ers GENOMICS

Your connection to CRISPR/Cas9

CRISPR/Cas9 Patent Landscape Update 2023

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ERS Genomics

Is the global **CRISPR/Cas9** licensing leader

Grants **worldwide access** to the essential CRISPR/Cas9 patent portfolio

Offer **non-exclusive licenses** across life science sectors

ERS Genomics, Our Story…

2012
CRISPR/Cas9 gene editing technique patented by Emmanuelle Charpentier & Jennifer Doudna.

2014
ERS Genomics founded by Emmanuelle Charpentier, Rodger Novak & Shaun Foy to grant licenses to revolutionary gene-editing technology.

ERS begins to establish license agreements globally with companies who would benefit from the ‘genetic scissors’.

2016
First European patents granted

2018
US patent office grants ERS its first US patent for CRISPR/Cas9 gene editing

2020
Emmanuelle jointly awarded the Nobel Prize for ‘rewriting the code of life’.

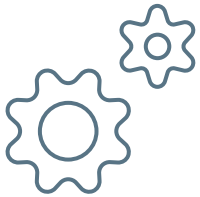
European Opposition Division affirm key CVC patent over Opposition.

Today, we provide licenses to the CRISPR/Cas9 patent portfolios held by Emmanuelle Charpentier, The Regents of the University of California, and University of Vienna (the CVC Group).

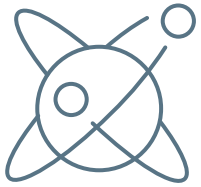
100+
Granted patents

80+
countries

CVC Patent Portfolio



Compositions & methods of using Cas9 with dual or single guide RNA and delivery formats of these compositions in a cell

