

CiteAb for researchers and suppliers: How identifying product citations from publications can help accelerate science

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Abstract. The monumental waste of time and money when the incorrect reagent is purchased is a prevalent problem in life science research. CiteAb is an innovative technology company that has developed unique data collection technology to identify product citations from the scientific literature in order to solve this problem. Citation data powers a search engine which ranks products by citation count. This provides researchers with a simple, unbiased and reliable method to identify the best reagent for their experiment. CiteAb then saw an opportunity to provide citation-based data products to reagent suppliers and financial companies to maximise their business performance, reach and impact. CiteAb technology is estimated to have saved the life science industry \$10 billion, ultimately helping accelerate science. This success has driven sustained revenue growth with no external investment. This article will give an overview of CiteAb's technology, products, impact and future directions, including the potential for partnerships with publishers.

Keywords: Market data, search engine, reagent citations, data mining, reproducibility

1. The problem with finding the right research reagent

Research antibodies are invaluable tools for life scientists in their research and are used in a variety of applications, many of which are common and important detection methods in the laboratory.

There are over six million antibodies from 250 suppliers to evaluate, and over \$1 billion is spent on research antibodies annually. When selecting an antibody from this vast quantity there are many factors to consider, including, but not limited to, cross species reactivity, validation and application [1]. The difficulty in selecting the right antibody has contributed to the reproducibility crisis in the life science industry, as well as a massive waste in time and money in research globally [2]. It is worth noting that in contrast to research antibodies, therapeutic antibodies are very well regulated and all available antibodies have been through strict controls involving manufacturer and clinical trials.

An overview of CiteAb (<https://www.citeab.com/>) was provided at the DotComms session at the APE 2022 conference. This paper will summarise the presentation, covering: the purpose and methodology of collecting product citations to tackle the problem of finding the right research reagent, the impact on researchers and suppliers, insights into the team and company growth, and future directions.

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Fig. 1. CiteAb data collection pipeline.

2. Identification of product citations

CiteAb's innovative data collection technology combines proprietary text mining technology with extensive human reviewing to identify and understand reagent information from scientific publications (Fig. 1.). This technology started development within the University of Bath. It was then further developed and refined over more than eight years by CiteAb computer scientists and those at its sister technology company, Storm Consultancy.

CiteAb's unique approach produces highly valuable, structured data of the highest quality, based on independent benchmarking [3]. CiteAb has now collected over 3.8 million individual product citations. This data is used to help researchers and suppliers accelerate science.

3. The CiteAb search for researchers

Reagent data collected is used to power the CiteAb search, which ranks products by citations (Fig. 2.). This has fundamentally changed the way researchers find the most appropriate reagent for their experiments. Examining the literature for information on reagents of interest is now a commonly suggested method for those in the purchasing process, supported by the European Monoclonal Antibodies Network [4].

In the search, users are able to click through to product pages to find more information about the product and evaluate it further. Further details include validation information and published images in which the product has been used. The search tool also clearly identifies the relevant supplier so users can click through and buy the product, or get in touch with the supplier concerning any further questions (Fig. 3.).

The CiteAb search tool is easily distinguishable from commercial reagent listing sites because nobody can pay to be more highly ranked. Overall, this provides a transparent, impartial and simple method for researchers to find the best reagent for their work.

CiteAb gradually expanded to collect data on biochemicals, kits, cell lines, proteins and equipment in response to researcher feedback and requests. This data was integrated into the search tool in order to help a wider range of researchers.

The search enables tens of thousands of researchers each month to spend more time and resources on life saving research. The tool is used globally, serving researchers from hundreds of the world's top academic institutions, all 100 of the largest pharmaceutical companies and a variety of smaller biotechnology companies.

sox2 Antibodies Search

Results for 'sox2' antibodies
1,595 products found

Reagent type

- Antibodies (1,595)
- Biochemicals (3)
- Experimental Models (22)
- Kits (108)
- Proteins (83)

Refine your results Clear all

Antibody Type -

- Primary (1,334)

Clonality +

Recombinant +

Host +

Validation Method +

Application ● +

Reactivity +

Conjugate +

Protein +

Modification +

Mutation +

Supplier +

Anti-SOX2 antibody 570 Citations
ab97959 is a primary antibody from Abcam
Host: Rabbit Applications: WB, IHC and 12 more
Clonality: Polyclonal Reactivity: Thornback ray, Homo sapiens (Human) and 20 more
Validations: None Available

