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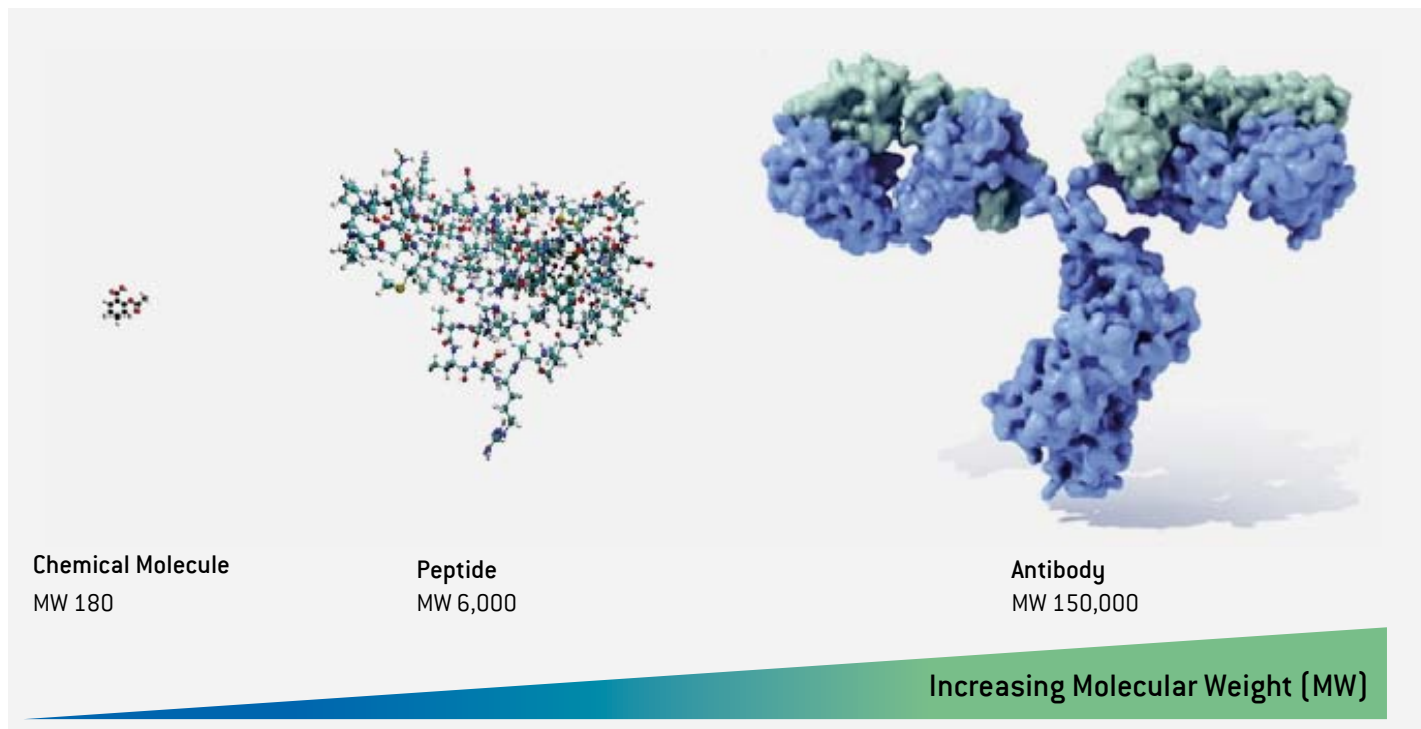
Peptides – a growing area of interest for the pharmaceutical industry

Peptides are becoming essential components of the new breed of pharmaceuticals prescribed in a growing subset of indications. This has included diabetes, HIV, cancer, hepatitis, Alzheimer’s disease, osteoporosis, obesity, infections, inflammations, sexual dysfunction, and even wrinkle and acne treatment. In 2008, the pharmaceutical peptide market alone was estimated at USD 8.5 billion with an annual demand approaching 1500kg.

Having identified the huge potential for this new class of molecule, Lonza entered the manufacturing space in the late 1990s. Whilst peptide production at Lonza Visp (Switzerland) began over a decade ago, this business (part of Lonza Exclusive Synthesis) was significantly boosted with the acquisition of the peptide manufacturing site from UCB in Braine-l’Alleud (Belgium) in 2006. By uniting the two peptide facilities,

Lonza became a pioneer in peptide custom manufacturing and now demonstrates a successful track record of providing active pharmaceutical ingredients (APIs) via three peptide technologies – liquid phase, solid phase and recombinant technology. Today, Lonza can provide gram to hundreds of kilogram quantities of peptides produced at cGMP or non-GMP standards and can support both early- and late-phase commercial projects. Additionally, our research and development centers in Visp and Braine offer a full range of process R&D services for peptides. More recently, Lonza Nansha (China) has become Lonza’s third peptide manufacturing site, acting to leverage the company’s global asset strategy.

