Medicilon

Integrated Preclinical Drug Discovery and Development Services

SHANGHAI MEDICILON INC.

COMPANY PROFILE

From its inception in 2004, Shanghai Medicilon Inc. (STAR Market, stock code: 688202.SH) has been committed to providing comprehensive research and development (R&D) services to biopharmaceutical companies, research institutions, and any organizations working in the preclinical space, with the primary objective of supporting and accelerating pharmaceutical, biopharmaceutical and medical device R&D worldwide.

A Comprehensive CRO for Pre-Clinical Pharmaceutical R&D

- End-to-end services and solutions covering the entire spectrum of preclinical biopharmaceutical R&D. Supporting everything from target discovery, candidate development, preclinical screening and safety through IND submission
- Focus on communication and collaboration with clients in a variety of target indication areas such as neoplasms, neurological diseases, diabetes, inflammation, etc

State-of-the-Art Facilities

- Three R&D centers with over 794,000 ft^2 of lab space in Shanghai, China
- AAALAC accredited animal facilities
- GLP/GMP compliant facilities, instrumentation with FDA and NMPA regulations

High-Performance Teams

- Internationally trained scientists with Ph.D. degree and/or with 10+ years of R&D and management experience
- Timely support and consultations through one-on-one communication

IP Protection

- Strict internal policies and excellent historical track record

SERVICE SCOPE

Drug Discovery

Chemistry
Biology

Preclinical Research

Pharmacology
Pharmacokinetics
Safety Assessment
Bioanalysis

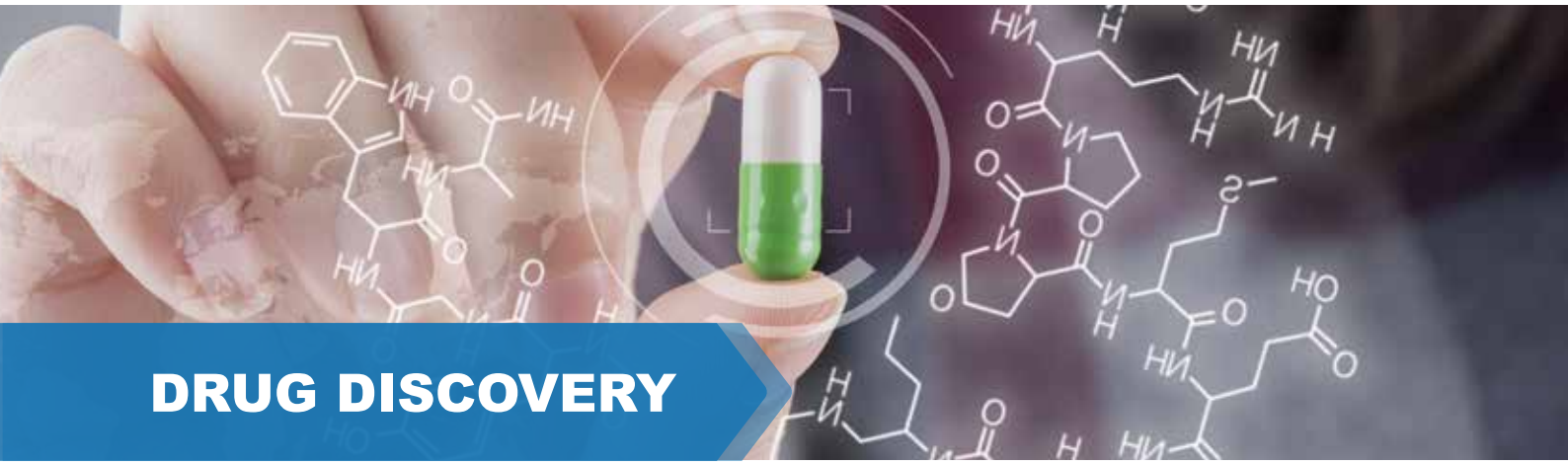
Drug Development & CMC

Drug Substance
Drug Product

IND Filing

FDA
NMPA
TGA
EMA

Address: 1 Broadway, 9th Fl, Cambridge Innovation Center
Cambridge, MA 02142
Email: marketing@medicilon.com
Website: www.medicilon.com



DRUG DISCOVERY

Medicilon's Discovery Chemistry and Biology divisions have established a strong track record assisting thousands of clients worldwide with the discovery and development of small molecules, biologics as well as cell- and gene-therapies. Combining the most cutting-edge instrumentation and high-performance, experienced scientists, Medicilon has the expertise, capabilities and capacity to support projects of any size.

