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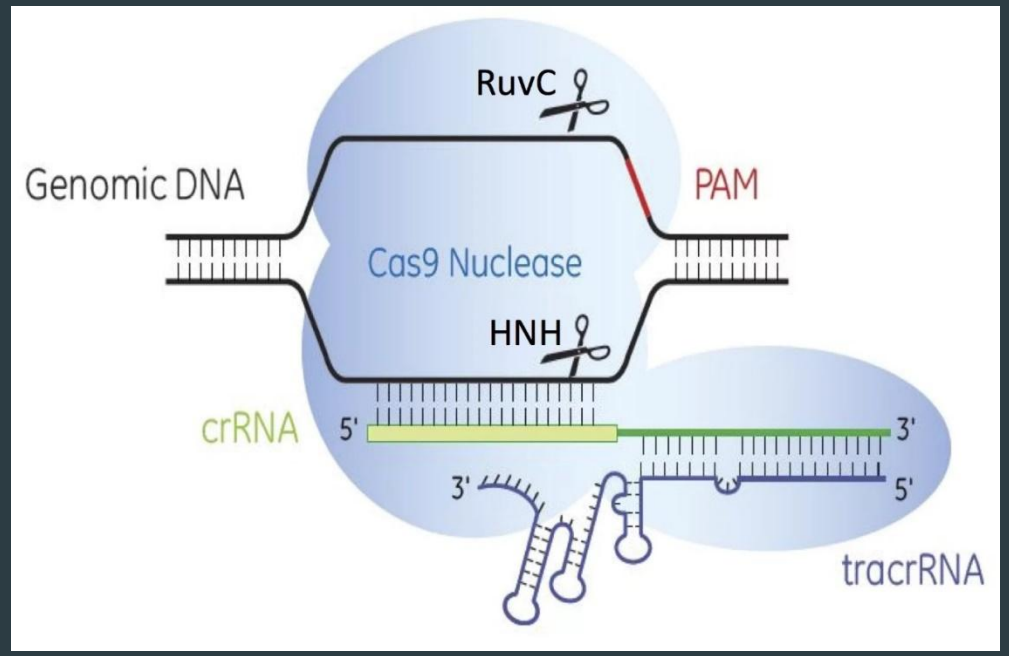
Software development for the detection of pam sequences in the CRISPR/Cas system

Authors:

Scientific adviser:

Структуру, которую я написала, можно не на один слайд. Например схема р аботы программы или описание криспера.

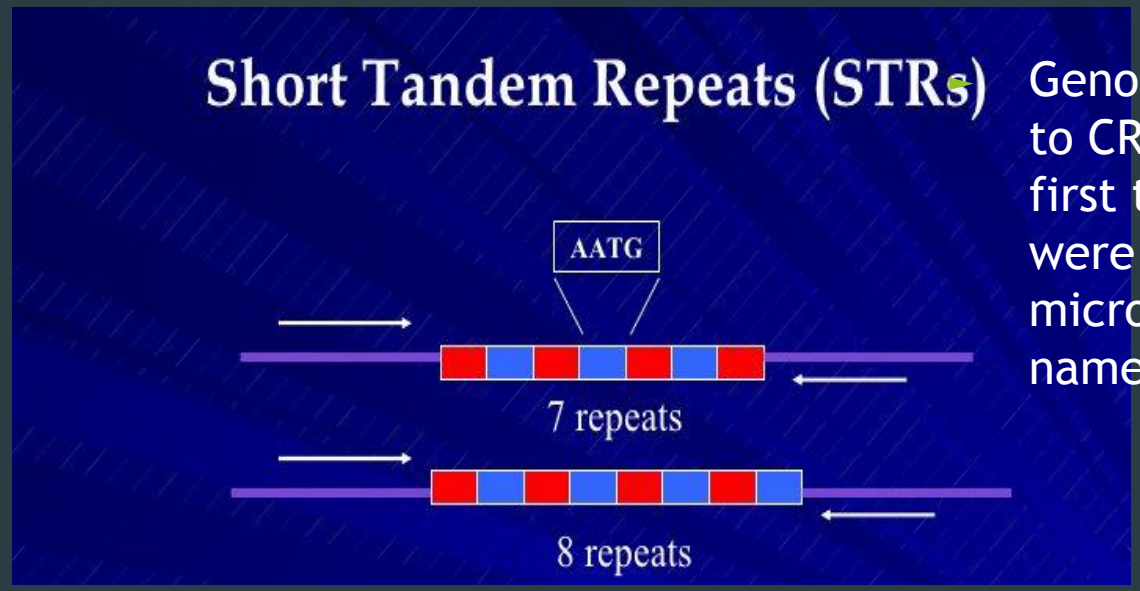
Описываете кратенько смысл System CRISPR CAS



