

Searching for Alternatively Splicing Group II Introns.

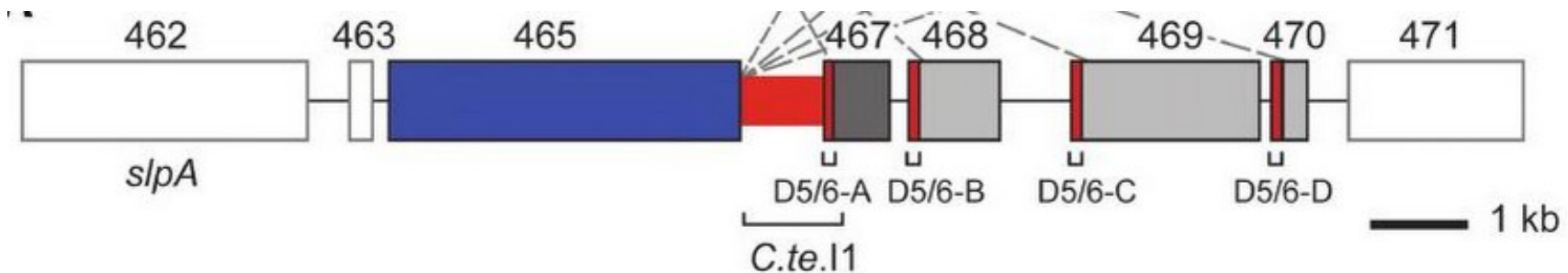
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Alternative splicing

- Some group II introns have the ability to alternative splicing.
- Introns can have several different variants of the secondary structure, each of which leads to its own splicing reaction.

Example of an intron with four alternative 5 and 6 domains[1]:



[1] Bonnie A. McNeil, Dawn M. Simon and Steven Zimmerly.
Alternative splicing of a group II intron in a surface layer protein gene in *Clostridium tetani*.
Nucleic Acids Research, 2014, Vol. 42, No. 3.

Materials and methods

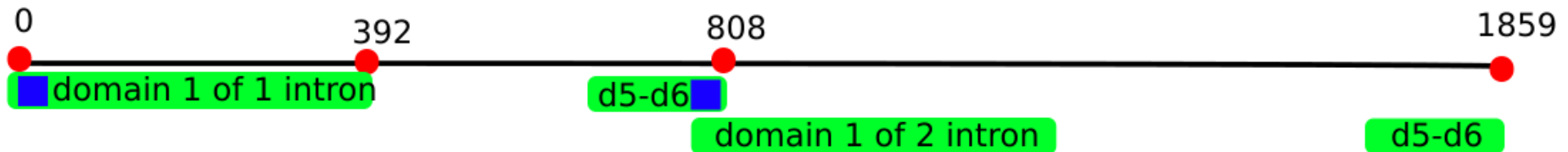
- We built a model of the secondary structure of group II introns using a public database of intron structures
<http://webapps2.ucalgary.ca/~groupii/>
- Using our model, we reconstructed the secondary structure of some introns from the RFAM open database
<http://rfam.xfam.org/family/RF00029>
- To search for a given secondary structure in genomic sequences, we used the Rscan program
<http://www.softberry.com/freedownloadhelp/rna/rscan/rscan.all.html#RScanDescription>

RFAM introns

- We filtered the RFAM introns by the z-score energy of their first domain: $z\text{-score} < -1.48$
- We restored the secondary structure of 397 eukaryotic group II introns from the RFAM base:
 - 3 IIB type introns
 - 15 IIA type introns, as well as two highly homologous groups of IIA introns of 64 and 315 introns in each.

Alternate splicing group

- We found that 57 of the 64 introns of the homologous group potentially have the ability to alternative splicing.
- The structure of the introns of this group:



