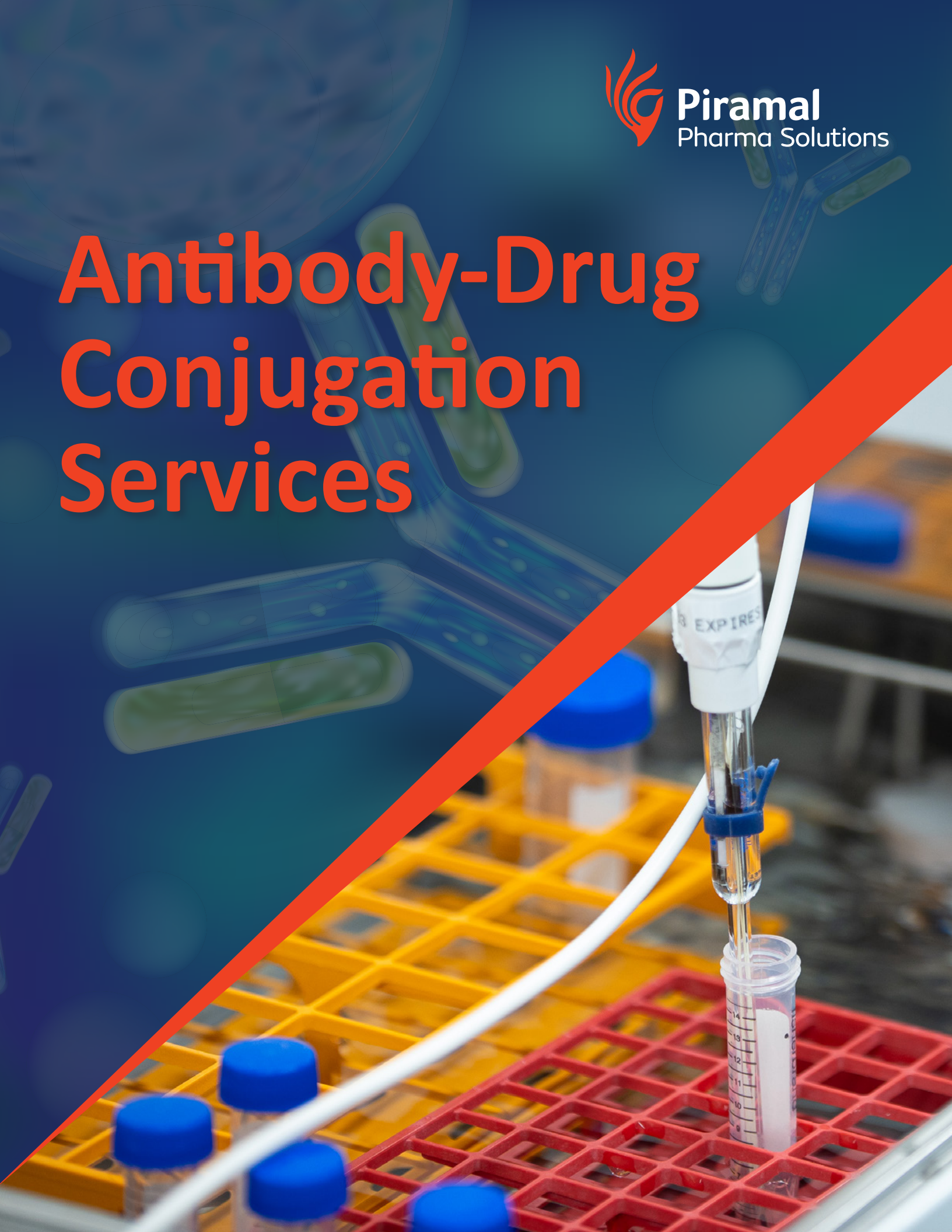
Piramal
Pharma Solutions

Antibody-Drug Conjugation Services



A Global Leader
in delivering ADC and bioconjugate solutions

Our world-class facilities in the UK, US, and India, backed by a highly experienced team, offer integrated services spanning conjugation development to clinical and commercial ADC GMP batch manufacturing and fill/finish.

