A C A A T A C C G G C C A C T T C T T C T G G G T T A A C G T |      |      |      |
| mScn10a cds (GRI) | A C A A T C A A A A C A A T A C T G G C C A C T T C T T C T G G G T T A A C G T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 4050                                                                            | 4060 | 4070 | 4080 |
| Y09108-cds        | C A A A G T C A A C T T C G A C A A C G T C G C T A T G G G C T A C C T C G C G |      |      |      |
| mScn10a cds (GRI) | C A A A G T C A A C T T C G A C A A C G T T G C T A T G G G C T A C C T C G C G |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 4130                                                                            | 4140 | 4150 | 4160 |
| T G T A T G C A G C T G T C G A T T C T C G A G A T A T C A A C A G T C A G C C |      |      |      |
| T G T A T G C A G C T G T C G A T T C T C G A G A T A T C A A C A G T C A G C C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 4170                                                                            | 4180 | 4190 | 4200 |
| C A A T T G G G A G G A G A G C C T G T A C A T G T A C C T A T A C T T C G T C |      |      |      |
| C A A T T G G G A G G A G A G C C T G T A C A T G T A C C T A T A C T T C G T C |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 4210                                                                            | 4220 | 4230 | 4240 |
| G T C T T C A T C A T T T T C G G T G G C T T C T T C A C G C T G A A T C T C T |      |      |      |
| G T C T T C A T C A T T T T C G G T G G C T T C T T C A C G C T G A A T C T C T |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                 |                                                 |      |      |
|---------------------------------|-------------------------------------------------|------|------|
| 4250                            | 4260                                            | 4270 | 4280 |
| T T G T C G G G G T C A T C A T | C G A C A A C T T C A A T C A A C A G A A A A A |      |      |
| T T G T C G G G G T C A T C A T | T G A C A A C T T C A A T C A A C A G A A A A A |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                             |                     |      |      |
|-------------------------------------------------------------|---------------------|------|------|
| 4290                                                        | 4300                | 4310 | 4320 |
| A A A G T T G G G G G C C A G G A C A T C T T C A T G A C   | G G A A G A A C A A |      |      |
| A A A G C T A G G G G G C C A G G A C A T C T T C A T G A C | A G A G G A G C A G |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 4330                                                                            | 4340 | 4350 | 4360 |
| A A A A A T A T T A C A A T G C C A T G A A A A A A C T G G G C T C C A A A A   |      |      |      |
| A A G A A G T A C T A C A A T G C C A T G A A A A A G C T G G G C T C C A A G A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                     |                             |      |      |
|-----------------------------------------------------|-----------------------------|------|------|
| 4370                                                | 4380                        | 4390 | 4400 |
| A A C C C C A A A A G C C C A T C C C A C G G C C T | C T G A A T A A G T A C C A |      |      |
| A A C C C C A G A A G C C C A T C C C A C G G C C T | T T G A A T A A G T A C C A |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                   |               |      |      |
|-------------------------------------------------------------------|---------------|------|------|
| 4410                                                              | 4420          | 4430 | 4440 |
| G G G C T T C G T G T T T G A C A T T G T G A C C A G G C A A G C | C T T T G A C |      |      |
| G G G C T T C G T G T T T G A C A T T G T G A C C A G G C A A G C | A T T T G A C |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                             |                                                       |      |      |
|-----------------------------|-------------------------------------------------------|------|------|
| 4450                        | 4460                                                  | 4470 | 4480 |
| A T C A T C A T C A T G G T | T C T C A T C T G C C T C A A C A T G A T C A C C A   |      |      |
| A T C A T C A T C A T G G C | C T C T C A T C T G C C T C A A C A T G A T C A C C A |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                                 |      |      |      |
|---------------------------------------------------------------------------------|------|------|------|
| 4490                                                                            | 4500 | 4510 | 4520 |
| T G A T G G T G G A G A C C G A C A A T C A G A G C G A G G A G A A G A C G A A |      |      |      |
| T G A T G G T G G A G A C C G A C A A T C A G A G C G A G G A G A A G A C G A A |      |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                 |                                 |      |      |
|-------------------------------------------------|---------------------------------|------|------|
| 4530                                            | 4540                            | 4550 | 4560 |
| G G T T C T G G G C A G A A T C A A C C A G T T | T T T G T G G C G G T C T T C   |      |      |
| G G T C C T G G G C A G A A T C A A C C A G T T | C T T C G T G G C C G T C T T C |      |      |

Y09108-cds  
mScn10a cds (GRI)

|                                                                 |                 |      |      |
|-----------------------------------------------------------------|-----------------|------|------|
| 4570                                                            | 4580            | 4590 | 4600 |
| A C G G G C G A G T G T G T G A T G A A A G T G T T C G C C C T | G C G A C A G T |      |      |
| A C G G G C G A G T G T G T G A T G A A G A T G T T C G C C C T | T C G G C A G T |      |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                 |      |                                     |      |         |
|------|---------------------------------|------|-------------------------------------|------|---------|
| 4650 | G G T G A T T C T G T C C A T T | 4660 | G A G T C T G T T G T T T T C T G C | 4670 | A A T C |
|      | G G T G A T T C T G T C C A T T |      | A G T C T G T T G T T T T C T G C   |      | A T C   |

Y09108-cds  
 mScn10a cds (GRI)

|      |         |      |                                                       |      |           |      |     |
|------|---------|------|-------------------------------------------------------|------|-----------|------|-----|
| 4690 | C T T A | 4700 | T C A C T A G A A A G T T A C T T C T C C C C C A C G | 4710 | T T C T T | 4720 | C C |
|      | C T T A |      | T C A C T A G A A A G T T A C T T C T C C C C C A C G |      | T C T T   |      | A C |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 4730 | G C G T C A T C C G T C T G G C C A G G A T C G G C C G C A T C C T C A G G C T | 4740 |  | 4750 |  | 4760 |
|      | G C G T C A T C C G T C T G G C C A G G A T C G G C C G C A T C C T C A G G C T |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 4770 | G A T T C G A G C A G C C A A G G G G A T T C G C A C G C T G C T C T T C G C C | 4780 |  | 4790 |  | 4800 |
|      | G A T T C G A G C A G C C A A G G G G A T T C G C A C G C T G C T C T T C G C C |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                     |      |  |      |  |      |
|------|---------------------------------------------------------------------|------|--|------|--|------|
| 4810 | C T C A T G A T G T C C C T G C C C G C C C T C T T C A A C A T C G | 4820 |  | 4830 |  | 4840 |
|      | C T C A T G A T G T C C C T G C C C G C C C T C T T C A A C A T C G |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 4850 | T C C T C T T C C T C G T C A T G T T C A T C T A C T C C A T C T T C G G C A T | 4860 |  | 4870 |  | 4880 |
|      | T C C T C T T C C T C G T C A T G T T C A T C T A C T C C A T C T T C G G C A T |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 4890 | G G C C A G C T T C G C T A A T G T C A T A G A T G A G G C T G G C A T C G A C | 4900 |  | 4910 |  | 4920 |
|      | G A C C A G C T T C G C T A A T G T C A T A G A T G A G G C T G G C A T C G A C |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 4930 | G A C A T G T T C A A C T T C A A G A C C T T T G G C A A C A G C A T G C T G T | 4940 |  | 4950 |  | 4960 |
|      | G A C A T G T T C A A C T T C A A G A C C T T T G G C A A C A G C A T G C T G T |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 4970 | G C C T T T T C C A G A T C A C C A C G T C G G C T G G C T G G G A T G G C C T | 4980 |  | 4990 |  | 5000 |
|      | G C C T T T T C C A G A T C A C C A C G T C G G C T G G C T G G G A T G G C C T |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                               |      |  |      |  |      |
|------|-------------------------------------------------------------------------------|------|--|------|--|------|
| 5010 | C C T C A G C C C C A T C C T C A A C A C A G G A C C C C C T A C T G C G A C | 5020 |  | 5030 |  | 5040 |
|      | C C T C A G C C C C A T C C T C A A C A C A G G A C C C C C T A C T G C G A C |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 5050 | C C C A A C C G G C C C A A C A G C A A T G G C T C C A A G G G G A A T T G T G | 5060 |  | 5070 |  | 5080 |
|      | C C C A A C C G G C C C A A C A G C A A T G G C T C C A A G G G G A A T T G T G |      |  |      |  |      |

