

Can Fusion Transcript between a transposable element and an exon generate piRNAs in mouse (*Mus musculus*)?

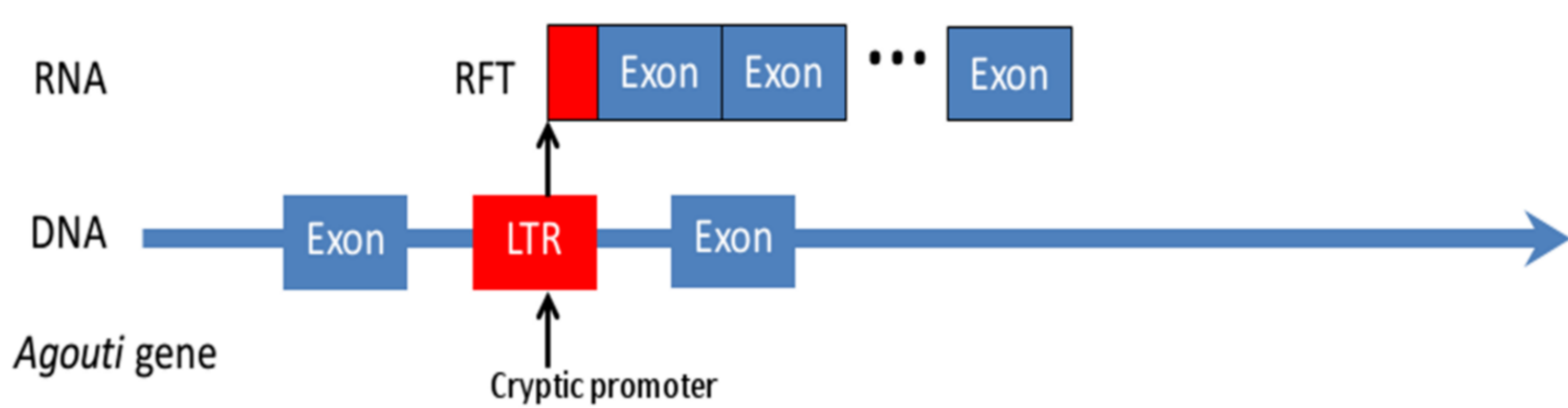
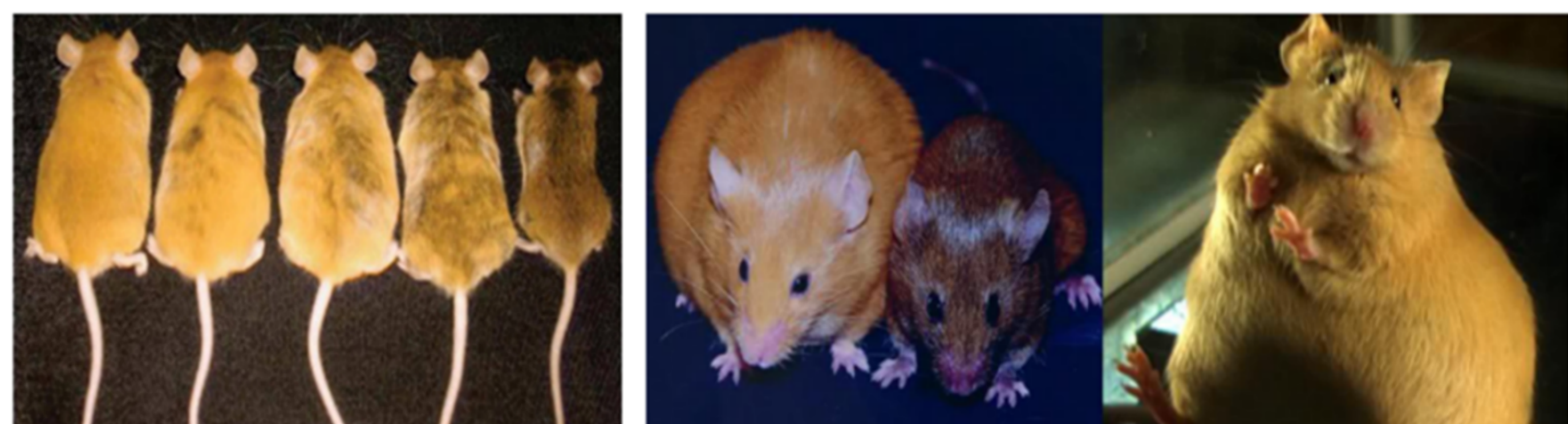