- **CRISPR** (clustered regularly interspaced short palindromic repeats) - prokaryotic analogue of the immune system of vertebrates, allowing to protect single cells of prokaryotes from destruction by phages. This system works in the cells of 90% of archaea and 50% of bacteria

Здесь актуальность и новизна. Найдите в статьях про криспер. Значимость и новизна: создание нового приложения для блаблабла.

The first study



Genomic structures corresponding to CRISPRs were observed for the first time in 1987 in E. coli and were subsequently found in other microorganisms under different names.

Цель исследования: Разработка приложения для определения PAM-последовательности Cas-эффекторов

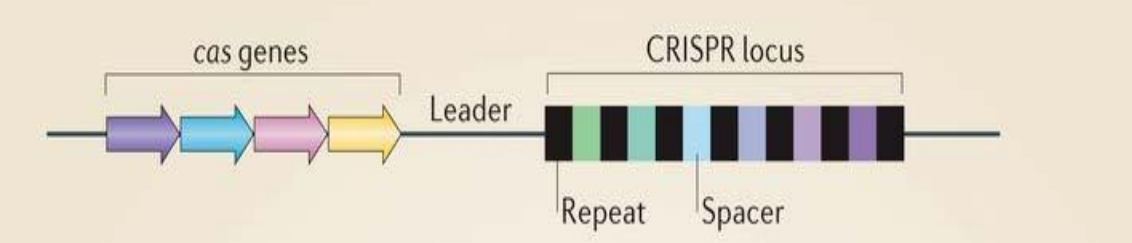
Задача 1: Разработать биоинформатический инструмент (in silico) для предсказания PAM-последовательности Cas-эффектора.

Подзадачи:

Определение общей структуры алгоритма поиска PAM-последовательности

Написание программных модулей для реализации отдельных шагов алгоритма.

Composition CRISPR CAS



- The immune function of CRISPR systems were installed in 2005, the CRISPR system consists of two fundamental components: CRISPR cassettes and Cas proteins. Each functional cassette contains three types of elements: lead sequence, spacers, and repeats.

