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DIVERSITY OF CRISPR SYSTEM In the euryarchaeal pyrococcales [1]

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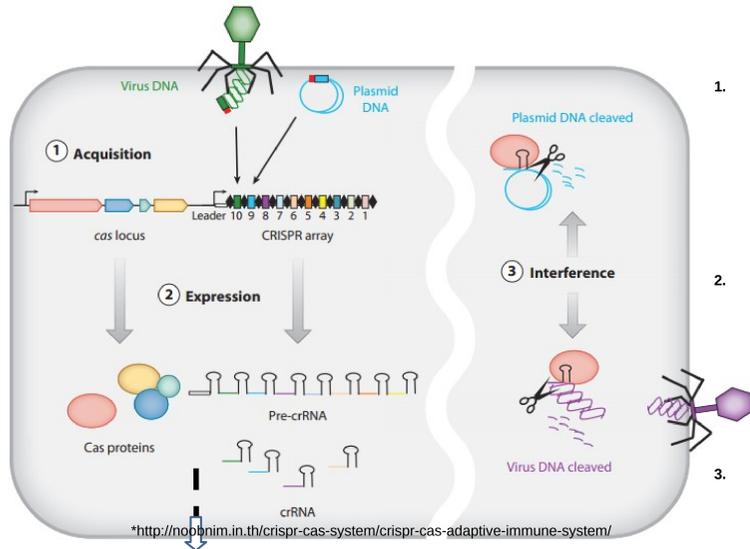
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CRISPR-Cas systems: RNA-interference-based immune systems in prokaryotes

CRISPR-cas systems are found in approximately 48% of sequenced bacteria and 90% of sequenced archaea. They function as prokaryotic immune systems, in that they confer resistance to exogenous genetic elements.

CRISPRs (Clustered Regularly Interspaced Short Palindromic Repeats) are arrays of direct repeats separated by variable short sequences called spacers or guides that generally derived from invader genetic elements such as plasmids and prophages.

CRISPR-associated (cas) genes are often located adjacent to the CRISPR locus. They



- Acquisition:** new spacers are incorporated into the genome between CRISPR repeats, after exposure to each new foreign element.
- Expression:** small non-coding CRISPR RNAs (crRNAs) are generated. A long precursor is first produced then processed between repeats and matured into crRNAs.
- Interference:** crRNAs-Cas protein complexes bind to invading nucleic acid target and cleave it

Bioinformatic tools for studying the diversity of CRISPR and cas genes in six pyrococcal genomes

stage of CRISPR mechanism.

Identification of CRISPRs loci

CRISPRdb [2] | Patscan

CRISPR loci

Identification of CRISPRs features

Promoters | Repeats | Spacers

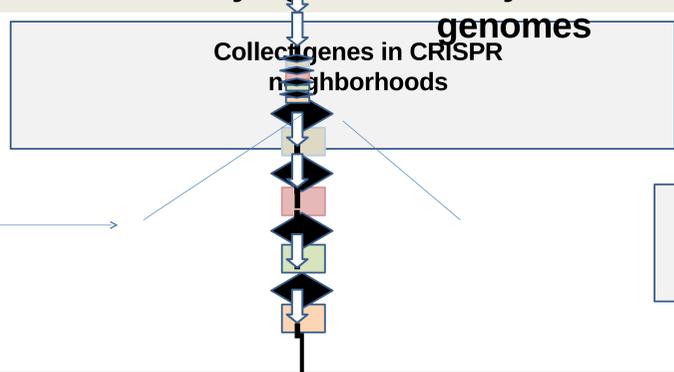
Clustering

Promoters | Repeats

Multalin | Multalin

Comparison to space of CRISPR repeats

Space of CRISPR repeats [3]



