

Primary markets and growth trends

Abcam's core market, the global life science research reagents market, is currently estimated at approximately \$3bn¹, and growing at around 4% per annum¹. Within this figure, primary antibodies, where Abcam currently generates around three-quarters of its revenue, currently contribute approximately \$1bn¹.

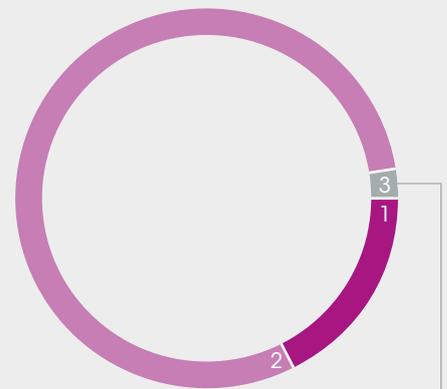
Through its Custom Products and Licensing activities, Abcam is extending the commercial application of its capabilities in antibody engineering into diagnostic and therapeutic markets in partnership with bio-pharmaceutical and diagnostic companies.

According to industry forecasts, the combined diagnostic and therapeutic antibody markets totalled over \$120bn in 2017². We estimate Abcam can address up to \$5bn of these markets through the development of in vitro diagnostic (IVD) products, other antibodies and immunoassays and biological therapeutics.

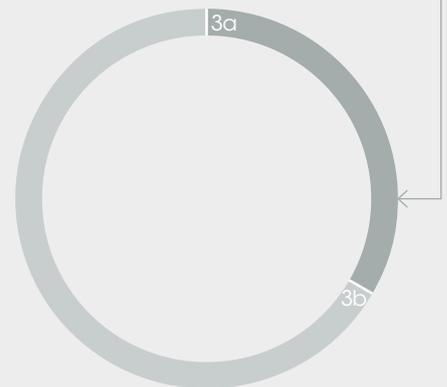
The global market for antibodies and antibody-related products

Antibodies and associated life science research reagents have a broad range of commercial applications that exploit their ability to recognise and bind to specific targets, with three broad areas of use, as outlined below.

Estimated global market (2017)



- 1 Diagnostics \$22bn
- 2 Therapeutics \$100bn
- 3 Research reagents \$3bn



- 3a Primary research antibodies ~\$1bn
- 3b Other research reagents ~\$2bn

1 Source: Pivotal Scientific (2017)

2 Source: Market research, internal company estimates.

	Research Use Only (RUO)	Diagnostics	Therapeutics
Products	Antibodies and associated research reagents	Antibodies and immunoassays	Monoclonal antibodies
Description	<p>Antibodies and associated reagents are used to detect, quantify and modify proteins in scientific research experiments and thus enable conclusions to be drawn about the target molecule and pathway of interest. They are fundamental, irreplaceable tools for the work of life scientists.</p> <p>Regulatory approval of research-grade antibodies is not required.</p>	<p>Antibodies have become a critical component of many In Vitro Diagnostic (IVD) assays. Uses include but are not limited to, the detection of infections, recognition of allergies and the measurement of hormones and other biological markers in blood.</p> <p>Antibody diagnostics generally require regulatory approval.</p>	<p>Antibodies can be used as therapeutic agents for the treatment of diseases including certain cancers and immune-related diseases.</p> <p>Therapeutic antibodies require high levels of regulatory approval.</p>
Total estimated market size	~\$3bn ^{1,2}	~\$22bn ²	~\$100bn ²
Abcam estimated addressable market size	~\$3bn ^{1,2}		~\$5bn ²
Long-term estimated market growth trend	~4% ²		~5-8% ²
End-markets	<ul style="list-style-type: none"> Academic labs located in universities, higher education and government research institutes Clinical labs in pharma and biotech companies working in the drug discovery and diagnostic markets Core facilities located in hospitals, research institutes, and other large organisations 	Clinical labs in pharma and biotech companies working in the drug discovery and diagnostic markets.	
Abcam sales	Catalogue sales (RUO)	Custom Products and Licensing	
Competition	Although only a few players have significant global scale and liquidity, the marketplace for RUO antibody suppliers is fragmented and competitive, reflecting the wide range of technologies and applications that use these products and the unregulated status of the market.	<p>Companies in diagnostic and therapeutic-use markets include specialist diagnostic businesses, Contract Research Organisations (CROs) and in-house teams at biotechnology and biopharmaceutical firms, who may outsource antibody design and discovery when reaching capacity or when they encounter a problem that requires outside expertise.</p> <p>We have built a significant network of collaborations across this landscape and are working on many bespoke projects in partnership with large biopharma and diagnostic companies to develop antibodies for these markets.</p>	

1 Source: Pivotal Scientific (2017).

2 Source: Market research, internal company estimates.

Long-term market growth drivers

Fundamental drivers for growth and change in our markets include:

Research funding

What this means

The long-term trend in life science research funding is positive in many countries around the world, driven by increased healthcare research into major therapeutic areas such as oncology, chronic diseases associated with changing lifestyles and ageing populations, as well as the ongoing threat from communicable diseases such as HIV/Aids, Ebola and the Zika virus.

