charles river

DISCOVERY AND SAFETY ASSESSMENT

In Vitro Sciences Facilities and Capabilities

This datasheet provides an overview of Charles River Discovery and Safety Assessment *in vitro* services. For more information on our services according to Good Manufacturing Practices, such as cell banking and bioassays, contact us at askcharlesriver@crl.com.

	Facilities													
	Cleveland, Ohio, USA	Ashland, Ohio, USA	Skokie, Illinois, USA	Horsham, Pennsylvania, USA	Morrisville, North Carolina, USA	Reno, Nevada, USA	Worcester, Massachusetts, USA	Montreal & Sherbrooke, Canada	Cambridge & Harlow, UK	Edinburgh, UK	Kuopio, Finland	Leiden, Netherlands	Den Bosch, Netherlands	Portishead, UK
ADMET														
Drug Transporter and Permeability														
BCRP-MDCK									•					
Caco-2 cells									•				•	
Efflux														
Efflux inhibition (MDR1, BCRP, BSEP, Caco-2)							•		•				•	
Efflux substrate (MDR1, BCRP, Caco-2)							•		•				•	
FDA/EMA Drug Transporter Panel									•					
Influx														
Influx inhibition (OAT1, OAT3, OATP1B1, OATP1B3, OCT1, OCT2)									•					
Influx substrate (OAT1, OAT3, OATP1B1, OATP1B3, OCT1, OCT2)									•					
Intestinal Absorption Models														
MDCK cells							•		•					
MDR1-MDCK							•		•					
Extrahepatic Metabolism														
Plasma and blood							•		•				•	
Skin, intestinal and lung							•		•	•			•	

EVERY STEP OF THE WAY

	Facilities													
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Hepatic Metabolism														
Hepatocytes							•		•	•			•	
Metabolite identification									•	•			•	
Metabolic stability							•		•	•			•	
Metabolite profiling							•		•	•			•	
Metabolite profiling with accurate mass MS									•	•			•	
Microsomes							•		•	•			•	
MIST assessment										•			•	
Radioprofiling										•			•	
Reactive metabolite assessment									•	•			•	
Species comparison							•		•	•			•	
Subcellular fractions							•		•	•			•	
Protein Binding														
Equilibrium dialysis							•	•	•	•			•	
Melanin binding							•						•	
Microsomes/hepatocyte binding							•		•	•				
Plasma protein binding							•		•				•	
*Rapid equilibrium dialysis (RED)									•	•			•	
SPR (HAS, AGP)									•					
Tissue binding							•		•	•				
Ultracentrifugation							•			•				
Ultrafiltration								•		•			•	
Prediction of Drug-Drug Interactions														
CYP450 enzyme identification							•		•	•			•	
CYP450 enzyme induction							•		•	•			•	
CYP450 inhibition							•		•	•			•	
Time-dependent CYP450 inhibition							•		•	•			•	
Red Blood Cell Partitioning							•	•	•	•			•	

**also available at Wilmington, MA*

	Facilities													
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DERMAL ABSORPTION														
Flow Cells and Static Cells (OECD 428)														
Consumer exposure										•			•	
Dermal drug delivery										•			•	
Formulation screening										•			•	
Formulation supraequivalence										•			•	
Human and animal skin										•			•	
Operator exposure										•			•	
Skin metabolism during absorption, including metabolite ID										•				
Systemic availability										•			•	
Transdermal drug delivery										•			•	
Skin Penetration										•			•	
DISCOVERY SERVICES														
Adeno/lentiviral production												•		
Adipokine analysis (cytometric bead arrays)					•				•	•		•		
Apoptosis induction assessment								•	•	•	•	•		
Biochemical assays for HTS and profiling									•			•		•
*Biomarker assays (MSD, Luminex®, AlphaLISA®)				•			•		•			•		•
Biophysical fragment screening									•					
**Cell banking	•					•	•							
Cell-based assays for HTS and profiling	•								•			•		•
Cell signaling profiling					•	•		•	•	•	•			•
Cell transfection	•					•			•	•		•		•
Chemoproteomics									•					
Complex endpoint analysis of *in vivo* models														•
Compound screening for cytotoxicity in primary CNS cells											•	•		
*Compound screening in tumor cells									•			•		•
CRISPR/Cas9 editing									•			•		•