Medicilon's Advantages

01 Flexible service models, including FTE and FFS, to meet diverse needs and priorities

02 Innovative technologies to meet novel R&D demands: AI-aided drug design, structure-based drug discovery (SBDD), fragment-based drug discovery (FBDD), DNA-encoded chemical library (DEL) technology, PROTAC, etc.

03 Best overall value: strong expertise and capability, rapid turnaround time, full regulatory compliance

04 Well-developed biology sharing service platform: 10+ years of cooperation with Shanghai Synchrotron Radiation Facility (SSRF)

05 Protein free rooms, purification rooms, cell culture rooms, and BSL-2 laboratories

Chemistry Services

- Structure-activity relationship (SAR)
- Computer-aided drug design (CADD)
- Synthesis of small molecule compounds or libraries
- Chemical synthesis, discovery, and structure optimization of
  - hit compounds
  - lead compounds
- Custom synthesis
- Synthesis of standards, reference compounds, and molecular probes
- Synthesis of special reagents, intermediates, and molecular fragments
- Synthesis of impurities and metabolites
- Synthesis of stable isotope internal standards
- Synthesis of deuterated compounds
- Synthesis and resolution of chiral compounds
- Scale-up synthesis of up to kilogram-quantity

New Platforms

- PROTAC
- Photoredox
- DNA-encoded chemical library (DEL) screening
- Green chemistry
- AI-enabled drug discovery
- Bioelectronic isostere technology

Biology Services

Structural Biology

- X-ray crystallography and Cryo-EM analysis
- Protein expression and purification (prokaryotic protein, yeast protein, insect cell protein, mammalian cell protein)
- Preparation of M9 culture medium containing Se substituent

In Vitro Biology

- Compound, CDC, ADCC cytotoxicity assay
- Gene editing and stable cell line construction
- CAR-T/CAR-NK construction and target cell killing

Computational Biology

- 3D organoid-based drug screening
- High-throughput kinase, receptor-targeted agonist/antagonist screening
- Virtual screening
- FBDD services

Expression and Purification of Recombinant Proteins

- Prokaryotic expression system (*E. coli*)
- Yeast protein expression system
- Insect cell protein expression system (Baculovirus)
- Mammalian cell protein expression system (Fc, Human Serum Albumin, 3xFlag, GST, 6His)

Protein Crystal Services

- Protein crystal condition high throughput screening
- Protein synchrotron radiation diffraction data collection
- Protein-compound co-crystallization

Fragment screening

Recombinant Kinase Preparation

- Various expression systems: insect cells, HEK293 cells, *E. coli*
- Holoenzyme or kinase region
- Screening at analysis level and structure biology level
- Recombinant kinase products

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DRUG DEVELOPMENT & CMC SERVICES

Services Related to APIs and Formulation

A wide-range of API services for both innovative and generic drugs including process development and optimization, quality studies, scale-up, technology transfer, process validation, and IND registration service.

Over 43,000 ft^2 of formulation laboratory and GMP-compliant facilities can support phase I and phase II clinical trials.

SERVICES

Extensive experience in supporting a wide variety of formulation dosage forms including capsules, tablets, granules, injections, inhalants lyophilized powders, eye drops, ointments, tinctures, etc.

Also supporting formulation process development, quality tests, stability studies, and the evaluation of packaging materials and containers.