Growth in research spending is driven by increases in government, industry or private investment, or a combination of all three. Notably, funding for collaborations between private and public organisations to improve funding in certain research areas has increased markedly in recent years, e.g. NIH's BRAIN Initiative, Cancer Moonshot and the Precision Medicine Initiatives in the US and China.

+5.5%

Average annual growth in NIH appropriations, 2014-2018

Source: National Institutes of Health

What this means for Abcam

Increased funding for life science research serves to expand the number of projects undertaken and researchers employed, increasing the requirement for Abcam's products.

Abcam's approach is to understand the drivers for changes in research and development (R&D) funding across different regions and research areas. This means we can provide the most efficient and effective solutions that best serve consumer needs.

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Technological advances

What this means

Over the last decade, technological advances in Next Generation Sequencing (NGS) have led to a large reduction in the cost of gene sequencing. The effect of this reduction has been profound, leading to a significant increase in the number of targets and biomarkers being identified, whilst simultaneously allowing more resource to be reallocated from gene identification to proteomic research (researching the function of the products of genes) in areas including stem cell research, gene editing, epigenetics, neuroscience and cancer.

Technological innovation has also seen the accessibility and capabilities of 'high-throughput' automated instrumentation rise, particularly within clinical labs and core facilities. These platforms allow hundreds of samples to be tested simultaneously, generating large amounts of data and enabling scientists to increase their productivity and achieve results faster.

~1/20,000th

Estimated relative cost of sequencing an entire human genome in 2016 (~\$1,000) compared with 2006 (~\$20m)

Source: National Human Genome Research Institute

What this means for Abcam

Abcam's antibodies and related reagents are a fundamental tool of proteomic research. A greater focus on research into protein function is therefore linked to increasing demand for these products.

High-throughput platforms require large volumes of reagents, increasing overall demand for our products and creating opportunities for Abcam to form collaborations and supply agreements with biopharmaceutical and diagnostic companies.

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China

What this means

The Chinese government has placed scientific and technological innovation at the centre of the long-term socio-economic development of the country and is supporting this major initiative through funding, reform, and societal status.

China's 13th Five-Year Plan (2016-2020) set the aim to become an 'Innovation Nation' by 2020, an international leader in innovation by 2030, and a world powerhouse in scientific and technological innovation by 2050.

Consequently, the amount of life science research conducted in China has expanded significantly in recent years, with further growth anticipated in the future.

2.5%

Proportion of GDP China plans to spend on R&D by 2020 (from 2.1% in 2017)

Source: OECD

What this means for Abcam

China represents an important and growing market for Abcam, contributing over 15% of Abcam's catalogue sales in 2017/18, up from c.5% in 2013.

In 2017, Abcam was ranked number 1 for antibody research citations (source: CiteAb).

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Antibody innovation

What this means

Innovation in antibody manufacturing techniques such as recombinant-based engineering and the emergence of powerful genome editing tools such as CRISPR are speeding up the accuracy and pace of research.

These developments are helping to address an increasing demand from researchers for more precise and reliable research tools as they seek to increase confidence in their outcomes, reduce waste and address the 'reproducibility crisis' in scientific research.

\$10 billion

Estimated amount wasted on irreproducible research in the US due to biological reagents and reference material

Source: PLOS study, June 2015

What this means for Abcam

Through in-house development and acquisition, Abcam has access to leading recombinant antibody manufacturing technologies and is pioneering antibody quality and validation techniques.

As a leading provider of research antibodies, we are dedicated to providing researchers around the globe with products they can trust, that are of the highest integrity, along with the data needed to support and validate their research.

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Expanding diagnostic and therapeutic use

What this means

The use of antibodies across both diagnostic and therapeutic applications has increased in recent years and this trend is forecast to continue.

Antibody-based companion diagnostic tests are becoming an important way of identifying patients most suited to a therapeutic treatment, supporting better patient outcomes and assisting governments looking to reduce healthcare costs.

