FROM THE ANALYST'S COUCH

The most successful oncology drug portfolios of the past decade

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Oncology is the therapeutic area with the highest total sales in the prescription drug market, and these sales have steadily increased over the past decade (see Related links). A large patient population, typically characterized by high levels of unmet need, and consistent innovation by pharmaceutical companies are key drivers of this market. In this article, we analyse trends in the oncology drug market over the past decade using data on drug sales from GlobalData (see Supplementary Box 1 for details).

Trends in the oncology drug market

Leading companies. By aggregating all company-reported drug sales over a 10-year period, it is apparent that Roche has surpassed all competing companies in oncology, generating US$252 billion in sales during 2010–2019 (FIG. 1a). Celgene and Novartis follow, with just over $80 billion in sales apiece. Bristol Myers Squibb (BMS) and Merck & Co. take fourth and fifth place, with $55 and $50 billion in sales, respectively. Interestingly, even after the BMS–Celgene merger, which was completed in 2019, the combined sales of the two companies would still be lower than the total sales of Roche. The remaining companies — Johnson & Johnson, AstraZeneca, Pfizer, Eli Lilly and Takeda — each reported total sales of less than $50 billion in the period analysed.

Drug portfolios that generated the highest revenue. An analysis of Roche's portfolio shows that three biologic agents — the CD20-specific monoclonal antibody (mAb) Rituxan/MabThera (rituximab), the VEGF-specific mAb Avastin (bevacizumab) and the HER2-specific mAb Herceptin (trastuzumab) — were responsible for the majority of the company's oncology sales (FIG. 1b). All three of these pioneer assets were developed by Genentech, which was fully acquired by Roche in 2009. These top three agents dominated sales throughout the decade, while new agents in Roche's oncology portfolio consolidated its revenue stream from 2014 onwards. It is noteworthy that high sales have been generated by Roche's own 'follow-on' products to Herceptin: the HER2-specific mAb Perjeta (pertuzumab) and the HER2-specific antibody–drug conjugate Kadcyla (trastuzumab emtansine).

An assessment of oncology portfolios for the remaining companies suggests that a higher number of agents does not correlate with higher revenues. Rather, reliance on a few key agents that generate the majority of sales underlies the positions of all the leading companies (Supplementary Figs 1– 9). For example, Celgene generated most of its oncology sales from Revlimid (lenalidomide), Novartis from Gleevec/Glivec (imatinib) and Tasigna (nilotinib), and BMS from Opdivo (nivolumab) (Supplementary Figs 1– 3).

Blockbuster sales become more pronounced. Of the 172 oncology agents in the dataset, 49 have reached 'blockbuster' status by generating more than $1 billion in sales in any given year during 2010–2019. Interestingly, plotting individual drug sales per year shows that mega-blockbusters with more than $5 billion in yearly sales generated progressively more revenue over time, resulting in disproportionate sales coming from only a few drugs (FIG. 2a). This is the case for drugs such as Merck's Keytruda (pembrolizumab), Celgene/BMS's Revlimid and BMS's Opdivo, which each generated $7 billion or more in 2019.

Most successful classes of therapy. One way to illustrate the evolution of cancer therapy over the past decade is to examine