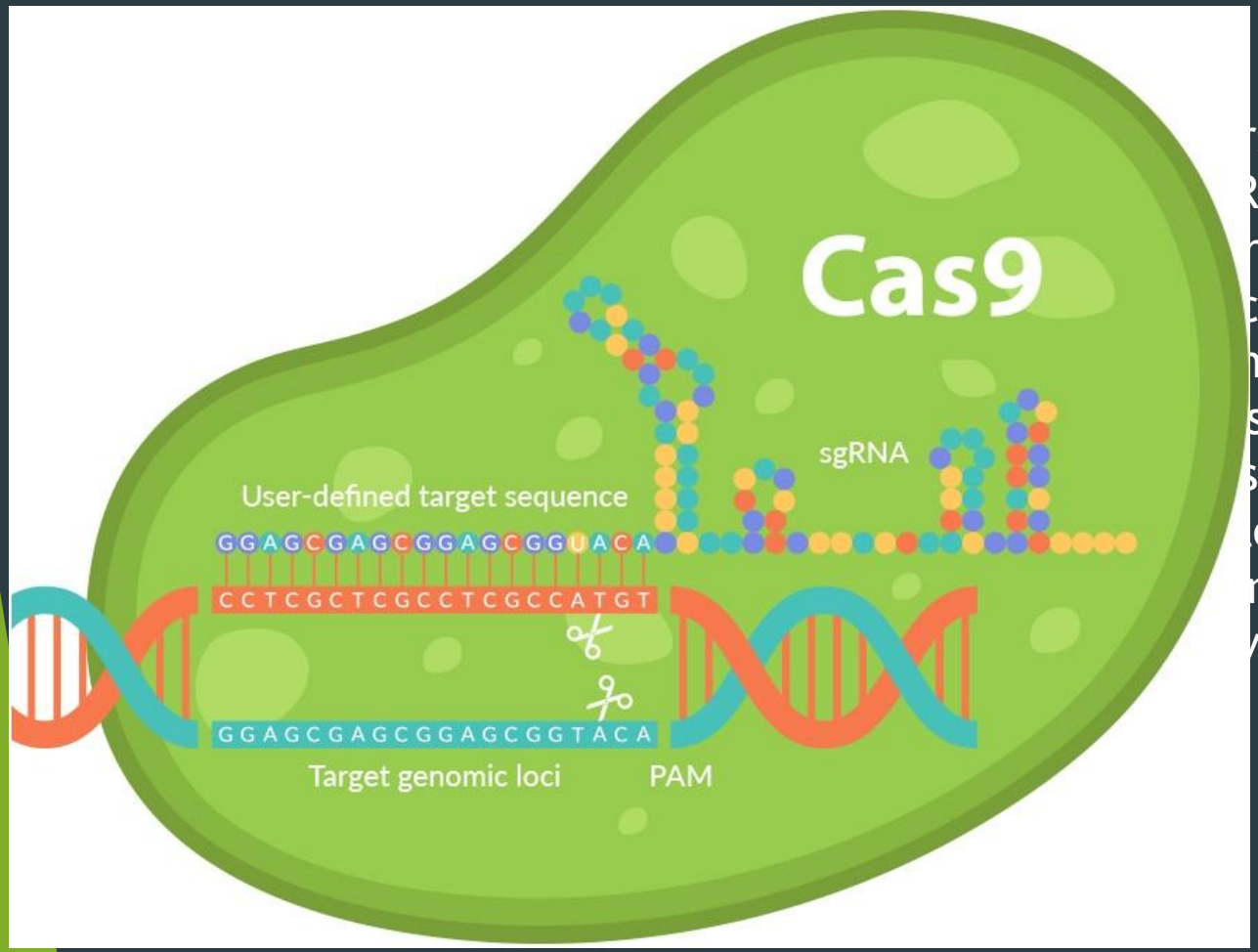
Методы проведения исследования. Структура работы. Эмпирический и экспериментальный (из присланной мной презентации берите)

- Repeats within one cassette, as a rule, are identical to each other in sequence and length, less often — can differ in one or two, most often terminal, nucleotides.

Принцип работы программы. Что она делает и как. Я не знаю про программы. На какой основе она создана. Вам лучше знать.

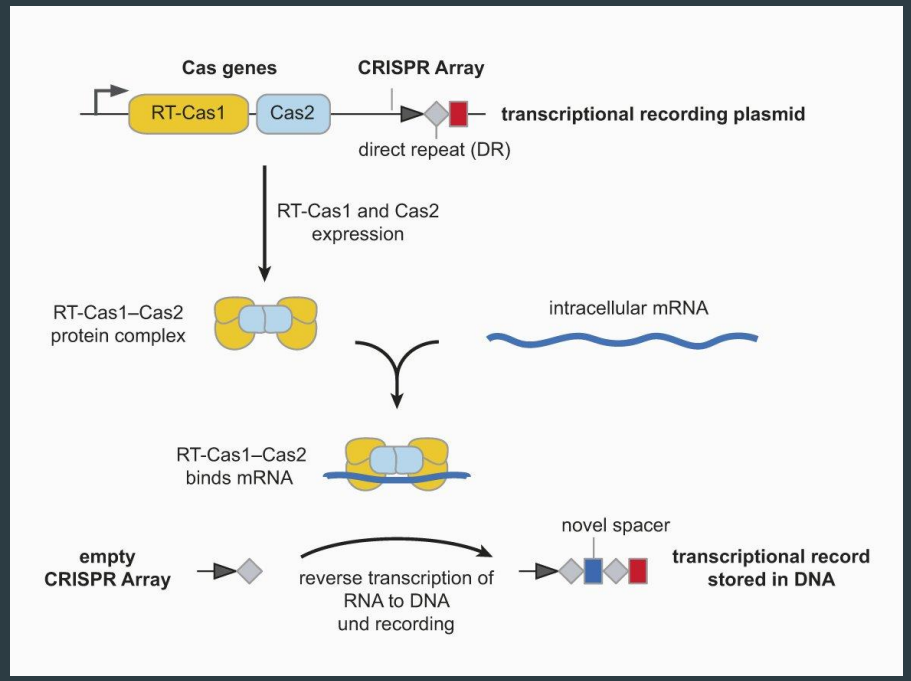
- Spacers are unrelated, non-recurring, short sequences located between the repeats and occur from fragments of foreign genetic elements that fall within the prokaryotic cell and called protospacer. The length of the spacers within the cassette is approximately equal to the length of the repeats. A set of spacers in strains of the same species is usually very different.

