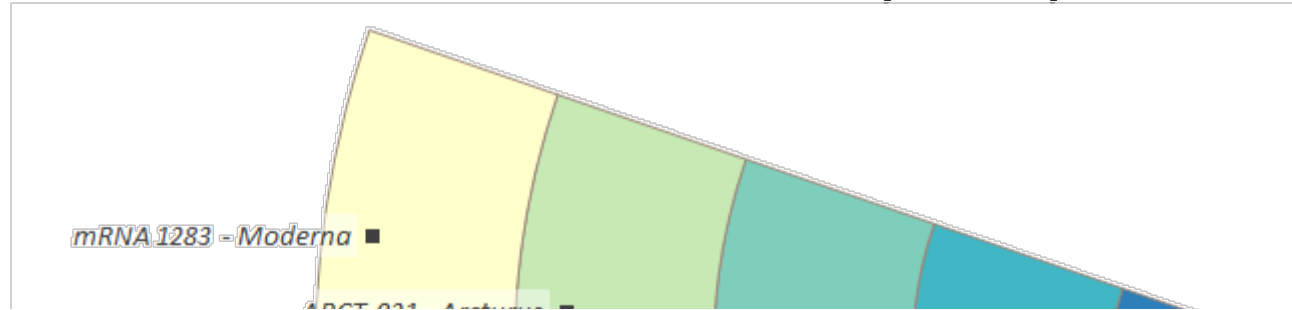


COVID-19 Vaccines – US, UK, & Europe

VP-SCE BullseyeSM



COVID-19 vaccines in context:
a look at the mRNA technology IP landscape

Phase 1

Phase 2

Phase 3

In Review

Authorized

▲ Phase change

+ New this update

PIUG 2021, Tuesday, May 25, 1:45 pm

Matt Eberle,

Lead Developer, Analytics & Custom Solutions

BizInt Solutions

Included: clinical phase or above in the US, UK, or Europe. Vaccines are placed at the highest phase attained in any of these countries. Some vaccines are at a higher phase globally.

Excluded: Vaccines only showing development outside of the selected countries.

Updated May 4, 2021

Source: Adis R&D Insight, Pharmaprojects, Cortellis, GlobalData
Created with VantagePoint – Smart Charts Edition (VP-SCE)



Main Themes

- Analyzing a few key fields yields multiple possibilities for visualization
- Different visualizations can lead to different insights (even with the same fields)
- Patterns don't have to be complex to be meaningful
- Look for patterns but go back to data to verify

VP-SCE Features used for these examples

- **List Cleanup**
 - Assignees
 - Corporate Source
 - Indications
- **Visualizations**
- **Further Processing**
 - Divide Corporate Source to separate organization name from department
 - Extract Years
- Mark Unique – CPCs only found in records from one of the top assignees
- Thesaurus – convert CPC codes to meaning

New in Visualizations - VP-SCE 12

- **Milestone Timeline**
 - Brand new
 - Combines features of Event and Duration Timelines
- **Bullseye**
 - Updated design
- **Piano**
 - Split long columns into two
 - Inverted bottom to top
 - Color palette choices
- **More new visualizations**
 - Multi donut
 - Scatter Plot (Motion Bubble)
 - Butterfly Chart

Search Strategies

(If you don't like these, I have others...)

Cortellis Patents: Any Action (RNA vaccine)

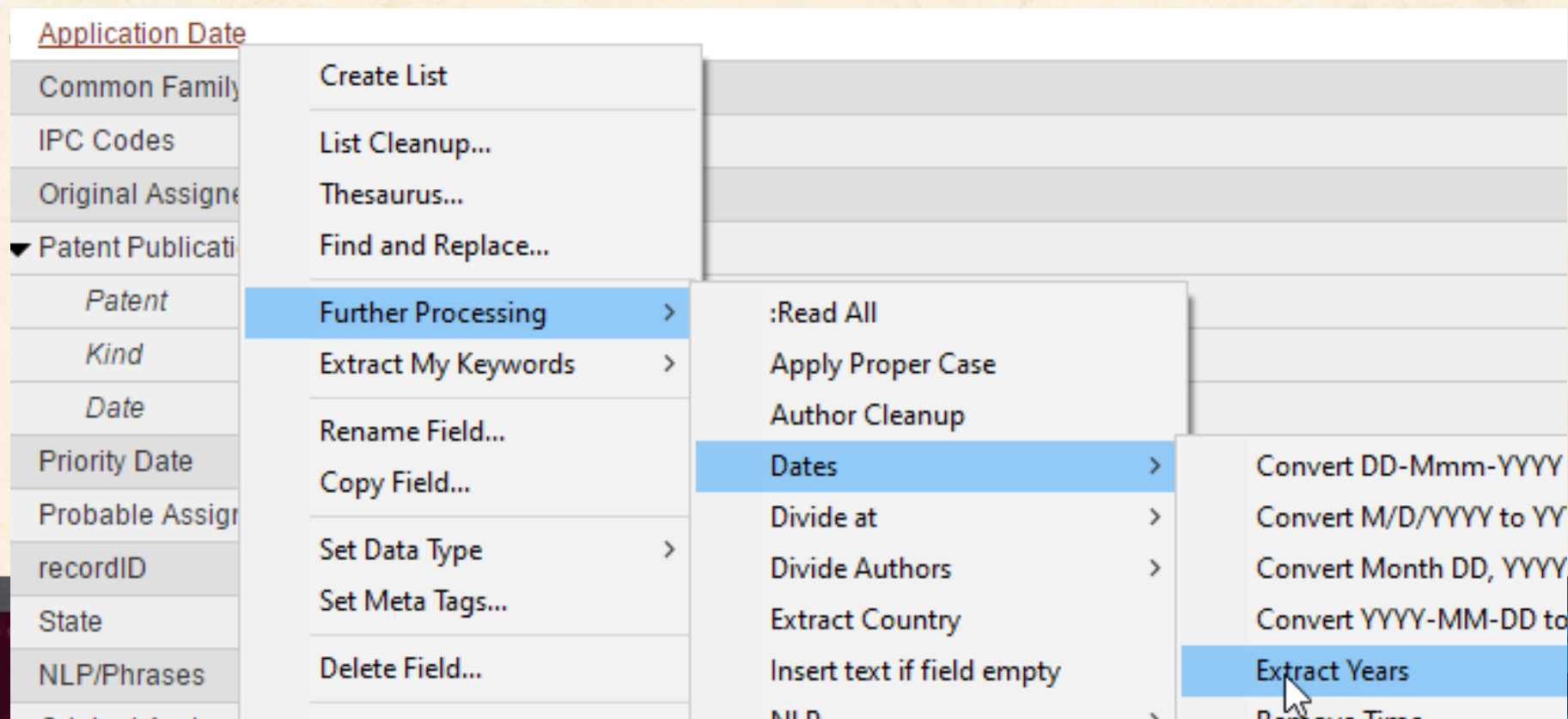
Cortellis Integrity: Patents related to Drugs & Biologics search results for: Query > Product Category = “RNA Vaccines”