Y09108-cds  
 mScn10a cds (GRI)

|      |                                                                                 |      |  |      |  |      |
|------|---------------------------------------------------------------------------------|------|--|------|--|------|
| 5090 | G A A G C C C A G C G G T G G G C A T C C T C T T C T T C A C C A C C T A C A T | 5100 |  | 5110 |  | 5120 |
|      | G A A G C C C A G C G G T G G G C A T C C T C T T C T T C A C C A C C T A C A T |      |  |      |  |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5170                                                                            | 5180 | 5190 | 5200 |
| Y09108-cds        | G T G A T T C T G G A G A A C T T C A A T G T G G C C A C A G A A G A G A G C A |      |      |      |
| mScn10a cds (GRI) | G T G A T T C T G G A G A A C T T C A A T G T G G C C A C A G A A G A G A G C A |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5210                                                                            | 5220 | 5230 | 5240 |
| Y09108-cds        | C G G A G C C C C T G A G C G A G G A C G A C T T T G A C A T G T T C T A T G A |      |      |      |
| mScn10a cds (GRI) | C G G A G C C C C T G A G C G A G G A C G A C T T T G A C A T G T T C T A T G A |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5250                                                                            | 5260 | 5270 | 5280 |
| Y09108-cds        | G A C C T G G G A G A A G T T T G A C C C G G A G G C C A C C C A G T T C A T T |      |      |      |
| mScn10a cds (GRI) | G A C C T G G G A G A A G T T T G A C C C G G A G G C C A C C C A G T T C A T T |      |      |      |

|                   |                                                                             |      |      |      |
|-------------------|-----------------------------------------------------------------------------|------|------|------|
|                   | 5290                                                                        | 5300 | 5310 | 5320 |
| Y09108-cds        | G C C T T T T C T G C C C T C T C A G A C T T T G C A G A C A C A C T C T C |      |      |      |
| mScn10a cds (GRI) | G C C T T T T C T G C C C T C T C A G A C T T T G C A G A C A C A C T C T C |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5330                                                                            | 5340 | 5350 | 5360 |
| Y09108-cds        | G C C C T C T T A G A A T C C C A A A A C C T A A T C A G A A T A T A T T A A T |      |      |      |
| mScn10a cds (GRI) | G C C C T C T T A G A A T C C C A A A A C C T A A T C A G A A T A T A T T A A T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5370                                                                            | 5380 | 5390 | 5400 |
| Y09108-cds        | C C A G A T G G A C C T G C C G T T G G T C C C C G G A G A T A A G A T C C A C |      |      |      |
| mScn10a cds (GRI) | C C A G A T G G A C C T G C C G T T G G T C C C C G G A G A T A A G A T C C A C |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5410                                                                            | 5420 | 5430 | 5440 |
| Y09108-cds        | T G T T T G G A C A T C C T C T T T G C C T T C A C A A A G A A T G T C T T G G |      |      |      |
| mScn10a cds (GRI) | T G T T T G G A C A T C C T C T T T G C C T T C A C A A A G A A T G T C T T G G |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5450                                                                            | 5460 | 5470 | 5480 |
| Y09108-cds        | G A G A A T C T G G G G A G T T G G A T T C T C T G A A G A C T A A T A T G G A |      |      |      |
| mScn10a cds (GRI) | G A G A A T C T G G G G A G T T G G A T T C T C T G A A G A C T A A T A T G G A |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5490                                                                            | 5500 | 5510 | 5520 |
| Y09108-cds        | A G A G A A G T T T A T G G C A A C T A A T C T T T C C A A A G C A T C C T A T |      |      |      |
| mScn10a cds (GRI) | A G A G A A G T T T A T G G C A A C T A A T C T T T C C A A A G C A T C C T A T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5530                                                                            | 5540 | 5550 | 5560 |
| Y09108-cds        | G A A C C A A T A G C A A C C A C C C T C C G G T G C A A G C A G G A A G A C A |      |      |      |
| mScn10a cds (GRI) | G A A C C A A T A G C A A C C A C C C T C C G G T G C A A G C A G G A A G A C A |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5570                                                                            | 5580 | 5590 | 5600 |
| Y09108-cds        | T C T C A G C C A C C A T T A T T C A A A A G G C C T A T C G G A A C T A C A T |      |      |      |
| mScn10a cds (GRI) | T C T C A G C C A C C A T T A T T C A A A A G G C C T A T C G G A A C T A C A T |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5610                                                                            | 5620 | 5630 | 5640 |
| Y09108-cds        | G T T G C A A C G C T C C T T G A T G C T C T C C A A C A C C C T G C A T G T G |      |      |      |
| mScn10a cds (GRI) | G T T G C A A C G C T C C T T G A T G C T C T C C A A C A C C C T G C A T G T G |      |      |      |

|                   |                                                                                 |      |      |      |
|-------------------|---------------------------------------------------------------------------------|------|------|------|
|                   | 5690                                                                            | 5700 | 5710 | 5720 |
| Y09108-cds        | G C T A T G T T A C A T T C A T G G C A A A T G A C A A C G G T G G G C T C C C |      |      |      |
| mScn10a cds (GRI) | G C T A T G T T A C A T T C A T G G C A A A T G A C A A C G G T G G G C T C C C |      |      |      |

|                   |                   |                                                               |      |      |
|-------------------|-------------------|---------------------------------------------------------------|------|------|
|                   | 5730              | 5740                                                          | 5750 | 5760 |
| Y09108-cds        | A G A C A A A T C | A G A A A C T G C T T C T G C T A C G T C T T T C C C A C C A |      |      |
| mScn10a cds (GRI) | A G A C A A A T C | G G A A A C T G C T T C T G C T A C G T C T T T C C C A C C A |      |      |

|                   |                 |                                                                 |      |      |
|-------------------|-----------------|-----------------------------------------------------------------|------|------|
|                   | 5770            | 5780                                                            | 5790 | 5800 |
| Y09108-cds        | T C C T A T G A | A A G C G T C A C C A G G G G C C T G A G T G A C A G G G C C A |      |      |
| mScn10a cds (GRI) | T C C T A T G A | C A G C G T C A C C A G G G G C C T G A G T G A C A G G G C C A |      |      |

|                   |             |                                                                     |      |      |
|-------------------|-------------|---------------------------------------------------------------------|------|------|
|                   | 5810        | 5820                                                                | 5830 | 5840 |
| Y09108-cds        | A C A T T A | A C A C A T C T A G C T C A A T G C A A A A T G A A G A T G A A G T |      |      |
| mScn10a cds (GRI) | A C A T T A | G C A C A T C T A G C T C A A T G C A A A A T G A A G A T G A A G T |      |      |

|                   |                                     |                                       |      |      |
|-------------------|-------------------------------------|---------------------------------------|------|------|
|                   | 5850                                | 5860                                  | 5870 | 5880 |
| Y09108-cds        | C A C T G C T A A G G A A G G G A A | T A G C C C T G G A C C T C A G T G A |      |      |
| mScn10a cds (GRI) | C A C T G C T A A G G A A G G G A A | G A G C C C T G G A C C T C A G T G A |      |      |

# Appendix C

|              |                                              |                                             |                                             |
|--------------|----------------------------------------------|---------------------------------------------|---------------------------------------------|
| Y09108       | MEFPFGSVGTTNFRRTPT                           | ESLAEIEKQIAAHRAAKKGR                        | TK                                          |
| mScn10a(GRI) | MEFPFGSVGTTNFRRTPT                           | GSLAEIEKQIAAHRAAKKGR                        | PK                                          |
| Y09108       | QRGQKDKSEKPRPQLDLKACNQLPRFYGELPAELVGEPL      |                                             |                                             |
| mScn10a(GRI) | QRGQKDKSEKPRPQLDLKACNQLPRFYGELPAELVGEPL      |                                             |                                             |
| Y09108       | DLDPFYSTHRTFILL                              | NKSRTISRFSATWALWLFSPFNLIR                   |                                             |
| mScn10a(GRI) | DLDPFYSTHRTFIVL                              | DKSRTISRFSATWALWLFSPFNLIR                   |                                             |
| Y09108       | RTAIKVSVHSWFSIFITVTILVNCVCMTRTDLPEKLEYVF     |                                             |                                             |
| mScn10a(GRI) | RTAIKVSVHSWFSIFITVTILVNCVCMTRTDLPEKLEYAF     |                                             |                                             |
| Y09108       | TVVYTFEALIKILARGFCLNEFTYLRDPWNWLD FSVITLA    |                                             |                                             |
| mScn10a(GRI) | TVVYTFEALIKILARGFCLNEFTYLRDPWNWLD FSVITLA    |                                             |                                             |
| Y09108       | YVGA AVDLRGISGLRTFRVLRA LKTVSVIPGLKVIVGALI   |                                             |                                             |
| mScn10a(GRI) | YVGA AIDLRGISGLRTFRVLRA LKTVSVIPGLKVIVGALI   |                                             |                                             |
| Y09108       | HSVRKLADV TILTVFCLSVFALVGLQLFKGNLKNKCIKNG    |                                             |                                             |
| mScn10a(GRI) | HSVRKLADV TILTVFCLSVFALVGLQLFKGNLKNKCIKNG    |                                             |                                             |
| Y09108       | TDPHKADNLSSEMA                               | E DIFIKPGTTDPLL CGNGSDAGHCPN                |                                             |
| mScn10a(GRI) | TDPHKADNLSSEMA                               | G DIFIKPGTTDPLL CGNGSDAGHCPN                |                                             |
| Y09108       | G YVC Q KT P                                 | 330 340 350 360                             | DNP DFN YTS FDS FAWA FL SL FRL MT QD SWER L |
| mScn10a(GRI) | D YVC R KT S                                 | DNP DFN YTS FDS FAWA FL SL FRL MT QD SWER L |                                             |
| Y09108       | YQQT L RAS GKMYMVFFVLVIFLGSFYLVNLILA VVTMAYE |                                             |                                             |
| mScn10a(GRI) | YQQT L RAS GKMYMVFFVLVIFLGSFYLVNLILA VVTMAYE |                                             |                                             |
| Y09108       | EQSQATIAEIEAKEKKF                            | Q EALEVLQKEQEVLAA LGI                       | D TTS                                       |
| mScn10a(GRI) | EQSQATIAEIEAKEKKF                            | K EALEVLQKEQEVLAA LGI                       | G TTS                                       |

Y09108 490 500 510 520  
mScn10a(GRI) YNQRRMSFLGLSSGRRRASHG SVFHFRA PSQDV SF PDGIL  
YNQRRMSFLGLSSGRRRASHS SVFHFRA PSQDV SF PDGIL

Y09108 530 540 550 560  
mScn10a(GRI) DDGVFHGDQESRRN SILLGRGAGQAGPLPRSP LPQSPNPG  
DDGVFHGDQESRRS SILLGRGAGQAGPLPRSP LPQSPNPG

Y09108 570 580 590 600  
mScn10a(GRI) R KHGK EGGQLGM PTGELA AGT PEGPALDAAGQKNFLSA G YL  
P RRG E EGGQ RGV PTGELA TGA PEGPALDAAGQKNFLSA D YL