Результаты. Что в итоге получили. Воды можно немного налить. Строчек на 7.



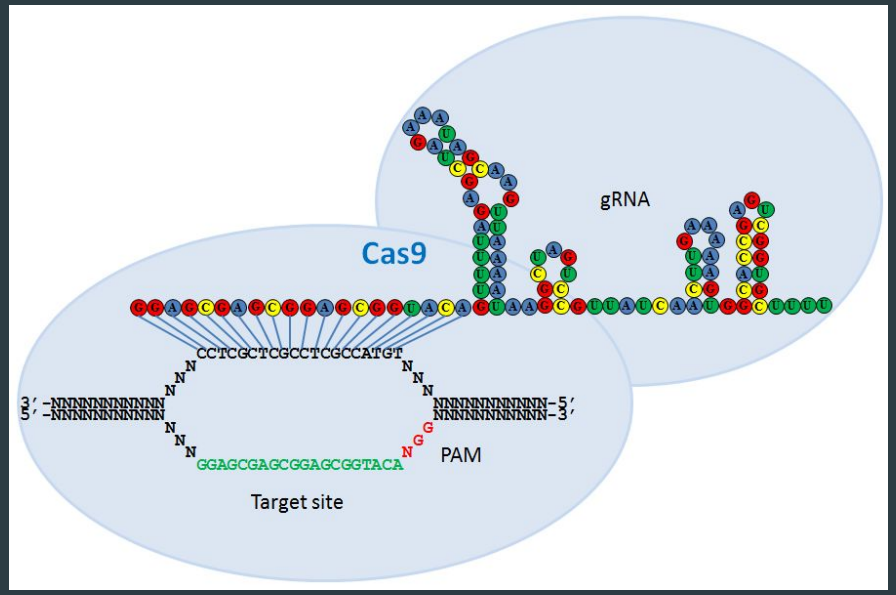
rst understanding of the
R/Cas System function
red after the discovery of a
correspondence of the
nce of some crispr spacer
s to sequences occurring in
s or plasmids. This led, in
o the assumption that they
nvolved in protecting against
vasion of genetic elements.

Выводы и возможные перспективы. Как вы знаете, они безграничны. Молекулярная биологи, генная инженерия.