Medline (PubMed): “mrna vaccines” OR “mrna vaccine”

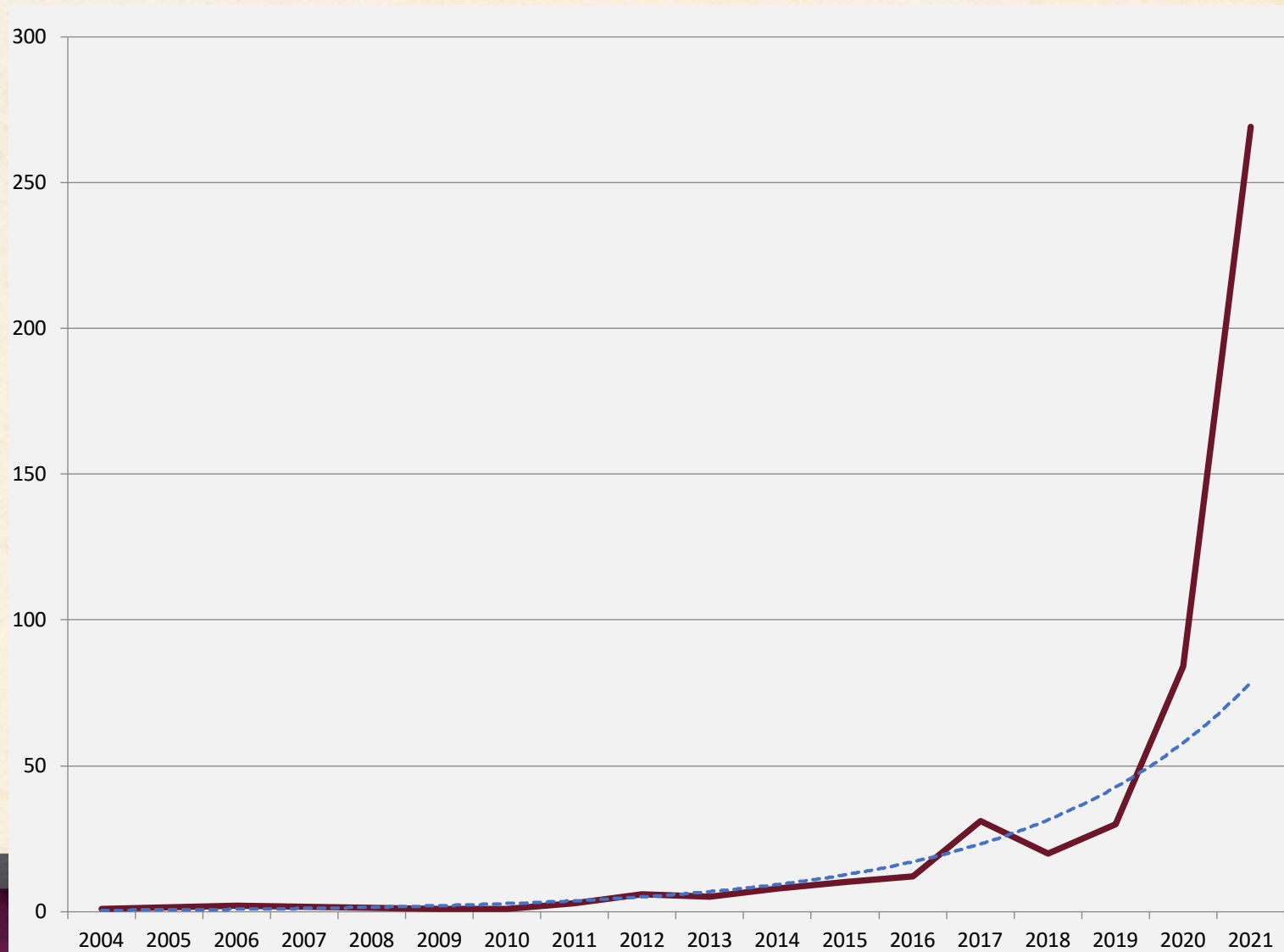
Nature review article: (ribonucleic acid or RNA or messenger ribonucleic acid or mRNA or messenger RNA) NEAR5 (vaccin*)

RNA vaccines: Where did they come from?

Extract Years from Application Date (or Priority Date, Publication Date... you get



RNA vaccines: Where did they come from?

