Ptk7-G749R cas9-ki(PM) Mouse Model Strategy

-CRISPR/Cas9 technology

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Reviewer: Jia Yu

Design Date: 2021-8-9

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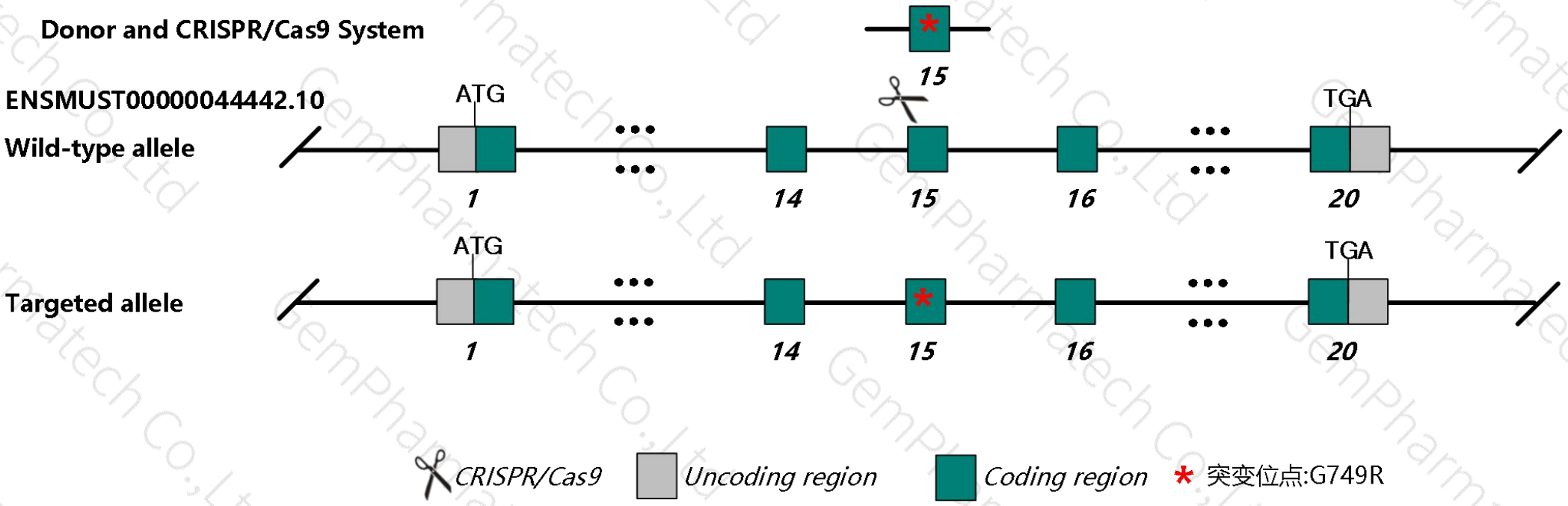
Project Overview

Project Name	Ptk7-G749R
Project type	cas9-ki(PM)
Strain background	C57BL/6JGpt
Project cycles	5-8 months

