Why is CRISPR important- what can we expect in the future

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Our genes make us who we are
CRISPR/Cas9

**How CRISPR works**

1. The Cas9 protein forms a complex with guide RNA in a cell.

2. This complex attaches to a matching genomic DNA sequence adjacent to a spacer (yellow segment).

3. The Cas9-RNA complex cuts the double strands of the DNA.

4. Programmed DNA may be inserted at the cut.

Credit: MRS Bulletin (Ball, Cambridge. 2016)
Why is CRISPR such a game changer?

- Time (weeks to years)
- Precision
- Versatility
- Cheaper (thousands to hundreds$)
What can we do with CRISPR Technology?

- Develop newer better CRISPR
- Delivery mechanism
- RESEARCH genes
- Gene editing in genetic disease
- Somatic vs Germline
- Libraries, screens
- Food industry
- Gene editing of plants/ crops
Current applications

- Engineer mosquitoes to become resistant to malaria. His resistance is even passed to subsequent generations when the engineered mosquitoes mate with ‘normal’ (wild type) mosquitoes.
- Cut out pieces of the embedded viral genome of HIV forever silencing the virus. Trying to apply this to hepatitis B virus, human papillomavirus, and herpes virus
- Knock out porcine endogenous retroviruses, making future transplants with porcine organs much safer,
- When CRISPR is combined with current molecular tools such as high throughput functional screens, for example, CRISPR-cas9 can be adapted to comprehensively identify new cancer drug targets.
CRISPR in Clinical Trials

- First in human use of CRISPR occurred in China, in October 2016 to treat lung Cancer. A gene in immune cells was switched off, using CRISPR, to make it resistant to cancer immunosuppression strategies.

- By May 2017 there was 20 trials, including on HPV, CAR T
Thank you
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