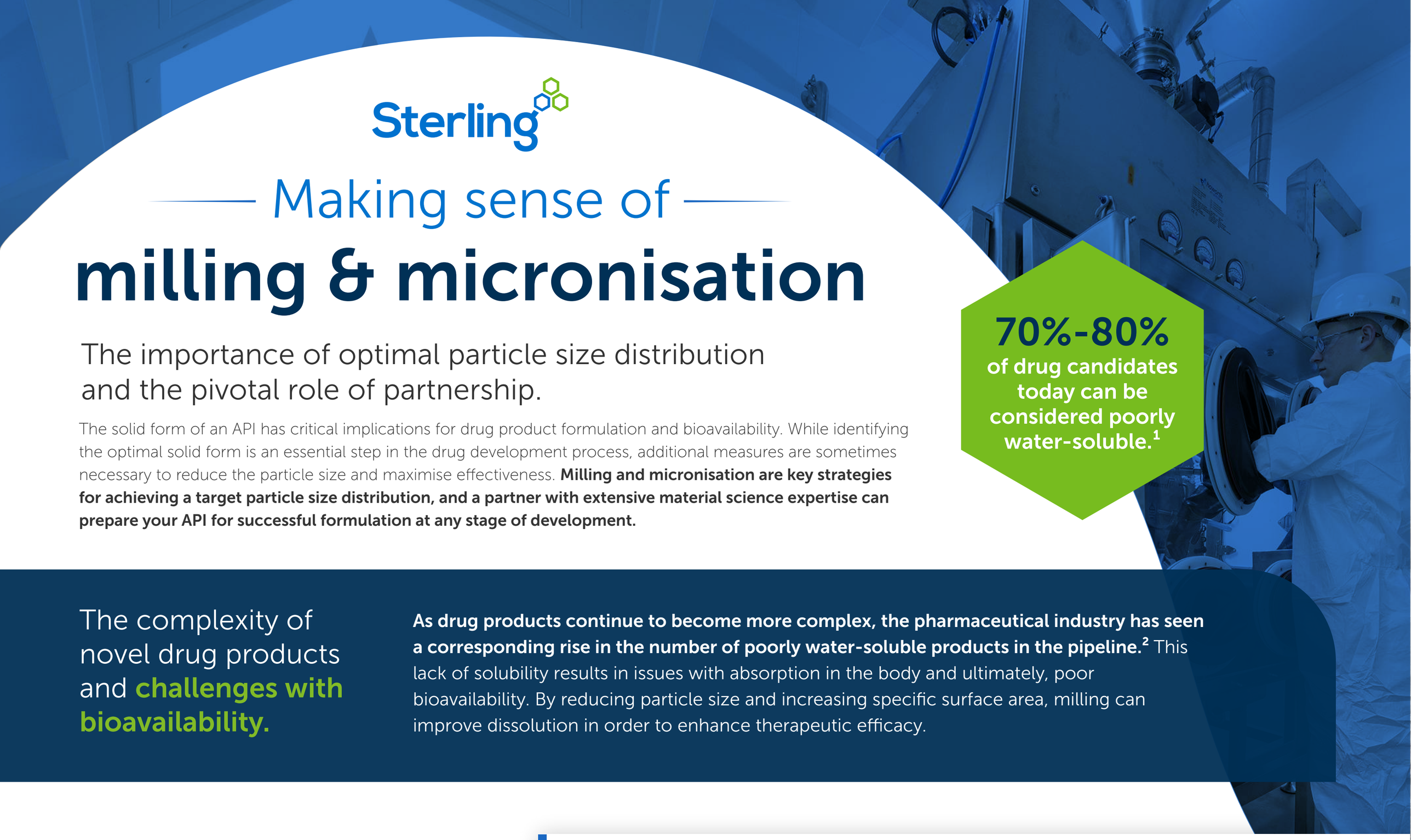
Making sense of

milling & micronisation

The importance of optimal particle size distribution and the pivotal role of partnership.

The solid form of an API has critical implications for drug product formulation and bioavailability. While identifying the optimal solid form is an essential step in the drug development process, additional measures are sometimes necessary to reduce the particle size and maximise effectiveness. **Milling and micronisation are key strategies for achieving a target particle size distribution, and a partner with extensive material science expertise can prepare your API for successful formulation at any stage of development.**



70%-80%
of drug candidates today can be considered poorly water-soluble.[1]

The complexity of novel drug products and challenges with bioavailability.