Medicilon's Advantages

01 Successfully contributed to 100+ IND approvals of APIs for both innovative and generic drugs

02 Integrated solutions covering the entire drug discovery and development spectrum including technology development, scale-up, manufacturing, and registration

03 In-house pilot-scale agent workshop and 2 cGMP API production lines fulfilling the IND approval requirements of the FDA

04 Rapid and continuous expansion in industrial capacity and capability

05 Active engagement and collaboration with other research institutions on innovation

Chemical Analysis Services

- Method development, pre-validation, and transfer
- Compound purity test and related substance analysis
- Content method development (gravimetric analysis, external standard method, quantitative nuclear magnetic resonance, etc.)
- Chiral analysis method development and screening
- Isomer impurity analysis and method development (SFC, HPLC, and GC)
- Purification, preparation (Prep-HPLC), resolution of chiral molecules (SFC or Prep-HPLC) for compounds and impurities
- Structure elucidation by the combination of UV, IR, MS, and NMR spectra
- Compound solubility and stability tests (HPLC)
- In-process control analysis support, standardization of reference standards, analytical procedure validation, study on analytical methods for PGI/residual solvent/elemental impurity, stability study, and other physico-chemical detection analyses (moisture/melting point/optical rotation/ROI/LOD/LC-MS/IR/UV/TGA/DSC, etc.)
- Technology safety assessment and analysis

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PRECLINICAL RESEARCH

Medicilon's Preclinical Research Division services include toxicology, pharmacology and efficacy studies, absorption, distribution, metabolism, and excretion (ADME), drug metabolism and pharmacokinetics (DMPK), as well as bioanalytical solutions for small molecules, biologics, and medicinal herbs. We maintain a large in-house library of animal disease models to meet the research demands in different therapeutic areas. Medicilon can also assist clients in the preparation of a preclinical safety evaluation package.

Equipped with Ph.D. level scientists as well as the most innovative technology and platforms, Medicilon is committed to providing customer-oriented service support and delivering high-quality results.

Medicilon's Advantages

01	Extensive pharmaceutical drug discovery and development expertise in small molecules (NCE), biologics, and medicinal herbs for any therapeutic modalities
02	Full AAALAC accredited laboratories and facilities
03	200+ oncology models and 100+ non-tumor disease models for safety and efficacy assessment
04	A full range of bioanalytical services and global regulatory affairs to enable successful IND submission
05	IT platforms such as Watson LIMS software and Provantis ensure seamless data collaboration, submission (SEND format), and security
06	Dedicated research scientists with flexible capacity

PHARMACOLOGY

The Pharmacology department combines strong technical expertise with extensive experience in consulting, conducting, and evaluating efficacies in small molecule and biologic drugs using a wide variety of *in vivo* and *in vitro* research models. Our focused therapeutic areas include, but are not limited to CNS, cardiovascular and metabolic diseases, inflammation, immunological diseases, and digestive diseases.

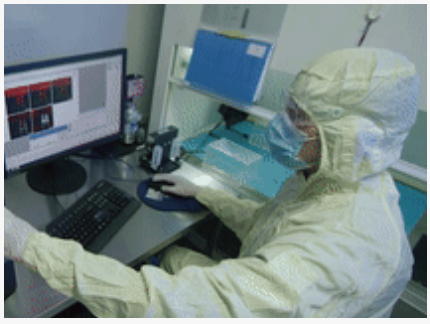
Tumor Animal Models

- ~ 150 CDX models
- ~ 40 PDX models
- ~ 20 Syngeneic models
- ~ 20 Humanized mice models
- ~ 30 Transgenic models

Non-tumor Animal Models

- ~ 40 CNS disease models
- ~ 10 Digestive system disease models
- ~ 10 Inflammation and Immune system
- ~ 20 Cardiovascular and metabolic models
- ~ 5 Others diseases models