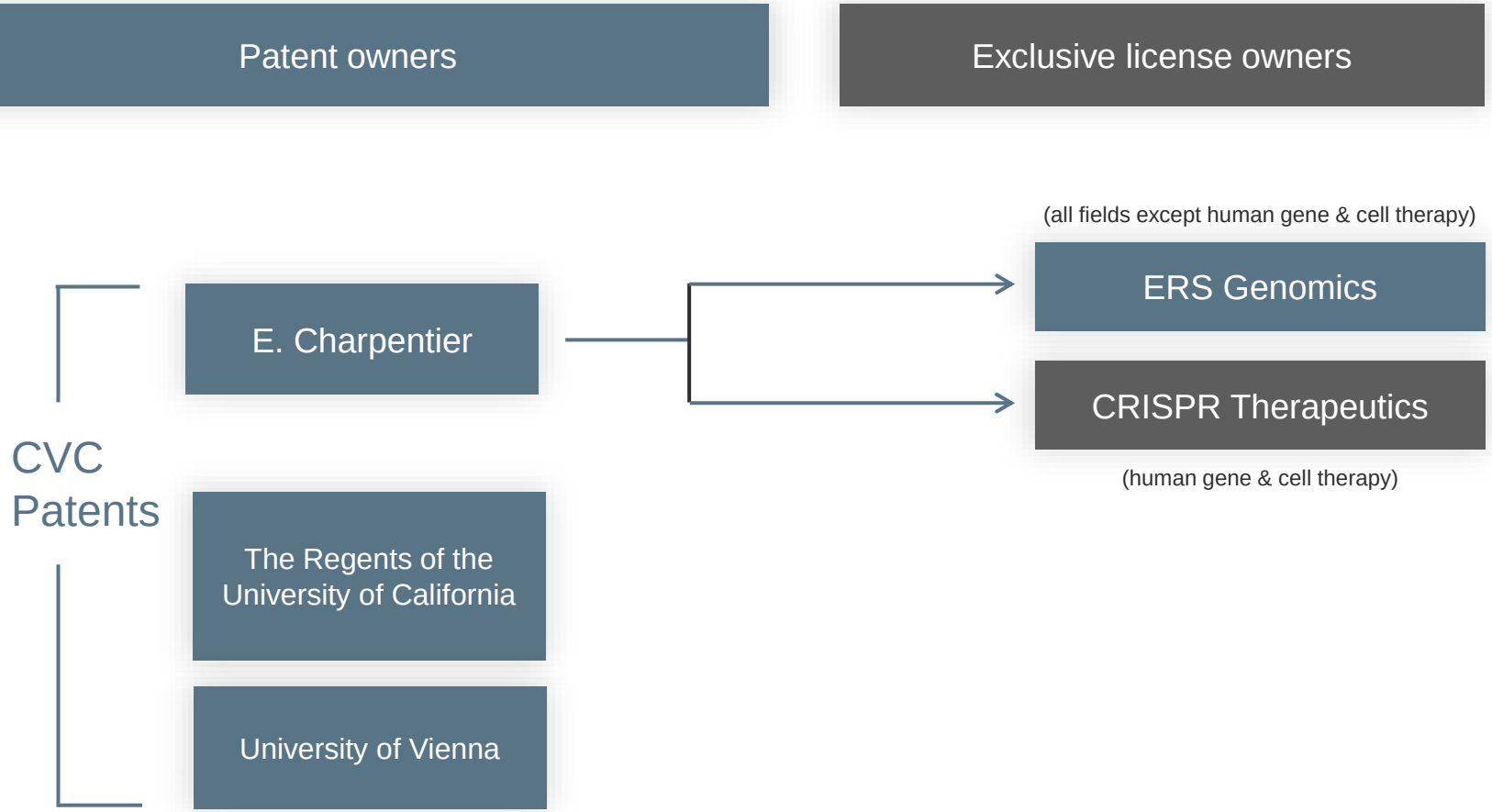


Use of **CRISPR/Cas9** complex to cleave **DNA**

Using mutated Cas9, such as dCas9 or nCas9, to:

- Nick DNA
- Bring an effector domain to a specified DNA sequence, such as for CRISPRi and CRISPRa
- Base editing

The CRISPR/Cas9 Patents are Jointly Owned



*CVC stands for University of **C**alifornia, University of **V**ienna, and Emmanuelle **C**harpentier and is the acronym used to describe the owners of what are commonly referred to as the UC Berkeley CRISPR patents.