Our Unique Position Includes:

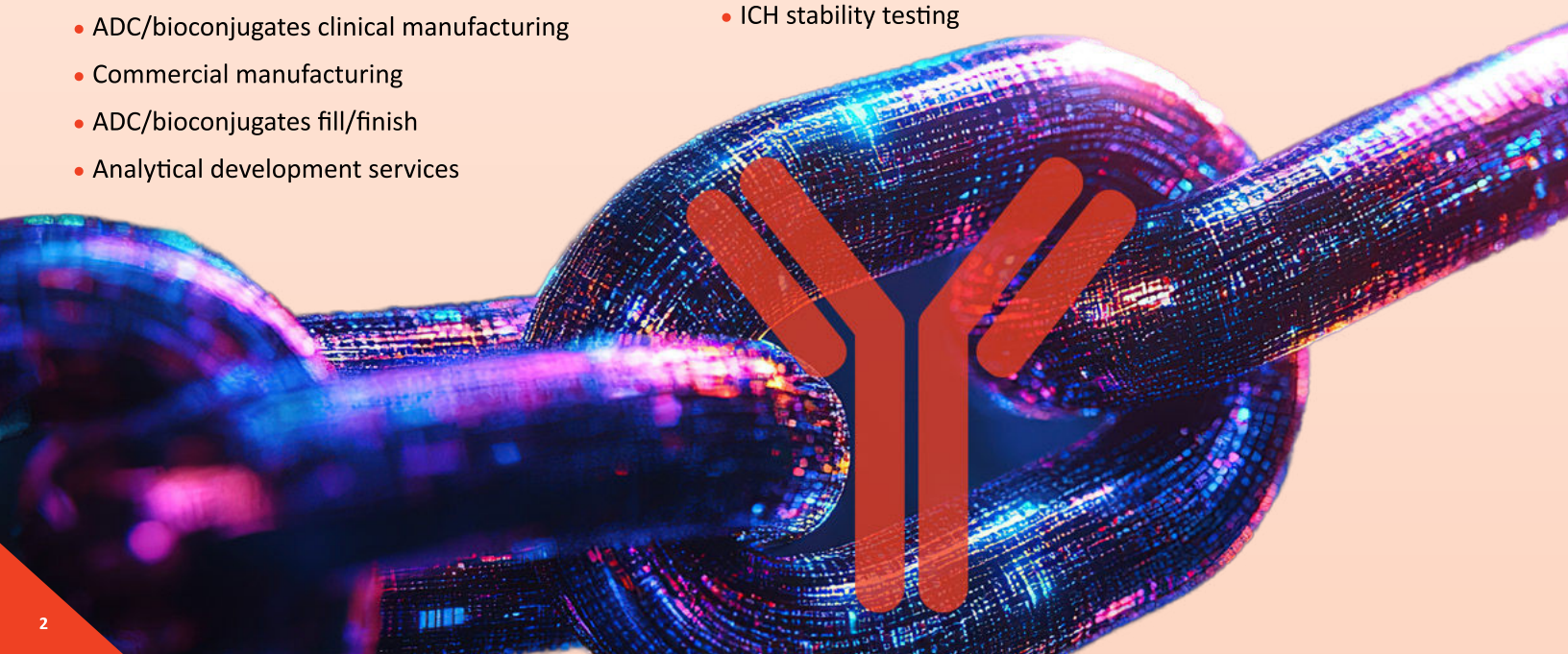
- World's first FDA-approved ADC CDMO
- First CDMO to manufacture commercial ADC product
- Two commercial ADCs launched
- 125+ integrated ADC projects executed since 2020
- Integrated services, from preclinical development of conjugated ADC to sterile fill/finish
- >98% GMP batch success rate
- Global supplier for commercial ADCs
- GMP manufacturing: 850+ batches, 40 bioconjugate entities, early phase to commercial
- 20+ years of commercial manufacturing experience
- Development lab: 650+ batches, 200+ bioconjugate entities
- Worked with over 60 different toxin/toxin-linker systems
- Successfully audited by US FDA, UK MHRA, Japan PMDA, Brazil ANVISA, and Turkey Ministry of Health

Our Bioconjugation Services

End-to-end service, from conjugation development through clinical trial supply and commercial manufacturing.