Strategy

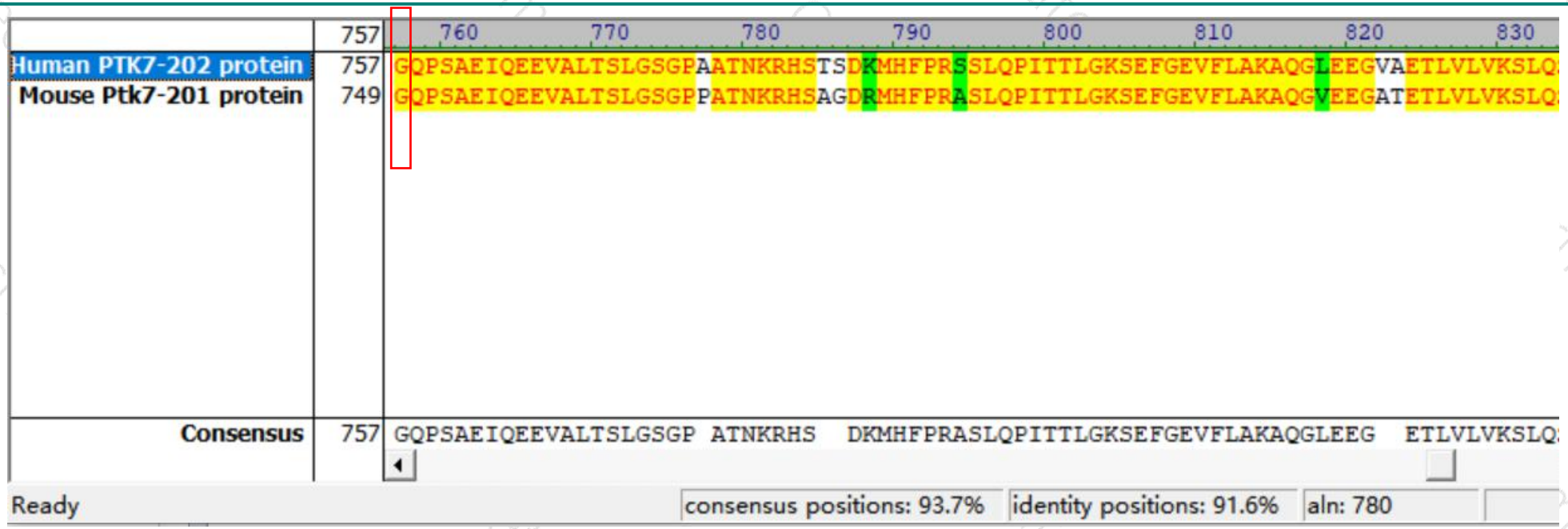
This model uses CRISPR/Cas9 technology to edit the *Ptk7* gene and the schematic diagram is as follow:



Technical Description

- The mouse *Ptk7* gene has 2 transcripts.The human *PTK7* gene has 20 transcripts.
- According to the structure of *Ptk7* gene and requirements of customer, the 757th amino acid(G) of human *PTK7-202*(NM_002821.5) gene corresponds to the 749th amino acid(G) of mouse *Ptk7* gene after comparing homology of mouse *Ptk7* gene and human *PTK7* gene.This project produced *Ptk7*-G749R point mutation on exon15 of the transcript of *Ptk7*-201(ENSMUST00000044442.10, NM_175168.4). The 749th amino acids will be mutated from G to R, and the corresponding codon will be mutated to AGG by the GGT.
- The mouse *Ptk7*-201 transcript contains 20 exons. The translation initiation site ATG is located at exon1, and the translation termination site TGA is located at exon20, encoding 1062aa.
- In this project, *Ptk7* gene will be modified by CRISPR/Cas9 technology. The brief process is as follows: In vitro, CRISPR/Cas9 system and Donor were microinjected into the fertilized eggs of C57BL/6JGpt mice.Fertilized eggs were transplanted to obtain positive F0 mice which were confirmed by PCR and sequencing. A stable F1 generation mouse model was obtained by mating positive F0 generation mice with C57BL/6JGpt mice.

A comparison of the aa homology of human and mouse *Ptk7* gene



The 757th amino acid(G) of human *PTK7* gene corresponds to the 749th amino acid(G) of mouse *Ptk7* gene after comparing homology of mouse *Ptk7* gene and human *PTK7* gene.

Mutation Site

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Before mutation

```
+2                                          G  P  L  Q  N  G  Q  P  S  A  E  I  Q  E  E  V  A  L  T  S  L  G  S
57901  TAGGTTATCC CCTGACCCCT TGTTCCCAGG TGGGCCTTTG CAGAATGGTC AGCCATCAGC CGAGATCCAG GAAGAAGTGG CGTTGACCAG CTTGGGCTCT
       ATCCAATAGG GGACTGGGGA ACAAGGGTCC ACCCGGAAAC GTCTTACCAG TCGGTAGTCG GCTCTAGGTC CTTCTTCACC GCAACTGGTC GAACCCGAGA
+2      G  P  P  A  T  N  K  R  H  S  A  G  D  R  M  H  F  P  R  A  S  L  Q  P  I  T  T  L
58001  GGCCCCCCAG CCACCAACAA GCGCCACAGC GCCGGTGATA GGATGCATTT CCCGAGAGCC AGCCTGCAGC CTATCACCAC TCTGGGTATG CCGCCTTGCC
       CCGGGGGGTC GGTGGTTGTT CGCGGTGTCG CGGCCACTAT CCTACGTAAA GGGCTCTCGG TCGGACGTCG GATAGTGGTG AGACCCATAC GGCGGAACGG
```