Y09108 610 620 630 640  
mScn10a(GRI) NEPFRAQRAMSVVSIMTSVIEELEESKLKCPPCLIS F A Q K  
NEPFRAQRAMSVVSIMTSVIEELEESKLKCPPCLIS L A Q K

Y09108 650 660 670 680  
mScn10a(GRI) YLIWECCPKWRKF KMVL L ELVTDPPFAELTITLCIVVNTVF  
YLIWECCPKWKKF KMVL F ELVTDPPFAELTITLCIVVNTVF

Y09108 690 700 710 720  
mScn10a(GRI) MAMEHYPM TDAFDAMLQAGNIVFTVFF TMEMAFKIIAFDP  
MAMEHYPM TDAFDAMLQAGNIVFTVFF TMEMAFKIIAFDP

Y09108 730 740 750 760  
mScn10a(GRI) YYYFQKKWNIFDCVIVTVS LLELS A SKKGSLSVLRSL RLL  
YYYFQKKWNIFDCVIVTVS LLELS T SKKGSLSVLR T F RLL

Y09108 770 780 790 800  
mScn10a(GRI) RVFKLAKSWPTLNMLIKI IGNSVGALGNLT FILAII VFIF  
RVFKLAKSWPTLNMLIKI IGNSVGALGNLT FILAII VFIF

Y09108 810 820 830 840  
mScn10a(GRI) ALVGKQLLS ENYGCRRDGVSVWNGEKL RWHMCDFFHSFLV  
ALVGKQLLS ENYGCRRDGI SVWNGERLRWHMCDFFHSFLV

Y09108 850 860 870 880  
mScn10a(GRI) VFRI LCGEWIENMWVCMEVSQ N YICLT LFLTV MV LGNLVV  
VFRI LCGEWIENMWVCMEVSQ D YICLT LFLTV MV LGNLVV

Y09108 890 900 910 920  
mScn10a(GRI) LNLFIALL LNSFSADNLTAPEDDGEVNNLQLALARIQV L G  
LNLFIALL LNSFSADNLTAPEDDGEVNNLQVALARIQV F G

Y09108 930 940 950 960  
mScn10a(GRI) HRASRAITSYIRSHCR F RWPKVETQLGMKPPLT SCKVENH  
HRASRAITSYIRSHCR L RWPKVETQLGMKPPLT SCKAENH

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1010                                                                            | 1020 | 1030 | 1040 |
| Y09108       | A E G E S D L D E L E E D V E Q A S Q S S W Q E E S P K G Q Q E L L P Q V Q K C |      |      |      |
| mScn10a(GRI) | A E G E S D L D E L E E D V E H A S Q S S W Q E E S P K G Q - E L L Q Q V Q K C |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1050                                                                            | 1060 | 1070 | 1080 |
| Y09108       | E N H Q A A R S P T S G M S S E D L A P Y L G E R W K R K D N P Q V P A E G V D |      |      |      |
| mScn10a(GRI) | E D H Q A A R S P P S G M S S E D L A P Y L G E R W Q R E E S P R V P A E G V D |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1090                                                                            | 1100 | 1110 | 1120 |
| Y09108       | D T S S S E G S T V D C P D P E E I L R K I P E L A E D L D E P D D C F T E G C |      |      |      |
| mScn10a(GRI) | D T S S S E G S T V D C P D P E E I L R K I P E L A E E L D E P D D C F P E G C |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1130                                                                            | 1140 | 1150 | 1160 |
| Y09108       | T R R C P C C K V N T S K S P W A T G W Q V R K T C Y R I V E H S W F E S F I I |      |      |      |
| mScn10a(GRI) | T R R C P C C K V N T S K F P W A T G W Q V R K T C Y R I V E H S W F E S F I I |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1170                                                                            | 1180 | 1190 | 1200 |
| Y09108       | F M I L L S S G T L A F E D N Y L E E K P R V K S V L E Y T D R V F T F I F V F |      |      |      |
| mScn10a(GRI) | F M I L L S S G A L A F E D N Y L E E K P R V K S V L E Y T D R V F T F I F V F |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1210                                                                            | 1220 | 1230 | 1240 |
| Y09108       | E M L L K W V A Y G F K K Y F T N A W C W L D F L I V N I S L T S L I A K I L E |      |      |      |
| mScn10a(GRI) | E M L L K W V A Y G F K K Y F T N A W C W L D F L I V N I S L T S L I A K I L E |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1250                                                                            | 1260 | 1270 | 1280 |
| Y09108       | Y S D V A S I K A L R T L R A L R P L R A L S R F E G M R V V V D A L V G A I P |      |      |      |
| mScn10a(GRI) | Y S D V A S I K A L R T L R A L R P L R A L S R F E G M R V V V D A L V G A I P |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1290                                                                            | 1300 | 1310 | 1320 |
| Y09108       | S I M N V L L V C L I F W L I F S I M G V N L F A G K F S R C V D T R S N P F S |      |      |      |
| mScn10a(GRI) | S I M N V L L V C L I F W L I F S I M G V N L F A G K F S R C V D T R S N P F S |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1330                                                                            | 1340 | 1350 | 1360 |
| Y09108       | V V N S T F V N N K S D C H N Q N N T G H F F W V N V K V N F D N V A M G Y L A |      |      |      |
| mScn10a(GRI) | V V N S T F V T N K S D C Y N Q N N T G H F F W V N V K V N F D N V A M G Y L A |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1370                                                                            | 1380 | 1390 | 1400 |
| Y09108       | L L Q V A T F K G W M D I M Y A A V D S R D I N S Q P N W E E S L Y M Y L Y F V |      |      |      |
| mScn10a(GRI) | L L Q V A T F K G W M D I M Y A A V D S R D I N S Q P N W E E S L Y M Y L Y F V |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1410                                                                            | 1420 | 1430 | 1440 |
| Y09108       | V F I I F G G F F T L N L F V G V I I D N F N Q Q K K K L G G Q D I F M T E E Q |      |      |      |
| mScn10a(GRI) | V F I I F G G F F T L N L F V G V I I D N F N Q Q K K K L G G Q D I F M T E E Q |      |      |      |

|              |                                                                                 |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|
|              | 1450                                                                            | 1460 | 1470 | 1480 |
| Y09108       | K K Y Y N A M K K L G S K K P Q K P I P R P L N K Y Q G F V F D I V T R Q A F D |      |      |      |
| mScn10a(GRI) | K K Y Y N A M K K L G S K K P Q K P I P R P L N K Y Q G F V F D I V T R Q A F D |      |      |      |

|              |               |                                                   |                 |      |      |
|--------------|---------------|---------------------------------------------------|-----------------|------|------|
|              |               | 1530                                              | 1540            | 1550 | 1560 |
| Y09108       | T G E C V M K | V F A L R Q Y Y F T N G W N V F D F I V V I L S I | A S L L F S A I |      |      |
| mScn10a(GRI) | T G E C V M K | M F A L R Q Y Y F T N G W N V F D F I V V I L S I | S S L L F S A I |      |      |

|              |                       |                                                           |      |      |      |
|--------------|-----------------------|-----------------------------------------------------------|------|------|------|
|              |                       | 1570                                                      | 1580 | 1590 | 1600 |
| Y09108       | L K S L E S Y F S P T | F F R V I R L A R I G R I L R L I R A A K G I R T L L F A |      |      |      |
| mScn10a(GRI) | L S S L E S Y F S P T | L L R V I R L A R I G R I L R L I R A A K G I R T L L F A |      |      |      |

|              |                                                       |                           |      |      |      |
|--------------|-------------------------------------------------------|---------------------------|------|------|------|
|              |                                                       | 1610                      | 1620 | 1630 | 1640 |
| Y09108       | L M M S L P A L F N I A L L L F L V M F I Y S I F G M | A S F A N V I D E A G I D |      |      |      |
| mScn10a(GRI) | L M M S L P A L F N I G L L L F L V M F I Y S I F G M | T S F A N V I D E A G I D |      |      |      |

|              |                                                                                 |      |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|------|
|              |                                                                                 | 1650 | 1660 | 1670 | 1680 |
| Y09108       | D M F N F K T F G N S M L C L F Q I T T S A G W D G L L S P I L N T G P P Y C D |      |      |      |      |
| mScn10a(GRI) | D M F N F K T F G N S M L C L F Q I T T S A G W D G L L S P I L N T G P P Y C D |      |      |      |      |

|              |                                                                                 |      |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|------|
|              |                                                                                 | 1690 | 1700 | 1710 | 1720 |
| Y09108       | P N R P N S N G S K G N C G S P A V G I L F F T T Y I I I S F L I V V N M Y I A |      |      |      |      |
| mScn10a(GRI) | P N R P N S N G S K G N C G S P A V G I L F F T T Y I I I S F L I V V N M Y I A |      |      |      |      |

|              |                                                                                 |      |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|------|
|              |                                                                                 | 1730 | 1740 | 1750 | 1760 |
| Y09108       | V I L E N F N V A T E E S T E P L S E D D F D M F Y E T W E K F D P E A T Q F I |      |      |      |      |
| mScn10a(GRI) | V I L E N F N V A T E E S T E P L S E D D F D M F Y E T W E K F D P E A T Q F I |      |      |      |      |

|              |                                                                                 |      |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|------|
|              |                                                                                 | 1770 | 1780 | 1790 | 1800 |
| Y09108       | A F S A L S D F A D T L S G P L R I P K P N Q N I L I Q M D L P L V P G D K I H |      |      |      |      |
| mScn10a(GRI) | A F S A L S D F A D T L S G P L R I P K P N Q N I L I Q M D L P L V P G D K I H |      |      |      |      |