Specific service areas include:

- Proof of concept preclinical development studies
- Bioconjugation process development and scale-up
- ADC/bioconjugates clinical manufacturing
- Commercial manufacturing
- ADC/bioconjugates fill/finish
- Analytical development services
- Toxicology, bulk drug substance, and finished drug product release testing
- ICH stability testing



Our Team

People are our greatest asset. Our technical knowledge is what separates us from the pack. Our service is world-class because of our people. Our dedicated team of more than 300 employees is split across our development, quality, manufacturing, and administrative services functions.

- Technical knowledge
- Empowering creative thought
- Consistent in our thought
- Protecting and enhancing
- Aspiring to be the best
- Striving to be humble

Our R&D team includes world experts in process development, scale-up, and analytical development, including cell-killing assays. Our GMP manufacturing experience is unparalleled and backed by a strong quality assurance team. While being supported by a global parent company, our ADC services site in Grangemouth maintains that personal touch for our clients, providing tailored client-centric solutions for their projects.

Proof of Concept

The site provides cost-effective proof of concept conjugation services to demonstrate the viability of cytotoxic drugs or monoclonal antibodies for use in therapeutic ADCs. ADC standards are followed to benchmark client materials.

Tailored To Your Needs

Core Strengths

- Short lead times to start your projects
- Competency to operate at mg-g scale for preparation of low endotoxin conjugates
- Integrated process and analytical development functions
- Process development and scale-up to GMP manufacture

Client Cytotoxic or Linker Technologies

- Piramal can make various conjugates with model antibodies using your linker or drug platforms
- Experience with a range of novel linker technologies

Client Antibodies for Suitability of Conjugation

- Programs tailored to meet your needs
- Comparison of different chemistries (cysteine, lysine)
- Range of different linkers available (cleavable, non-cleavable, PEGylated)
- Range of payloads available (microtubule-disrupting drugs, DNA damaging compounds, experience with a range of non-cytotoxic payloads)
- Preparation of different drug loadings
- Analytical characterization and screening of conjugates

Analytical Services

Piramal provides onsite analytical services for ADC characterization. These include analytical method development and validation, method transfer, and release/stability testing for bulk drug substances and finished products.

Analytical Category	Typical Assays	
Identity	✓ icIEF Profile ✓ HIC Profile	✓ Dot Blot ✓ ELISA
Strength	✓ Protein Concentration (UV/SEC/SoloVPE)	
Potency	✓ Drug Load ✓ Binding ELISA	✓ Cell-Based Assay ✓ Effector Function Assays (ADCP/ADCC)
Purity	✓ SEC ✓ CE-SDS (R and NR) ✓ Charge Profile (cIEF/icIEF/CEX) ✓ % Unconjugated Ab (HIC)	✓ Conjugate Distribution (HIC/PLRP) ✓ Residual Solvent (LC or GC) ✓ Residual Drug-Related Species
Safety	✓ Bioburden	✓ Endotoxin
Quality	✓ pH ✓ Osmolality	✓ Appearance (Color and Clarity) ✓ Excipient Levels (Tween)
Characterization	✓ Peptide Mapping (LC-MS) ✓ Glycan Profiling (LC-MS/CE)	✓ Drug Distribution (LC-MS)

Drug Substance and Drug Product Stability Testing

- State-of-the-art onsite analytical development and quality control laboratories
- Full testing to ICH guidelines
- Over 80 stability trials conducted for clinical and commercial ADC batches