Life Science Ingredients	Custom Manufacturing: Exclusive Synthesis & Biopharmaceuticals		Bioscience
Nutrition Ingredients	Small Molecules	Mammalian Operations	Cell Therapy
Microbial Control	Peptides	Biopharma R&D Services	Rapid Testing
Performance Intermediates	Biochemicals	Microbial Operations	Media
	Pharma Sales and Marketing		Cell Discovery
			Molecular Biology



Bridging the gap between small molecules and proteins

A peptide can be considered a concatenation of anywhere between 2 and 100 amino acids in length. Any shorter and you have a single amino acid; any longer and you find yourself in the realm of proteins. Considered in molecular weight terms, peptides fit neatly in the gulf between a chemical small molecule and a biological protein as shown in the figure above.

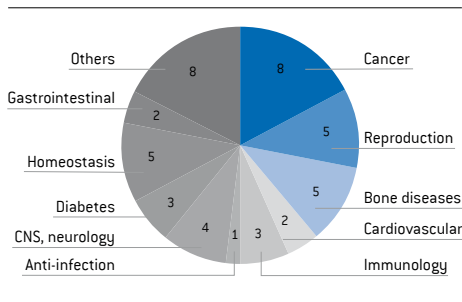
The function and mechanism of peptide action can vary enormously from acting as immunostimulatory hormones, assisting protein degradation, and possessing antibiotic activity. More recently, their use has been extended to include receptor antagonism and inhibition of protein-protein interactions. It is typical at this point

to also draw reference to their benefits in comparison with small molecules, and in principle, peptides have been shown to have higher potency, higher specificity, lower toxicity, less accumulation in organs and exhibit fewer drug-drug interaction complications. If there were no downsides, then one would legitimately speculate that the top 10 best-selling drugs would all be peptide-based and this naturally not the case. In fact 8 out of the top 10 blockbuster drugs are actually small molecule therapies and on the flip-side for peptides – limiting their wide-spread appeal – they have poor bioavailability, require more complicated delivery mechanisms, are prone to degradation/stability issues and the synthesis chemistry is difficult to master.

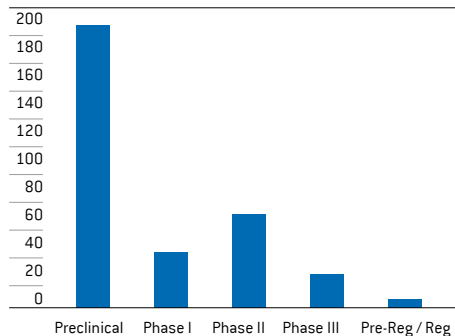


Peptide R&D pipeline shows considerable growth

The first chemically synthesized peptide drug to be launched was a luteinizing hormone-releasing hormone (LHRH) agonist in 1984 (leuprorelin; Takeda/Abbott). Today, there are 46 peptide-based therapies available on the market. The figure below shows the therapeutic applications for these launched peptide drugs and demonstrates that oncology currently represents the most served therapeutic class for marketed peptide drugs, followed by therapies for reproduction and bone diseases.



The R&D pipeline for peptides has shown unprecedented growth over the past few years with 321 candidates currently in clinical or preclinical trials. The figure below shows the R&D pipeline for peptide drugs in 2008. An annual pipeline growth of 16% contrasts well against their small molecule brethren which have grown at a modest 4% over the last few years. Whilst small molecules – with over 2 000 launched products and 5 000 candidates in the pipeline – still represent the backbone of the pharmaceutical industry, the four-fold higher growth witnessed for peptide R&D shows a widespread acceptance and the promise of things to come.