As drug products continue to become more complex, the pharmaceutical industry has seen a corresponding rise in the number of poorly water-soluble products in the pipeline.[2] This lack of solubility results in issues with absorption in the body and ultimately, poor bioavailability. By reducing particle size and increasing specific surface area, milling can improve dissolution in order to enhance therapeutic efficacy.

What are the key advantages of milling and micronisation?

Improving bioavailability is typically the key goal of milling and micronisation, but these processes can deliver other compelling advantages in API development. The right partner will provide the collaboration, expertise and range of specialised equipment necessary to meet your specific project requirements. **Here are some primary benefits of working with an experienced milling and micronisation partner.**

Did you know?

Milling can reduce particle size to **30 microns,** while micronisation can achieve a particle size of **1-5 microns.**

Enhanced bioavailability

Solubility and bioavailability are closely connected. When particle size is reduced, the product's solubility and dissolution rate increase, enabling improved absorption in the body.[2] **Milling has been advantageous in improving dissolution for a number of drugs, with early examples including ibuprofen, griseofulvin, and nifedipine.[2]**

Formulation

Particle size reduction can also play a critical role in product formulation. For example, inhaled drug products necessitate a particle size below 5-6 microns to effectively reach the lungs,[3] and tablets require a narrow API particle size distribution to maximise efficacy. **The shape of the particle can also be controlled to an extent through milling and micronisation, depending on the way the particle fractures.**

Process control

Milling or micronisation can help with process control once the particle size has been reduced. Traditionally, milling has been utilised to enhance bulk processing properties for crude drugs.[2] **In addition, milling and micronisation can help to improve the size uniformity of particles, which also helps to control processes.**

Versatility

Milling is considered a 'top-down' approach to particle size reduction, as opposed to other 'bottom-up' methods like precipitation that require careful solvent selection.[2] Because particles are physically broken down, milling and micronisation are more widely applicable than other particle size reduction methods. **Therefore, they can be utilised on a broad variety of APIs to reach a target particle size distribution.**

World-class facilities and expertise for milling and micronisation success.

At Sterling, our team members closely collaborate with customers to achieve their optimal particle size distribution. Across the sites we have the ability to utilise an array of different technologies and techniques, from cone mills, impact mills and pin mills to jet mills and wet mills. Our state-of-the-art equipment enables us to reach a target particle size of 30 microns through different types of mechanical milling or 2-5 microns through jet milling. **Our milling and micronisation equipment is housed in ISO class 8 cleanrooms equipped with CCTV monitoring, providing our customers full visibility into their projects.**

Service

We pride ourselves on being easy to do business with, removing layers of complexity, maximising flexibility and adaptability to your requirements, and doing what we say we will do, again and again.

Passion

We promise to treat your molecule as our own, drive progress by continually exploring new and emerging capabilities, and do the right thing for our people and planet.

Science

We combine our expertise in complex and hazardous chemistry, our world-class facilities and our full-lifecycle capabilities to place scientific excellence at the core of every solution we deliver.

Are you ready to work with a partner who delivers extensive material science expertise?
Learn more at www.sterlingpharmasolutions.com

1. Moreton, C. Poor Solubility – Where Do We Stand 25 Years after the 'Rule of Five'?, 2021. American Pharmaceutical Review. https://www.americanpharmaceuticalreview.com/Featured-Articles/573402-Poor-Solubility-Where-Do-We-Stand-25-Years-after-the-Rule-of-Five/ (accessed April 6, 2022) | 2. Loh, Z. H.; Samanta, A. K.; Heng, P. Overview of milling techniques for improving the solubility of poorly water-soluble drugs. Asian Journal of Pharmaceutical Sciences [Online] July 2015. ScienceDirect. https://www.sciencedirect.com/science/article/pii/S1818087615000100 (accessed April 6, 2022) | 3. Seibert, K.; Collins, P.; Fisher, E. Milling Operations in the Pharmaceutical Industry. In Chemical Engineering in the Pharmaceutical Industry: R&D to Manufacturing; Wiley, 2011; pp 365-378. https://books-library.net/files/books-library.online-06011849Pi9G6.pdf