State-of-the-Art Development

Cell-Based Assay (CBA) Experience

- World leader in the development of cell-killing assays
- Tailored development programs utilizing design of experiment approaches
- Experience in technical transfer/optimization of client methods
- Multiple CKAs developed and validated to meet client and regulatory requirements
- Expert knowledge of validation to regulatory standards <USP111>, <1032, <1033>, and PhEur 5.3
- Development of characterization methods

ADC Manufacturing

Our multi-product facility for clinical and commercial manufacturing of antibody-drug conjugates provides process development, characterization, optimization, and scale-up expertise to support successful GMP manufacturing.

Core Strengths

- Fully licensed by MHRA
- Approved for commercial ADC supply by FDA and other worldwide authorities
- Over 50 years of experience working safely with high-potency materials
- Over 20 years of experience working safely with ADCs and potent payloads
- Batch sizes up to 2.5kg input mAb
- Up to 1,000L reactive volume capability, depending on the complexity
- Five dedicated GMP production suites for clinical and commercial manufacturing
- Capable of handling compounds with OEL <0.01µ/m^3
- Dedicated or single-use product-contact manufacturing components
- 100% batch shipping success rate

Unparalleled Experience

- Over 1,500 ADC/bioconjugates batches manufactured
- Over 850+ GMP batches manufactured
- >98% GMP Batch success rate
- Over 200 different conjugates from 120 antibodies
- Over 60 different toxin/toxin-linker systems
- Over 40 different ADCs manufactured for GMP
- 2 commercial ADC products currently manufactured

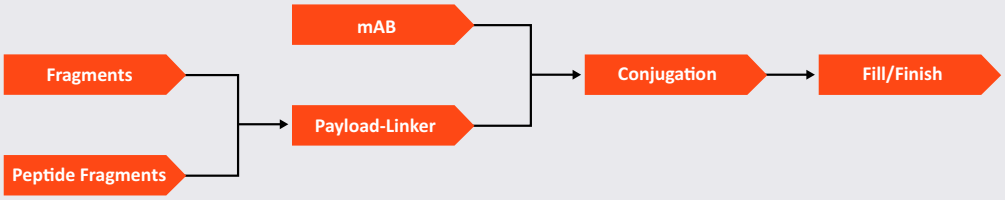
ADCelerate™ Rapid, Integrated ADC to IND

Accelerated Phase I GMP Delivery of Antibody-Drug Conjugates

Guaranteed Delivery at a Fixed Price in as Fast as 12 Months

- Shortens timelines, because speed matters
- Solutions that are customized to the scope of your project
- Take advantage of our experience in ADC problem-solving
- Includes first clinical supply of drug substance and drug product

Fully Integrated ADC Services



State-of-the-art antibody-drug conjugate manufacturing and aseptic fill/finish facility in Grangemouth, Scotland

We've expanded our market-leading ADC capabilities in Grangemouth with more capacity, new labs, and a customer experience center.

Global Supplies

Supply Chain Management

- Well-established relationship with World Courier or Pharmafreight
- Temperature logging on all shipments
- Typically, 2-3 days shipment time
- Shipping in small, insulated boxes, cryocontainers, and drums

Fill/Finish of ADC

Piramal offers aseptic filling of ADC drug product through our FDA-approved state-of-the-art manufacturing facility in Lexington, KY. Our facility is centered around mobile isolator technology, providing an ISO 5 environment during processing and product containment for potent and cytotoxic products.