|              |                                                                                 |      |      |      |      |
|--------------|---------------------------------------------------------------------------------|------|------|------|------|
|              |                                                                                 | 1810 | 1820 | 1830 | 1840 |
| Y09108       | C L D I L F A F T K N V L G E S G E L D S L K T N M E E K F M A T N L S K A S Y |      |      |      |      |
| mScn10a(GRI) | C L D I L F A F T K N V L G E S G E L D S L K T N M E E K F M A T N L S K A S Y |      |      |      |      |

|              |                                                                         |         |      |      |      |
|--------------|-------------------------------------------------------------------------|---------|------|------|------|
|              |                                                                         | 1850    | 1860 | 1870 | 1880 |
| Y09108       | E P I A T T L R C K Q E D I S A T I I Q K A Y R N Y M L Q R S L M L S N | T L H V |      |      |      |
| mScn10a(GRI) | E P I A T T L R C K Q E D I S A T I I Q K A Y R N Y M L Q R S L M L S N | P L H V |      |      |      |

|              |                         |                                                         |      |      |      |
|--------------|-------------------------|---------------------------------------------------------|------|------|------|
|              |                         | 1890                                                    | 1900 | 1910 | 1920 |
| Y09108       | P R A E E D G V S L P K | G G Y V T F M A N D N G G L P D K S E T A S A T S F P P |      |      |      |
| mScn10a(GRI) | P R A E E D G V S L P R | E G Y V T F M A N D N G G L P D K S E T A S A T S F P P |      |      |      |

|              |                               |                                   |               |      |      |
|--------------|-------------------------------|-----------------------------------|---------------|------|------|
|              |                               | 1930                              | 1940          | 1950 | 1960 |
| Y09108       | S Y E S V T R G L S D R A N I | N T S S S M Q N E D E V T A K E G | N S P G P Q N |      |      |
| mScn10a(GRI) | S Y D S V T R G L S D R A N I | S T S S S M Q N E D E V T A K E G | K S P G P Q N |      |      |

## Appendix D

### Activation properties of Scn10a channels heterologously expressed in sympathetic neurons

| Cell<br>mV | 1                      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | Mean   | SEM   | N |
|------------|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|---|
|            | Normalized Conductance |        |        |        |        |        |        |        |        |        |       |   |
| -39        | -0.003                 | -0.005 | -0.001 | -0.001 | -0.003 | -0.001 | -0.003 | -0.004 | -0.004 | -0.003 | 0.000 | 9 |
| -34        | -0.004                 | -0.006 | -0.001 | -0.003 | -0.003 | -0.001 | -0.004 | -0.004 | -0.004 | -0.003 | 0.001 | 9 |
| -29        | -0.005                 | -0.006 | -0.002 | -0.001 | -0.004 | 0.000  | -0.005 | -0.005 | -0.005 | -0.003 | 0.001 | 9 |
| -24        | -0.003                 | -0.008 | -0.002 | -0.002 | -0.001 | 0.002  | -0.005 | -0.003 | -0.004 | -0.003 | 0.001 | 9 |
| -19        | 0.000                  | -0.004 | 0.000  | 0.000  | 0.003  | 0.006  | -0.003 | -0.002 | -0.003 | 0.000  | 0.001 | 9 |
| -14        | 0.011                  | 0.006  | 0.006  | 0.011  | 0.015  | 0.025  | 0.005  | 0.005  | 0.003  | 0.010  | 0.002 | 9 |
| -9         | 0.049                  | 0.035  | 0.021  | 0.026  | 0.047  | 0.086  | 0.023  | 0.016  | 0.014  | 0.035  | 0.008 | 9 |
| -4         | 0.153                  | 0.122  | 0.068  | 0.064  | 0.111  | 0.203  | 0.091  | 0.044  | 0.051  | 0.101  | 0.018 | 9 |
| 1          | 0.343                  | 0.294  | 0.179  | 0.152  | 0.236  | 0.353  | 0.235  | 0.125  | 0.154  | 0.230  | 0.028 | 9 |
| 6          | 0.554                  | 0.529  | 0.346  | 0.280  | 0.396  | 0.501  | 0.430  | 0.268  | 0.322  | 0.403  | 0.036 | 9 |
| 11         | 0.722                  | 0.750  | 0.508  | 0.431  | 0.558  | 0.625  | 0.624  | 0.439  | 0.502  | 0.573  | 0.038 | 9 |
| 16         | 0.872                  | 0.905  | 0.661  | 0.575  | 0.718  | 0.736  | 0.775  | 0.599  | 0.664  | 0.723  | 0.038 | 9 |
| 21         | 0.963                  | 1.001  | 0.782  | 0.727  | 0.847  | 0.822  | 0.896  | 0.752  | 0.793  | 0.843  | 0.031 | 9 |
| 26         | 1.011                  | 0.958  | 0.890  | 0.837  | 0.919  | 0.909  | 0.965  | 0.868  | 0.900  | 0.917  | 0.018 | 9 |
| 31         | 0.966                  | 0.753  | 0.978  | 0.934  | 0.972  | 1.004  | 0.993  | 0.957  | 0.984  | 0.949  | 0.025 | 9 |

#### Boltzmann equation parameters as determined by nonlinear regression

|    |      |      |       |       |      |      |      |       |       |      |      |   |
|----|------|------|-------|-------|------|------|------|-------|-------|------|------|---|
| Vh | 5.07 | 5.42 | 11.21 | 13.49 | 9.33 | 6.90 | 8.12 | 13.16 | 11.43 | 9.35 | 1.06 | 9 |
| k  | 5.43 | 4.75 | 6.73  | 7.26  | 6.72 | 7.81 | 5.74 | 6.53  | 6.30  | 6.36 | 0.31 | 9 |

### Inactivation properties of Scn10a channels heterologously expressed in sympathetic neurons

| Cell<br>mV | 1                      | 2     | 3     | 4     | Mean  | SEM   | N |
|------------|------------------------|-------|-------|-------|-------|-------|---|
|            | Normalized conductance |       |       |       |       |       |   |
| -59        | 1.000                  | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 4 |
| -53        | 1.011                  | 0.998 | 1.001 | 0.985 | 0.999 | 0.005 | 4 |
| -48        | 0.960                  | 0.992 | 0.952 | 0.976 | 0.970 | 0.009 | 4 |
| -44        | 0.956                  | 0.963 | 0.883 | 0.933 | 0.934 | 0.018 | 4 |
| -38        | 0.936                  | 0.918 | 0.772 | 0.840 | 0.866 | 0.038 | 4 |
| -34        | 0.907                  | 0.841 | 0.611 | 0.717 | 0.769 | 0.066 | 4 |
| -28        | 0.825                  | 0.723 | 0.432 | 0.539 | 0.630 | 0.089 | 4 |
| -23        | 0.658                  | 0.560 | 0.278 | 0.348 | 0.461 | 0.089 | 4 |
| -18        | 0.388                  | 0.347 | 0.145 | 0.147 | 0.257 | 0.065 | 4 |
| -14        | 0.127                  | 0.137 | 0.046 | 0.046 | 0.089 | 0.025 | 4 |
| -9         | 0.027                  | 0.034 | 0.017 | 0.023 | 0.025 | 0.004 | 4 |
| -4         | 0.004                  | 0.008 | 0.004 | 0.009 | 0.006 | 0.001 | 4 |
| 1          | 0.000                  | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4 |

#### Boltzmann equation parameters as determined by nonlinear regression

|    |        |        |        |        |        |      |   |
|----|--------|--------|--------|--------|--------|------|---|
| Vh | -20.68 | -22.51 | -30.14 | -27.66 | -25.25 | 2.20 | 4 |
| K  | -4.30  | -5.56  | -6.52  | -5.89  | -5.57  | 0.47 | 4 |

## Appendix E

### Activation properties of TTX-R sodium channels in mouse DRG neurons

| Cell<br>mV | 1                      | 2      | 3     | 4     | 5     | 6      | 7     | 8      | 9      | Mean    | SEM    | N |
|------------|------------------------|--------|-------|-------|-------|--------|-------|--------|--------|---------|--------|---|
|            | Normalized Conductance |        |       |       |       |        |       |        |        |         |        |   |
| -58        | 0.001                  | 0.001  | 0.001 | 0.001 | 0.001 | 0.001  | 0.001 | 0.001  | 0.000  | 0.0007  | 0.0001 | 9 |
| -48        | 0.000                  | -0.002 | 0.000 | 0.000 | 0.001 | 0.000  | 0.000 | -0.001 | 0.000  | -0.0001 | 0.0003 | 9 |
| -43        | 0.001                  | -0.001 | 0.000 | 0.000 | 0.001 | 0.000  | 0.000 | 0.001  | 0.000  | 0.0003  | 0.0002 | 9 |
| -38        | 0.001                  | -0.001 | 0.000 | 0.002 | 0.004 | -0.001 | 0.000 | 0.002  | -0.001 | 0.0007  | 0.0005 | 9 |
| -34        | 0.003                  | 0.002  | 0.002 | 0.004 | 0.007 | 0.001  | 0.001 | 0.005  | 0.000  | 0.0028  | 0.0007 | 9 |
| -28        | 0.006                  | 0.007  | 0.006 | 0.009 | 0.010 | 0.009  | 0.005 | 0.009  | 0.002  | 0.0069  | 0.0008 | 9 |
| -24        | 0.013                  | 0.022  | 0.016 | 0.020 | 0.017 | 0.029  | 0.015 | 0.018  | 0.007  | 0.0175  | 0.0021 | 9 |
| -19        | 0.032                  | 0.057  | 0.046 | 0.047 | 0.032 | 0.082  | 0.048 | 0.042  | 0.022  | 0.0454  | 0.0058 | 9 |
| -14        | 0.086                  | 0.161  | 0.127 | 0.110 | 0.060 | 0.223  | 0.162 | 0.105  | 0.062  | 0.1217  | 0.0177 | 9 |
| -9         | 0.244                  | 0.373  | 0.312 | 0.268 | 0.134 | 0.437  | 0.433 | 0.271  | 0.184  | 0.2950  | 0.0349 | 9 |
| -4         | 0.511                  | 0.625  | 0.558 | 0.493 | 0.300 | 0.663  | 0.716 | 0.531  | 0.405  | 0.5335  | 0.0429 | 9 |
| 1          | 0.716                  | 0.796  | 0.746 | 0.688 | 0.519 | 0.839  | 0.888 | 0.757  | 0.633  | 0.7313  | 0.0369 | 9 |
| 6          | 0.852                  | 0.903  | 0.861 | 0.824 | 0.718 | 0.947  | 0.978 | 0.914  | 0.804  | 0.8668  | 0.0265 | 9 |
| 11         | 0.935                  | 0.969  | 0.933 | 0.921 | 0.859 | 0.999  | 1.000 | 0.988  | 0.923  | 0.9475  | 0.0153 | 9 |
| 16         | 0.982                  | 1.000  | 0.988 | 0.983 | 0.957 | 1.000  | 0.963 | 1.000  | 0.986  | 0.9843  | 0.0053 | 9 |
| 21         | 1.000                  | 0.985  | 1.000 | 1.000 | 1.000 | 0.903  | 0.852 | 0.924  | 1.000  | 0.9628  | 0.0185 | 9 |