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Introduction

There are fusions between Repeated Element and exons, which are related to diseases, for example: Agouti gene in mouse (*Mus musculus*). What evidences might support the recently Fusion Transcript (FTs) found by Wang et al 2016?



Michaud et al., Genes Dev. 1994

Figure1: Agouti Mice: Mice with different coat colors (a). The yellow, the larger and more prone to diabetes and other genetic diseases (b). Below: Yellow Agouti mutation: Transcript Fusion responsible for Yellow agouti phenotype.

Hypothesis

piRNAs alignment across the junction point support the transcription of Fusions Transcription.

Methodology

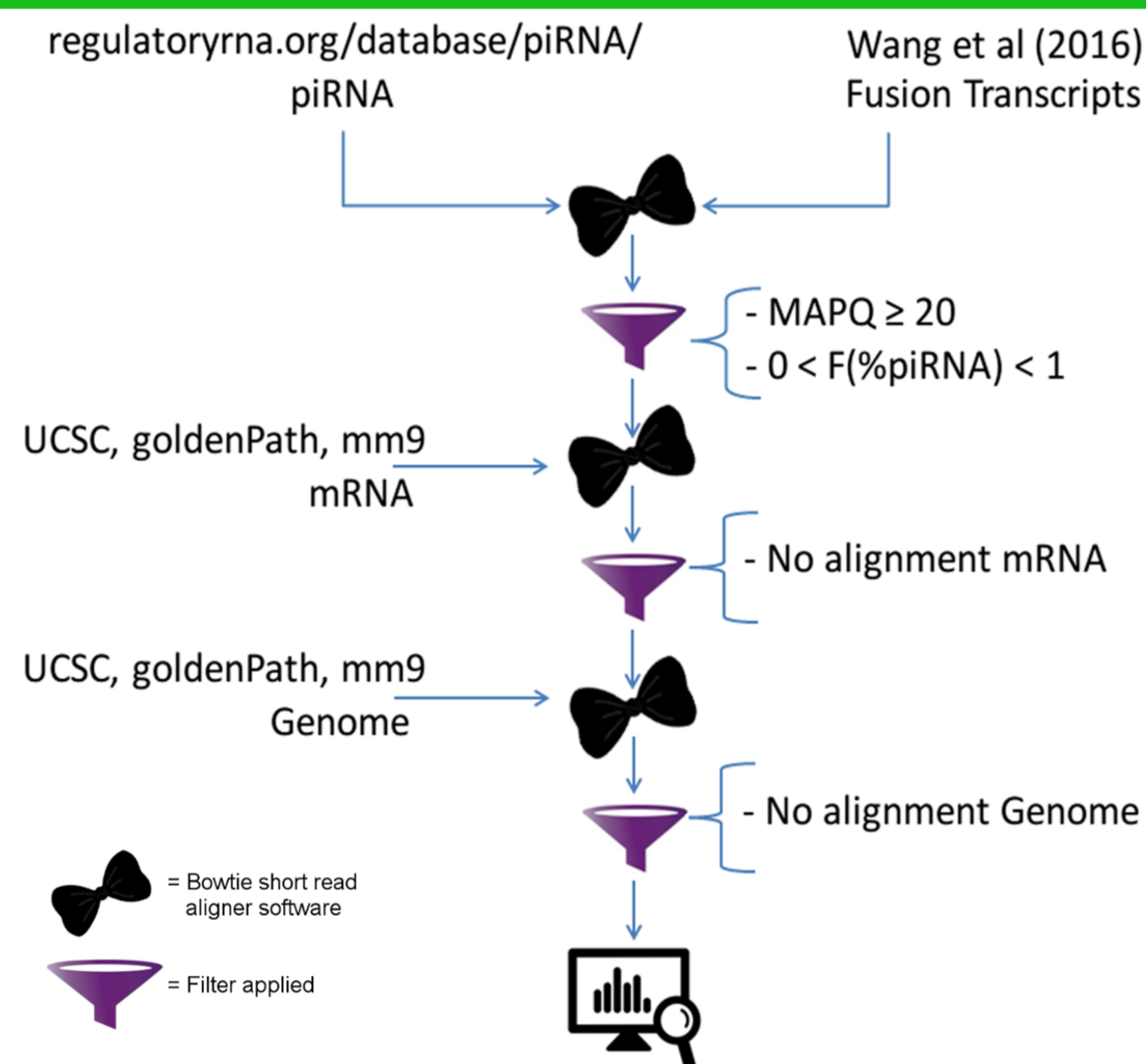


Figure2: Diagram showing the alignments made and the filters used.

