

# Engaging China in global efforts to develop new antimicrobials

**Antimicrobial resistance (AMR) is an increasingly important global health threat, but the pipeline of new antimicrobials under development is inadequate. Developing new antimicrobials is risky, with little financial reward, prompting calls for governments to adopt novel industrial and innovation policies to incentivise research and development (R&D).**

**China has a history of ‘mission-driven’ approaches to industrial and innovation policy, and in biotech and pharma this is leading to rapid growth and increasing technical sophistication. However, despite a commitment to developing new antimicrobials in the country’s AMR National Action Plan (NAP), they are not a priority in its industrial and innovation policy, and companies are not highly active in this area.**

**The UK can take practical measures to engage with China with the aim of bringing China’s substantial research and industrial capacity into efforts to develop new drugs in the face of the impending antimicrobial crisis.**

## Main messages

- Developing the pharma and biotech sector is a priority for the Chinese government. The sector is undergoing rapid reform, supported by innovation and industrial policies and targeted research funding.
- China has a long history of research into antimicrobials and has the largest manufacturing volumes in the world, though largely in bulk (and some speciality) active pharmaceutical ingredients (APIs).
- Review of policy, funding flows, and companies’ investments shows antimicrobials are not currently a government priority, despite commitments in China’s 2016 AMR NAP.
- There is a need to involve China’s formidable research and manufacturing capacity in global efforts to develop new antimicrobials.
- The UK should consider how best to engage with China, and develop the capacities, systems and relationships to underpin this.

## Background

### ***What place for antimicrobials in China's mission-driven biotech and pharma policy?***

AMR is already responsible for as many deaths as HIV/AIDS and malaria combined, and its health and financial impacts will increase. Alongside measures to control the emergence and development of resistance, there is a need for new antimicrobials. However, the pipeline is inadequate, with insufficient production of novel drugs to replace those with declining effectiveness due to increasing resistance. Companies have little incentive to do R&D for new antimicrobials, given the investment needed, risks, and the limited market for new drugs, which must be used selectively to retain their effectiveness.

There is a need for concerted policy support to R&D for new antimicrobials. 'Mission-driven' approaches to innovation can be characterised as using joined up innovation and industrial policy to set clear goals that address societal challenges; to foster innovation for multiple technical and non-technical solutions; and to create/shape markets to drive demand. A number of international initiatives and countries are applying novel approaches to antimicrobial R&D, including innovative

'pull' mechanisms to incentivise companies in the absence of a functioning market for new drugs.

China's 2016 AMR NAP committed to developing one or two 'completely new' antimicrobials. The Chinese government is no stranger to using innovation and industrial policy for strategic, developmental, and social ends, including in biotech and pharma. Given the NAP, and China's mission-driven support to development of biotech and pharma, how is R&D for new antimicrobials being supported? Is China a potential contributor to global R&D for new antimicrobials?

## Key findings

Our research on antimicrobial development in China used multiple data sources to build a picture of policy and activity in antimicrobial R&D in China. They included government policy documents, research funding data, Chinese companies' R&D funding, and secondary documentation and interviews. The main findings are as follows:

### ***Increasingly detailed pharma and biotech policy, but antimicrobials are a gap***

Pharma and biotech are priority sectors specified in the NAP, and have received priority support since the



Antibiotic drugs

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1990s, and increasingly in the 2000s and 2010s, under the aegis of China's Mid-Long Range Science and Technology Development Plan (2006-2020) and other sector-specific plans and policies. Reviewing this policy trend shows:

- Joined-up policies straddle multiple government ministries, the private sector and academia, and support both supply and demand sides, showing the importance of China's mission-driven approach in promoting development of the biotech/pharma sector.
- Increasingly, this is paying off, as shown by the emergence of new and innovative companies and sectors, though China is starting from a low base, and there remains some way to go for the Chinese biotech/pharma industry to achieve widespread capability for innovation.
- The increase in innovativeness is mostly driven by sector-wide ('horizontal') reforms, increased investment, and return migration bringing innovative ideas and international management approaches.
- There are limitations to how far horizontal policies can support the development of antimicrobials, which are not singled out in government policy, despite this becoming more detailed in the last 10 to 15 years.

### ***Antimicrobials are marginal in China's strategic biotech development programme***

The Chinese government has supported strategic, targeted biotech and pharma research programmes since the 1990s to build research platforms and labs, upgrade capacities, and target specific technologies and drugs. The New Drugs Creation Programme (NDCP) – China's key biotech modernisation programme – ran from 2008 to 2020, targeting ten key areas, including antimicrobials. Key findings:

- We estimate the programme channelled around US\$16bn into new drug development, but as it is considered nationally strategic, detailed priorities and funding allocations are not made public.
- There has been some support to antimicrobial development, but details are not public, except for 2017 (the year after China's NAP), which calls for "breakthroughs in three to five key technologies for drug discovery and preclinical evaluation of anti-drug-resistant bacteria... and two to three innovative varieties obtain clinical approvals".