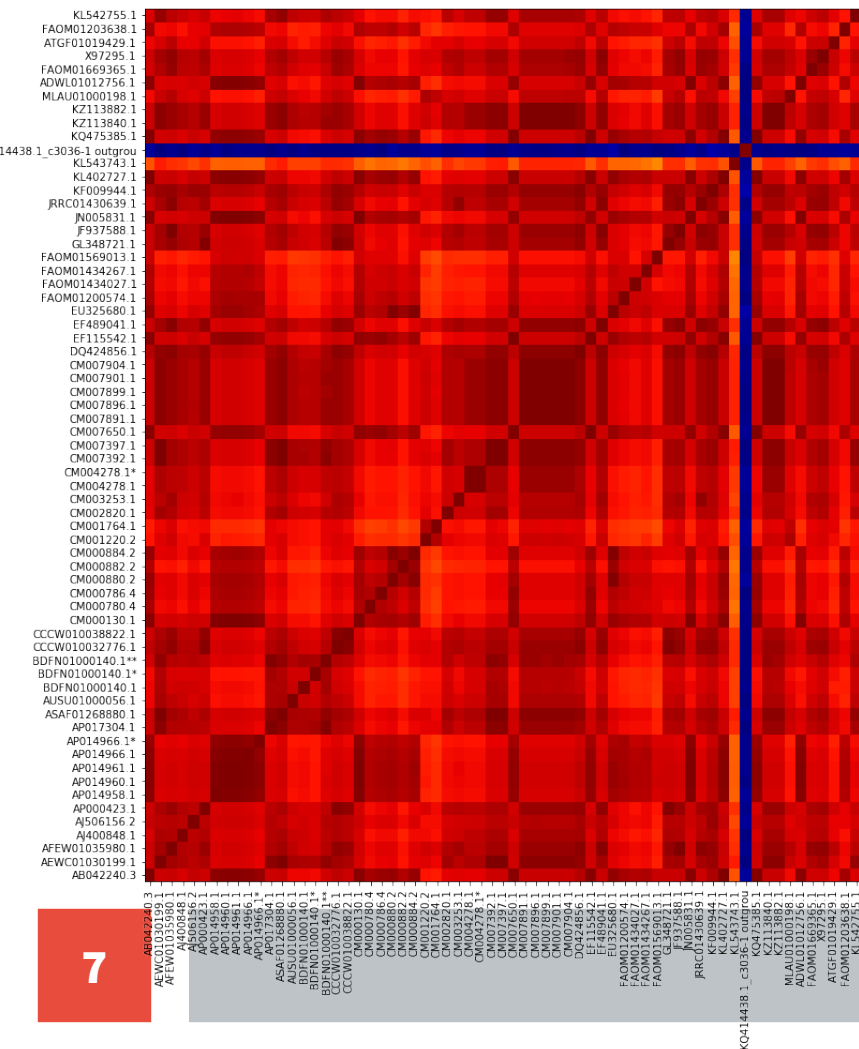
■ - ibs1/ibs2 pseudoknots

- Each intron is followed by a second intron with its secondary structure.
- ibs1 / ibs2 pseudoknots of the second intron overlap with the right splice site of the first intron.

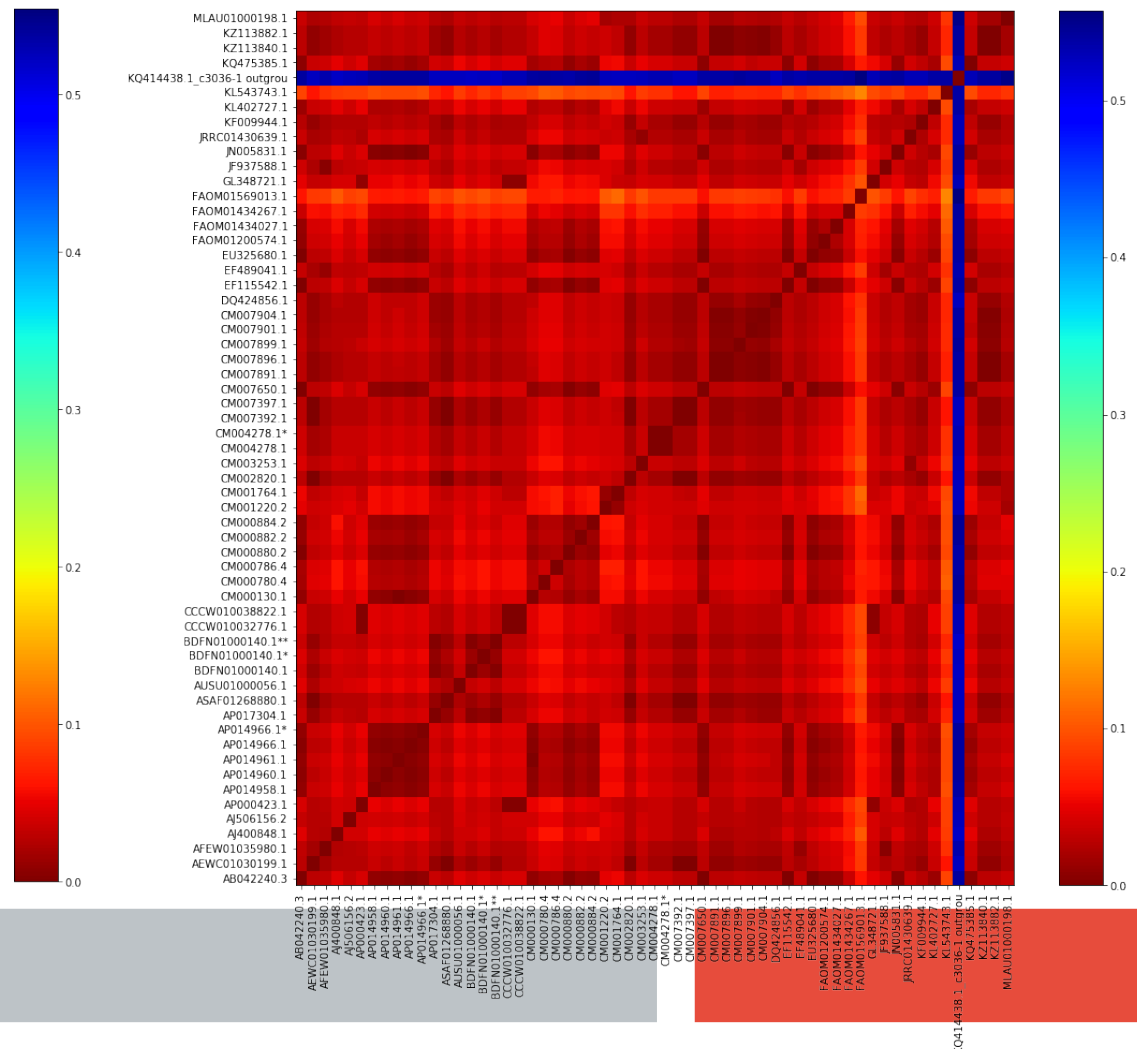
Alternate introns: homology

The first domain of both groups of alternative introns is highly homologous (In alignment there is a non-homologous outgroup intron)

First intron



Second intron



Alternate splicing

- Intron 1 and 2 are not homologous to each other. Homology between 1 domains of 1 and 2 introns - 35-40%
- In the second intron, some pseudoknots are missing. The presence of pseudoknots is shown in the table:

Intron	group size	alpha	kappa	epsilon	ibs1/ebs1	ibs2/ebs2
1	64	64	64	64	64	64
2	57	0	57	55	53	57