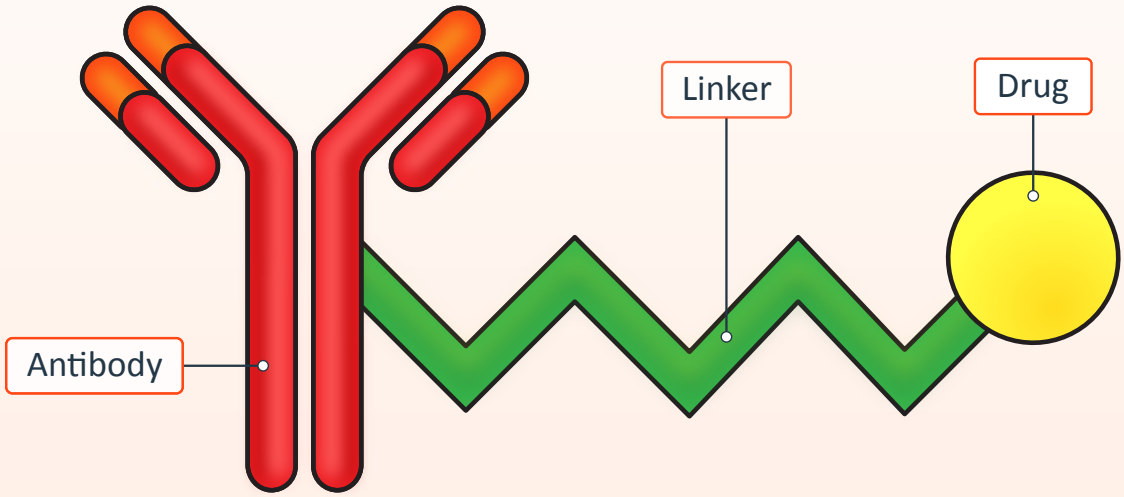
Aseptic Filling Capabilities Include:

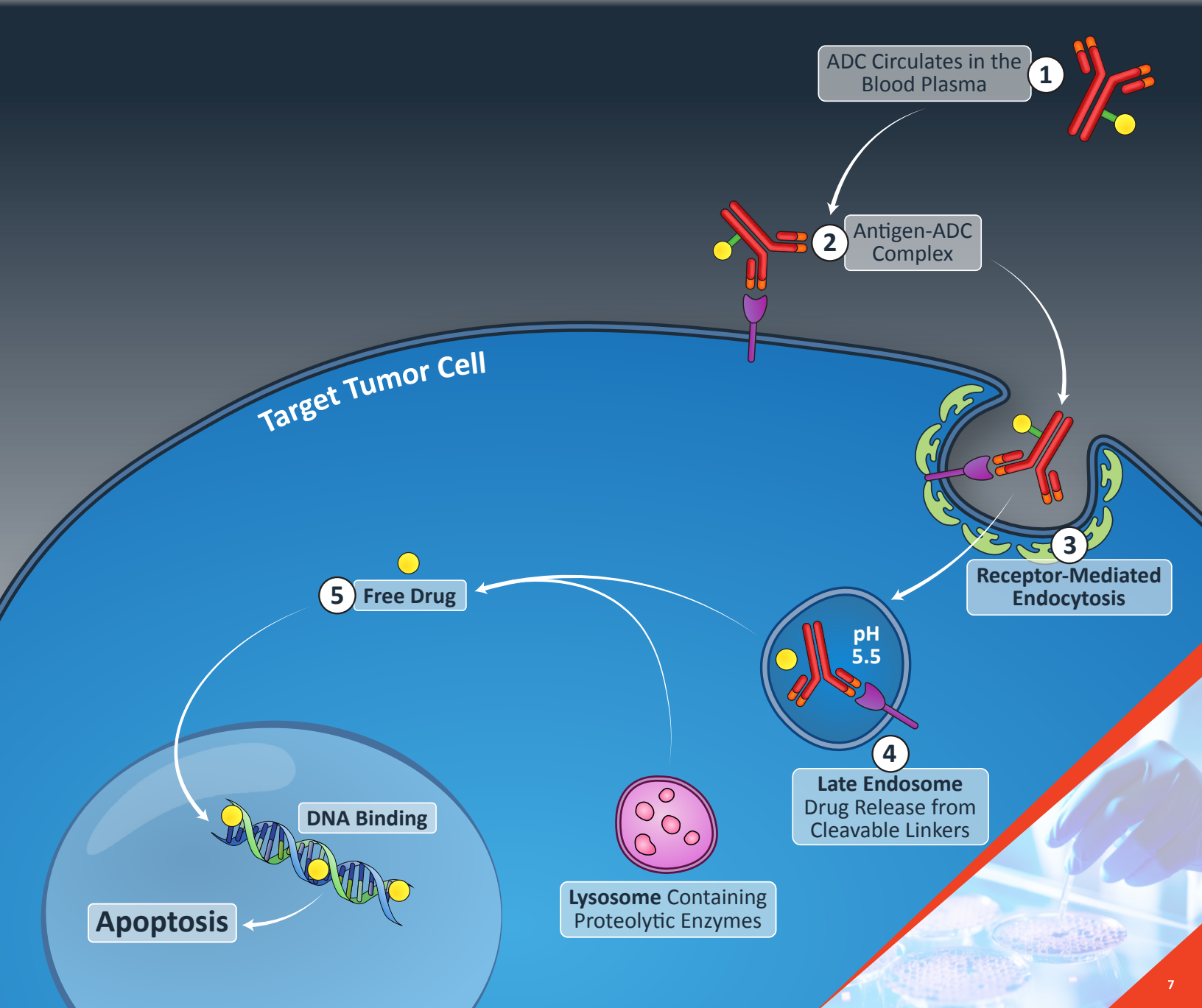
- Pre-formulation and formulation of liquid and lyophilized drug products
- Liquid and lyophilized drug product manufacturing
- Vial capabilities for liquid products: 2-100mL
- Vial capabilities for lyophilized products: 2-50mL
- Dispensing volumes from 0.5mL to 50mL
- Batch sizes up to 100,000 vials for liquid-filled products (size dependent)
- Batch sizes up to 15,000 vials for lyophilized products (size dependent)