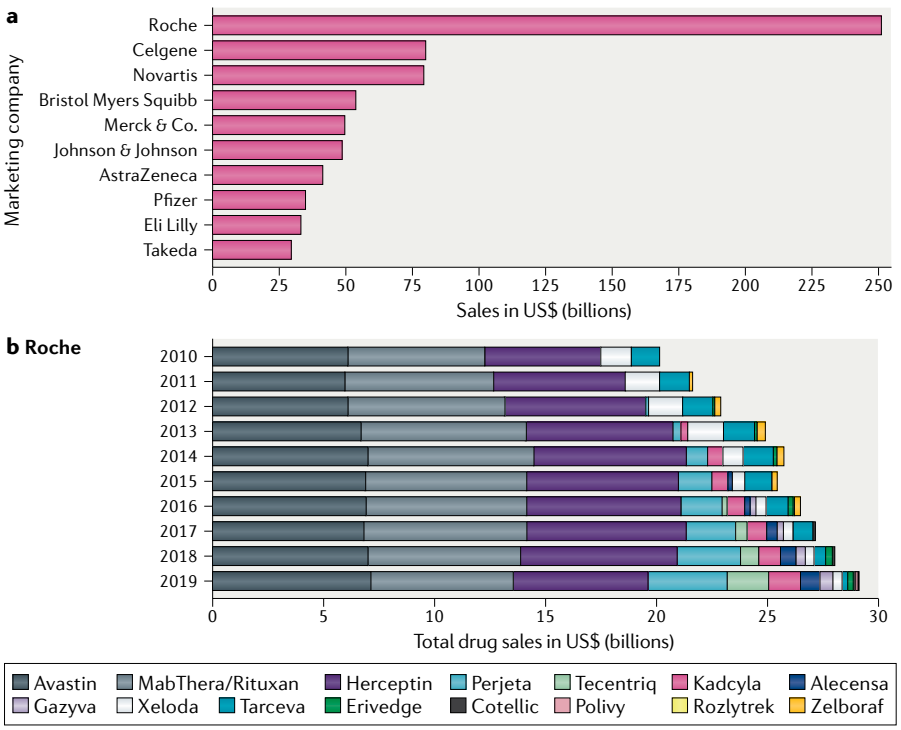

Fig. 1 | **Total oncology drug sales and sales by company. a** | Aggregated oncology drug sales per company for the top 10 companies during 2010–2019. **b** | A breakdown of individual drug sales during 2010–2019 for Roche. See Supplementary Box 1 for details.