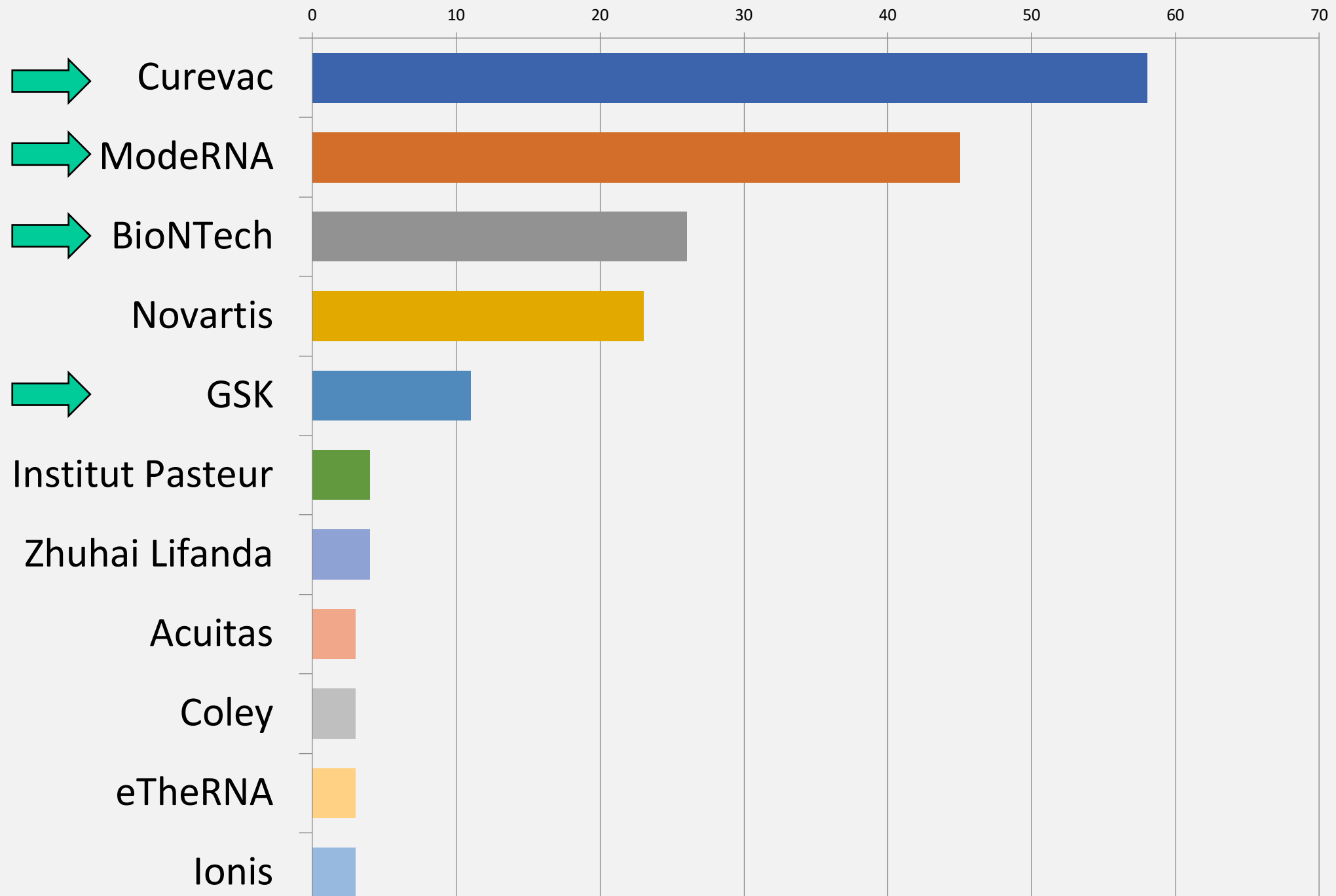


RNA vaccines: Whose IP?

Cleanup Assignees (or Corporate Source/Affiliation)

# Records	Item Name (225 items)
58	<input type="checkbox"/> CUREVAC AG
23	Curevac Gmbh
38	CUREVAC AG
33	<input type="checkbox"/> Modernatx, Inc.
1	Moderna, Inc.
5	MODERNATX INC
27	Modernatx, Inc.
23	Novartis Ag
17	<input type="checkbox"/> BioNTech RNA Pharmaceuticals GmbH
14	<input type="checkbox"/> TRON - Translationale Onkologie An Der Universit#195;#164;tsmedizin Der Joha
11	Glaxosmithkline Biologicals Sa
10	<input type="checkbox"/> Moderna Therapeutics

1	58	61	Curevac
2	45	47	Moderna
3	34	34	BioNTech (+Novartis)
4	26	26	BioNTech
5	17	18	Johannes Gutenberg-Universit#195;#164;
6	1	1	Individual
7	6	6	University Of Massachusetts
8	5	5	The Trustees Of The University Of Penn
9	4	4	Institut Pasteur
10	4	4	Zhuhai Lifanda
11	3	3	Acuitas
12	3	5	Coley
13	3	3	eTheRNA
14	3	3	FOTIN MLECZEK MARIOLA
15	3	3	Hvidovre Hospital
16	3	3	Ionis



There are only two time periods
Create pre-2020 and 2020 groups



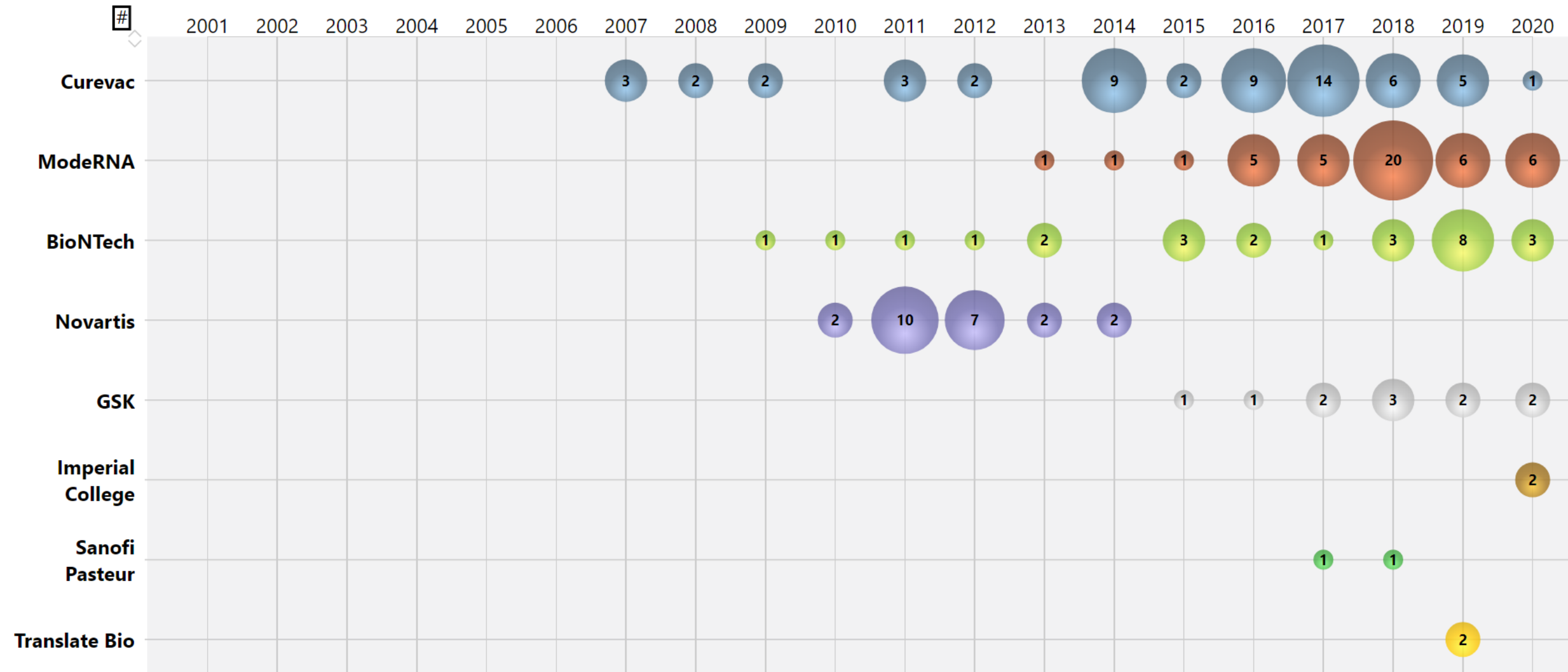
Pre-2020 & 2020

Total	Original Assignee: Remove/Company Suffix (Cleaned)	Pre-2020 AKA, The Before Times	2020 The New Normal
54	Curevac Ag		
41	Moderna		
25	BioNTech		
23	Novartis Ag		
10	Glaxosmithkline Bi...		
4	Institut Pasteur		
3	Acuitas		
3	Coley		
3	Etherna Immunoth...		
3	Isis Innovation		

Further into time (and company)
**VP-SCE Bubble Charts - a great
exploratory visualization**



