1. What is CRISPR?

2. What are the stages of CRISPR immunity?

CRISPR RNA processing by a Type IV Cas6 endoribonuclease

Hannah Taylor, Emily Warner, Valerie Crowley, Ryan Jackson
Utah State University, Department of Chemistry and Biochemistry

USU Student Research Symposium
April 12, 2018

3. How diverse is CRISPR?

4. What is the function of the Type IV Cas6 protein?
CRISPR is an adaptive bacterial immune system that defends bacteria against phage (viruses that infect bacteria).
2. What are the stages of CRISPR immunity?

CRISPR associated genes and proteins are called cas genes and Cas proteins.
3. How diverse is CRISPR?

<table>
<thead>
<tr>
<th></th>
<th>Interference complex:</th>
<th>Target:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><img src="image1.png" alt="Interference complex" /></td>
<td>DNA</td>
</tr>
<tr>
<td>II</td>
<td><img src="image2.png" alt="Interference complex" /></td>
<td>DNA</td>
</tr>
<tr>
<td>III</td>
<td><img src="image3.png" alt="Interference complex" /></td>
<td>RNA</td>
</tr>
<tr>
<td>IV</td>
<td><img src="image4.png" alt="Interference complex" /></td>
<td>?</td>
</tr>
<tr>
<td>V</td>
<td><img src="image5.png" alt="Interference complex" /></td>
<td>DNA</td>
</tr>
<tr>
<td>VI</td>
<td><img src="image6.png" alt="Interference complex" /></td>
<td>RNA</td>
</tr>
</tbody>
</table>
4. What is the function of the Type IV Cas6 protein?

Type I Cas6 proteins process the pre-crRNA into crRNAs.

- The Type I and Type IV CRISPR systems are similar &
- Type IV CRISPR systems have a cas6 gene

The Type IV Cas6 protein likely processes CRISPR pre-crRNAs into smaller RNAs.
4. What is the function of the Type IV Cas6 protein?

- The Type IV Cas6 processes pre-crRNAs into smaller RNAs
4. What is the function of the Type IV Cas6 protein?

- Structural comparison with Type I Cas6 proteins reveals the Type IV Cas6 active site.
4. What is the function of the Type IV Cas6 protein?

- The Type IV Cas6 cleaves the CRISPR repeat
- The amino acids His-63 and Tyr-50 are involved in the cleavage event
Significance

- The Type IV Cas6 protein does process the pre-crRNA during biogenesis.

Future Directions

Where does the Type IV Cas6 cleave the repeat?
Does Type IV pre-crRNA processing happen in vivo?
Characterize more Type IV Cas proteins.
Acknowledgements

- Jackson lab
- Emily Warner – purified MaCas6 and mutants
- Ryan Jackson – solved the structure of MaCas6

References


Questions?