The use of monoclonal antibody (MAb) treatments is associated with benefits such as greater efficacy and precision, reducing patient side-effects. To date, 78 MAbs have been approved for therapeutic use by the US FDA, with many more currently in clinical trials.

50%+

Proportion of sales of the top 100 therapeutic products expected to be derived from biologics, including monoclonal antibodies, in 2022

Source: Evaluate Pharma

What this means for Abcam

Abcam retains strong capabilities in the custom design and manufacture of recombinant monoclonal antibodies and we are building a reputation for successfully partnering with pharmaceutical, diagnostic and instrument companies.

We are working with these companies to develop antibodies and immunoassays that they will take to market for diagnostic and therapeutic applications.

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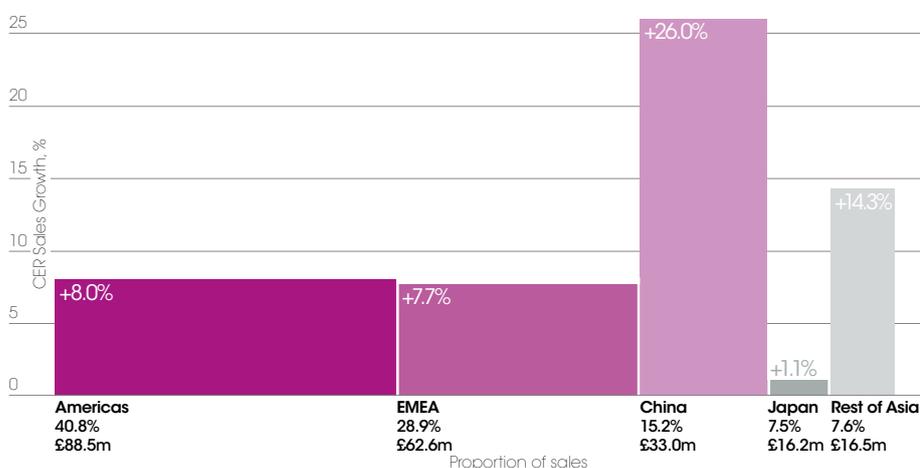
Regional dynamics

Regional Government Funding Review

A significant proportion of Abcam's revenue comes from publicly funded life scientists through research grants. This type of funding to the life sciences sector varies regionally – a summary of the funding environment in key regions is shown below.



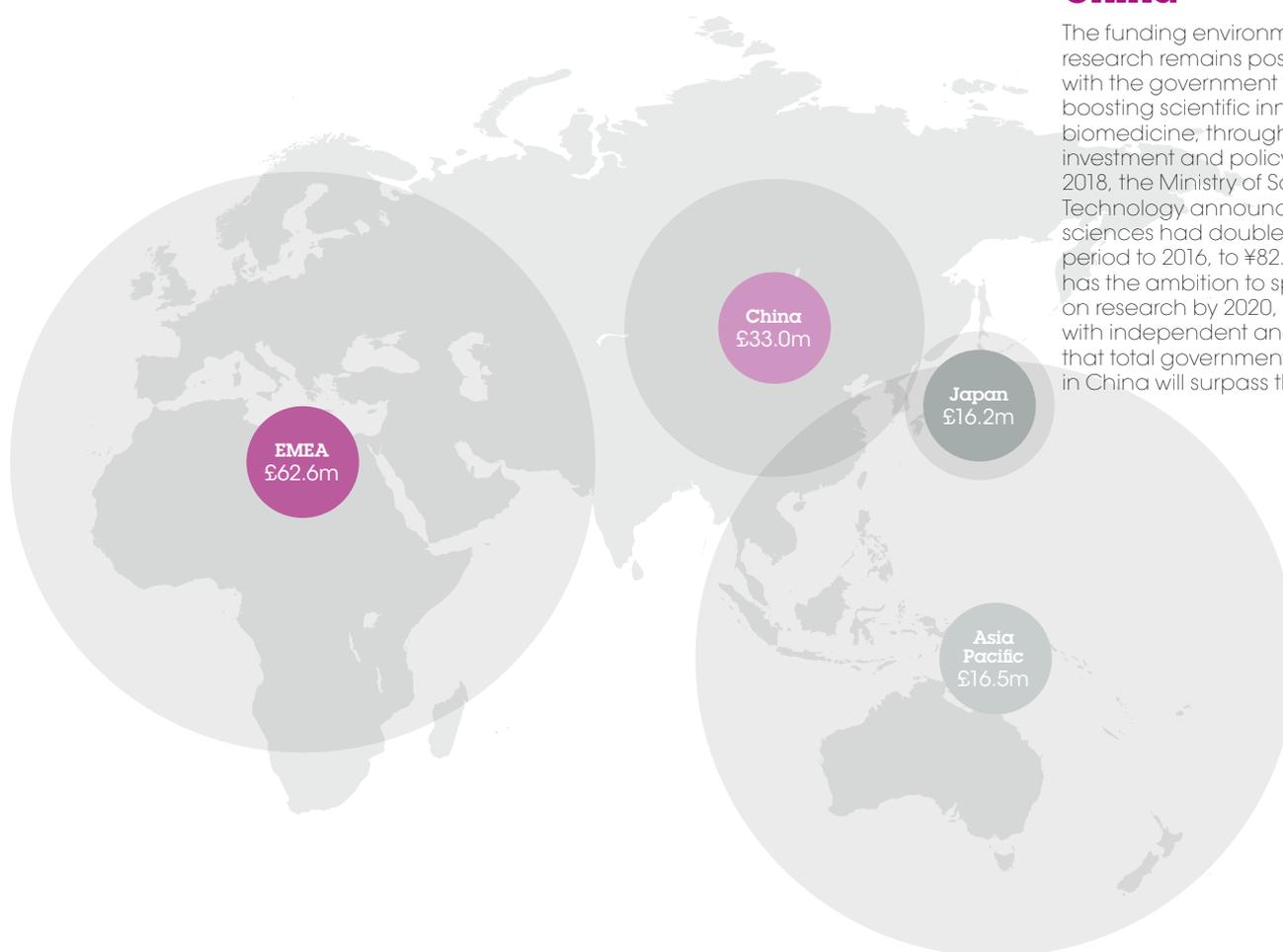
Abcam split of catalogue sales and CER growth by region in 2017/18