- Overall, support to antimicrobials appears limited – only two of 35 'innovative' NDCP-supported drugs are antimicrobials, and few NDCP-supported research publications focus on antimicrobials, compared to thousands for high-profile areas such as cancer therapies.

### ***Developing new antimicrobials is not a major focus for Chinese companies***

China is one of the world's largest antibiotic manufacturers, and a major exporter, though most production is bulk or speciality APIs. This sector developed rapidly with China's entry into global markets, resulting in fragmentation, overcapacity, and a generally low technical level. This compounds legacy problems from the planned economy period. Main findings:

- Overall, Chinese biotech/pharma R&D spending remains low compared to international competitors. Companies specialising in antimicrobials tend to have small margins, limiting the possibility of investment in R&D, most of which goes to more profitable products. Government policy restricting antimicrobial prescriptions is hurting companies' outlooks.
- Listed companies generally have the highest R&D budgets of all Chinese pharma companies. Data from a commercial database showed that 24 companies are active in developing antimicrobials, though the majority of drugs under development are generics, rather than innovative drugs.
- Publicly available information on antimicrobials under development in China shows 11 new (non-generic) antibiotics and two new TB drugs in R&D, including in clinical trials. All target WHO priority pathogens, but none is substantially innovative according to WHO's classification – meaning that all are similar to existing drugs and are likely to rapidly develop resistance.

### ***Does increasing scientific research capacity provide the potential for future global contribution?***

Chinese academic literature on antimicrobials shows vibrant debates on drug development and apparent widespread capacity in this area, supported by national programmes like the NDCP. However, Chinese agencies are not actively engaged in international initiatives for the development of new antimicrobials, prompting questions about China's potential future contribution. Key findings:

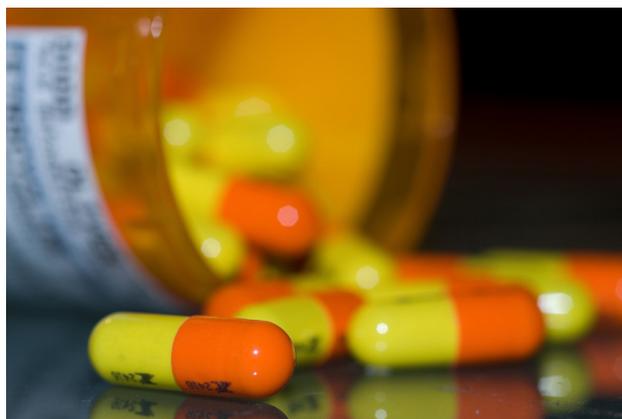
- Scholarly literature shows lively debate around drug development and priority targets, and there are calls from within the field for breakthrough innovation in antimicrobials.
- There has been substantial funding support to platforms and capacities that may play a greater role if this is a policy priority and there are incentives to do so.
- Chinese leadership increasingly recognises the importance of global health, though China at present is barely active in international initiatives for the development of new antimicrobials.
- China could potentially play a larger global role, though geopolitical tensions create risks of divergence in global drug development efforts.

## Practical implications

China is increasingly important in biotech and pharma value chains, and its importance is set to rise, supported by increased investment and improved capacity and regulatory environment. There is a need for UK government and funding agencies to assess how productive partnerships for global health can be forged, including in, but not limited to, antimicrobial development.

### Key recommendations:

- 1 Convene UK stakeholders (government, industry, academia, funding agencies) to clarify the potential benefits to the UK of, and priorities for, engagement with Chinese counterparts in pharma and biotech to support improved global health outcomes in AMR and antimicrobial development. Clarify this in a short statement to guide engagement going forward and to communicate intentions and priorities to UK, Chinese, and other stakeholders.
- 2 Reassess the challenges to, and modalities for, engaging with Chinese government (National Health Commission, Ministry of Science and Technology) and non-government agencies (universities/researchers, public sector bodies, companies)



Antibiotics

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on AMR and antimicrobial development in light of jointly agreed priorities of the 2021 UK-China Health Dialogue.

- 3 Assess the UK capacities, relationships, and resources needed to underpin effective engagement, and how these can be developed, including practical steps in the next one to five years. Present this in a short statement to support lobbying (to UK government, research councils, companies) for the support and resources needed.

## Further reading

Antimicrobial Resistance Collaborators (2022) 'Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis', *The Lancet* 399.10325: 629-655, doi:[10.1016/S0140-6736\(21\)02724-0](https://doi.org/10.1016/S0140-6736(21)02724-0)

Department of Health and Social Care and The Rt Hon Sajid Javid MP (2021) Joint statement from UK-China Health Dialogue, 26 November 2021 <https://www.gov.uk/government/news/joint-statement-from-uk-china-health-dialogue>

National Health and Family Planning Commission *et al.* (2016) Notice on the Issuance of the National Action Plan (2016-2020) on the containment of antimicrobial resistance [国家卫生计生委、国家发展和改革委员会、教育部等关于印发遏制细菌耐药国家行动计划(2016-2020)的通知].



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