### Boltzmann equation parameters as determined by nonlinear regression

|    |       |       |       |       |      |       |       |       |       |       |      |   |
|----|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|------|---|
| Vh | -3.61 | -6.20 | -4.72 | -3.38 | 0.72 | -7.56 | -7.73 | -4.48 | -1.69 | -4.29 | 0.91 | 9 |
| k  | 4.94  | 4.97  | 5.25  | 5.53  | 5.40 | 5.00  | 3.99  | 4.55  | 4.99  | 4.96  | 0.15 | 9 |

### Inactivation properties of TTX-R sodium channels in mouse DRG neurons

| Cell<br>mV | 1                      | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | Mean   | SEM    | N |
|------------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|---|
|            | Normalized Conductance |       |       |       |       |       |       |       |       |        |        |   |
| -58        | 1.000                  | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.0000 | 0.0000 | 9 |
| -53        | 0.972                  | 0.990 | 0.988 | 1.009 | 1.002 | 0.961 | 0.989 | 0.991 | 0.988 | 0.9877 | 0.0047 | 9 |
| -48        | 0.919                  | 0.963 | 0.944 | 0.996 | 1.013 | 0.913 | 0.952 | 0.965 | 0.950 | 0.9572 | 0.0108 | 9 |
| -43        | 0.810                  | 0.878 | 0.869 | 0.943 | 0.974 | 0.805 | 0.870 | 0.892 | 0.859 | 0.8777 | 0.0183 | 9 |
| -38        | 0.625                  | 0.759 | 0.732 | 0.815 | 0.875 | 0.620 | 0.697 | 0.726 | 0.663 | 0.7236 | 0.0282 | 9 |
| -33        | 0.369                  | 0.567 | 0.513 | 0.583 | 0.680 | 0.420 | 0.421 | 0.452 | 0.390 | 0.4885 | 0.0347 | 9 |
| -29        | 0.140                  | 0.321 | 0.266 | 0.272 | 0.377 | 0.222 | 0.158 | 0.184 | 0.148 | 0.2321 | 0.0277 | 9 |
| -23        | 0.046                  | 0.125 | 0.087 | 0.079 | 0.145 | 0.125 | 0.049 | 0.084 | 0.058 | 0.0888 | 0.0119 | 9 |
| -19        | 0.023                  | 0.035 | 0.032 | 0.033 | 0.050 | 0.078 | 0.023 | 0.060 | 0.035 | 0.0410 | 0.0061 | 9 |
| -14        | 0.013                  | 0.011 | 0.015 | 0.015 | 0.023 | 0.042 | 0.013 | 0.035 | 0.020 | 0.0210 | 0.0036 | 9 |
| -9         | 0.003                  | 0.003 | 0.006 | 0.005 | 0.010 | 0.021 | 0.005 | 0.021 | 0.007 | 0.0091 | 0.0023 | 9 |
| -4         | 0.001                  | 0.002 | 0.001 | 0.000 | 0.000 | 0.005 | 0.002 | 0.009 | 0.003 | 0.0025 | 0.0010 | 9 |
| 1          | 0.000                  | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.0000 | 0.0000 | 9 |

### Boltzmann equation parameters as determined by nonlinear regression

|    |        |        |        |        |        |        |        |        |        |        |      |   |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|---|
| Vh | -36.20 | -32.35 | -33.04 | -32.68 | -30.89 | -35.43 | -35.16 | -34.53 | -35.62 | -33.99 | 0.60 | 9 |
| k  | -4.71  | -4.78  | -4.41  | -3.66  | -3.83  | -5.54  | -3.82  | -3.97  | -3.95  | -4.30  | 0.21 | 9 |

[illegible]

200 220 240  
 ■CCCTTTTCTCTGCCTCCTCCTTCTCC■CCTCCTTCTTCTCCTTCCTTCTTCCTT  
 9 4/25whole ▶ TCCCTTTTCTCTGCCTCCTCCTTCTCCTCCTCCTTCTTCTCCTTCCTTCTTCCTT  
 A 4/25whole ▶ .CCCTTTTCTCTGCCTCCTCCTCCTTCTCCACCTCCTTCTTCTCCTTCCTTCTTCCTT  
 B 4/25whole ▶ .CCCTTTTCTCTGCCTCCTCCTCCTTCTCCTCCTCCTTCTTCTCCTTCCTTCTTCCTT  
 Intron1-in/A-NotI ▶  
 Intron1-in/B-NotI ▶  
 Intron1-out/A-SwaI ◀  
 Intron1-out/B-SwaI ◀  
 Intron1-out/A-SwaI/I-CeuI ◀  
 Intron1-out/B-SwaI/I-CeuI ◀

260 280 300  
 CTCTTCTTCT **KWYYK** **CRKYSB**Y CCTTTTGAATGAC **KATSKMG** **SMMRY** GACAACCAACAAT  
 9 4/25whole ▶ CTCTTCTTCTTTCTTCATTGCTCCTTTTGAATGACTATGTAGCAAACGACAACCAACAAT  
 A 4/25whole ▶ CTCTTCTTCTTTCTTCATTGTTCTTTTGAATGACTATGTAGCAAATGACAACCAACAAT  
 B 4/25whole ▶ CTCTTCTTCTTTCTTCATTGTTCTTTTGAATGACTATGTAGCAAATGACAACCAACAAT  
 Intron1-in/A-NotI ▶ GATCGCGGCCGCCCTTTTGAATGACTATGTAGC  
 Intron1-in/B-NotI ▶ GATCGCGGCCGCGACAACCAACAAT  
 Intron1-out/A-Swal ◀  
 Intron1-out/B-Swal ◀  
 Intron1-out/A-Swal/I-Ceul ◀  
 Intron1-out/B-Swal/I-Ceul ◀

|   |                             |                                                                  |     |     |
|---|-----------------------------|------------------------------------------------------------------|-----|-----|
|   |                             | 320                                                              | 340 | 360 |
|   |                             | CAGCAACCTACCCATAGGGGCTCTAGAATTTATGTCCTCTGAGAGTCCCAAGATTCCTCAAA   |     |     |
|   |                             |                                                                  |     |     |
| 9 | 4/25whole ▶                 | CAGCAACCTACCCATAGGGGCTCTAGAATTTATGTCCTCTGAGAGACCCCAGAATTCCAA     |     |     |
| A | 4/25whole ▶                 | CAGCAACCTACCCATAGGGGCTCTAGAATTTATGTCCTCTGAGAGTTCCTCAAGATTCCTCAAA |     |     |
| B | 4/25whole ▶                 | CAGCAACCTACCCATAGGGGCTCTAGAATTTATGTCCTCTGAGAGTCCCAAGATTCCTCAAA   |     |     |
|   | Intron1-in/A-NotI ▶         |                                                                  |     |     |
|   | Intron1-in/B-NotI ▶         | CAGCAACC                                                         |     |     |
|   | Intron1-out/A-SwaI ◀        |                                                                  |     |     |
|   | Intron1-out/B-SwaI ◀        |                                                                  |     |     |
|   | Intron1-out/A-SwaI/I-CeuI ◀ |                                                                  |     |     |
|   | Intron1-out/B-SwaI/I-CeuI ◀ |                                                                  |     |     |

380 400 420  
ATGTCAC~~C~~CACTTGCAGAACTACCTGCAACCGACAAA~~T~~TCTCGCCCCTGCTAGAGCAAG  
9 4/25whole ▶ ATGTCACACACTTGCAGAACTACCTGCAACCGACAAAGTCTCGCCCCTGCTAGAGCAAG  
A 4/25whole ▶ ATGTCACACACTTGCAGAACTACCTGCAACCGACAAAATCTCGCCCCTGCTAGAGCAAG  
B 4/25whole ▶ ATGTCACGCACTTGCAGAACTACCTGCAACCGACAAAATCTCGCCCCTGCTAGAGCAAG  
Intron1-in/A-NotI ▶  
Intron1-in/B-NotI ▶  
Intron1-out/A-Swal ◀  
Intron1-out/B-Swal ◀  
Intron1-out/A-Swal/I-Ceul ◀  
Intron1-out/B-Swal/I-Ceul ◀