After mutation

```
+2                                          G  P  L  Q  N  R  Q  P  S  A  E  I  Q  E  E  V  A  L  T  S  L  G  S
57901  TAGGTTATCC CCTGACCCCT TGTTCCCAGG TGGGCCTTTG CAGAATAGGC AGCCATCAGC CGAGATCCAG GAAGAAGTGG CGTTGACCAG CTTGGGCTCT
       ATCCAATAGG GGACTGGGGA ACAAGGGTCC ACCCGGAAAC GTCTTATCCG TCGGTAGTCG GCTCTAGGTC CTTCTTCACC GCAACTGGTC GAACCCGAGA
+2      G  P  P  A  T  N  K  R  H  S  A  G  D  R  M  H  F  P  R  A  S  L  Q  P  I  T  T  L
58001  GGCCCCCCAG CCACCAACAA GCGCCACAGC GCCGGTGATA GGATGCATTT CCCGAGAGCC AGCCTGCAGC CTATCACCAC TCTGGGTATG CCGCCTTGCC
       CCGGGGGGTC GGTGGTTGTT CGCGGTGTCG CGGCCACTAT CCTACGTAAA GGGCTCTCGG TCGGACGTCG GATAGTGGTG AGACCCATAC GGCGGAACGG
```

The yellow region is exon15 of *Ptk7-201,* the red region represents the mutation site.

Notice

- According to the data of MGI, Mice homozygous for a gene trapped allele die perinatally with defects in neural tube closure and planar cell polarity in the ear. ENU-induced mutant mice show omphalocele, impaired neural tube, heart and lung development, rib defects, polydactyly, failed eyelid closure and altered cell polarity.
- One or Two synonymous mutations of amino acids will be intronduced on exon15 of *Ptk7*.
- Mouse *Ptk7* gene is located on Chr17. Please take the loci in consideration when breeding this mutation mice with other gene modified strains, if the other gene is also on Chr17, it may be extremely hard to get double gene positive homozygotes.
- The scheme is designed according to the genetic information in the existing database. Due to the complex process of gene transcription and translation, it cannot be predicted completely at the present technology level.

Gene name and location （NCBI）

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Ptk7 PTK7 protein tyrosine kinase 7 [*Mus musculus* (house mouse)]

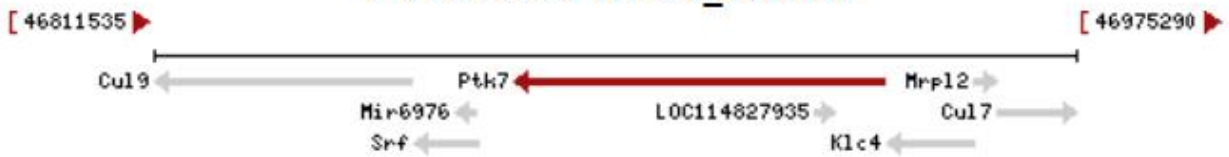
Download Datasets

Gene ID: 71461, updated on 23-Jun-2021

Summary

Official Symbol	Ptk7 provided by MGI
Official Full Name	PTK7 protein tyrosine kinase 7 provided by MGI
Primary source	MGI:MGI:1918711
See related	Ensembl:ENSMUSG00000023972
Gene type	protein coding
RefSeq status	VALIDATED
Organism	Mus musculus
Lineage	Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Euteleostomi; Mammalia; Eutheria; Euarchontoglires; Glires; Rodentia; Myomorpha; Muroidea; Muridae; Murinae; Mus; Mus
Also known as	chz; mPTK7/CCK; mPTK7/CCK4; 8430404F20Rik
Expression	Broad expression in limb E14.5 (RPKM 30.4), ovary adult (RPKM 29.7) and 22 other tissues See more
Orthologs	human all