**also available at Shrewsbury, MA*
***also available at Freiburg, Germany*

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Custom cell-based assay development e.g., neutralizing antibody assay, antibody-dependent cell-mediated cytotoxicity (ADCC) assay and cytokine release assay, primary immune cell assays	•			•	•	•		•	•	•	•	•		•
Custom cell line development and validation	•								•			•		
Cytokine analysis (cytometric bead arrays)					•	•			•	•		•		•
Cell death/viability endpoints, cell counts, immunocytochemistry										•	•	•	•	•
FACS sorting														•
Flow cytometry					•	•	•		•	•		•	•	•
Gene expression analysis (Lightcycler, digital droplet PCR)												•		•
hESC/iPSC-derived cell-based assays												•		
High content assays									•			•		
High-throughput ion channel screening and profiling	•								•					
High-throughput mass spectrometry							•		•					
Human donor blood assays									•			•		•
Human primary cell-based assays	•											•		•
Immuno-oncology assays														•
Isothermal titration calorimetry									•					
**In vitro* drug combination analysis					•				•					
Live cell imaging (IncuCyte®)									•					•
Membrane preparation	•								•					
Multi-electrode arrays									•					
Nanostring														•
Neurite outgrowth (NOG) assay in primary cells											•	•		
NMR (protein ligand interactions)									•					
Pharmacology assays						•	•	•	•	•	•	•		•
Primary immune cell assays e.g., T cells, B cells, myeloid cells, natural killer cells														•
*Proliferation assays				•		•	•	•	•	•		•		•
Protein expression (cytometric bead arrays)					•	•		•	•	•	•	•		•
Protein production									•					
Radiometric assay for HTS									•					

**also available at Freiburg, Germany*

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Radiometric assay for compound profiling									•					
Receptor binding assays						•		•	•	•			•	•
RNAi screening												•		
*Slice electrophysiology											•			
**Surface plasmon resonance (Biacore)									•					
Thermal shift assay									•					
Ussing chamber electrogenic transport assay	•													
X-ray crystallography									•					
Zebrafish developmental toxicology				•									•	
Zebrafish neurotoxicology				•										
Antimicrobial and Antiviral Testing Services														
Bacterial culture (broth and agar culture, growth analysis, CFU)														•
Molecular microbiology (PCR, RT-PCR, qRT-PCR, nanostring, cloning, transformation, protein expression, SDS-PAGE, western blotting)														•
Antimicrobial testing (MIC, MBC, biofilm assays, time-kill assays, resistance testing, tolerance testing, disc-diffusion, E-test strips, persister cell assays, PK/PD analysis)														•
Microbiology cell culture (adherence assays, internalization, macrophage/ phagocytosis assays, transfection)														•
Vaccine testing (serum bactericidal assays, ELISAs, opsonophagocytosis assays by flow cytometry)														•
Viral Assays (HAI assays, plaque assays, viral yield reduction, TCID50, EC50/CC50 assays)														•
Microbiology microscopy/luminescence assays (confocal, fluorescence, fluorescence plate assays)														•
ENDOCRINE DISRUPTION														
Estrogen receptor binding using rat uterine cytosol - OPPTS 890.1250													•	
Human recombinant estogen receptor (hrER) binding assay - OECD 493													•	
Estogen receptor transcriptional activation - OPPTS 890.1300 and OECD 455													•	
Androgen receptor binding using rat prostate cytosol - OPPTS 890.1150													•	
Steroidogenesis assay - OPPTS 890.1550 and OECD 456													•	