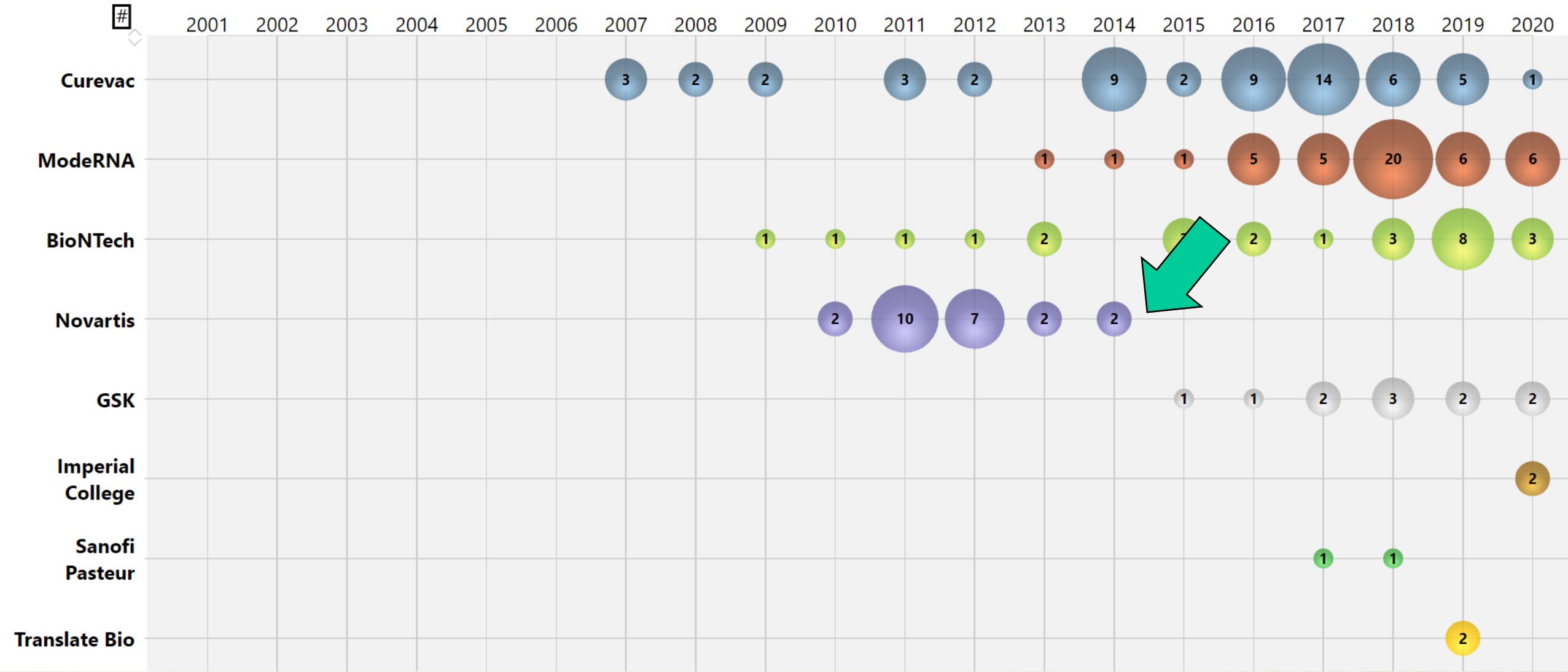
Original Assignee (1) (Cleaned) vs. Application Date: Dates/Extract Years



RNA vaccines: Pattern hunting in action

- Looking across, which companies show broad activity over the majority of the timespan shown?
- Looking down, are there years where some companies show more activity than others? And are these always the companies with the most activity?
- Are there gaps?

Original Assignee (1) (Cleaned) vs. Application Date: Dates/Extract Years



HOW COVID UNLOCKED THE POWER OF RNA

It was a Friday afternoon in March 2013 when Andy Geall got the call. Three people in China had just become infected with a new strain of avian influenza. The global head of vaccines research at Novartis, Rino Rappuoli, wanted to know whether Geall and his colleagues were ready to put their new vaccine technology to the test.

US researchers in Cambridge, Massachusetts, had packaged strings of RNA nucleotides inside of small fat droplets, known as lipid nanoparticles (LNPs), and used them to

introduce a messenger RNA.

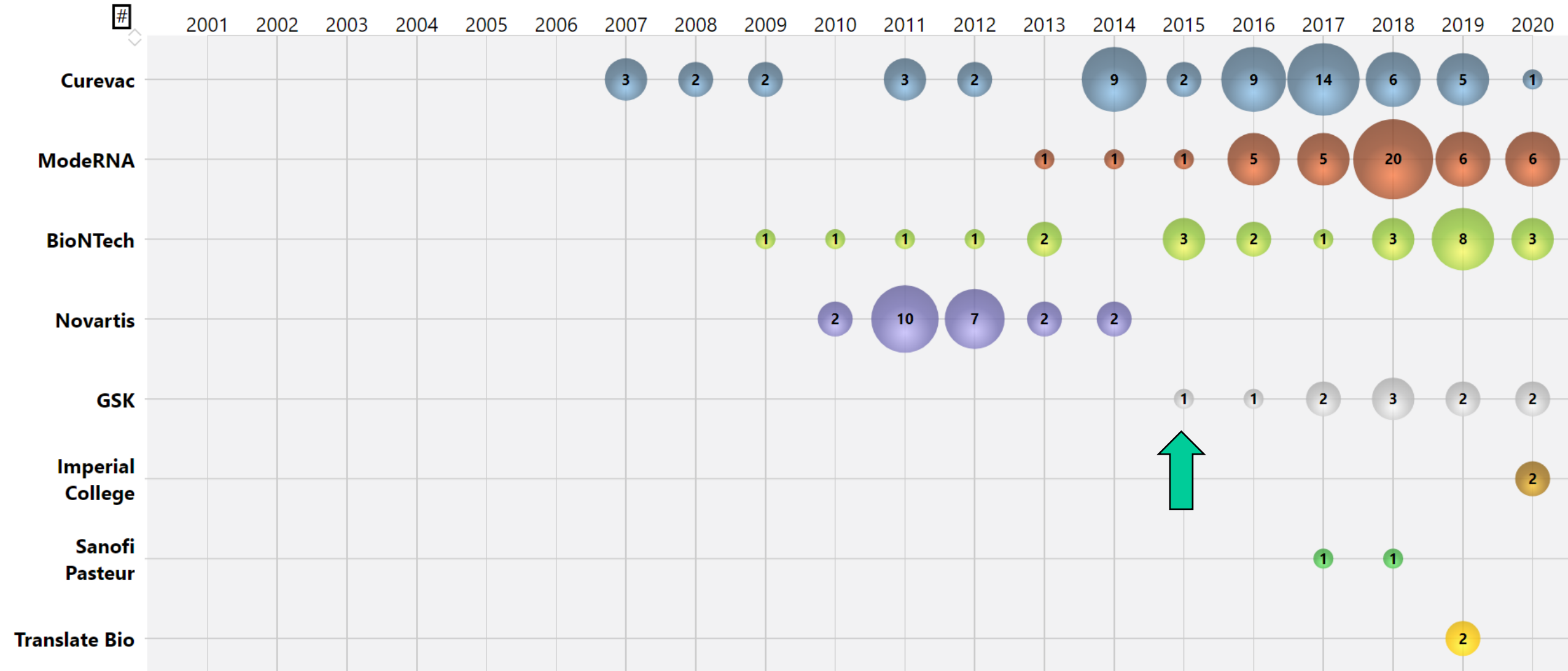
The development happened at a breakneck speed³. The Novartis team had achieved in one month what typically took a year or more.

oped, would work in people. In 2015, Novartis sold its vaccines business.