Anti-Sox2 Antibody 515 Citations
AB5603 is a primary antibody from MilliporeSigma
Host: Rabbit Applications: WB, IHC and 13 more
Clonality: Polyclonal Reactivity: Homo sapiens (Human), Mus musculus (House mouse) and 7 more
Validations: None Available

Sox2 (D6D9) XP ® Rabbit mAb 362 Citations
3579 is a primary antibody from Cell Signaling Technology
Host: Rabbit Applications: WB, IHC and 8 more
Clonality: Monoclonal (D6D9) Reactivity: Homo sapiens (Human), Mus musculus (House mouse), and Papio cynocephalus (Baboon)
Validations: Biological Strategies and Knockdown

Human/Mouse/Rat SOX2 Antibody 285 Citations
AF2018 is a primary antibody from R&D Systems
Host: Goat Applications: WB, IHC and 10 more
Clonality: Polyclonal Reactivity: Homo sapiens (Human), Mus musculus (House mouse) and 9 more
Validations: None Available

Human/Mouse/Rat SOX2 Antibody 284 Citations
MAB2018 is a primary antibody from R&D Systems
Host: Mouse Applications: WB, IHC and 10 more
Clonality: Monoclonal (245610) Reactivity: Homo sapiens (Human), Mus musculus (House mouse) and 6 more
Validations: None Available

Data for a range of reagents

Ranked by citations

Results refined further

Fig. 2. Example of search in use with functional aspects highlighted.

4. Reagent data generating a commercial return

CiteAb has four main products with their foundations in the same underlying, high quality data: citation provision, published images, product listing and market data. The versatility and quality of the data products has driven CiteAb success, with a 40% revenue growth in 2021 and an average growth of ~30% each year, without taking on additional investment.

Citations and images are used on suppliers' websites to demonstrate product use and help drive sales. They can be provided as a widget, which provides real time citation updates, or via an API or excel file. Annotation is carried out at the level required by the company and can include information such as application or validation method.

The CiteAb listing service enables suppliers to maximise exposure of their products to the hundreds of thousands of researchers who use the search tool every year. Suppliers can also list on the custom listing

(3579) Sox2 (D6D9) XP® Rabbit mAb
 ★ Save this reagent to your favourites

Antibody info | Additional Info

Supplier	Cell Signaling Technology	Target	Transcription factor SOX-2
Host	Rabbit	UniProt	P48431 - SOX2_HUMAN
Type	Primary	Gene	SOX2
Clonality	Monoclonal (D6D9)	Modification	Unmodified
Recombinant	Yes		
Conjugate	Unconjugated		

[View Product On Supplier's Website](#)
[Request a Quote from Cell Signaling Technology](#)

Supplier suggested

Validations
 Biological Strategies

Applications
 Flow cytometry/Cell sorting (FC/FACS) | Immunofluorescence (IF) | Western Blotting (WB)

Reactivity
 Homo sapiens (Human)

From the literature
 5 images have been found

Validations
 Knockdown

Applications
 ● WB
 ● IHC
 ● IF
 ● ICC
 ● 6 Others

Reactivity
 ● Homo sapiens (Human)
 ● Mus musculus (House mouse)
 ● Papio cynocephalus (Baboon)

Dilutions for WB
 ● 1:1,000
 ● 1:500
 ● 1:400
 ● 1:300
 ● 1:2,000

Supplied by

Cell Signaling Technology
 Info@cellsignal.com
 877-678-8324
 3 Trask Lane, Danvers, MA 01923, USA.

Key Signaling Pathways in Cancer

Related Searches
 Target
 P48431 antibodies
 SOX2 antibodies
 ANOP3 antibodies
 MCOF53 antibodies

Clone
 D6D9

Custom Antibodies
 If you can't find the antibody you're looking for, why not consider a custom reagent from one of these suppliers.

[Custom antibody suppliers](#)

Calculators
 A collection of useful calculators with more to come!

[Use dilution calculator](#)

Report a Problem
 Spotted a mistake? Please let us know so that we can put it right!