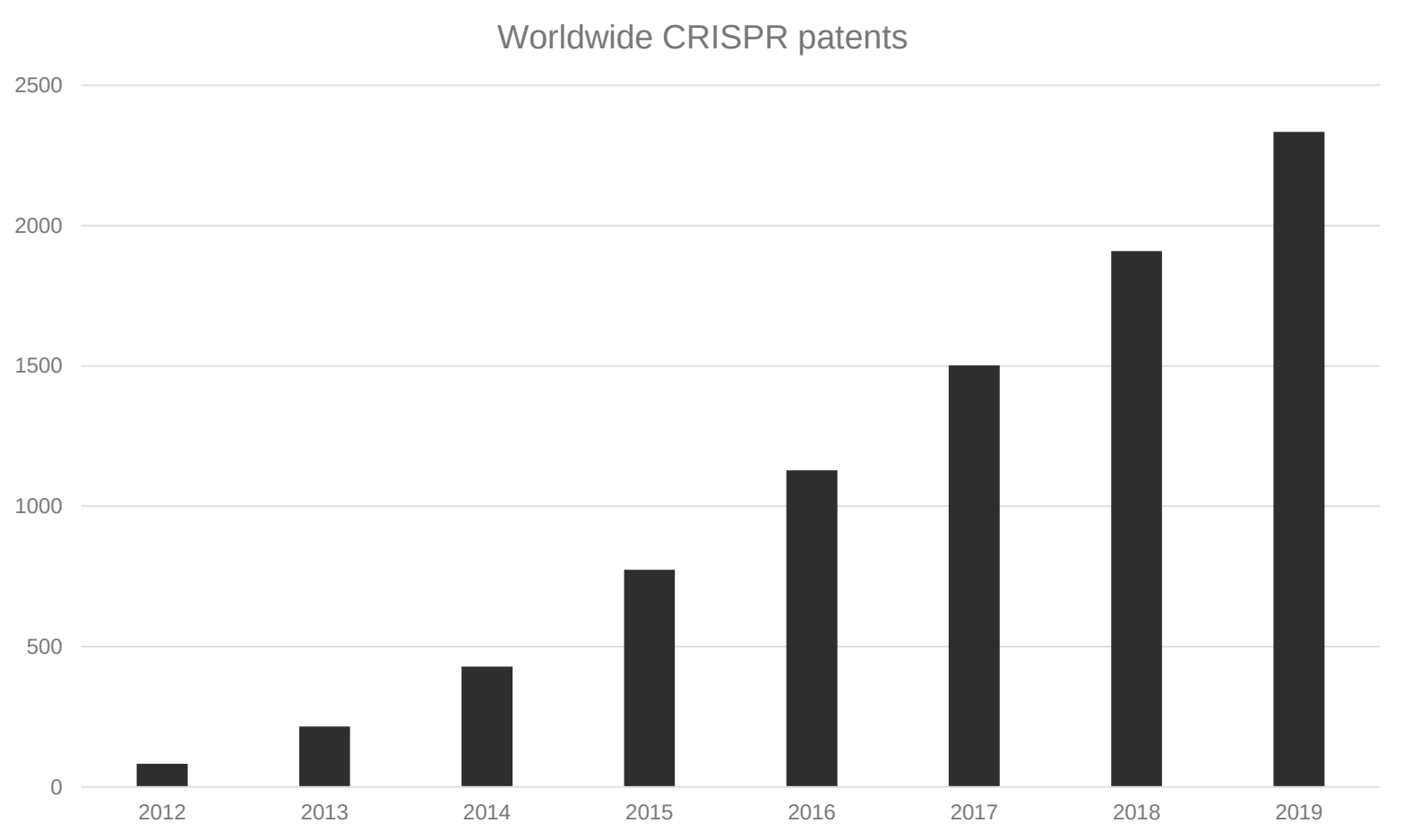
The Patent owners are referred to as

“CVC”

While patents are jointly owned, ERS operates **independently** and provides **legal access** to the CVC **portfolio-no other license from any CVC member is required**

IP Landscape

CRISPR/Cas9 - Worldwide CRISPR Patents



As of 2020, 12,000 CRISPR patent applications filed worldwide, falling into about 4,600 patent families.

Platform	Patents
Cas9	6563
Cas12a	1510

CRISPR/Cas9 - Fundamental Versus Supplemental Patents

Fundamental patents: Where *any use* of a technology requires a license to these patents

Examples of previous fundamental patent estates:

- Cohen-Boyer patents on recombinant methods
- Cabilly patents on monoclonal antibodies

Supplemental patents: Improvements or specific uses of a technology that may be required in addition to a license to the fundamental patents.

Timeline - in Chronological Order

Vilnius group

Is the first to file two provisional applications, BUT they do NOT include that Tracr-RNA is a necessary component of the complex.

CVC

files 2 months after Vilnius, but tells the story of how the complex consists of three elements:

1. CRISPR-RNA
2. Tracr-RNA
3. Cas9 protein

Toolgen

files its first provisional application 4 months after CVC with some data showing use in eukaryotic cells

The CVC group also describes how the CRISPR-RNA and Tracr-RNA can be combined into a 'single guide RNA'

Sigma

files its first provisional application 6 months after CVC with some data showing use in eukaryotic cells and tries to use 'targeted insertion' as a differentiating factor

The first provisional application from CVC does not contain data on use in eukaryotic cells, but describes methods to carry that out and subsequently publishes in Science.

The Broad Institute

files last, more than six months after CVC, with data showing use in eukaryotic cells

Within 6 months of the May publication, five independent labs across the world have gotten CRISPR to work in eukaryotic cells.