Oncology Research Center
Pharmacology Equipment and Facilities



Cancer Models

1.Xenograft Models

Cancer Type	Human Cancer Cell Lines
Head and Neck	FaDu, Detroit 562, CAL-27
Oral Epithelial Carcinoma	KB
Lung Cancer	DMS114, NCI-H69, NCI-H146, NCI-H209, NCI-H446, NCI-H526, NCI-H1688, 95-D, A549, Calu-1, Calu-3, Calu-6, HCC827, NCI-H226, NCI-H292
Breast Cancer	SUM159, MDA-MB-231, MDA-MB-468, Bcap-37, 2LMP, ZR-75-1, ZR-75-30, HCC70, HCC1954, MDAMB-361, MCF-7, BT474
Gastric Cancer	MKN-45, NCI-N87, BGC-823, HGC-27, MKN-28, NUGC-3, SCH, SGC-7901
Pancreatic Cancer	AsPC-1, BxPC-3, Capan-1, Capan-2, CFPAC-1, HPAF-II, MIAPaCa-2,
Renal Cancer	ACHN, OS-RC-2, 786-O, A498
Hepatocellular Carcinoma	Bel-7402, Hep-3B, Huh-7, PLC/PRF/5, QGY-7703, SK-HEP-1, SMMC-7721
Glioblastoma	U87-MG
Colon and Cecum Cancer	COLO 201, COLO 205, COLO 320 DM, CW-2, DLD-1, HCT-8, HCT-15, HCT-116, HT-29, LoVo, LS1034, LS174T, LS411N, NCI-H716, RKO , SW48
Prostate Cancer	DU145,PC-3, LNCap, CL-1
Urinary Bladder Cancer	HT-1197, HT-1376, RT4, SCaBER, SW780, T24
Ovary Cancer	ES-2, HO-8910PM, PA-1, SK-OV-3, OVCAR-3
Endometrium/Hysterocarcinoma	An3 CA, HEC-1-A, ME-180, MFE-280
Cervical Cancer	SiHa, Hela
Skin Cancer	A431, Colo829
Melanoma	A375, A2058, C32, HMCB, SK-MEL-30, MDA-MB-435s, WM-226-4
Osteosarcoma	MG-63, SJSA-1
Fibrosarcoma	HT-1080
Muscle, Striated	SJCRH30
Myeloma	KMS-11, KMS-26, RPMI-8226, MM.1S

2. Orthotropic Models

Cancer Type	Cell Lines	Luciferase Cell Lines
Breast Carcinoma	MDA-MB-231, HCC1954, HCC70, MDA-MB-361, MCF7, HCC1954	MDA-MB-231-luc
Lung Cancer	NCI-H1650	A549-luc, LLC-luc
Colon Carcionoma	HCT-116	CT26.WT-luc
Glioblastoma	U87-MG	U87-MG-luc
Ovary Carcinoma	SK-OV-3	
Prostate Cancer	Pc3	
Leukemia	RL, MAVER-1, Karpas299, K562, HL-60	

Cancer Type	Cell Lines	Luciferase Cell Lines
Gastric Cancer	Hs 746T	
Pancreatic Cancer	Mia-Paca 2	Mia-Paca 2-luc
Renal Cancer	A498	

Cancer Type	Cell Lines	Luciferase Cell Lines
Bladder Cancer	UM-UC-3	
Melanoma		B16-F10-luc
Liver Cancer	H22	

3. Syngeneic Models

Cancer Type	Cell Lines
Breast Carcinoma	4T1,4T1-luc ,EMT6, JC, C1271
Lung Cancer	LLC1, LLC1-luc, KLN205
Colon Carcinoma	CT26.WT,CT26.WT-luc, CMT-93, MC38
Kidney Carcinoma	RENCA
DLBCL Lymphoma	A20
Acute Myeloid Leukemia	C1498

Cancer Type	Cell Lines
Leukemia	L1210, WEHI-3
Hepatoma	H22
Melanoma	B16-F10
Plasmacytoma	MPC-11
Lymphoma	P388D1, L5178-R (LY-R),E.G7-OVA
Pancreatic Cancer	Panc 02
Myeloma	J558

4. CD34+ HSC Humanized Models

Cancer Type	Cell Lines
Brain Cancer	U-87 MG
Breast Cancer	HCC1954, MDA-MB-231, JIMT-1
Colon Cancer	HT29, LoVo
Gastric Cancer	NCI-N87