**also available at Groningen, Netherlands*
***also available at Woburn, MA*

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Androgen receptor transactivism using the AR-EcoScreen™ - OECD 458													•	
Aromatase human recombinant - OPPTS 890.1200													•	
GENETIC TOXICOLOGY														
In Silico														
In silico structural analysis ICH M7													•	
Bacterial Reverse Mutation														
Ames - OECD 471			•					•					•	
Ames - OECD 471 - Azo Dye			•					•						
Ames; Blackburn modified ASTM E1687													•	
Ames - OECD 471 - Gas			•					•						
Micro-Ames (24-well, GLP)			•					•					•	
***In Vitro* Mammalian Cell**														
In vitro mammalian chromosomal aberration test (HPBL, CHO) - OECD 473			•					•					•	
In vitro mammalian chromosomal aberration test (HPBL, CHO) - OECD 473 - Gas			•											
In vitro mammalian chromosomal aberration test (HPBL, CHO; miniturized) - OECD 473			•					•					•	
In vitro mammalian cell micronucleus test (HPBL, TK6, CHO; manual scoring) - OECD 487			•					•					•	
In vitro mammalian cell gene mutation test (HPRT) - OECD 476			•										•	
In vitro mammalian cell gene mutation test (TK) - OECD 490			•					•					•	
Mechanism of action														
Fluorescent *in situ* hybridization (FISH)			•											
Kinetochore staining (CREST)			•											
MultiFlow™								•						
ToxTracker™								•						
non-GLP Screening														
In silico structural analysis (DEREK, SARAH)													•	
Bacterial reverse mutation test (Ames) - full plate			•					•					•	
Bacterial reverse mutation test (Ames) - micro-Ames			•					•					•	
Bacterial reverse mutation test (Ames) - fluctuation (Ames II and Ames MPF)			•					•					•	
In vitro mammalian chromosomal aberration test (HPBL, CHO)			•					•					•	
In vitro mammalian cell micronucleus test (TK6, CHO; flow cytometric scoring)			•					•						
In vitro mammalian cell micronucleus test (HPBL, TK6, CHO; manual scoring)			•					•					•	

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In vitro mammalian cell gene mutation test (HPRT)			•											
In vitro mammalian cell gene mutation test (TK)			•					•					•	
IN VITRO TOXICOLOGY														
Blood/Plasma compatibility							•			•			•	
*Cytotoxicity testing (ISO 10993-5/USP-NF)														
Agarose overlay										•			•	
- by elution										•			•	
- by direct contact													•	
Dermal Corrosion (OECD 431)														
SkinEthic EpiDerm™ model													•	
SkinEthic EpiSkin™ model										•			•	
Membrane barrier test method for skin corrosion (Corrositex™) - OECD 435)													•	
Dermal Irritation (OECD 439)														
SkinEthic EpiDerm™ model													•	
SkinEthic EpiSkin™ model										•			•	
*Cytotoxicity test to estimate starting doses for acute oral systemic toxicity tests (OECD 129)													•	
Ocular Irritation														
- Bovine corneal opacity and permeability (BCOP)										•			•	
- MatTek EpiOcular™										•			•	
- SkinEthic™ HCE model										•				
Inhalation Toxicity (with or without inhaling robot)														
- Epithelix Sàrl MucilAir™										•				
3D toxicology testing with with MatTek 3D models										•				
SKIN SENSITIZATION														
In silico skin sensitization assessment (i.e., DEREK)													•	
In chemico direct peptide reactivity assay (DPRA) (OECD 442C)													•	
In chemico peroxidase peptide reactivity assay (PPRA)														
ARE-Nrf2 luciferase test method (OECD 442D) KeratinoSens™													•	

**also available at Ballina, Ireland*

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ARE-Nrf2 luciferase test method (OECD 442D) LuSens														
Myeloid U937 skin sensitization test (USENS™) (OECD 442E)													•	
PHOTOTOXICITY														
Ultraviolet-visible spectral analysis (OECD 101)				•									•	
3T3 BALB/c neutral red uptake assay phototoxicity assessment (OECD 432)			•	•									•	
CHO neutral red uptake			•											
Phototoxicity assessment in 3D differentiated human keratinocytes (PhotoEpiderm™)													•	
SAFETY PHARMACOLOGY														
Cardiac channel panel	•													
hERG channel blockade (ICH S7B)	•								•	•				
Screening hERG	•								•					
Whole-cell patch clamp electrophysiology in hERG-transfected CHO cells	•								•	•				
Whole-cell patch clamp electrophysiology in hERG-transfected HEK 293 cells	•								•	•				
hERGLite channel trafficking assay	•													
Purkinje fiber assay	•													
Stem cell-derived human cardiomyocyte impedance assay	•													
Stem cell-derived human cardiomyocyte multiple electrode array assay	•													
Whole-cell patch clamp electrophysiology in hERG-transfected HEK 293 cells	•								•					
TECHNOLOGY TRANSFER														
Bespoke testing									•	•		•	•	
Evaluation of new assays							•		•	•		•	•	
Formal (ECVAM) test validation EU NETVAL membership										•				
Investigational and mechanistic toxicology										•				

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