Piramal
Pharma Solutions

PIRAMAL ADC
SERVICES

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WORLD adc BEST CMO AWARD

ABOUT US

Piramal is the world leader in delivering customer-centric solutions in the field of Antibody Drug Conjugates (ADCs) to global pharmaceutical companies. Our world-class facilities in the UK and US, backed by a highly experienced team, offer integrated services from Conjugation Development to Clinical and Commercial ADC GMP batch manufacturing and Fill/Finish.

Our Unique Position includes:

- Integrated service from preclinical development of conjugated ADC to sterile Fill/Finish
- >98% GMP batch success rate
- Global supplier for one of the only two marketed ADCs for past 5 years
- Manufactured 30 different ADC products to GMP
- Unparalelled manufacturing experience - over 800 batches (>400 GMP) for 130 different ADC candidates
- Worked with over 50 different toxin/toxin-linker systems
- Successfully audited by US FDA, MHRA PMDA and ANVISA
- World ADC 2014 Award – World leader in ADC conjugation services
- 2015 CMO Leadership Awards – Four awards for quality, reliability and regulatory excellence

OUR SERVICE

Piramal offers an end-to-end service from conjugation development through clinical trials supply to commercial manufacture. Specific service areas include:

- Proof-of-Concept Preclinical Development Studies
- Bio-Conjugation Process Development and Scale Up
- ADC Clinical Manufacturing
- Commercial Manufacturing
- ADC Fill/Finish
- Analytical Development Services
- Bulk Drug Substance and Finished Product Release Testing
- ICH Stability testing

DELIVERING ON OUR PROMISES

OUR TEAM

TECHNICAL KNOWLEDGE

EMPOWERING CREATIVE THOUGHT

CONSISTENT IN OUR THOUGHT

PROTECTING AND ENHANCING

ASPIRING TO BE THE BEST

STRIVING TO BE HUMBLE

People are what makes Piramal great. Our technical knowledge is what separates Piramal from the pack. We believe that our service is world-class because of our people. Currently we have a team of over 140 split across our Development, Quality and Manufacturing Services functions.

Our R&D team includes world experts in process development and scale-up and analytics, including cell-killing assays.

Our GMP manufacturing experience is unparalleled and backed by a strong Quality Assurance team. Whilst 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.

OUR VALUES

At Piramal, our core values of Knowledge, Action and Care have been an integral part of our guiding philosophy. Delivering on our promises is our key goal with our clients at the centre of everything we do.

PROOF OF CONCEPT

Cost-effective Proof of Concept conjugation service to demonstrate the viability of cytotoxic drugs or monoclonal antibodies for use in therapeutic ADCs.

TAILORED TO YOUR NEEDS

CORE STRENGTHS

- Short lead times to start your projects
- Competence 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 ANTIBODIES FOR SUITABILITY FOR CONJUGATION

- Programmes 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, protein ribosome inactivating toxins, chelators for radio immunotherapy)
- Preparation of different drug loadings
- Analytical characterisation and screening of conjugates

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

ADC STANDARDS TO BENCHMARK CLIENT MATERIALS

- Model antibody with DAR 2, DAR 4 with different ADC toxins

ANALYTICAL SERVICES

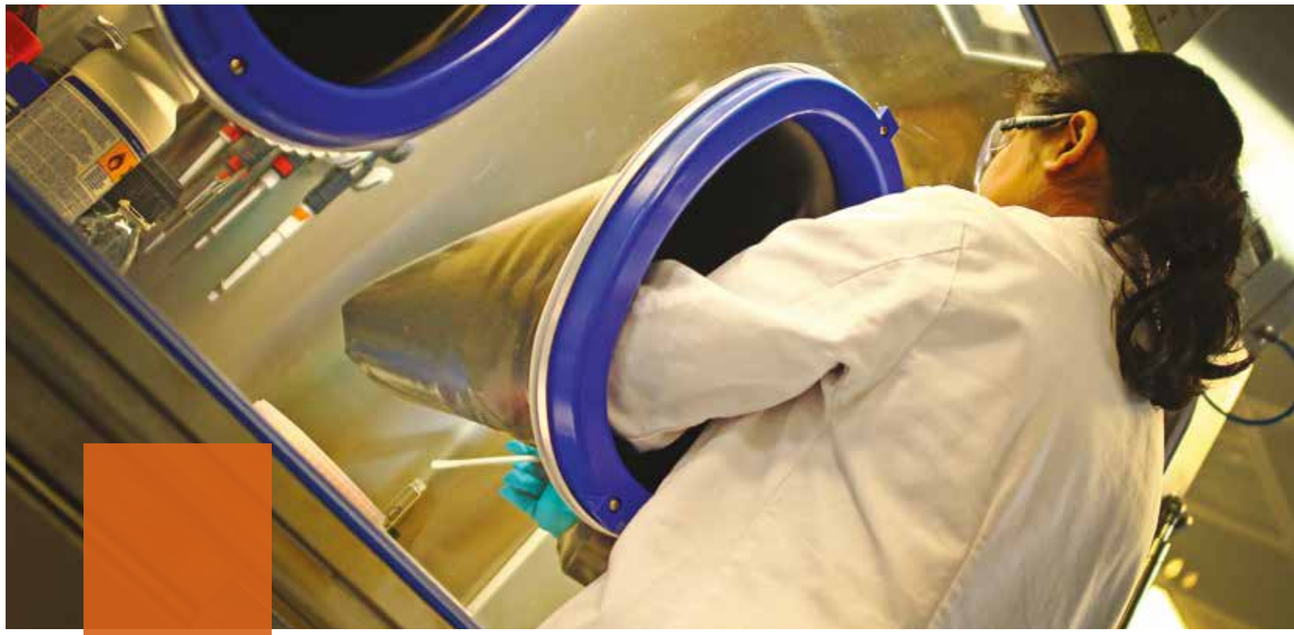
Piramal provides onsite analytical services for ADC characterisation. This includes analytical method development and validation, method transfer and release/stability testing for Bulk Drug Substance and Finished Product.