Cancer Type	Cell Lines
Lymphoma	Raji, TMD8, MOLM-13
Myeloma	RPMI-8226, NCI-H929
Pancreatic Cancer	Capan-2
Skin Cancer	A431

5. PBMC Humanized Models

Cancer Type	Cell Lines
Breast Cancer	HCC1954
Colon Cancer	HT29, Lovo, Ls174T
Lung Cancer	NCI-H292, HCC827
Leukemia	THP-1

Cancer Type	Cell Lines
Lymphoma	Raji, MOLM-13
Myeloma	NCI-H929
Skin Cancer	A431
Ovarian Cancer	OVCAR-3

6. PDX Models

Cancer Type	Cell Lines
Colon Cancer	PDXM-008C, PDXM-016C, PDXM-020C, PDXM-021C, PDXM-057C, PDXM-060C, PDXM-075C, PDXM-076C, PDXM-087C, PDXM-104C
Lung Cancer	PDXM-054Lu, PDXM-050Lu, PDXM-047Lu, PDXM-053Lu, PDXM-028Lu

Cancer Type	Cell Lines
Gastric Cancer	PDXM-092Ga, PDXM-091Ga,
Breast Cancer	PDXM-201B, PDXM-202B, PDX-203B
Liver Cancer	PDXM-211Li, PDXM-212Li
Pancreatic Cancer	PDXM-221Pa, PDXM-222Pa
Bladder Cancer	PDXM-231U, PDXM-232U
Lymphoma	PDXM-241Ly, PDXM-242Ly

Pharmacology Models

1. Neurological Disorders

Disease	Model	Species
Analgesia	Hot-Plate	Mouse/Rat
	Tail flick	Mouse/Rat
	Radiant heat pain	Mouse/Rat
	Complete Freund's adjuvant, CFA	Rat
	Acetic acid induced writhing	Mouse
	LPS-induced thermal hyperalgesia	Guinea pig
	Sciatic nerve injury model (SNI)	Rat
	Open field test	Mouse/Rat
	Shuttle box test	Rat
	Picrotoxin convulsions	Mouse
Antidepressant Tests	Forced swimming test	Mouse/Rat
	Tail suspension test	Mouse
	Reserpine-induced ptosis	Mouse
	MAO-A/B activity test	Rat
	Reserpine Antagonism	Mouse
	MPTP model	Rat
Antidementia Tests	Morris water maze	Mouse/Rat
	In light-dark box test	Mouse
	Memory retrieval impairment	Mouse
	D-galactose model	Mouse
	APP/PS1	Mouse
Antipsychotic Tests	Mk801 induced Schizophrenia with positive/negative symptom	Mouse
	Catalepsy	Rat

2. Digestive System and Other Disease Models

Disease	Model	Species
Renal Failure	Nephrectomy (5/6)	Rat
Anemia	Anemia model induced	Rat
Gastric Acid Secretion	Pylori ligation	Rat
	Histamine induced	Rat
Gastric Ulcer	Ethanol induced	Rat
	Cold water stress induced Rat	Rat
	Acetic acid chronic Rat	Rat

3. Inflammation and Immune System Disease Models

Disease	Model	Species
Arthritis	CIA induced	Mouse/Rat
	AIA adjuvant induced	Mouse/Rat
	Imidocriptine induced	Mouse
	Propranolol induced ear	Guinea pig
Acute Inflammation	Toe swollen	Mouse/Rat

4. Cardiovascular and Metabolic Diseases

Disease	Model	Species
Obesity and Diabetes	Streptozotocin induced diabetes	Mouse/Rat
	Spontaneous diabetes	db/db, ob/ob Mouse
	Spontaneous diabetes	Rat ZDF
	High-fat and high-sugar diet induced	Mice
Nonalcoholic Fatty Liver	Hereditary atherosclerosis	APOE Mouse
	Nonalcoholic fatty liver	Rat
Thrombus Model	Arteriovenous bypass thrombosis	Rat/Mouse
	Carrageenan induced tail vein thrombosis	Mice
	Deep vein thrombosis	Rat
	Carotid thrombosis	Rat/Mouse
Hyperuricemia	Potassium oxonate induced	Rat/Mouse
	Hypoxanthine induced	Mouse
Liver Fibrosis	Biliary ligation	Rat
	ConA induced	Mouse
Dyslipidemia	High fat/cholesterol/fructose diet induced	Hamster
	Hereditary atherosclerosis	APOE Mouse