440 460 480  
AGGCAAATCATAGTCAGCTGCTG~~T~~GG~~T~~CAATC~~T~~Y~~K~~NAAGCAGCTCCATATCCCACACCCG  
9 4/25whole ▶ AGGCAAATCATAGTCAGCTGCTGTGG.TCAATCCG.AAGCAGCTCCATATCCCACACCCG  
A 4/25whole ▶ AGGCAAATCATAGTCAGCTGCTGCGGGTCAATCTTGAAGCAGCTCCATATCCCACACCCG  
B 4/25whole ▶ AGGCAAATCATAGTCAGCTGCTGTGG.TCAATCTG.AAGCAGCTCCATATCCCACACCCG  
Intron1-in/A-NotI ▶  
Intron1-in/B-NotI ▶  
Intron1-out/A-Swal ◀  
Intron1-out/B-Swal ◀  
Intron1-out/A-Swal/I-Ceul ◀  
Intron1-out/B-Swal/I-Ceul ◀

500 520 540  
GGATTA~~A~~AACAGACATACTCATAATATT~~T~~CTG~~T~~GATT~~T~~TCTTCTTAAAGAAA~~T~~GCAAAAT  
9 4/25whole ▶ GGATTA~~A~~AACAGACATACTCATAATATTTCTGTGATTTTCTTCTTAAAGAAA.GCAAAAT  
A 4/25whole ▶ GGATTA~~A~~AACAGACATACTCATAATATTTCTGGGATTCTTCTTAAAGAAAAGCAAAAT  
B 4/25whole ▶ GGATTA~~A~~AACAGACATACTCATAATATT.CTGTGATTCTTCTTAAAGAAA.GCAAAAT  
Intron1-in/A-NotI ▶  
Intron1-in/B-NotI ▶  
Intron1-out/A-Swal ◀  
Intron1-out/B-Swal ◀  
Intron1-out/A-Swal/I-Ceul ◀  
Intron1-out/B-Swal/I-Ceul ◀

|                             | 560                                                          | 580 | 600 |
|-----------------------------|--------------------------------------------------------------|-----|-----|
|                             | TTTACTGCAATGAGGGAAAGATGTCAAAATTTATAAAGCTAGTTTGTGGGGGAATGG    |     |     |
| 9 4/25whole ▶               | TTTCACTGCAATGAGGGAAAGATG.TCAAAATTTATAAAGC.TAGTTTGTGGGGGAATGG |     |     |
| A 4/25whole ▶               | TT.CACTGCAATGAGGGAAAGATG.TCAGAATTTATAAAGC.TAGTTTGTGGGGGAATGG |     |     |
| B 4/25whole ▶               | TTTTACTGCAATGAGGGAAAGATGGTCAAAATTTATAAAGCCTAGTTTGTGGGGGAATGG |     |     |
| Intron1-in/A-NotI ▶         |                                                              |     |     |
| Intron1-in/B-NotI ▶         |                                                              |     |     |
| Intron1-out/A-SwaI ◀        |                                                              |     |     |
| Intron1-out/B-SwaI ◀        |                                                              |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ |                                                              |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ |                                                              |     |     |

|                             | 620                                                          | 640 | 660 |
|-----------------------------|--------------------------------------------------------------|-----|-----|
|                             | GATGGAGCTTCTTACAAAGCAAGGAGAAATCAATGGCTTCAGGGATATGGACAAACAC   |     |     |
| 9 4/25whole ▶               | GATGGAGCTTCTTACAAAGCAAGGAGGAAA.CAATGGCTTCAGGGATATGGAGCAAAGAC |     |     |
| A 4/25whole ▶               | GATGGAGCTTCTTACAAAGCAAGGAG.AAAGCAATGGCTTCAGGGATATGGAGCAAAGAC |     |     |
| B 4/25whole ▶               | GATGGAGCTTCTTACAAAGCAAGGAGGAAG.CAATGGCTTCAGGGATATGGAACAAAAAC |     |     |
| Intron1-in/A-NotI ▶         |                                                              |     |     |
| Intron1-in/B-NotI ▶         |                                                              |     |     |
| Intron1-out/A-SwaI ◀        |                                                              |     |     |
| Intron1-out/B-SwaI ◀        |                                                              |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ |                                                              |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ |                                                              |     |     |

|                             | 680                                                           | 700 | 720 |
|-----------------------------|---------------------------------------------------------------|-----|-----|
|                             | ACACCTGTGCTACCTGGATTTGTAGATGGACTGCAGAGGATGGAGGGGGGGGGGCGGG    |     |     |
| 9 4/25whole ▶               | ACACCTGTGCTACCTGGATTTGTAGATGGACTGCAGAGGATGGAGGGGGGGGGGG.CGGG  |     |     |
| A 4/25whole ▶               | ACACCTGTGCTACCTGGATTTGTAGATGGACTGCAGAGGATGGAGGGGGGGGGGGCGGG   |     |     |
| B 4/25whole ▶               | ACACCTGTGCTACCTGGATTTGTAGATGGACTGCAGAGGATGGAGGGGGGGGGG...CGGG |     |     |
| Intron1-in/A-NotI ▶         |                                                               |     |     |
| Intron1-in/B-NotI ▶         |                                                               |     |     |
| Intron1-out/A-SwaI ◀        |                                                               |     |     |
| Intron1-out/B-SwaI ◀        |                                                               |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ |                                                               |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ |                                                               |     |     |

|                             |                                                               |     |     |
|-----------------------------|---------------------------------------------------------------|-----|-----|
|                             | 740                                                           | 760 | 780 |
|                             | TATTGAAGAGCTGGAGACAGAGATAGGGGGCTGCTCTGTCAATCAAGTAGGGGTGATGG   |     |     |
| 9 4/25whole ▶               | .TATTGAAGAGCTGGAGACAGAGATAGGGGGCTGCTCTGTCAATCAAGTAGGGGTGATGG  |     |     |
| A 4/25whole ▶               | .TATTGAGGAGCTGGAGACAGAGATAGGGGGCTGCTCTGTCAATCAAGTAGGGGTGATGG  |     |     |
| B 4/25whole ▶               | GTATTGAGGAGCTGGAGACAGAGATAGGGGGCTGCTCTGTCAATCAAGTAGGGGTGATGG  |     |     |
| Intron1-in/A-NotI ▶         |                                                               |     |     |
| Intron1-in/B-NotI ▶         |                                                               |     |     |
| Intron1-out/A-SwaI ◀        |                                                               |     |     |
| Intron1-out/B-SwaI ◀        |                                                               |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ |                                                               |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ |                                                               |     |     |
|                             | 800                                                           | 820 | 840 |
|                             | ACAGGAGGGTTGCAGTGGTCAGGCTGTCACCACTCTCTGGTTATTTTCCTCCCAAGAAGAG |     |     |
| 9 4/25whole ▶               | ACAGGAGGGTTGCAGTGGTCAGGCTGTCACCACTCTCTGGTTATTTTCCTCCCAAGAAGAG |     |     |
| A 4/25whole ▶               | ACAGGAGGGTTGCAGTGGTCAGGCTGTCACCACTCTCTGGTTATTTTCCTCCCAAGAAGAG |     |     |
| B 4/25whole ▶               | ACAGGAGGGTTGCAGTGGTCAGGCTGTCACCACTCTCTGGTTATTTTCCTCCCAAGAAGAG |     |     |
| Intron1-in/A-NotI ▶         |                                                               |     |     |
| Intron1-in/B-NotI ▶         |                                                               |     |     |
| Intron1-out/A-SwaI ◀        | GAG                                                           |     |     |
| Intron1-out/B-SwaI ◀        | GGTCAGGCTGTCACCACTCTCTGGATTT                                  |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ | GAG                                                           |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ | GGTCAGGCTGTCACCACTCTCTGGTTCGCTACCTTAGGACCGTT                  |     |     |
|                             | 860                                                           | 880 | 900 |
|                             | TGTAATCCTTCCCAAGAAGAATGAGAAGATGGAGTTCCCCTTTGGGTCCGTGGGAAC     |     |     |
| 9 4/25whole ▶               | TGTAATCCTTCCCAAGAAGAATGAGAAGATGGAGTTCCCCTTTGGGTCCGTGGGAAC     |     |     |
| A 4/25whole ▶               | TGTAATCCTTCCCAAGAAGAATGAGAAGATGGAGTTCCCCTTTGGGTCCGTGGGAAC     |     |     |
| B 4/25whole ▶               | TGTAATCCTTCCCAAGAAGAATGAGAAGATGGAGTTCCCCTTTGGGTCCGTGGGAAC     |     |     |
| Intron1-in/A-NotI ▶         |                                                               |     |     |
| Intron1-in/B-NotI ▶         |                                                               |     |     |
| Intron1-out/A-SwaI ◀        | TGTAATCCTTCCCAAGAAGATT                                        |     |     |
| Intron1-out/B-SwaI ◀        |                                                               |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ | TGTAATCCTTCCCAAGAAGTTCGCTACCTTAGGACCGTTATAGTTACGATT           |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ | ATAGTTACGATT                                                  |     |     |

|                             | 920                                 | 940 | 960 |
|-----------------------------|-------------------------------------|-----|-----|
|                             | ACCAACTTCAGACGGTTCACTCCAGAGTCGCTGGC |     |     |
| 9 4/25whole ▶               | ACCAACTTCAGACGGTTCACTCCAGAGTCGCTGGC |     |     |
| A 4/25whole ▶               | ACCAACTTCAGACGGTTCACTCCAGAGTCGCTGGC |     |     |
| B 4/25whole ▶               | ACCAACTTCAGACGGTTCACTCCAGAGTCGCTGGC |     |     |
| Intron1-in/A-NotI ▶         |                                     |     |     |
| Intron1-in/B-NotI ▶         |                                     |     |     |
| Intron1-out/A-SwaI ◀        |                                     |     |     |
| Intron1-out/B-SwaI ◀        |                                     |     |     |
| Intron1-out/A-SwaI/I-CeuI ◀ |                                     |     |     |
| Intron1-out/B-SwaI/I-CeuI ◀ |                                     |     |     |