Results

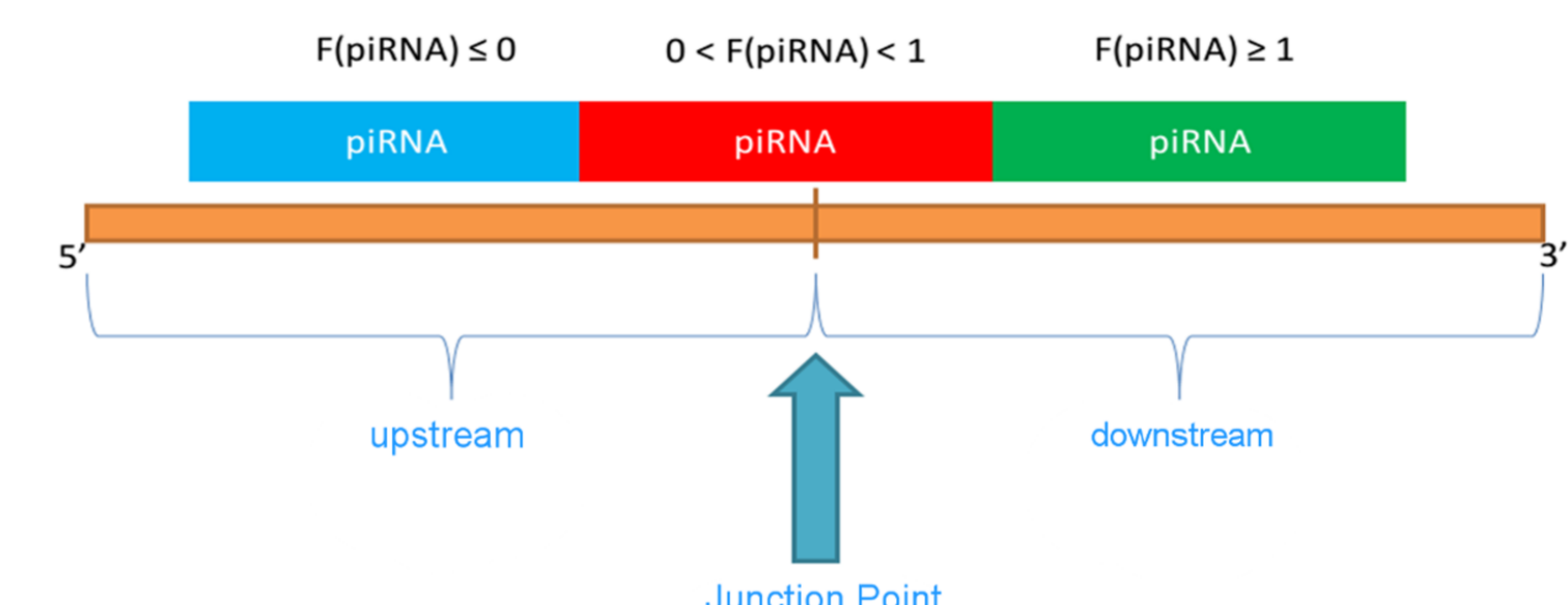


Figure 3: The formula $F(\text{piRNA}) = \frac{\text{\%piRNA length}}{\text{FT length}}$ determines the percentage of the length of the piRNA that crosses the junction point of the FTs. The percentage that aligned to upstream of the junction point (sky blue), aligned across the fusion point (red) and aligned to downstream of the junction point (green).