[Report a problem](#)

362 citations have been found for this product

All applications
All reactants
All validation methods

Transcriptional programs regulating neuronal differentiation are disrupted in DLG2 knockout human embryonic stem cells and enriched for schizophrenia and related disorders risk variants. [View PDF](#)

In Nature Communications on 14 January 2022 by Sanders, B., D'Andrea, D., et al.

Selective elimination of pluripotent stem cells by PIKfyve specific inhibitors. [View PDF](#)

In Stem Cell Reports on 3 January 2022 by Chakraborty, A. R., Vassilev, A., et al.

Effect of duty cycles of tumor-treating fields on glioblastoma cells and normal brain organoids. [View PDF](#)

In International Journal of Oncology on 1 January 2022 by Ye, E., Lee, J.E., et al.

Fig. 3. Product page format, including the supplier click through button and available characterisation information.

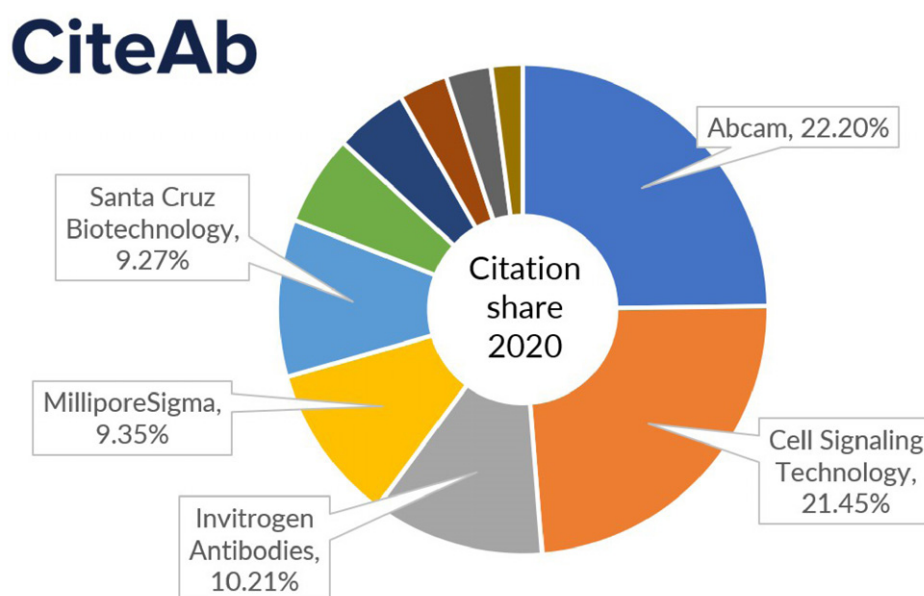


Fig. 4. Antibody supplier share (for the top ten suppliers) in 2020, demonstrating insights that can be provided to reagent suppliers from CiteAb citation data [6].

page to increase awareness of custom antibody production, peptide synthesis, histology services and cell line generation.

CiteAb market data can be used to inform strategy, product development and marketing. This data provides unparalleled insights into global reagent use for suppliers (Fig. 4.), and is some of the most used strategic data in these world-leading companies. It can enable suppliers to benchmark their performance, spot opportunities, and even help in making investment decisions.

The research antibody market is estimated to be worth around \$2.7 billion alone [5]. By using data to help navigate this vast market, both large and small suppliers are able to maximise their global impact, reach and business performance - ultimately helping them, and CiteAb, to increase the speed of scientific progress.

5. Future directions and partnerships

CiteAb have exciting plans to increase impact in the research reagent sector. For instance, expanding data collection into pre-prints in 2022 will give an earlier view of citations to help suppliers and researchers.

CiteAb is also growing the team year on year. The team, in turn, are developing the technology, expanding product offerings and managing company communications. Product managers come with a background in the health sciences and developers with expertise in computer science, including machine learning. The company is led by three co-founders with extensive knowledge and experience in life science research, commercial and operations and computer science.

Additionally, given CiteAb's position at the border of publishing and health science, work is being undertaken to forge partnerships with publishers. There is a broad scope for working together; partnerships

may open up novel, currently untapped, income streams for publishers. Partnerships may also involve access to novel data that can be used in areas such as annotation of publications or informing commercial activities. Through these partnerships, the aim is to enable publishers and CiteAb to more effectively help researchers.

CiteAb sees the potential for citation data to help an even greater number of companies and individuals in the life science space, and will continue to work to achieve this.

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