RNA vaccines are proving their worth. Last month, two RNA vaccine candidates – one from US pharmaceutical giant Pfizer and BioNTech in Mainz, Germany, and another from Moderna in Cambridge, Massachusetts – won emergency approval from regulators in several countries to fight COVID-19.

The era of RNA vaccines has arrived – and dozens of companies are getting in the game. “All of the major pharma are, in one way or the other, now testing out the technology,” says Jeffrey Ulmer, former head of preclinical research and development at GlaxoSmith-Kline’s vaccine division in Rockville, Maryland, and before that a member of Geall’s team at Novartis.

The idea of using RNA in vaccines has been around for nearly three decades. More streamlined than conventional approaches, the genetic technology allows researchers to fast-track many stages of vaccine research and development. The intense interest now could lead to solutions for particularly recalcitrant diseases, such as tuberculosis, HIV and malaria. And the speed at which they can be made could improve seasonal-flu vaccines.



Novartis announces completion of transactions with GSK

← [Back to News Archive](#)

Mar 02, 2015

- *Completes transactions with GSK including: acquisition of GSK oncology portfolio, creation of Consumer Healthcare joint venture, and sale of non-influenza Vaccines business*

Let's get moving

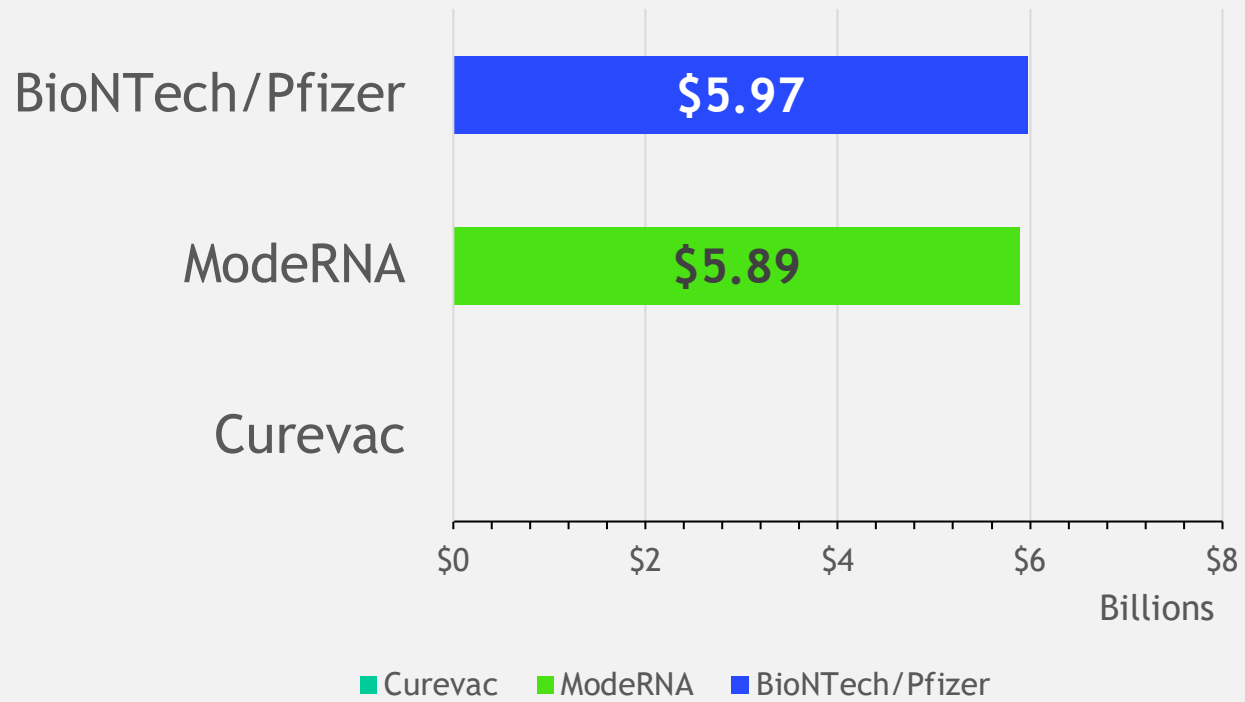
VP-SCE Scatter Plot (Motion Bubble) - a different perspective and another dimension

# Records	# Instances	Indications
126	126	Cancer
70	70	Infectious disease
47	47	Viral infection
45	45	Autoimmune disease
30	30	Bacterial infection
28	28	Influenza virus infection
25	25	Allergy
24	24	Respiratory syncytial virus infection
21	21	Genetic disorder
20	20	Melanoma
15	15	Parasitic infection
14	14	Fungal infection
13	13	Colon tumor
13	13	Prostate tumor
12	12	Breast tumor



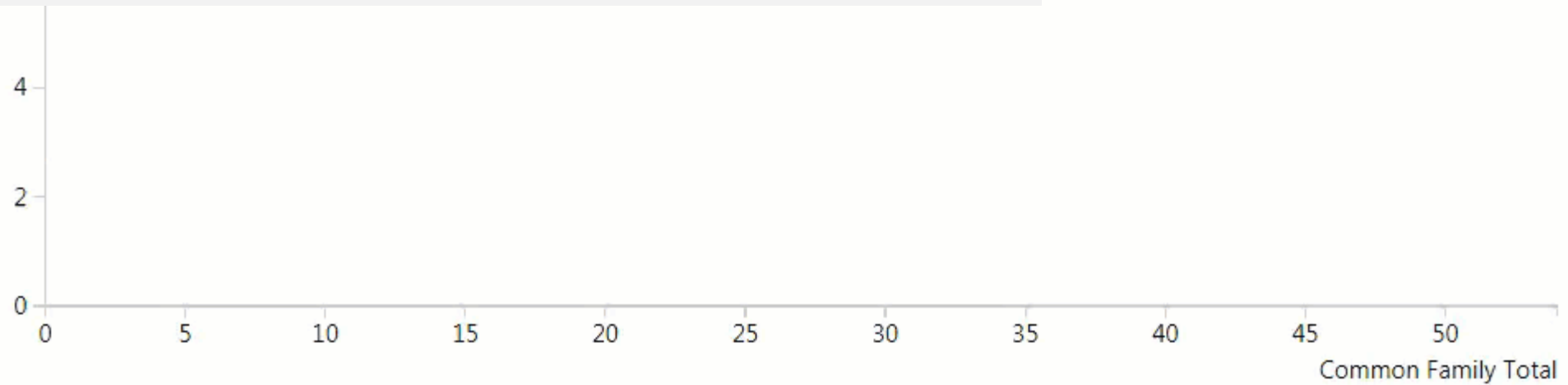
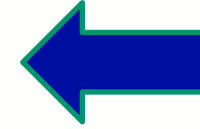
# Records	# Instances	Indications (1)
218	444	Infectious disease
167	328	Cancer
58	96	Inflammation/Immunology
24	25	Genetic disorder
19	24	Neurological disease
16	18	Cardiovascular disease
12	17	Respiratory disease

Operation Warp Speed Contracts for RNA vaccines



sector

to: < 2007 >



But wait... there's more: NPL

Same moves, different dataset

Publication Date

Create List

List Cleanup...