Chromosome 17 - NC_000083.7

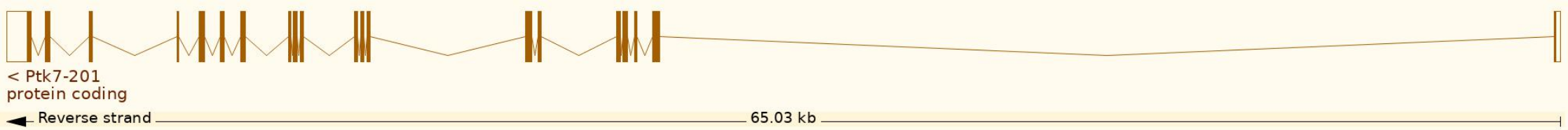


Transcript information（Ensembl）

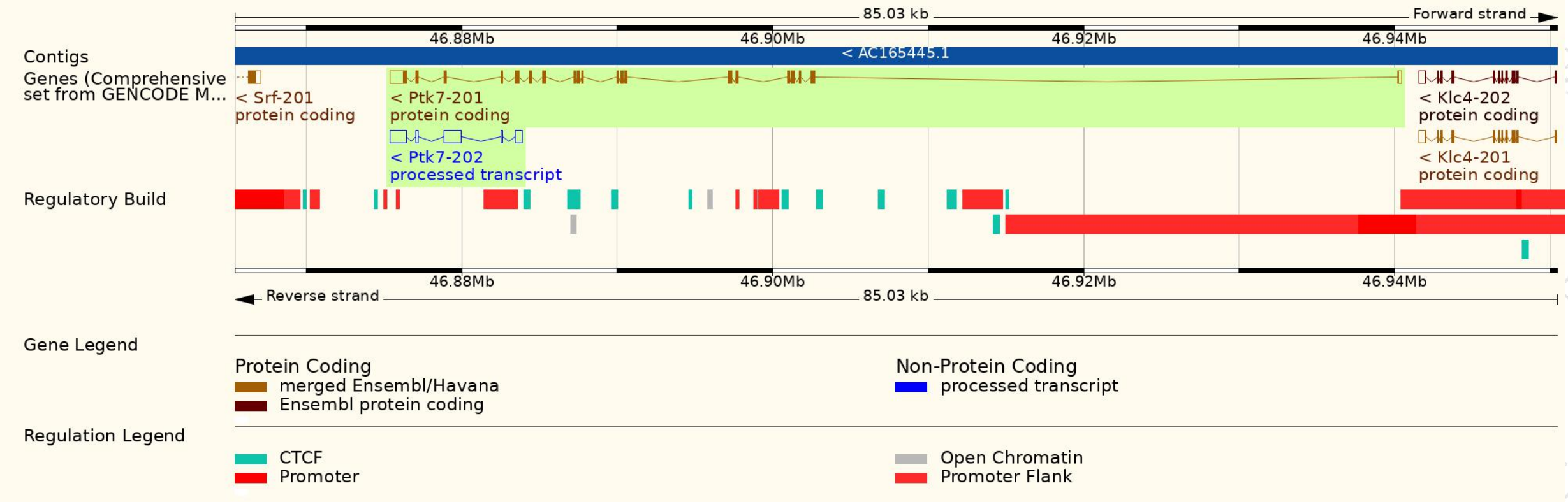
The gene has 2 transcripts, and all transcripts are shown below:

Name	Transcript ID	bp	Protein	Biotype	CCDS	UniProt Match	Flags
Ptk7-201	ENSMUST00000044442.10	4235	1062aa	Protein coding	CCDS37637	Q8BKG3	GENCODE basic APPRIS P1 TSL:1
Ptk7-202	ENSMUST00000232855.2	2819	No protein	Processed transcript	-	-	-