What Happens Next… Depends Largely on Location

"First to file"

- The principle whereby the first group to file a patent application describing an invention receives the patent
- This doctrine applies in all countries except the USA (at the time of filing):
  - China
  - Japan
  - Europe
  - Starting in mid-March of 2013, the USA also adopts this principle

"First to invent"

- A principle that existed in the USA until March 2013 (expiring one day after the CVC filings) that said that if you were not the first to file a patent application and you could prove by adequate documentation that you had conceived of an invention before the others that filed before you, that you would be rewarded with the patent
- This often requires a court to examine lab notebooks, statements of witnesses, and other information to determine who is 'first to invent'

Worldwide Foundational Patent Overview

Europe

- CVC has 2 granted patents

USA

- CVC has over 50 granted patents (“any cell type”)
- Broad has 13 granted patents (“eukaryotic cells only”)

Japan

- CVC has 3 granted patents
- Broad has 2 granted patents (limited claims)

China

- CVC has 3 granted patents
- Broad has 1 granted patent (conflicts with CVC patent)

India

- CVC has 1 granted patent

Australia

- CVC has granted patents
- Broad has granted patents
- Toolgen has granted patents
- Sigma has granted patents

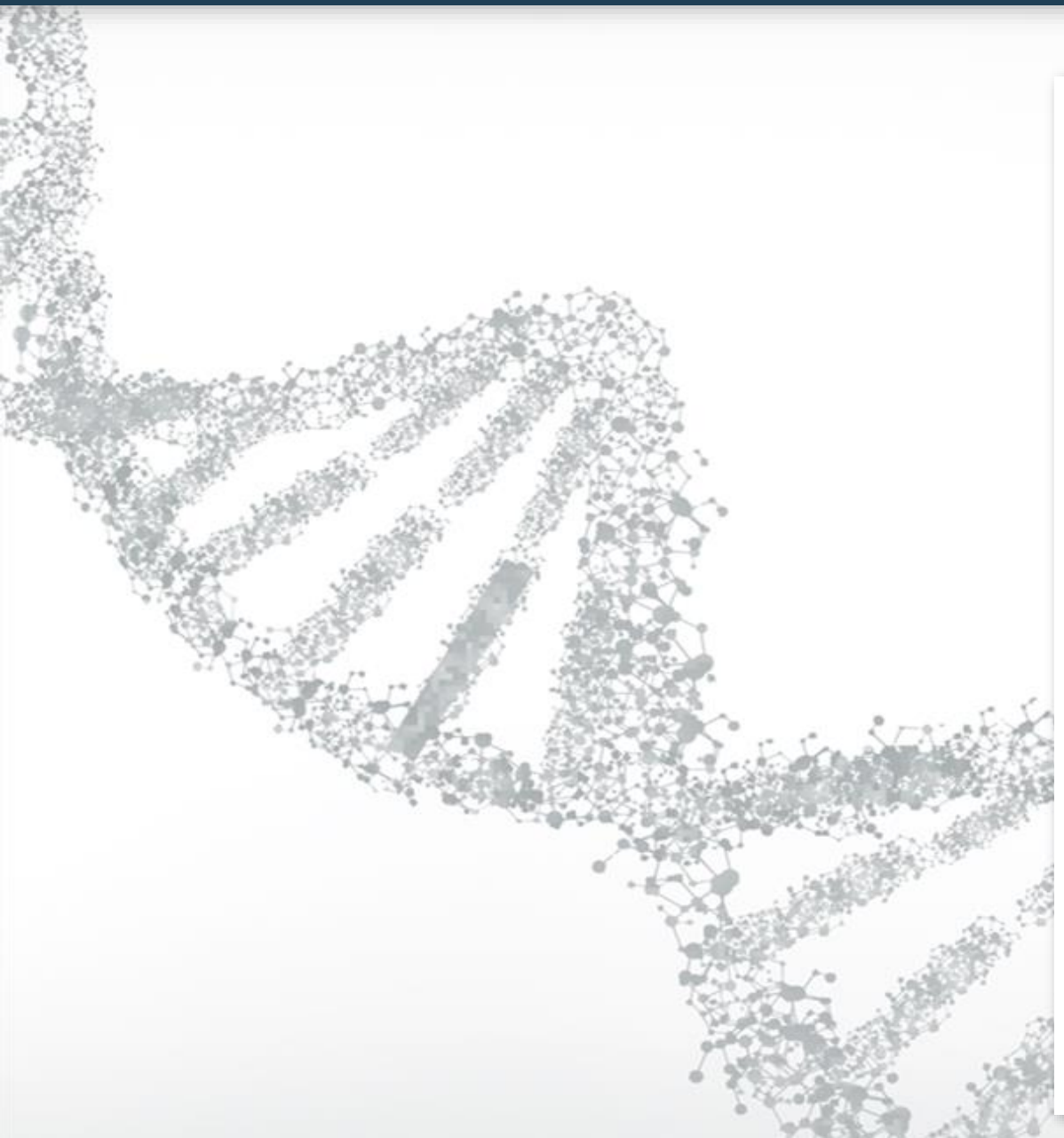
South Korea

- CVC has 1 granted patent
- Toolgen has 1 granted patent

Singapore

- CVC has 1 granted patent

Where Do Things Stand in the USA?