Thesaurus...

Find and Replace...

Further Processing >

Extract My Keywords >

Rename Field...

Copy Field...

Set Data Type >

Set Meta Tags...

Delete Field...

View Statistics...

:Read All

Apply Proper Case

Author Cleanup

Dates

Divide at

Divide Authors

Extract Country

Insert text if field

NLP

Further Processing

:Read All

Apply Proper Case

Author Cleanup

Dates

Divide at

Divide Authors

Extract Country

Insert text if field empty

NLP

Edit Groups

List Comparison

Group with Thesaurus

Groups

Backslash

Colon

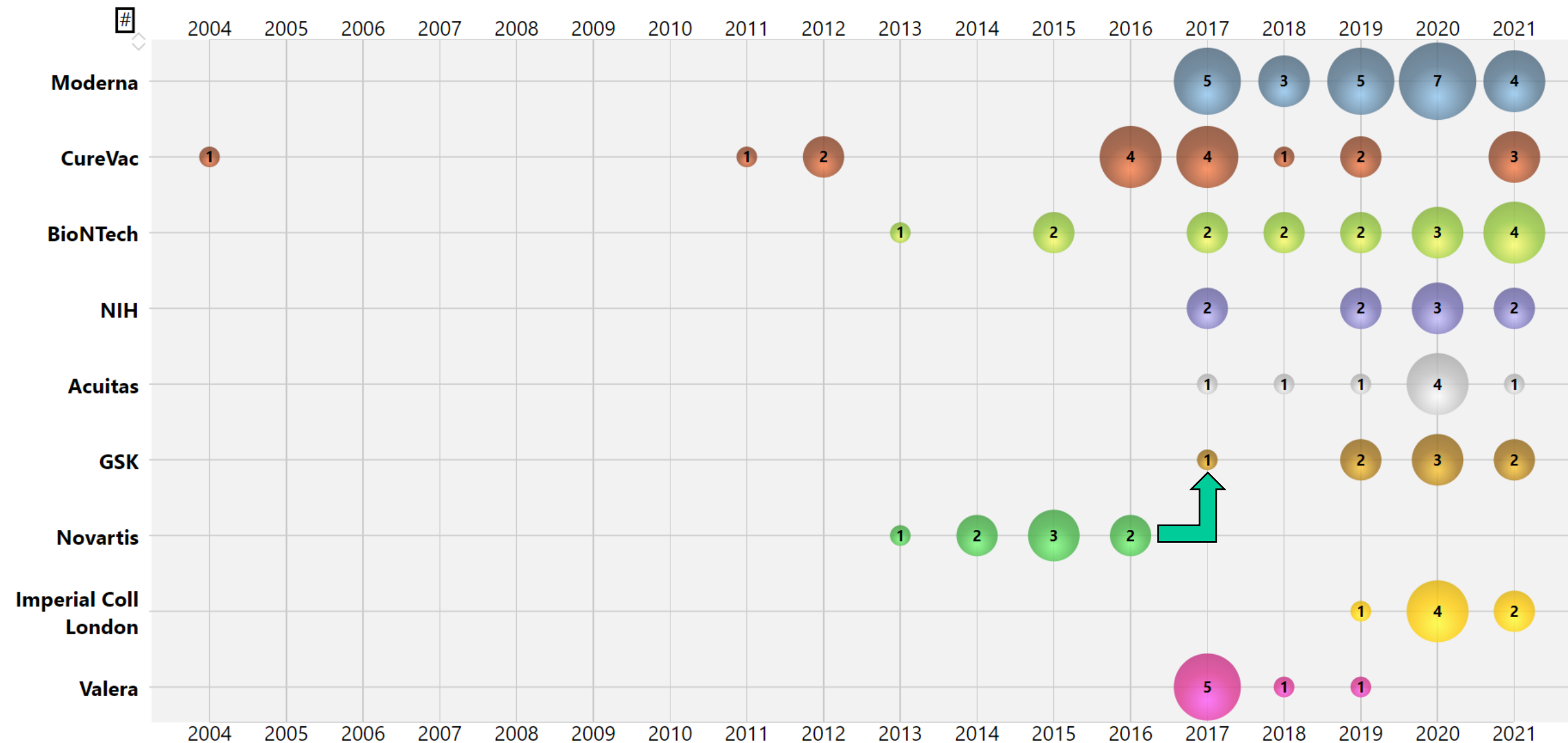
Comma

Divide at/Comma

Divide text at C

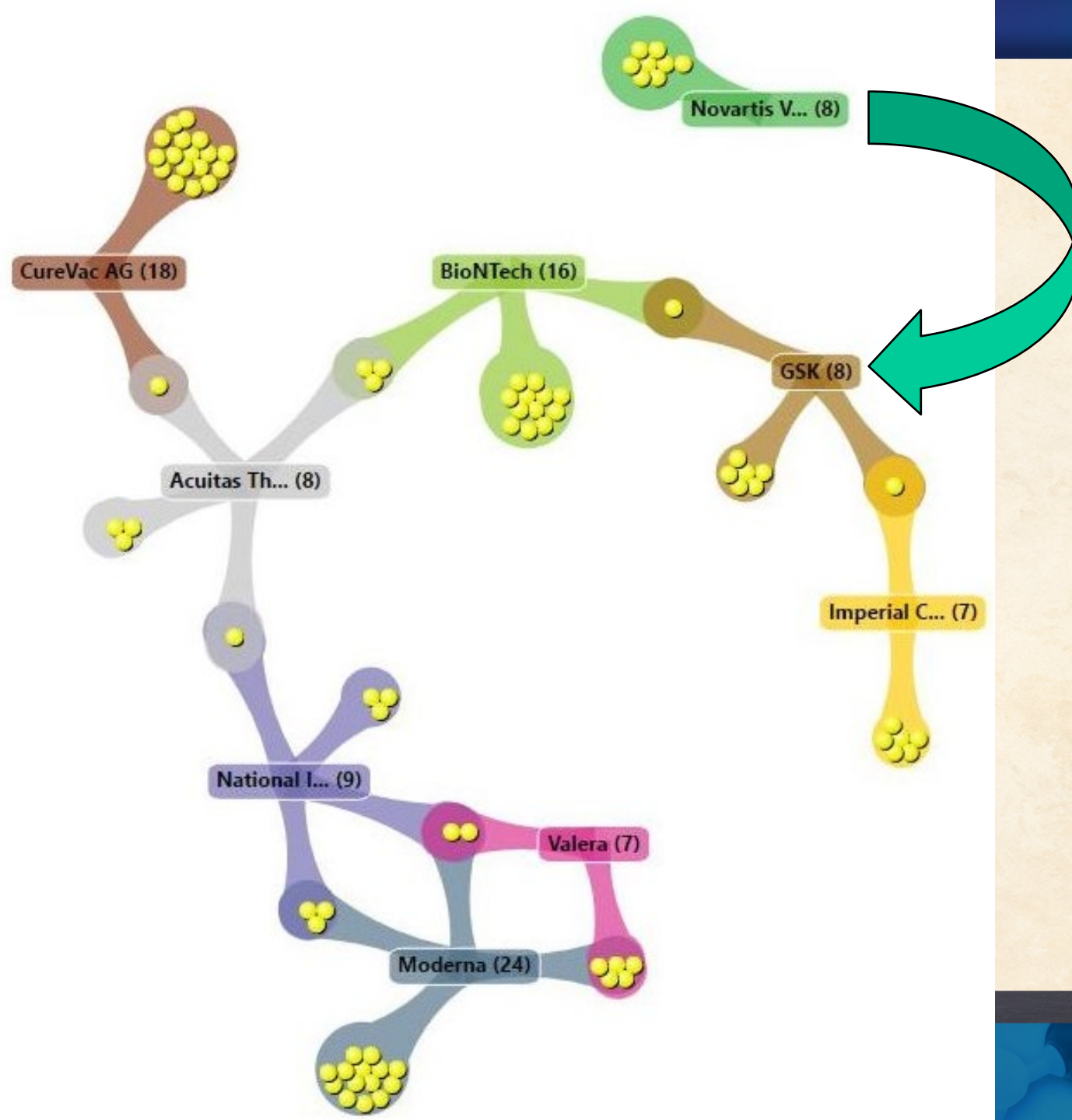
1	24	152	Moderna
2	18	80	CureVac AG
3	16	105	BioNTech
4	9	51	National Institutes of Health
5	8	24	Acuitas Therapeutics
6	8	29	GSK
7	8	73	Novartis Vaccines
8	7	28	Imperial College London