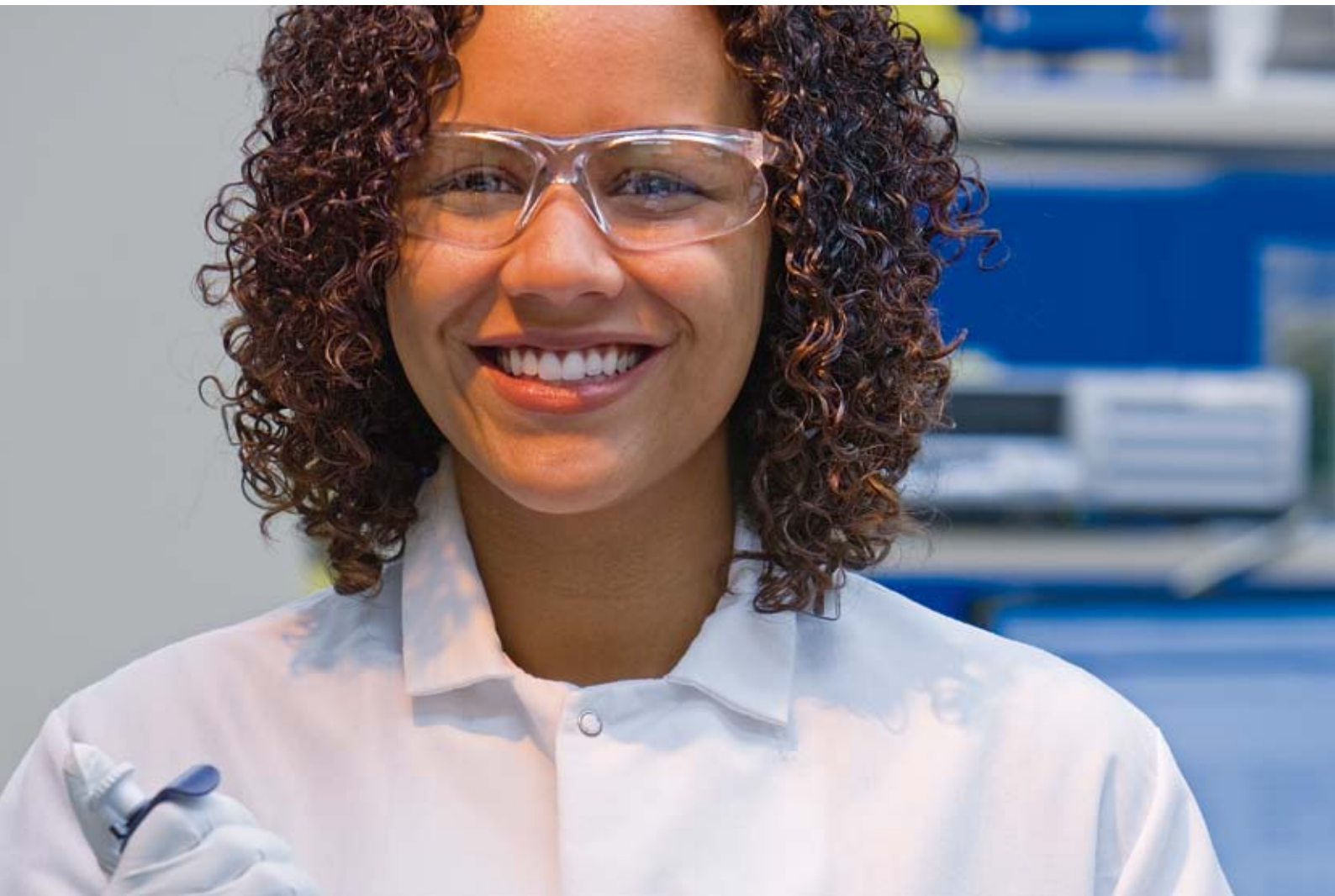


Analysis of the pipeline identifies the next generation of peptides that are due to hit the market over the next decade. Although oncology remains an area of important focus, the development of anti-diabetic peptides, bone-regenerating peptides, anti-infectious and metabolic modulators and suppressors of autoimmune response are all likely to become areas of notable development. By 2015 it is estimated that the number of launched peptides on the market could double to more than 80.

A growing peptide pharmaceutical market has a concomitant need for a responsive manufacturing base. Peptide synthesis on both small- and large-scale requires the deployment of advanced technology, state-of-the-art infrastructure, material handling, know-how and highly skilled personnel. Due to these prerequisites, the bulk of peptide production is usually outsourced to highly specialized custom manufacturing organizations (CMOs) – of which Lonza is one. Interestingly Bachem and Polypeptide, Lonza's two main competitors in this field, exist solely in the peptide manufacturing space, whilst Lonza offers a broader portfolio of manufacturing technologies.



In conclusion, Lonza is uniquely positioned to serve the growing needs of the pharmaceutical industry for peptide drugs with the right blend of technology, infrastructure, supply chain and experience, and to ultimately improve the quality of life of many patients with hitherto, unmet clinical needs.



Lonza