

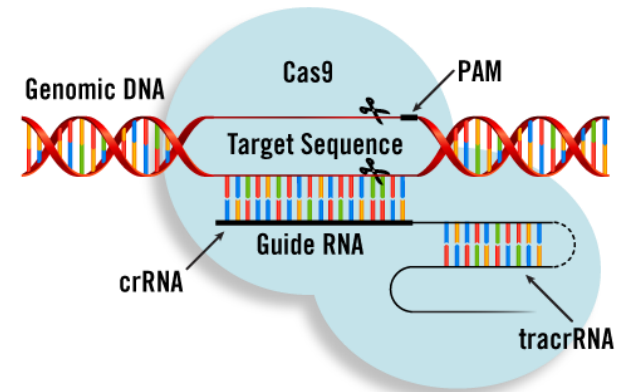
# CRISPR in Europe

Crop Innovation & Business  
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# Agenda

- ✗ Importance of CRISPR in Europe
- ✗ European Landscape
- ✗ Follow-on IP
- ✗ @EPO
- ✗ Summary- Access & Control



Source: [www.mirusbio.com](http://www.mirusbio.com)

# Importance of CRISPR in plants

- ✧ Technique & Market Opportunities
- ✧ Development in patent law
  - ✧ EPO: patentability of plants
- ✧ GMO status of CRISPR in plants
  - ✧ Sweden, Netherlands (House of Representatives)
  - ✧ EU directive

# European Landscape

× Same players as in US

× MIT/Broad – UC Berkeley – Toolgen – Dow/DuPont

Applicant	US	EPO
Vilnius Univ. (20-03-2012)	14/385241	EP2828386
UC Berkeley (25-05-2012)	13/842859	EP2800811
Toolgen (12-10-2012)	14/438098	EP2912175
Broad Institute (12-12-2012)	US8697359	EP2764103 EP2771468

# European Landscape

- ✧ Significant differences with US
  - ✧ EPO: Other rules on priority, sufficiency, novelty, inventive step
  - ✧ Third party observations
  - ✧ Different claims granted
    - ✧ US8697359 vs. EP2764103
  - ✧ Oppositions
  - ✧ National law & courts
- ✧ EPO filings & national filings

# Follow-on refinements

- × Practical value may be in refinements of technology
  - × Delivery, off-target prevention, repair strategies, vectors, application, activity..
- × MIT/BROAD filed several application on follow-up
  - × Delivery: 19 applications
- × UC Berkeley is less active
  - × Delivery: 0 applications
- × Many other applicants

# Example: TOOLGEN

- × First application (CAS, gRNA, NLS):
  - × Granted in KR, AU (AU2013335451)
  - × Pending EPO (EP2912175) & US (US2015344912/US2015322457)
- × WO2016021973 (Campylobacter CAS/AAV)
  - × Positive International Preliminary Report on Patentability
  - × EPO: March 2017
  - × SpCas9 too large; CjCas9 less robust, but works well with AAV.

# EPO vs USPTO – UC BERKELEY

- × EP2800811 (25-05-2012):
- × Broadly covering CRISPR/CAS technology...
  - × **24 March:** Intention to Grant
  - × 27 March: Response applicant: Agree
  - × 29 March: Withdrawal UK designation (there is a UK patent)
  - × 29 March: Filing of divisional applications
  - × ....Grant & Oppositions
- × Also Germany utility models



# EPO vs USPTO – UC BERKELEY

4. The method of claim 1, 2 or 3, wherein the target DNA is present in a bacterial cell, an archaeal cell, a single-cell eukaryotic organism, a plant cell, a cell from an invertebrate animal, or a cell from a vertebrate animal.

- ⌘ USPTO Interference: “..not have reasonably expected a CRISPR-Cas9 system to be successful in a eukaryotic environment”
- ⌘ EPO (and many other jurisdictions): First-to-file

# EPO – Broad/MIT (12-12-2012)

- × Broad: > 7 patent granted in Europe
  - × All opposed to
- × Intention to grant EP2800811 (UC Berkeley) may become important.
- × It will be several years before the fight for these patent rights in Europe is well and truly over

# Summary - Access and control

- ✗ First generation patents: may take several years to settle
- ✗ Outcome in EP and US will likely differ
- ✗ Follow-up inventions may become important (Broad/MIT; Toolgen)
  
- ✗ Where to license? Terms?
- ✗ Availability to academics/non-profit via e.g. Addgene
- ✗ Exclusive licences could “bottleneck the use of CRISPR CAS” – Science – Letter 17-02-2017
- ✗ Initiatives for patent pools (MPEG LA)

# Questions?

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