- The CVC group has over 50 granted patents not involved in any interference:
  - Includes 'use in a cell' (no limitation as to what kind of cell).
  - Stand alone compositions and uses of single guide RNA and TracrRNA.
- The Broad holds 13 fundamental patents:
  - Use only in eukaryotes
- Toolgen and Sigma have so far been granted no fundamental patents.
- Multiple ongoing interferences:

Patent Interferences - US

Interference No. 106,115 CVC/ Broad

Feb, 2022: US PTAB ruled that Broad will retain its intellectual property over the use of CRISPR/Cas9 in eukaryotes.

CVC has Appealed: Motion Phase concludes Q2 2023

Interference No. 106,127 CVC/Toolgen

Interference No. 106,126 Broad/Toolgen

Interference No. 106,132 - CVC/Sigma

Interference No. 106,133 - Broad/Sigma

The US PTAB has initiated 5 independent interference proceedings focused on specific claim sets limited to eukaryotic applications. **None of CVC's 55 issued US patents are involved in these ongoing proceedings**

PTAB Decision in 106,115 Interference

February 28, 2022

The ruling:

US PTAB ruled that the Broad Institute and Harvard will retain its intellectual property over the use of CRISPR-Cas9 gene editing in eukaryotes.

US PTAB confirmed that its decision regarding priority of invention was focused on single-guide CRISPR/Cas9 systems in eukaryotic cells and has no impact on any of CVC's granted US foundational patents.

To summarize, in the US…

The CVC group continues to hold over 50 valid US patents

- Use in 'any cell'
- Compositions and uses of single guide RNA

The Broad continues to hold 13 fundamental patents - Use only in eukaryotes

U.S. Court of Appeals, Federal Circuit Case Number 22-1594, filed on April 4, 2022

CVC and Broad have appealed the PTAB decision in US Interference No. 106,115. Briefing continues in this Federal Circuit appeal with Broad filing its reply brief and counter appeal this February, CVC will file its reply in May. Both the Broad and CVC patents currently coexist in the US as they relate to use in eukaryotic cells.

CVC Patent Oppositions - Europe

CVC EP2800811: UPHELD 2/2020

Foundational CRISPR/Cas9 patent directed to single guide system; not limited to eukaryotes –covers cellular and non cellular applications

CVC EP3241902: Revoked 4/2021

Claims directed to chimeric Cas9. Revoked based on strict EPO written description requirements. **Subject matter preserved in multiple divisional filings**.

CVC EP3401400 : UPHELD 2/2022

Foundational CRISPR/Cas9 patent with claims directed to dual guide RNA and eukaryotic applications.

With notable revocations of Broad, Sigma and Toolgen patents, CVC maintains a dominant IP position in Europe

Other CRISPR Patent Oppositions - Europe

Broad EP2771468 - REVOKED
Broad foundational CRISPR/Cas9 patent (in eukaryotes)
Lost priority due to flaw in assignment of priority rights by inventor and accordingly invalid for lack of novelty. Appeal rejected.
Several other patents in this family also subject to same priority issue

Sigma EP3138910– REVOKED
Patent directed to use of CRISPR/Cas9 systems to insert DNA into chromosomal sequence of eukaryotic cell. Found invalid for obviousness.

Toolgen EP2912175- REVOKED
Toolgen foundational CRISPR/Cas9 patent (in mammalian cells). Revoked on procedural grounds after patentee attempted to introduce entirely new set of main and auxiliary requests shortly before the hearing (and withdrew previous requests) – the new requests were not admitted.

Thank you!

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