Project Management

Piramal prides itself on its world-class project management, which was designed in partnership with its clients.

- Virtual extension of your company
- Flexible and tailored to meet clients' needs
- Single point of contact to champion your project
- Project management ensures continuity for the entire program of activities and remains with projects from technology transfer to GMP manufacturing


Linker
Drug
Antibody


ADC Circulates in the Blood Plasma
1
2
Antigen-ADC Complex
Target Tumor Cell
3
Receptor-Mediated Endocytosis
pH 5.5
4
Late Endosome
Drug Release from Cleavable Linkers
5
Free Drug
DNA Binding
Apoptosis
Lysosome Containing Proteolytic Enzymes

Global Presence
Superior Solutions

1	Riverview	HPAPI Development & Manufacturing	USFDA, PMDA
2	Sellersville	Formulation Development & Manufacturing	USFDA, EMA
3	Lexington	Sterile Development & Manufacturing	USFDA, PMDA
4	Grangemouth	ADC Development & Manufacturing	USFDA, MHRA
5	Morpeth	API & Formulation Development & Manufacturing	USFDA, MHRA
6	Aurora	API Development & Manufacturing	USFDA, PMDA

7	Digwal	API Development & Manufacturing	USFDA, MHRA
8	Turbhe	Peptide API Development & Manufacturing	USFDA
9	Ennore	API Development & Manufacturing	WHO-GMP
10	Ahmedabad-PDS	Drug Discovery	
11	Pithampur	Formulation Manufacturing	USFDA, EU Finland, ANVISA
12	Ahmedabad-PPDS	Formulation Development	USFDA, EU Finland
13	Mahad	Formulation Manufacturing (Indian Market), Vitamin & Nutritional Premixes	USFDA, WHO-GMP
14	Rabale	API Development	
15	Hyderabad*	Vaccines & Biologics Process Development & Manufacturing	

*Yapan Bio: A Piramal Pharma Ltd. Associate Company

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