Collect all known cas genes

CRISPRdb | Literature | Annotation

Clustering of protein genes

Blast

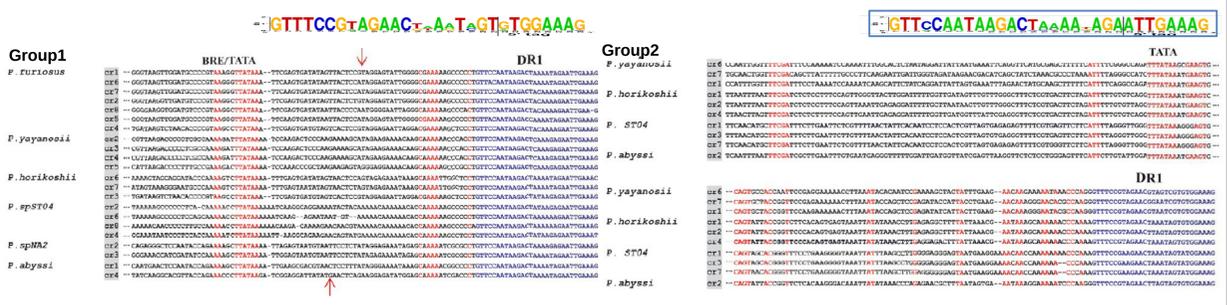
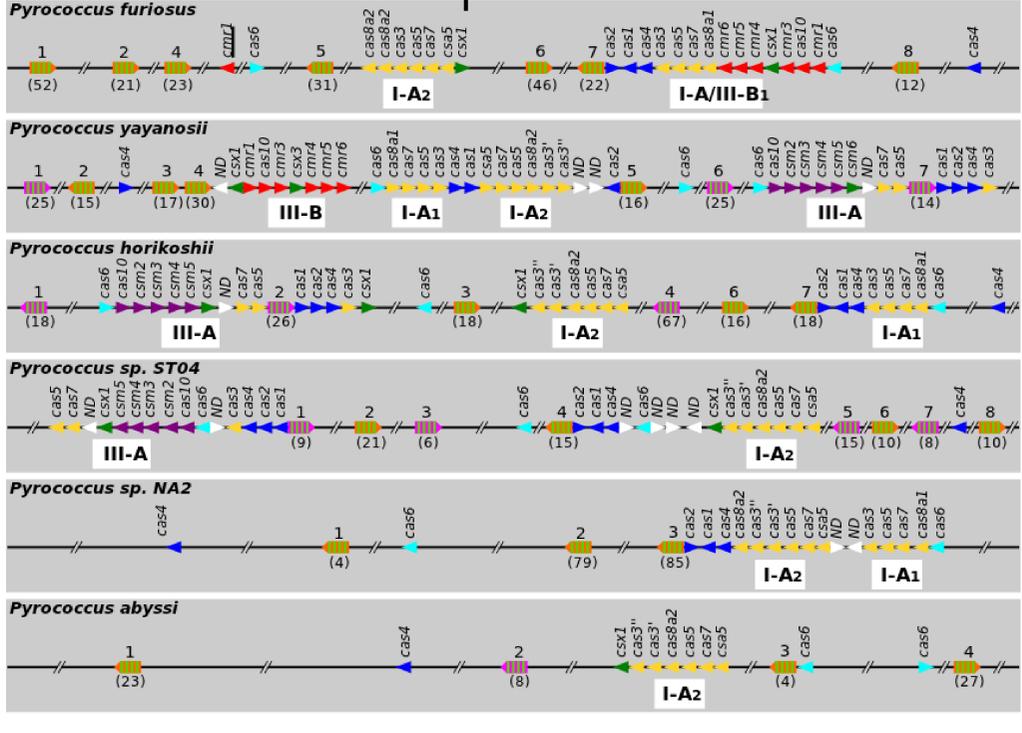
Groups of homologous genes

Identification of cas genes

TIGRFam database | COG database

Identification of CRISPR/Cas system

Makarova nomenclature [4]



Conclusions

Three different cas genes types were identified within the six pyrococcal genomes (subtypes I-A, III-A and III-B). Subtype I-A is ubiquitously represented. Sequence alignments show strong homologies between CRISPRs and Cas proteins belonging to similar systems.

The diversity of CRISPR system situations in the Pyrococcales illustrates the modularity and instability of CRISPR systems.

There are lot of things that we still do not understand but knowledge in the CRISPR field is added as quickly as guide sequences in an active CRISPR array.

References

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Model of pyrococcal CRISPR mode of action