5. Other Disease Models

Disease	Model	Species
Skin Healing	Full-thickness skin trauma	Rat
	Pressure ulcers	Rat
	Skin scald	Rat

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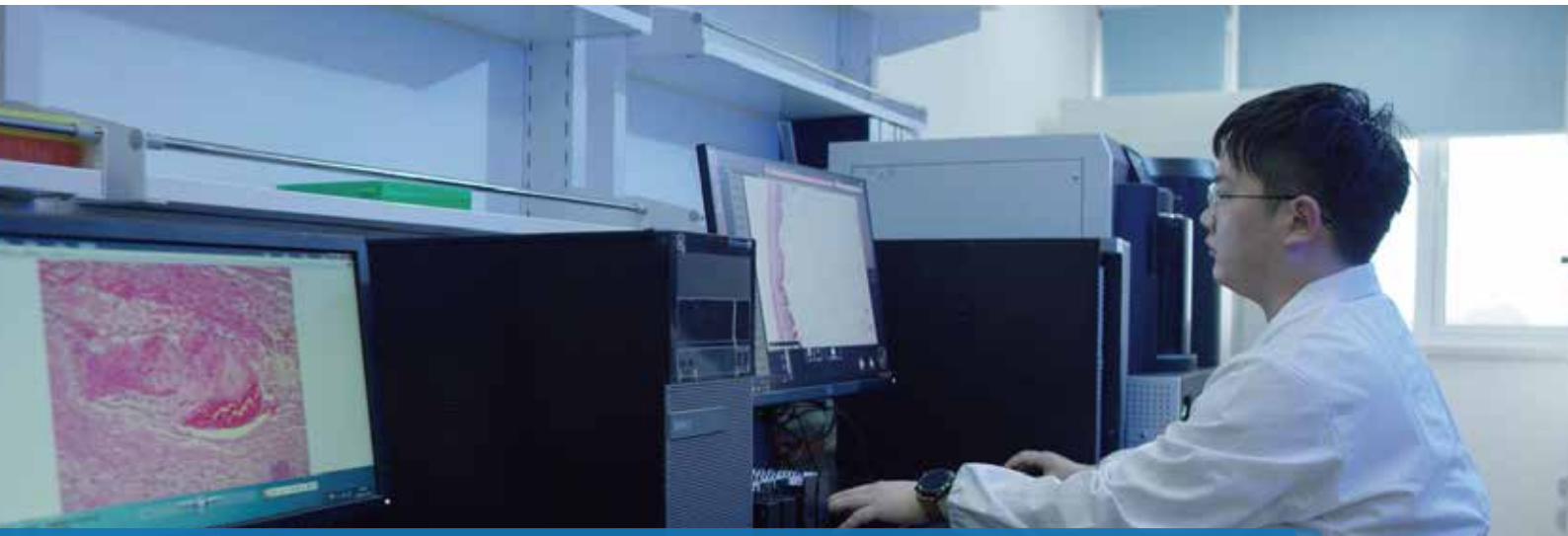


PRE-CLINICAL SAFETY ASSESSMENT GLP & NON-GLP

Medicilon's state-of-the-art facilities are fully AAALAC-accredited. With state-of-the-art platforms and experienced scientists, Medicilon ensures that drug efficacy and safety assessments are conducted in the most professional manner while meeting the global regulatory standard. From stand-alone preclinical studies to comprehensive IND-enabling packages, Medicilon provides flexible service options to assist biopharmaceutical clients efficiently reach their development millstones.