Americas

Concerns over the US funding environment received a temporary respite during the year, with a \$3bn or 8.6% increase in the 2018 NIH budget, to \$37.3bn, approved as part of the omnibus spending bill. Research areas including cancer, Alzheimer's, neurological disorders and infectious diseases received the largest increases in funding, with the cancer-focused precision medicine 'All of Us' initiative receiving a 26% increase. Despite the strong rise, adjusting for the rate of inflation in biomedical research, the 2018 NIH budget is still more than 11% below its historical peak in 2003.

Across the wider region, in March 2018 the Canadian government announced plans to increase basic science research by c.\$4bn over the next five years.



China

The funding environment for scientific research remains positive in China, with the government focused on boosting scientific innovation, including biomedicine, through increased investment and policy reform. In February 2018, the Ministry of Science and Technology announced that R&D in basic sciences had doubled in the five-year period to 2016, to ¥82.3bn (\$12.4bn). China has the ambition to spend 2.5% of GDP on research by 2020, up from 2.1% in 2017, with independent analyses anticipating that total government R&D expenditure in China will surpass the US by 2022.

EMEA

The funding environment across Europe was stable in the year with the European Research Council (ERC) budget increased c.5% to approximately €1.9bn in 2018, in line with the Horizon 2020 programme commitments. The EC is currently in the process of designing the next funding framework to succeed Horizon 2020, with a draft budget of €97.7bn (\$112bn) proposed, a 27% increase on the prior programme.

Whilst Brexit continues to provide uncertainty for the life science community in the UK, the government's Industrial Strategy White Paper published in November 2017 proposed increased commitments to R&D investment, including the ambition to raise total R&D spending to 2.4% of GDP by 2027, from 1.7% in 2016.

Japan

Whilst the overall economy has picked up in recent quarters, long-standing structural issues in Japan, including a declining population resulting in fewer scientists, and an extended period of flat or declining investment in life science research, mean the environment for research output remains challenging.

Japan's share of global scientific publications has been declining for several years and the value of grants to national universities in 2017 was 10% less than in 2004. The government's 2018 budget, approved in March 2018, did include rises in spending on science and technology, although budgets for those ministries most closely involved with scientific research received only modest increases.

Asia Pacific

The Asia Pacific region has seen strong economic growth in recent years and several countries have seen a corresponding increase in scientific funding, although the situation differs widely between countries.

Korea is the largest market in the region, spending over 4% of its GDP on R&D to support its commitments to boost basic research and further develop its biopharma industry.

Singapore, Australia and New Zealand have also continued to see high levels of government support for biomedical science research.