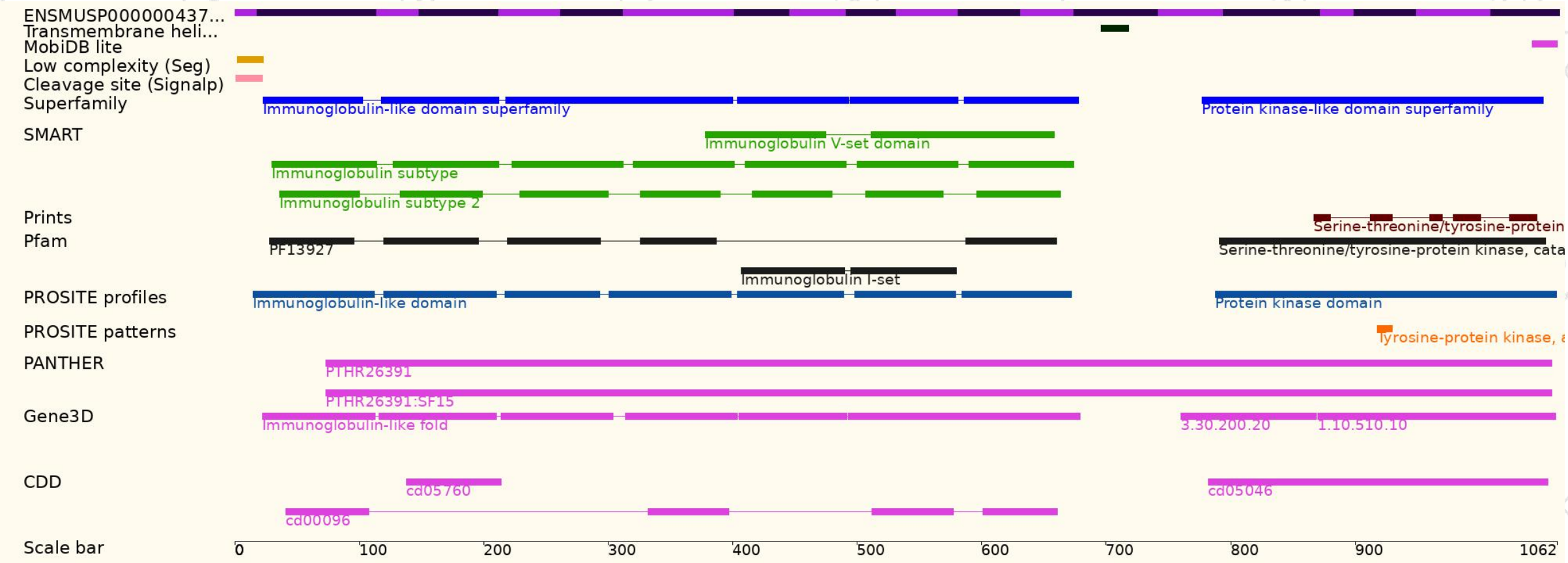
The strategy is based on the design of *Ptk7*-201 transcript, the transcription is shown below:



Genomic location distribution

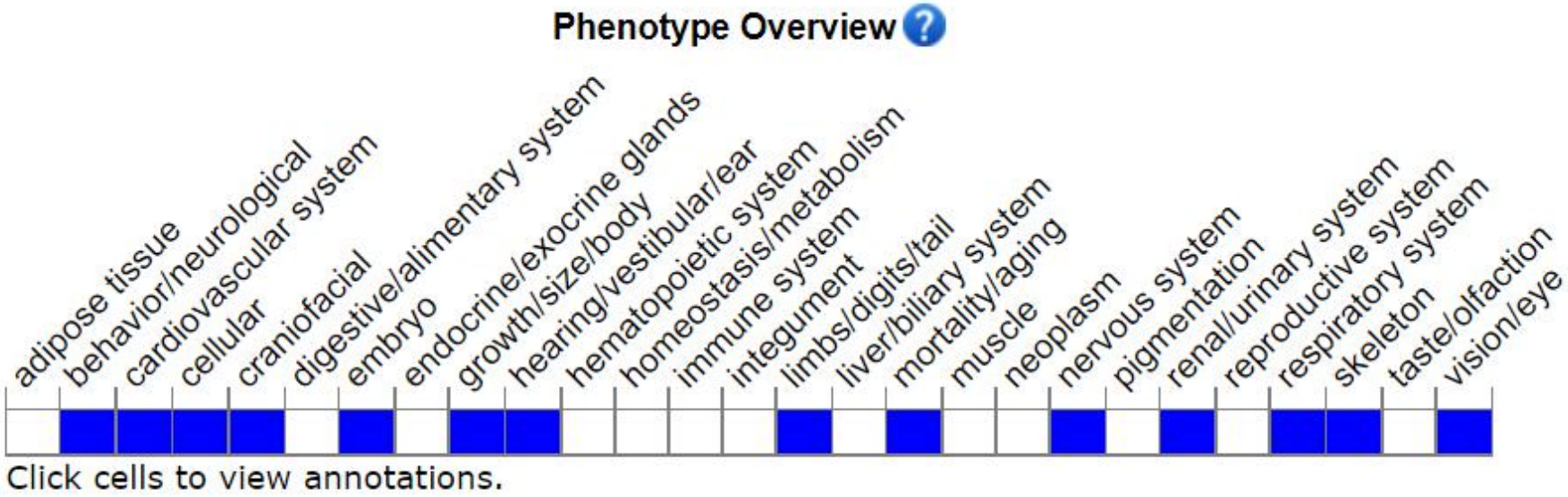


Protein domain



Mouse phenotype description(MGI)

URL link is as follows:
http://www.informatics.jax.org/marker/MGI:1918711



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If you have any questions, please feel free to contact us.
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