9	7	28	Valera

Corporate Source: Divide at/Comma (Cleaned) - Orgs vs. Publication Date: Dates/Extract Years



Find connections

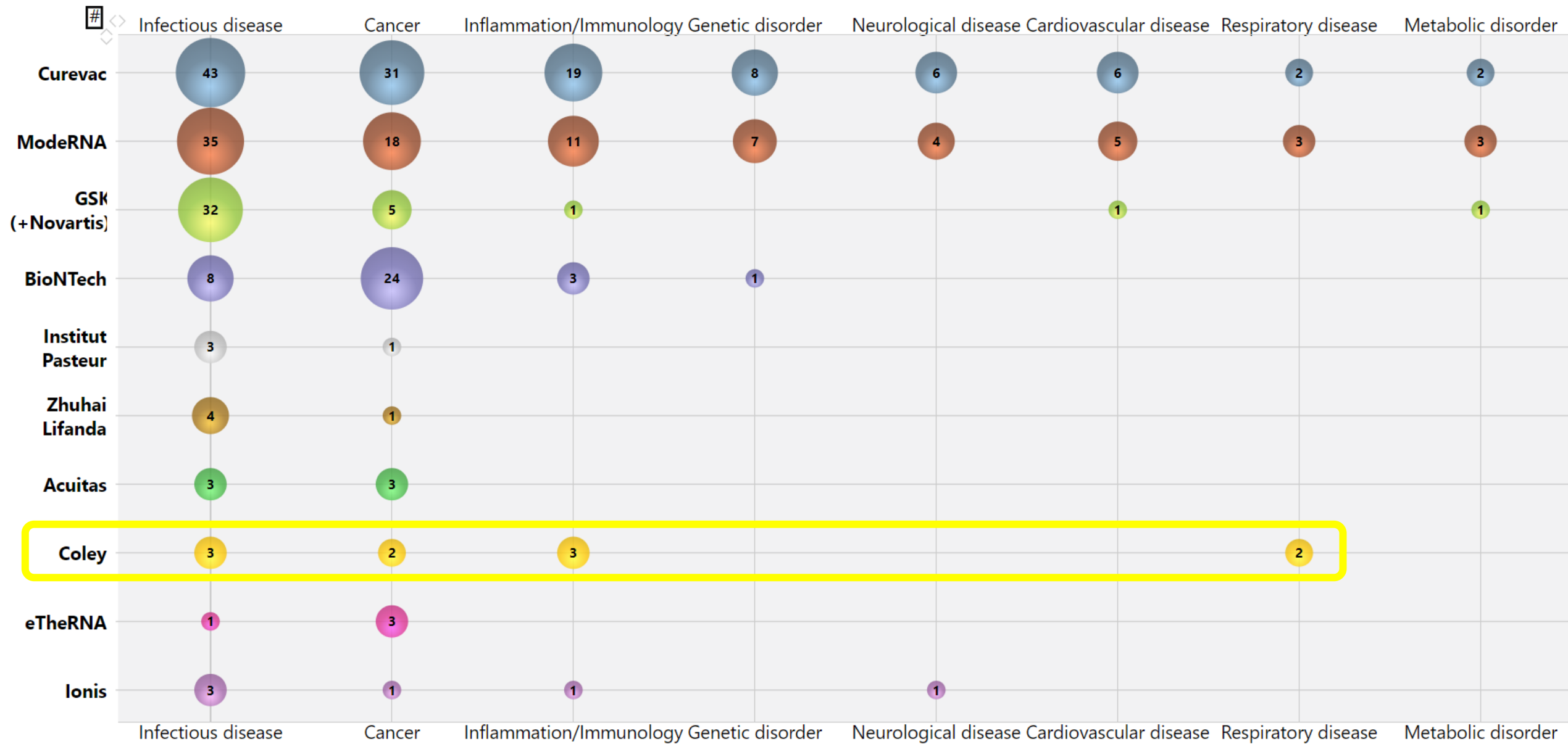
No additional cleanup, we can build a network map...



Another look with the same components

Bubble Chart of Assignees by Indications

Original Assignee (1) (Cleaned) (Cleaned) vs. Indications (1)



Enhanced Title

Original Assignee

Novelty

Common Family

Immunostimulatory oligoribonucleotide analogs containing modified oligophosphate moieties - useful for treating cancer, allergy, asthma, or infection

Coley Pharmaceutical GmbH

An isolated oligoribonucleotide (ORN) comprising a 5'-triphosphate analog and a pharmaceutical composition comprising the isolated

WO 2009060281

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What Ever Happened to Coley's Toxins?