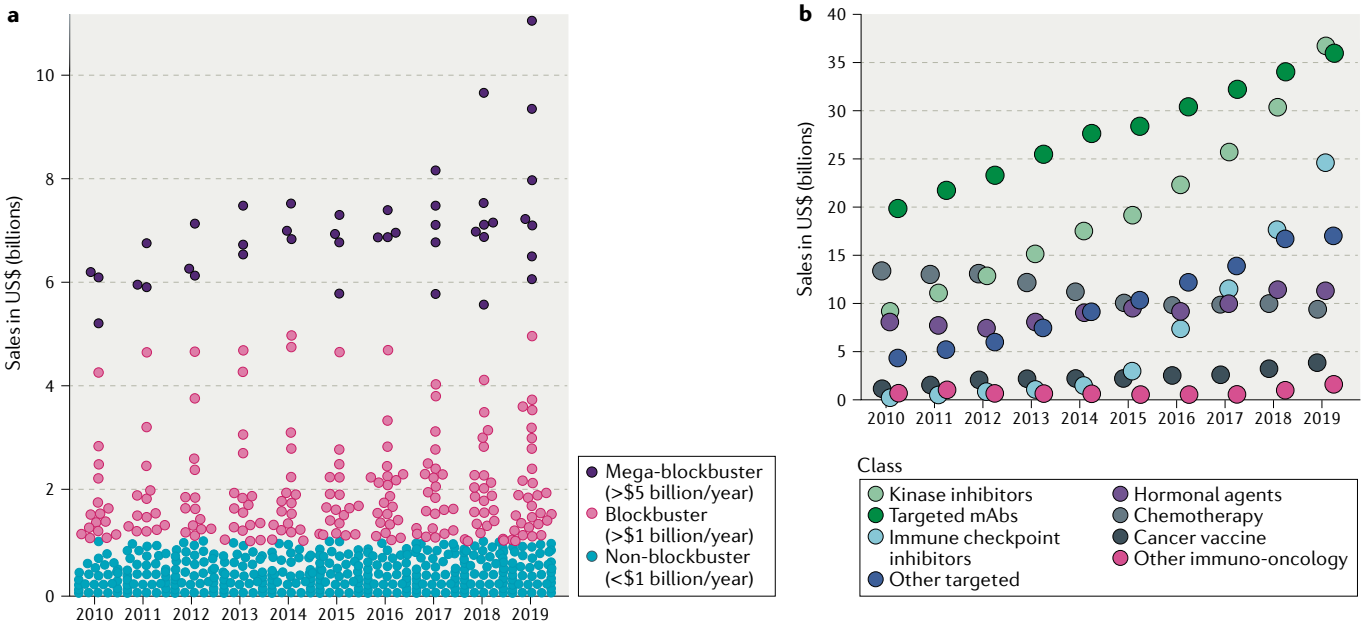

Fig. 2 | **Selected key oncology drugs generate higher sales each year. a** | Box plot of individual drug sales per year during 2010–2019. **b** | An evolution of sales of the most established classes of agents used in oncology during 2010–2019. Immune checkpoint inhibitors, which are monoclonal antibodies (mAbs), were categorized separately from other mAbs. See Supplementary Box 1 for details.

the revenues for individual agents in terms of their drug class. FIGURE 2b illustrates total revenues for individual classes of therapy across the past decade. As the role of precision medicine in the clinic grew during 2010–2019, the role of targeted therapies — in particular small-molecule kinase inhibitors and mAbs (excluding checkpoint inhibitors) — has grown substantially. Conversely, sales from chemotherapies have declined, as older products lost patent protection and/or some of their uses were superceded by newer agents such as targeted therapies. This is illustrated by a 17% reduction in market share from 2010–2019 (representing $3.9 billion) for chemotherapy and a combined increase of $56 billion for targeted therapies (including kinase inhibitors, targeted mAbs excluding checkpoint inhibitors and other targeted agents).

Nevertheless, this substantial revenue growth for targeted therapies over the past decade only represents a 6% increase in overall market share of the oncology prescription drug market. This marginal increase is explained by the introduction of immune checkpoint inhibitors into the treatment paradigm — arguably the single greatest factor to revolutionize the oncology field in the past decade. Since the first checkpoint inhibitor was approved in 2011, sales of drugs in this class, such as the PD1/PDL1 inhibitors Keytruda and Opdivo, have grown to $25 billion.

Conclusion and outlook

Major efforts by biotech and pharma companies to innovate in cancer therapy have been rewarded with outstanding commercial success. Developing and marketing a few key agents has been crucial to a successful oncology portfolio, with disproportionate sales garnered by a blockbuster or mega-blockbuster supporting the place of some companies in the top 10 list of those with oncology portfolios.

The decade from 2010–2019 has been shaped by the rise of immune checkpoint inhibitors and the consolidation of targeted kinase inhibitors and mAbs as the main drivers of revenues in successful oncology portfolios. A substantial proportion of revenues from these agent classes after 2010 derives from patent-protected blockbusters. Key examples include Merck's Keytruda, BMS's Opdivo, Pfizer's Ibrance (palbociclib) and AbbVie and Johnson & Johnson's Imbruvica (ibrutinib). As ageing blockbusters come off patent towards the end of the next decade, new opportunities will emerge for the development of novel approaches to cancer treatment and the development of effective biosimilars. For older blockbuster agents such as Avastin, Rituxan/MabThera and Herceptin, biosimilar competition has already begun and will introduce new market dynamics. There is also enthusiasm across multiple oncology indications for the burgeoning promise of new approaches to immunotherapy, including CAR-T cell therapy and bispecific mAbs.

A key trend identified is the expanded indication lifecycle management strategy employed for leading drugs, including identifying responsive patient subgroups based on biomarkers rather than the tissue of origin of the cancer, as with pembrolizumab and microsatellite instability-high tumours. Novel targets will also be elucidated from the increasing understanding of the genomic complexity of tumour heterogeneity and the continual refinement of methods to detect and target key oncogenic drivers in the clinic. As innovation continues, we expect further growth for the oncology market, consolidation of existing key classes of agents and the emergence of novel classes of agents, leading to market diversification.

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