## Appendix G:

### Primers for 5' Rapid Amplification of cDNA Ends:

GCCAGCGACTCTGGAGTGAACCGTC- Scn10a5'RACE1

GACCAGCTCTGCTGGGAGCTCGC- Scn10a5'RACE2

GAACCTGGGCAGCTGGTTACAGGCC- Scn10a5'RACE3

### RACE products

Scn10a RACE Clone B from ATG out

Sequence Range: 1 to 245 5'UTR (245+ cds)

```

      10      20      30      40      50      60
CCGGACAAGTGTAAAGTTTCGCAGAGCTGGGGTCTCCAGCTTACTTCTGCTAATGCTACCC
_____5' UTR MOUSE SCN10A_____>

      70      80      90     100     110     120
CAGGCCTTTAGACGGAGAACAGATGGCAGATGGAGTTTCTTCCTGCCATGCGCGAATGCT
_____5' UTR MOUSE SCN10A_____>

     130     140     150     160     170     180
GAGCGGATCTCATGATCCCCGAGCTCATGGCTTTCAGTAGAGGCAACCTGGGCTAAGAAG
_____5' UTR MOUSE SCN10A_____>

     190     200     210     220     230     240
AGATCTCCGACTTACGGAGCAGCAAAGAAGAGTGTAATCCTTCCCCAAGAAGAATGAGA
_____5' UTR MOUSE SCN10A_____>
```

>Start\_codon

|

AGATG

```

GAGTTCCTCCCTTTGGGTCCGTCCGGAACCTACCAACTTCAGACGGTTCCTCCAGAGTCGCTGGCAGAGATCGAGA
AGCAGATCGNTGCCACCGCGCCGCCAAGAAGGGCAGACCTAAGCAAAGAGGACAGAAGGACAAGAGTGAGAA
GCCCAGGCCTCAGTTGGACTTGAAGGCCTGTAACCAGCTGCCCAGGTTC
```

Scn10a RACE Clone I from ATG out

Sequence Range: 1 to 209 5'UTR (210+ cds)

```

      10      20      30      40      50      60
ACGCGGGGACTTCTGCTAATGCTACCCCAGGCCTTTAGACGGAGAACAGATGGCAGATGG
_____SCN10A 5'UTR_____>

      70      80      90     100     110     120
AGTTTCTTCCTGCCATGCGCGAATGCTGAGCGGGTCTCATGATCCCCGAGCTCATGGCTT
_____SCN10A 5'UTR_____>
```

>splice\_5'\_end\_of\_exon

|

```

     130     140     150     160     170 |     180
TCAGTAGAGGCAACCTGGGCTAAGAAGAGATCTCCGACTTACGGAGCAGCAAAGAGTGTA
_____SCN10A 5'UTR_____>
```

>Start\_codon

|

190 200 |  
AATCCTTCCCCAAGAAGAATGAGAAGATG  
\_\_\_\_SCN10A 5'UT\_\_\_\_>

GAGTTCCCCTTTGGGTCCGTGGGAACCTACCAACTTCAGACGGTTCAC'TCCAGAGTCGCTGGCAGAGATCGAGAAGCAGA  
CCGCTGCCACCGCGCCGCCAAGAAGGGCAGACCTAAGCAAAGAGGACAGAAGGACAAGAGTGAGAAGCCCAGGCCTCA  
GTTGGACTTGAAGGCCTGTAACCAGCTGCCCAGGTTC

[illegible]

## Appendix I:

LM-PCR primers: used for LM-PCR out (upstream) from the RACE products

CAGGTTGCCTCTACTGAAAGCCATGAGC –LMPCRScn10a-1

GCTCAGCATTGCGGCATGGCAGG –LMPCRScn10a-2

CTCCATCTGCCATCTGTTCTCCGTC –LMPCRScn10a-3

CTCCATCTGCCATCTGTTCTCCGTC –LMPCRScn10a-3a

CTCCGTCTAAAGGCCTGGGGTAGC –LMPCRScn10a

Sequence of combined two rounds of LM-PCR 5' from ends of RACE products:

```

      10      20      30      40      50      60
ATTCCAGTTGCTGAGTGAGAGAGAGCACTGTAGGGTCATGGAAGGACAGTGGGGAGGTCTG

      70      80      90     100     110     120
TTAGAGGTCTTGAAATTATATAGTGACCTCGCCATGATGGTGGTCTCAGAGATCGAGAG

      130     140     150     160     170     180
ATGATGTAATCAGGAGGACTCTAGGAATTCAAGTTAGAGGCCCCAGAAAGAGGGCTGTGG

      190     200     210     220     230     240
ACGAGGGACGGCTCTTGATTACCTCTAGATGCTGGGCTTGTGAGTCCAGGCAAGCAGAG

      250     260     270     280     290     300
TGTTCCTGGAGAGGCTTCTCTGGGGGAGGATCATTCTGAGCAGGGCACAGGCACAGAAAT

      310     320     330     340     350     360
CATTAGTCCATCTGTAACATGTCTGAGATGTTAGTGGAGTGTCCATGAAGGGAAATTCA

      370     380     390     400     410     420
GGCTTCTACCACATTAGTGTATATTTAAATCTGACACCAGGAGAGAGATTTATGATGGAG

      430     440     450     460     470     480
CTGACAGACTCCGGTGCCATGTCAGGTAGGTGACTGAAGCCCTGGGGAAGGAGAGGCGTA

      490     500     510     520     530     540
GGATGGAATCTTAAACGATTCTCCAACACTTCCAGGTGGCAGAGGAGGAGGCAGCCCA

      550     560     570     580     590     600
GGCCAGAGAAGCTCCTCTGAAAACAGAACTCAAGAGGGTGGAGTGTGGTGCAAGGACCAT

      610     620     630     640     650     660
GCAGCTAATCCTGCGGAGCCCTAGGATGAGAGCGCCAGAGAGGAGACACATGACACAGG

      670     680     690     700     710     720
GAGACCAGTAGAAACCTGTTAAGATTCCGGGTGTCTCAGGACTGCCTCTGGATGCACACT

      730     740     750     760     770     780
TCTTCCTTCTTGGGAAGTTACTTTTCTGTCACTGTGATGAAATACCTTAACCAAGGTGAC

      790     800     810     820     830     840
TCAAAGAAGAGAGGGTTTATCTGGGCTCACGGGTCCAGAGGTAGAGGAACACATGGAGAT

      850     860     870     880     890     900
CGTGGTGGGGAACCAGTGTAGCAGGCAAGCATGGTGGCTGGGGCTGAGGCTGAGAGCTTA

      910     920     930     940     950     960
TATCTTTGTCTGTATACAGAAAGCAGAGAGAGCCAACCTGGGAATGACTTGTGGCTTTTGG
```

970 980 990 1000 1010 1020  
 AACCTGAAACCTGTCTTCGGTGACATGCTCCCTCCAGCGAAGGCAATGCCTCCTCAAACCT  
 1030 1040 1050 1060 1070 1080  
 CCCCAGGGGACCACAACTAGGAACCAAGCACTCAGATGCCCCGAGACTATGAGCGACA  
 1090 1100 1110 1120 1130 1140  
 TCTCCTTCAGATCACCACACTTGGGTACACCCATTCTCCTGTCTCATCCAGTTTGCTCTT  
 1150 1160 1170 1180 1190 1200  
 CTGGAAGGGTGGTGAGAGGGATGACAGCTAGTGACAAGTTGGAGAGACTTTAGAATAATT  
 1210 1220 1230 1240 1250 1260  
 GCCATCACACAAAGCCTACCTTATCAGTTAGTGGCTGGCACGCTATCCCAACAGCTTGAG  
 1270 1280 1290 1300 1310 1320  
 TCTGAACCTTGCCAGAAATGGCCTCCGTCTCACCTCTCCCAGGCTCCCCAGCACCCACAGG  
 1330 1340 1350 1360 1370 1380  
 TGCCCTCCCCCAAGACCTGACATCATCGGAGCACTGAAGAGATGCCTCCTCTGCCCTTT  
 1390 1400 1410 1420 1430 1440  
 CTCCCCTGGTCTGATTGCTACCAGGCAGCTGATCCACATGCCCTGCTCCAAGTTTGACCC  
 1450 1460 1470 1480 1490 1500  
 CAGTCAGCAGGCTTCTCTGAAGAAGAGGGTCTGTTAGCATGACACACAGCATTTCCCATG  
 1510 1520 1530 1540 1550 1560  
 CAACAGAACCTTGGAACCTAGGACAGAACTCAAGATATCAACGTGACACACACATGTACA  
 1570 1580 1590 1600 1610 1620  
 TGTACCCTTACACACCTGAACGTGCATATACACACGTACACTTGTACACACACTAAAATA  
 1630 1640 1650 1660 1670 1680  
 ACTGTGGTGCCAGGAGTGATCAGGGTACTGAGGTGACAGTCATTCAAGGCTTGCCCTTT  
 1690 1700 1710 1720 1730 1740  
 CTCCACGTGACACACTTTGACCTTACCACCTGTTTCCACCTTGCTCTGGCATTTTAAAAA  
 1750 1760 1770 1780 1790 1800  
 CATGACATTTTTAGTAAATTCTTTGAATTTTTTTGAGACAGGGTCTTACACTACAGCTCA  
 1810 1820 1830 1840 1850 1860  
 AGCTGATCTTTGGGTTTGCAGCAATCCTCTTCCCTCGACCAACCCCCCAACTAGGATGTGA  
 1870 1880 1890 1900 1910 1920  
 GCTGCCATGCCAGTTTGACTCTTTCCCAGATGTTTGTTTTTATTCTGTATGTATGAGTG  
 1930 1940 1950 1960 1970 1980  
 TTCTCACTGTATGTATGTCTGTATATGCACCATGTAGAGCCCCAAAGCAGTTGCTGAATG  
 1990 2000 2010 2020 2030 2040  
 CTCCGGAGCTTGAGCTGTGGGTGGCTGTGAGCTGCCACGTGGGGTGCCAAGAATAGAAC  
 2050 2060 2070 2080 2090 2100  
 ACAGGTCTCTGCAAGAGCATCGAATGCTCTTAACCACTGAGCTATCCCTCCAGGTATTA  
 2110 2120 2130 2140 2150 2160  
 AAACATAAAATAAGCTTGACTTTTTACTCTGACATAATTTAAATTCACAAAAAGTTTTTA  
 2170 2180 2190 2200 2210 2220  
 AAAAAACGTAACAGCTTCCGTATACTCCCAATCCCATTCCCCAGTTAGGATATTCTTTA  
 2230 2240 2250 2260 2270 2280  
 ACCATAGTACATTGTCAAATGAGAAAATAACATTATACACACGACTGATTTTGGTGA