Immunostimulatory composition (RNA motif and a modified phosphatidylcholine) for vaccinating against infection and

April 02, 2015 | Matthew Tontono

48.1 CortPat

polymer
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WO 2006116458

Use of a modified oligoribonucleotide modulatory motif - for treating autoimmune disorders.



49.1 CortPat

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WO 2008033432

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Those of you who watched Part 3 of the Ken Burns documentary *Cancer: The Emperor of All Maladies* last night might have been surprised to learn that the most promising breakthrough in cancer treatment today—immunotherapy—actually goes back more than 100 years, to a man named William Coley. Coley was a surgeon at Memorial Hospital who developed an approach to treating cancer that involved

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disorder,

inhibiting an RNA-mediated immune response or DNA-mediated immune response is also claimed. The modified oligoribonucleotide is claimed to be useful for stimulating an immune response in a subject.

50.1 CortPat

50.1 CortPat

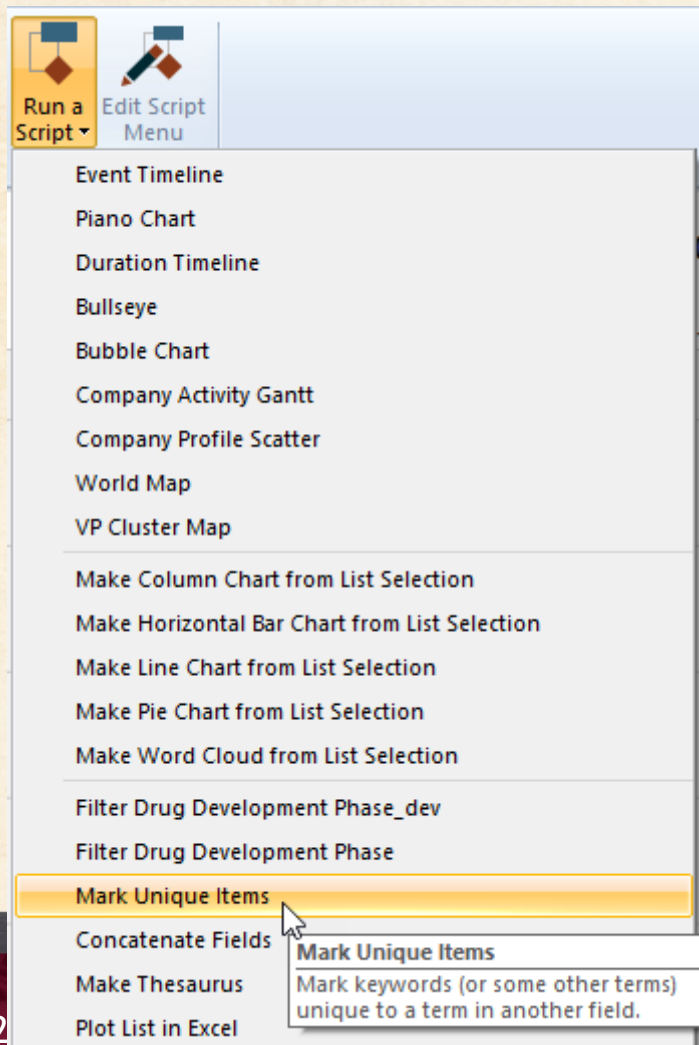
50.1 CortPat

More in VP-SCE v12

- **Filter by Selected** – Filter any field by a selection
- **Create Field from Each Group** – Create groups and then create a new field for each group.
- **Filter Drug Development Phase** – Easily create a Drug Development Phase table for a single indication, or for a few key indications

All patents not created equal?

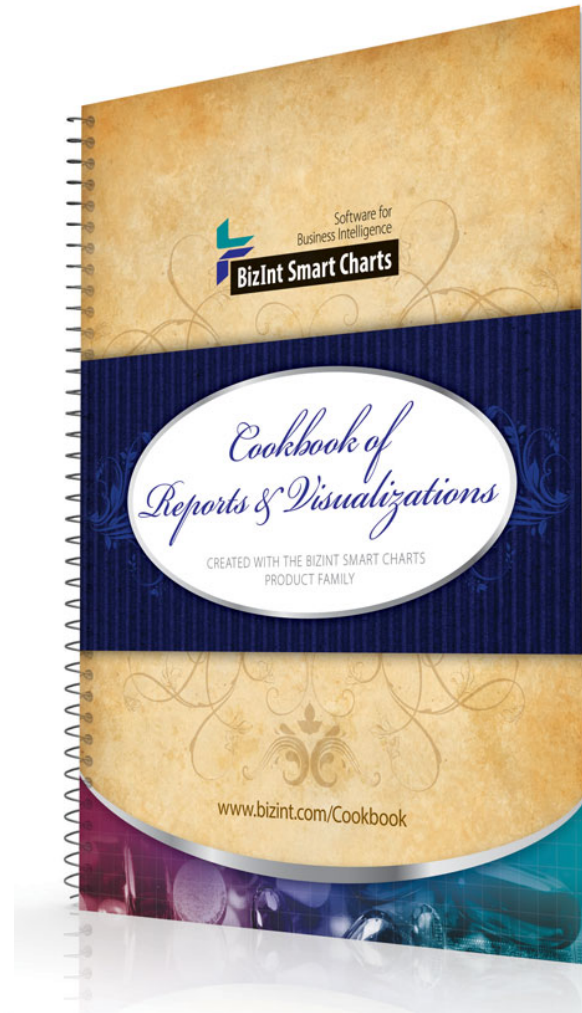
Mark Unique



Curevac	Moderna	BioNTech	GSK	Imperial College	Translate Bio	Arcturus
Intradermal administration	Nanocapsules; Nanoparticles	Microemulsions or submicron	Emulsions; Emulsion	General methods applicable to	MicroRNAs, miRNAs	containing sulfur
regulating RNA stability, not	intranasal	fusions, other than Fc, for	Plasmodium	General methods for inserting a gene into	interfering N.A.	
Sugars, nucleosides,	Dispersions; Emulsions	Antigen presenting cells	Processes for preparing;	General methods for preparing the	the non-active part being	
Nucleic acids having	Nucleic acids or oligonucleotides	IL-2	against cytokines,	Mutagenizing nucleic acids		
Virus-like particles	Viruses as such	MHC-molecules	Chimeric viral vector			
Inorganic adjuvants	avirulent or attenuated	having 5 to 11 amino acids	from protozoa			
Veterinary vaccine	Virus like particles [VLP]	Macromolecular compounds				

- The **Cookbook** is a collection of sample reports and visualizations which you can create with the BizInt Smart Charts product family.
- *New version for v12 coming soon!*

bizint.com/Cookbook





Software for
Business Intelligence

BizInt Smart Charts

Patents & IP Sequences | Clinical Trials | Drug Pipelines

Thank You!

Questions?

Visit us “in” the booth after lunch:

Wednesday: 12:45

Thursday: 12:30

support@bizint.com