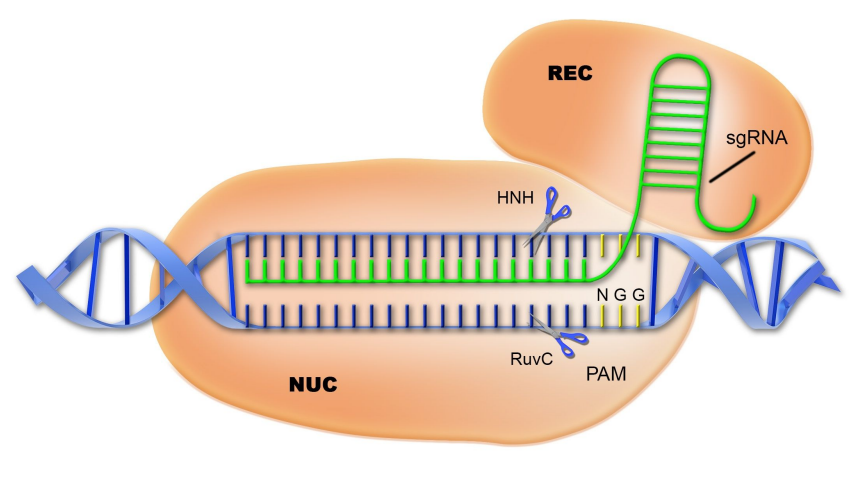


When the virus enters a bacterium or archaea equipped with a CRISPR system, the adaptive functional module of the system is activated: specific Cas proteins. Common to all microorganisms are Cas1 and Cas2, which are cut from the alien genome special episodes procaspases. Pick up procaspases in some cases helps and effector protein. Proteins select sites near a particular sequence of PAM (protospacer adjacent motif) — just a few nucleotides that have been identified near one end of protospacers but are not the same for different CRISPR systems. Then these same adaptive proteins embed the fragment in the CRISPR cassette, always on the one hand — in the leader sequence.

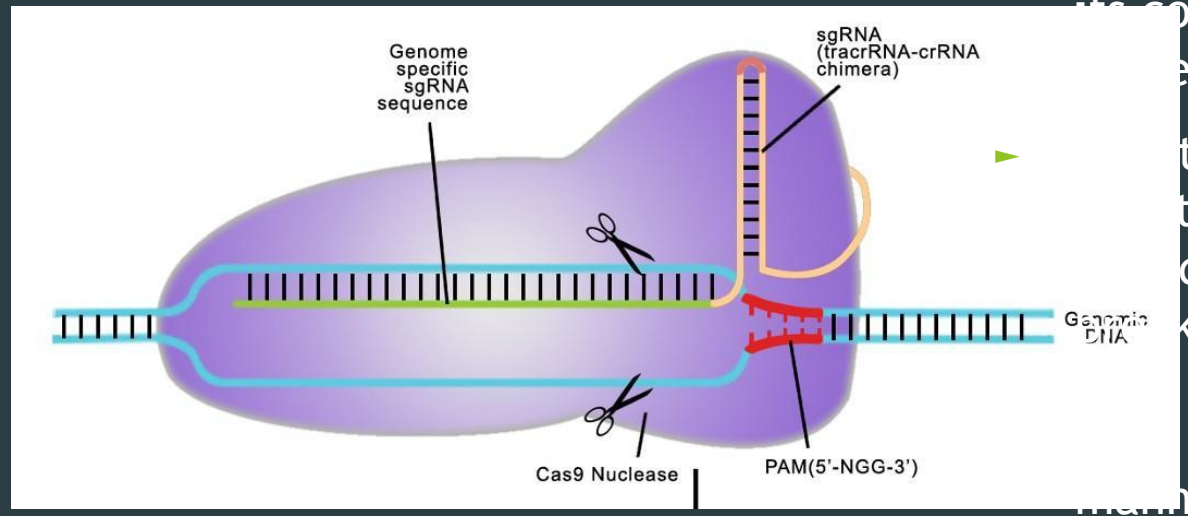
The molecular scenario of destruction of foreign DNA using CRISPR-CAS



- 1. The CRISPR array is transcribed and subsequently processed into separate units called CRISPR RNA (crRNA).



- 2. Ribonucleoprotein complex (Cascade + shrink) scans of the alien DNA, looking for PAM motifs and anchor areas. For recognizing procaspase the required number of interactions: 1) PAM motif near protospatherion associated with the unstructured loop of the protein Cse1; 2) 7 nucleotides of the 3’-end of the protospace complementarily interact with the corresponding part of the Srna. This region of the spacer/protospace is called the anchor region



- 3. Cascade-a complex associated with an alien DNA target, changes its conformation and recruits cas9 protein.
- After some time, the complex disintegrates into subunits. Cas9 then produces a large number of breaks in the alien DNA, starting from the place of its landing and chopping in a more or less random manner — until its complete destruction.

Urgency

Since CRISPR/Cas technology is currently one of the fastest growing areas of modern biotechnology, the implementation of the task set by the organizers of the competition is relevant and promising.