In Vivo Toxicology

- General toxicology
- Safety pharmacology
- Development and reproductive toxicology
- Genetic toxicology
- Inhalation toxicology
- Immunotoxicology
- Carcinogenicity study
- Local toxicity study (hemolysis, allergy, and irritation tests)

Histopathology

- H&E staining
- Immunohistochemistry (IHC)
- Tissue cross reaction (TCR)

Clinical Pathology

- Hematological analysis
- Urinalysis
- Clinical biochemical analysis
- Hemagglutination analysis
- Lymphocyte typing

PHARMACOKINETICS

Medicilon's PK/PD department has 18+ years of experience in preclinical pharmaceutical safety assessment. Our experienced scientists and dedicated study directors provide expert guidance as well as oversight of the overall project to ensure quality and KPI's are met on time and budget. From high throughput screening to a full-scale New Drug Application (NDA), Medicilon's flexible and highly competitive solutions can be tailored to meet each sponsor's needs.

In Vitro ADME

Medicilon's *in vitro* ADME services range from high throughput screening to IND enabling support. Our objective is to provide competitive, flexible, and customized solutions meeting each individual sponsor's requirements at different stages of the drug R&D pipeline.

- Lipophilicity, solubility tests
- Caco-2 permeability
- Transporters: substrate and inhibition studies
- hERG test

Distribution

- Protein binding: plasma, tissue, and microsomes
- Red blood cell partition

Metabolism

- Metabolic stability: microsomes, S9, and hepatocyte
- Matric stability: plasma, tissue, and buffer
- *In vitro* metabolite profiling and identification

DDI

- Cytochrome P450 (CYP) inhibition (IC_{50} and TDI)
- CYP induction
- Enzyme phenotyping: phase I and phase II enzymes (recombinant enzyme and chemical inhibition)

In Vivo DMPK

Service Overview

Pharmacokinetics screening service

Pharmacokinetics/Toxicokinetic for IND submission

- Formulation screening
- Multi-period crossover bioequivalent
- Tumor-bearing mouse PK/PD
- Tissue distribution (biodistribution, BBB permeability studies)
- Mass balance
- ^{125}I, ^{14}C, ^{3}H labeled isotope drug metabolism research
- Drug-drug interactions
- Metabolite identification and profiling
- Excretion studies

Modality

Small and large molecular therapeutic products of almost all modalities

Biologically Relevant Animal Species

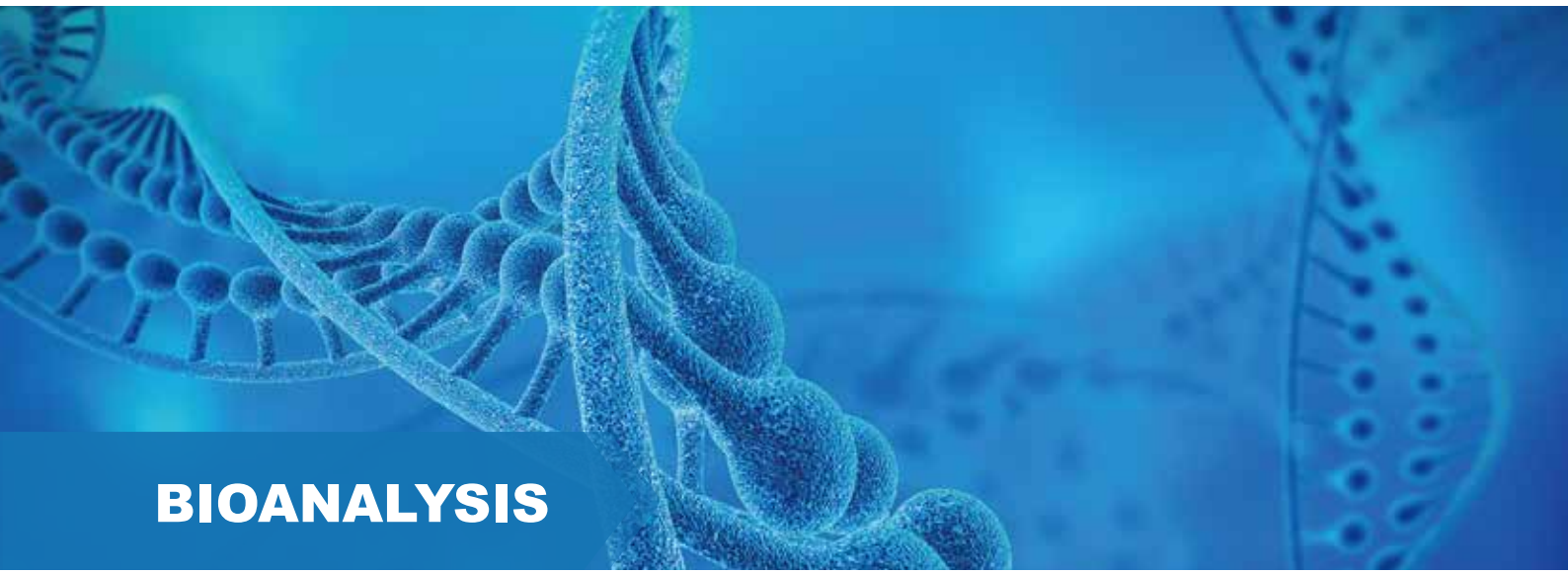
Rodents, rabbit, canines, swine, non-human primates (Cynomolgus and Rhesus monkey)