ANALYTICAL CATEGORY	TYPICAL ASSAYS	
Identity	✓ icIEF Profile ✓ HIC Profile	✓ Dot Blot ✓ ELISA ✓ Peptide mapping (HPLC and LC-MS
Strength	✓ Protein Concentration (UV)	
Potency	✓ Drug Load ✓ Binding ELISA	✓ Cell Based Assay
Purity	✓ SEC Chromatography ✓ SDS-PAGE (Red and Non-Red) ✓ CE-SDS (Red and Non-Red) ✓ icIEF or cIEF (Charge) ✓ % unconjugated antibody (HIC)	✓ Drug Load/Distribution (HIC or PLRP) ✓ Residual solvent (HPLC or GC) ✓ Residual drug related species (HPLC and LC-MS)
Safety	✓ Bioburden	✓ Endotoxin
Quality	✓ pH ✓ Osmolality	✓ Excipient levels (Tween) ✓ Appearance (colour and clarity)

DRUG SUBSTANCE & 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 clincal and commercial ADC batches

ANALYTICAL SERVICES



STATE OF THE ART DEVELOPMENT

CELL BASED ASSAY (CBA) EXPERIENCE

- World leader in development of Cell Killing Assays
- Tailored development programmes utilising Design of Experiment Approaches
- Experience in Technical Transfer/Optimisation of client methods
- Multiple CKAs developed and validated to meet client and regulatory requirements
- Expert knowledge of validation to regulatory standards <USP111>, <1032, <1034> and PhEur 5.3

ADC MANUFACTURING

Multi-product facility for clinical and commercial manufacturing of antibody drug conjugates (ADCs). Process development, characterisation, optimisation and scale-up expertise supporting successful GMP manufacturing.

CORE STRENGTHS

- Fully licenced by MHRA
- Approved for commercial ADC supply by FDA and other worldwide authorities
- >98% GMP batch success rate
- Over 30 years experience of working safely with high potency materials
- Over 10 years experience of working safely with ADCs and potent payloads
- Batch sizes up to 2.5 kg input mAb
- Up to 1000L reactive volume capability depending on complexity
- Three ADC manufacturing suites based on isolator technology
- Two commercial scale manufacturing suites
- Dedicated or single use product-contact manufacturing components
- 100% Batch shipping success

	DEVELOPMENT*		GMP**	
PLATFORM	**LAB SCALE (>1G)**	**TOXICOLOGY BATCH**	**PHASE I/II**	**PHASE III/ COMMERCIAL**
Auristatins	142	43	173	158
Maytansines	80	11	46	7
Others	142	4	39	0
Total	364	58	258	165

* at end Aug 17 | **at mid Sep 17

UNPARALLELED EXPERIENCE

- Over 800 ADC batches manufactured
- Over 400 GMP batches manufactured
- Over 300 Development programs completed
- Over 130 Different ADCs from over 85 antibodies
- Over 50 Different toxin/toxin-linker systems
- 30 different ADCs manufactured to GMP

YOU BEFORE US
IN EVERYTHING WE DO

SUPPLY CHAIN MANAGEMENT

- 100% successful shipments to Europe, US and Japan
- 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 centred around mobile isolator technology, providing an ISO 5 environment during processing, as well as product containment for potent and cytotoxic products.

Aseptic filling capabilities include:

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

OUR PEOPLE MAKE US GREAT

PROGRAMME MANAGEMENT

Piramal prides itself in our world-class programme management, designed in partnership with our clients.

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

Piramal Pharma Solutions

Preclinical development,
Commercial Manufacturing

Fill/ Finish

Grangemouth, UK

Kentucky, USA

BASED IN SCOTLAND'S CENTRE

Piramal's ADC Services facility is based in the centre of Scotland, located close to both Glasgow and Edinburgh International Airports. With regular direct flights from Europe and North America it could not be easier to visit. Great Scottish hospitality guaranteed and plenty of local attractions for those longer visits. Scotland is after all the home of golf and whisky.

WORLD ADC BEST CMO AWARD