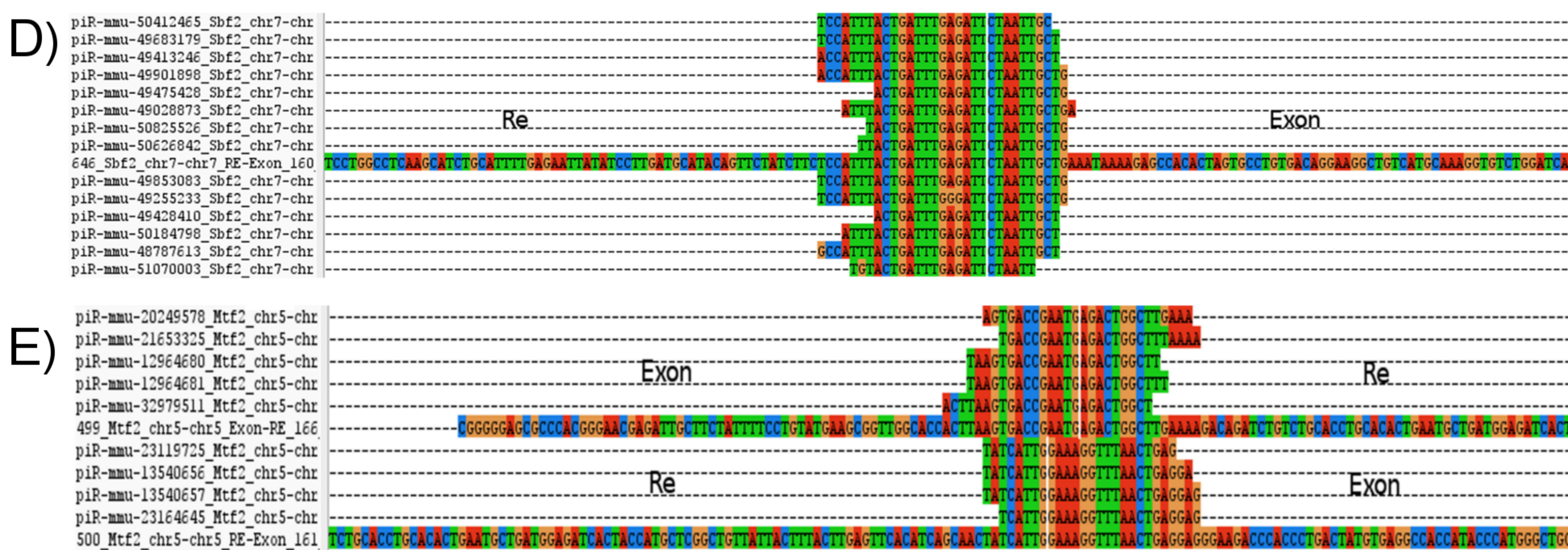
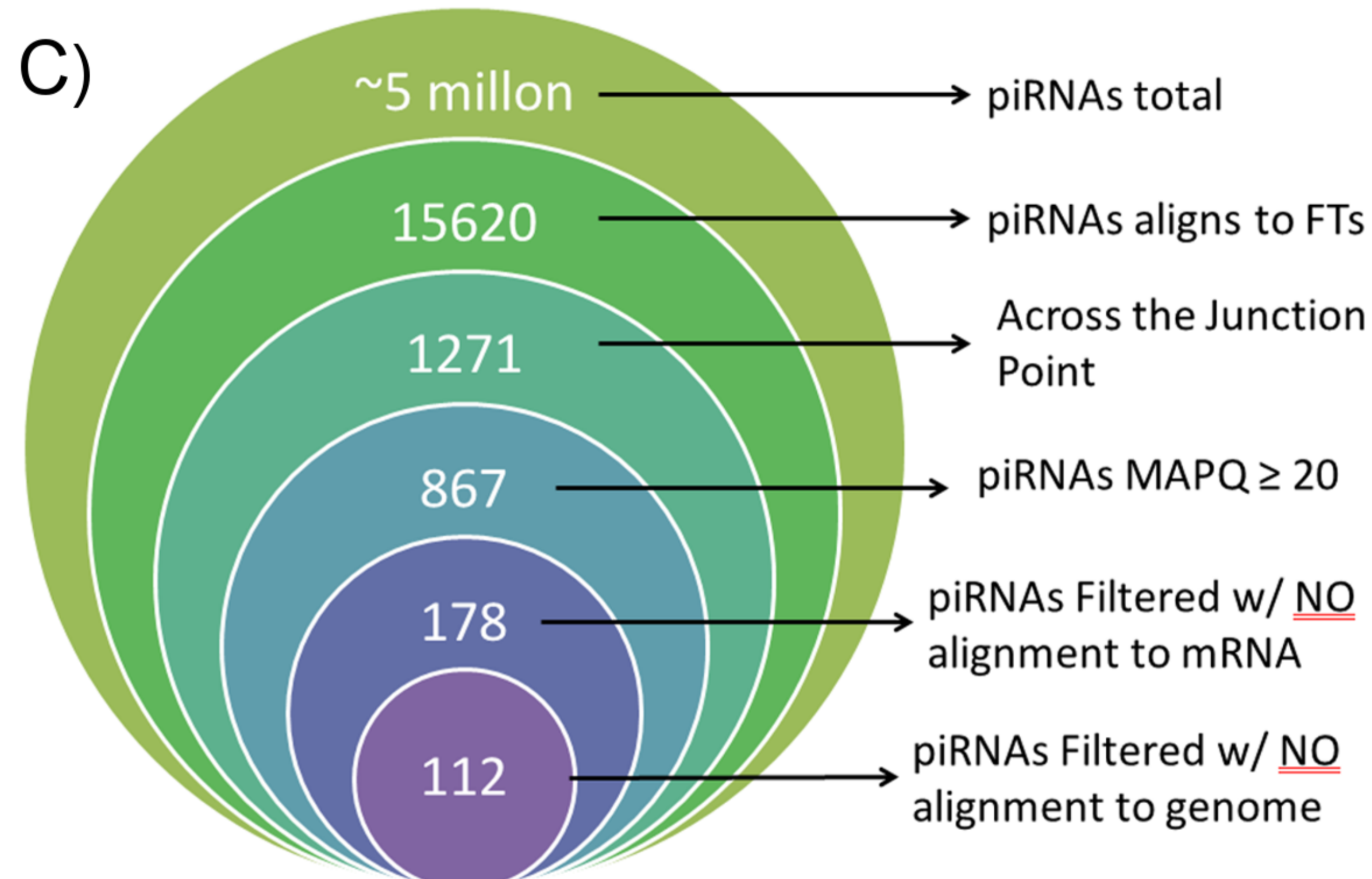
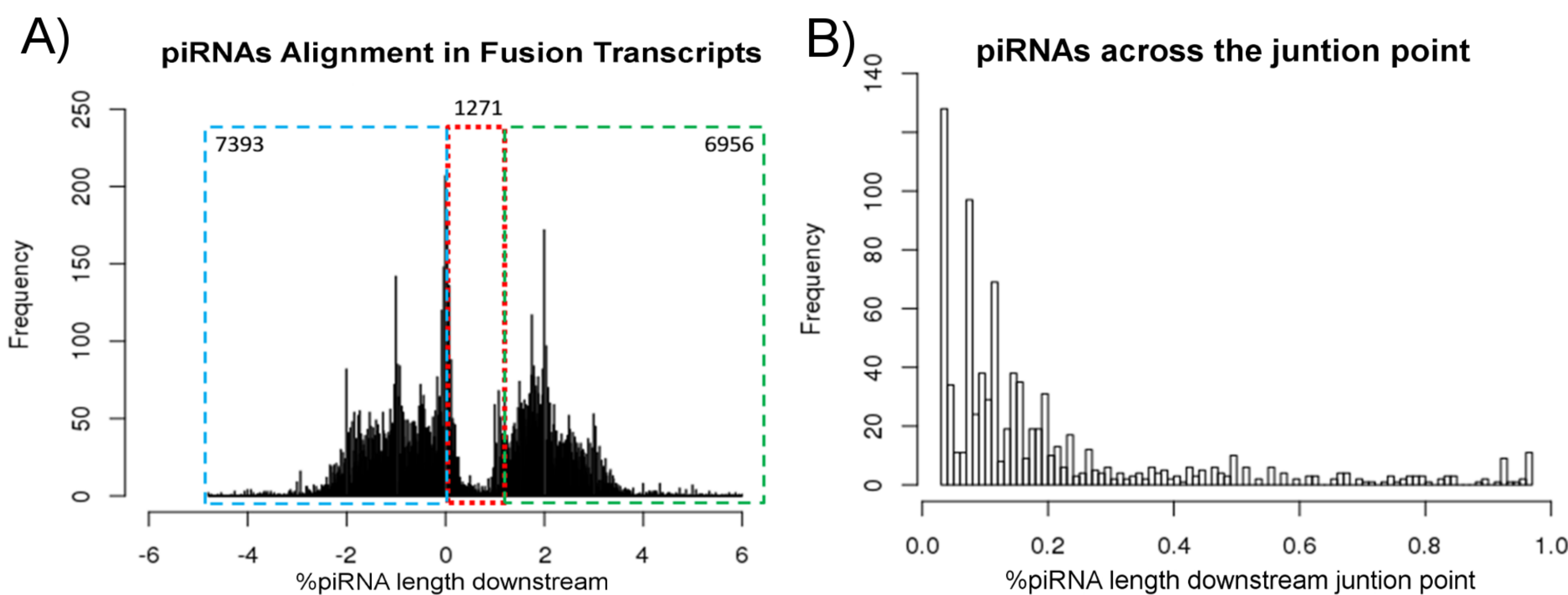


Figure 4: Graph (A) showing the proportions of piRNA aligned along the fusions. Respects the same-color code as in figure 3. (B) Graph which shows the piRNAs that aligned through the junction point. (C) Summary box of the amount of piRNA obtained in each stage. (D) Multiple alignment of piRNA and FT gene Sbf2, left repeated element (RE), right side exon (Exon) and center piRNA. (E) Multiple alignment of piRNA and two FTs of the Mtf2 gene. In the first FT is the exon (Exon) in the left part and to the right the repeated element (RE). In the second FT to the left is the repeated element (RE) and to the right the exon (Exon).

Conclusions

- 1) There are piRNAs that align across the junction point of the fusion, AND doesn't align to any mRNA and genome.
- 2) One piRNA sequence at one junction point of the FT.
- 3) Different piRNAs might map along one FT, but only one maps across the junction point.
- 4) Which means there are specific piRNAs to control fusion isoforms of genes that include RE.

Questions

- Might FTs originate piRNAs?
- Might these variants be transcribed during germline development, when piRNAs are active?
- What FTs might be transcribed during development?

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