Surgical Techniques

Venous cannulation, biliary cannulation, infusion pump, implantation, and continuous trace blood collection

Dose Strategies

Single, multiple, and cassette dosing



BIOANALYSIS

The Bioanalysis Department of Medicilon provides comprehensive bioanalytical services which includes PK/PD, ADA and NAB assay development and sample analysis for small molecule, biologics and vaccine bioanalytical development. Our lab implements a comprehensive management system for sample accessioning and experimental data processing, tracking and storage. All of our bioanalysis studies are in compliance with FDA/OECD/CFDA GLP regulations.

Small Molecule Bioanalysis

- Development, transfer, and optimization of LC-MS/MS methods to determine the drug concentrations in biological samples
  Clinical sample bioanalysis
- Bioequivalence experiments for generic drugs
- Supports early DMPK screening

Equipment

- SCIEX Triple Quad 6500+
- SCIEX Triple Quad 5500
- SCIEX API 4000
- Shimadzu LCMS 8050
- Shimadzu UHPLC
- Waters UPLC

Large Molecule Bioanalysis

- Immunoassays method development and validation
- Analysis of proteins, antibodies, ADCs, and peptide drugs
- Screening and analysis of biomarkers
- Drug resistance test (Immunogenicity)
- Vaccine test

Equipment

- MSD Sector Imager 6000
- Molecule Devices M2/M4/M5 Reader
- UV 2600 Spectrometer
- Biotech ELx405 Select
- Hamilton Workstation

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IND APPROVAL

Medicilon provides the IND application for the preclinical services. Medicilon is the CRO that fulfill both the China and US GLP standards. Medicilon could submit the application for both FDA and NMPA for your new drug. Since 2004, we have successfully helped our clients to submit their new drug application to FDA and NMPA and met the requirements of the FDA and NMPA. We have undergone several inspections and passed all of them. Medicilon will provide an efficient, cost-effective and professional service to help our clients to achieve their goals.

Medicinal Development Service Timelines for Small Molecules

Lead Discovery	Lead Optimization	Candidate Selection	Preclinical research and IND submission
4-6 months	5-8 months	3-5 months	12-18 months

Clinical Trial Registration Assistance

Medicilon assists global clients with the IND and ANDA applications to the FDA and NMPA

- Submission of IND/ANDA applications to FDA and NMPA on behalf of the clients
- Assist with IND registration package preparation in the format of SEND and eCTD
- Project management
- Compile, assess, and review technical documents for IND and ANDA submissions
- Multilevel of reviewing process to ensure the accuracy and compliance before filing
- A dedicated, experienced project manager maintains frequent communications with the FDA/NMPA agency throughout the application progress till the final approval is granted

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SHANGHAI MEDICILON INC.

Address: No.585 Chuanda Road, Pudong New Area, Shanghai (Headquarters)
Postcode: 201299
Tel: +86 (21) 5859-1500 (main line)
Fax: +86 (21) 5859-6369