|                                                                |      |      |      |      |      |
|----------------------------------------------------------------|------|------|------|------|------|
| 2290                                                           | 2300 | 2310 | 2320 | 2330 | 2340 |
| AAATCCTATTTGGAGTACACTACCTTTGACTGTGATTTCTTTTGCACATATGGCCCAGGC   |      |      |      |      |      |
| 2350                                                           | 2360 | 2370 | 2380 | 2390 | 2400 |
| TAGCCTGCAACTATTTATCATTATTTATCCCAGGGTGACTTGAACCTAGGGCAATTCTTC   |      |      |      |      |      |
| 2410                                                           | 2420 | 2430 | 2440 | 2450 | 2460 |
| TACCTCAGCTCTGCCCCACTCCCACCTCAACTCCAGTCCTGGGGTTACAGGAGCAAGCC    |      |      |      |      |      |
| 2470                                                           | 2480 | 2490 | 2500 | 2510 | 2520 |
| ATCAAGTTCTATAACATTTAATACACAAGGACACTGGTTAAACTCAGAAGGACCTAAATT   |      |      |      |      |      |
| 2530                                                           | 2540 | 2550 | 2560 | 2570 | 2580 |
| AGCATAAGACTATGGGGACCAGAGAAGTGAGAAGTGAGGACAGGGGAGGAGGGCAGGGGA   |      |      |      |      |      |
| 2590                                                           | 2600 | 2610 | 2620 | 2630 | 2640 |
| GGGAAGATGGGAGGAATGATGGGAAGAGAATGAGAGAAGGCAGGGAGGGAGAGGAGAAGG   |      |      |      |      |      |
| 2650                                                           | 2660 | 2670 | 2680 | 2690 | 2700 |
| CCAGTGAAGGGAGAATGGGAAGGGAGGGAGTTGAGAGAAGGCAGGATCGGGAGCCATAGA   |      |      |      |      |      |
| 2710                                                           | 2720 | 2730 | 2740 | 2750 | 2760 |
| ATGTCTGTAGGAAACCATCAAAGGCATTTAATTTAATAAAGCAACCAGGATTGTACATAA   |      |      |      |      |      |
| 2770                                                           | 2780 | 2790 | 2800 | 2810 | 2820 |
| TTCTACTGTGTACATACAAACACTCAAGTTTGGGAGCAAGAATTTAGCTTTCCTTCCC     |      |      |      |      |      |
| 2830                                                           | 2840 | 2850 | 2860 | 2870 | 2880 |
| CTGCCCCCTTTATGATTTCAGTCTCTGCTAGAAAAAGTGGAGCCTTGCAGGGTGTGGTGGTG |      |      |      |      |      |
| 2890                                                           | 2900 | 2910 | 2920 | 2930 | 2940 |
| CACGCCCTTTAATTCAGCGTTTGGGAGGCAGAGGCAGGTGGATTCTGTGAGTTCCCGGT    |      |      |      |      |      |
| 2950                                                           | 2960 | 2970 | 2980 | 2990 | 3000 |
| CAACCAAATCTCCATAGTATGATCCTTCGTGGAATACCGGCCAACCAAACAAGCAAACAA   |      |      |      |      |      |
| 3010                                                           | 3020 | 3030 | 3040 | 3050 | 3060 |
| ACAAACAAAATCCCAAACAAACCCACCCCAACCAATAGAGGGGATTATTGACTCAA       |      |      |      |      |      |
| 3070                                                           | 3080 | 3090 | 3100 | 3110 | 3120 |
| AGAAGCCAATAATTTTGAGTTGGTTTGGGACATTTGAGTAAATGAAGCTGTAATGGGCAA   |      |      |      |      |      |
| 3130                                                           | 3140 | 3150 | 3160 | 3170 | 3180 |
| GCATGGGCCCTCGACAGTTTCCTGCAGTATAGCATGGCTTCCTAAGGCTGCGTGGGTTC    |      |      |      |      |      |
| 3190                                                           | 3200 | 3210 | 3220 | 3230 | 3240 |
| ACTGTTACGGAGGGCTCAGCTCAGACAGGGGGTTCCCTGTGCAACCTCCTTTCTTATGGT   |      |      |      |      |      |
| 3250                                                           | 3260 | 3270 | 3280 | 3290 | 3300 |
| CCCACAACCCACAGATAGGGCACTTTCCTACCCAGCTCCCTTCTCGGCTCTCACTGGG     |      |      |      |      |      |
| 3310                                                           | 3320 | 3330 | 3340 | 3350 | 3360 |
| GTCGGAGAACATTTTGTTCAGCATTTTCATCTGAAGCCACGGTTTCACATCATCAAGTC    |      |      |      |      |      |
| 3370                                                           | 3380 | 3390 | 3400 | 3410 | 3420 |
| TGCAAAAAACCGTTCACAAACCACACCAGAACTTCTCGGTAAAGAACTCCTAAGACCAA    |      |      |      |      |      |
| 3430                                                           | 3440 | 3450 | 3460 | 3470 | 3480 |
| GAGGGAGACTGGGTAGATTGTTTTTAATTTGTTTCTTTTGTCAAAGGGGGACAAAACAC    |      |      |      |      |      |
| 3490                                                           | 3500 | 3510 | 3520 | 3530 | 3540 |
| GCTTTGGTGAGTGCAGTGTTTATTCTGGGACACAAACCCAGAGTCTGGAAGGGAGCATT    |      |      |      |      |      |
| 3550                                                           | 3560 | 3570 | 3580 | 3590 | 3600 |

CAACGGGTGCTGCTCTGCCACGCAGGGGCAGCGGTGGGACTCAGCCCATCCTGCTAAGGA  
3610 3620 3630 3640 3650 3660  
CGGGCAGCCTGAGCCAGGCTTGGGAGTCTGTCATGGCTGCCAGACGAATCATTATCTAAT  
3670 3680 3690 3700 3710 3720  
TGCAGCCTTTTCTCTCCTTAGGTTTCAGCAGGTCCCGAGAGAGCATTTAAAATCGCATT  
3730 3740 3750 3760 3770 3780  
TACTACTTTACCATCTAATCACACATAAGCCTCTCCCTATACCCTCCACCCTCCTTCCAT  
3790 3800 3810 3820 3830 3840  
TCAGAGTGTA CTTCTGGAGCCCATCCAGCAAGCAGGGTGGAACCATGACGGGAAATGG  
3850 3860 3870 3880 3890 3900  
GAACGGCGCCACGAAGGCGTGATTCCTTGTAGATCCTTGAGTGATGGACGGGTGAGGTT  
3910 3920 3930 3940 3950 3960  
TCCGTCAGGCAAGCCCAGCCACCTTCGTGGAGGAGCCCCGGACAAGTGTAAGTTTCGCAG  
3970 3980 3990 4000 4010 4020  
AGCTGGGGTCTCCAGCTTACTTCTGCTAATGCTACCCAGGCCTTTAGACGGAGAACAGA  
4030  
TGGCAGATGGAG

## Appendix J:

### Primers for genomic screening of mouse library:

CCTGTGTGTGCTGTAAAAAGGATC - EX1-3' OUT

TGAGAAGATGGAGTTCCCCTTTGG – EX1-5' IN

### Amplified fragment for PCR screening of mouse genomic library:

```

      10      20      30      40      50      60
TGAGAAGATGGAGTTCCCCTTTGGGTCCGTGGGAACCTACCAACTTCAGACGGTTCACCTCC
      70      80      90     100     110     120
AGAGTCGCTGGCAGAGATCGAGAAGCAGATCGCTGCCCACCGCGCCGCCAAGAAGGGCAG
      130     140     150     160     170     180
AACTAAGCAAAGAGGACAGAAGGACAAGAGTGAGAAGCCCAGGCCTCAGTTGGACTTGAA
      190     200     210     220     230     240
GGCCTGTAACCAGCTGCCAGGTTCTATGGCGAGCTCCAGCAGAGCTGGTCGGGGAGCC
      250     260     270
CCTGGAGGACCTGGATCCTTTTACAGCACACACAGG
```

Souslova VA, Fox M, Wood JN, and Akopian AN “Cloning and Characterization of a Mouse Sensory Neuron Tetrodotoxin-Resistant Voltage-Gated Sodium Channel Gene, Scn10a” *Genomics* **41**, 201-209 (1997).