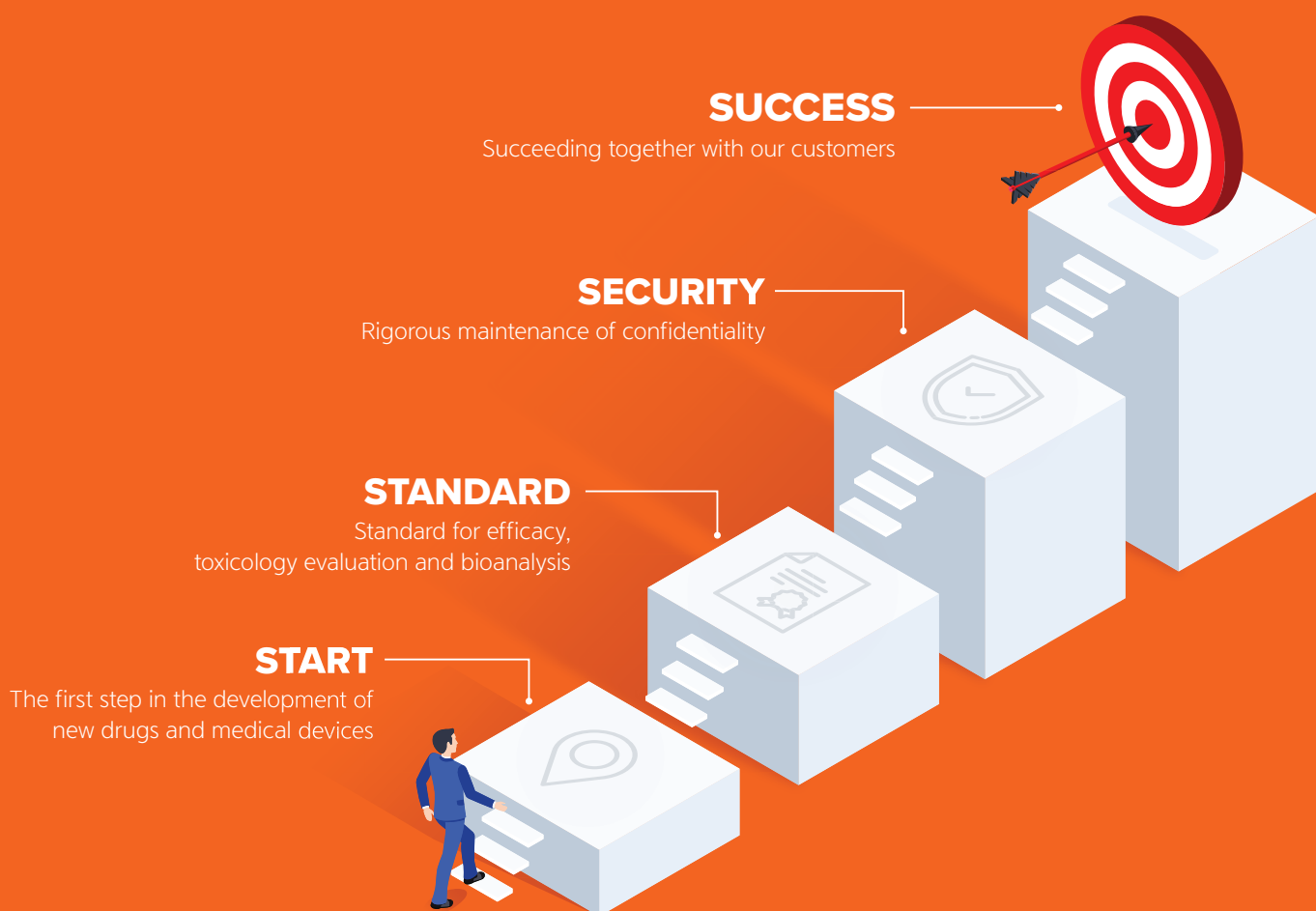


No. 1 CRO & the Most Trusted Partner for Asian Bio Companies



Non-Clinical Services

HLB bioStep Non-Clinical Services

Efficacy Study

Cancer	<ul style="list-style-type: none"> Xenograft, Syngeneic, Orthotopic 	Bone Disease	<ul style="list-style-type: none"> Monosodium Iodoacetate-induced OA (Osteoarthritis) Collagen-induced OA ACLT (Anterior cruciate ligament transection) + meniscectomy OA OVX (Ovariectomy)-induced osteoporosis
In-vitro	<ul style="list-style-type: none"> Oncology Immunology Research Metabolic Health Skin care Neurology Customized in-vitro experiment service 	Liver Disease	<ul style="list-style-type: none"> CCl₄-induced liver fibrosis MCD or CDAHFD-induced MASLD/MASH MDR2 knockout mouse liver disease (Fibrosis, MASLD) Bild duct ligation induced liver cirrhosis
Endocrine & Metabolic Disease	<ul style="list-style-type: none"> Ovariectomy (OVX)-induced climacterium db/db mouse (DM type II), STZ (Streptozotocin) (DM type I) HFD (High fat diet)/HCD (High cholesterol diet) induced hyperlipidemia Sodium taurocholate induced pancreatitis 	Cardiovascular Disease	<ul style="list-style-type: none"> Hepatectomy or splenectomy induced hemorrhage TAC (Transverse aortic constriction) Myocardial infarction Apolipoprotein E knockout (ApoE^{-/-} KO) mouse arteriosclerosis Tail bleeding mouse
Neurologic Disorder	<ul style="list-style-type: none"> Stroke (Middle cerebral artery occlusion) Thromboembolic infraction Alzheimer's disease (APP/PS1 TG, 3xTg, 5xFAD mouse) Charcot-Marie-Tooth disease (CMT) 	Respiratory Disease	<ul style="list-style-type: none"> Idiopathic pulmonary fibrosis (IPF) Asthma LPS induced ARDS Mouse expectorant Guinea pig antitussive
Ocular Disease	<ul style="list-style-type: none"> Dry AMD (Sodium iodate induced AMD) Wet AMD (Laser-induced choroidal neovascularization) Benzalkonium-induced dry eye LPS induced uveitis STZ induced diabetic retinopathy Dexamethasone induced glaucoma 	Hair Growth	<ul style="list-style-type: none"> Catagen phase (Dexamethasone, DHT, corticosterone, testosterone) Anagen phase
Gastrointestinal Disease	<ul style="list-style-type: none"> EtOH or NSAID induced gastritis Reflux esophagitis Shay rat Lumen perforated rat (LPR) Heidenhain pouch dog (HPD) DSS induced IBD 	Skin Disease	<ul style="list-style-type: none"> AD cream induced atopic dermatitis in NcNga mouse Wound healing Psoriasis
Kidney Disease	<ul style="list-style-type: none"> Cisplatin induced acute renal failure Adenine induced chronic kidney disease Unilateral ureteral obstruction 	Pain	<ul style="list-style-type: none"> Chronic constriction injury (CCI) STZ induced diabetic peripheral neuropathy PBQ induced systemic pain Spinal cord injury (SCI) Carrageenan induced paw edema
		Dental Disease	<ul style="list-style-type: none"> Ligation (w/LPS) induced periodontitis Beagle mandibular defect

Pharmacokinetics / Toxicokinetics

Pharmacokinetics Study	<ul style="list-style-type: none"> In vivo ADME studies : Various species (Dog, Rat, Mouse, Rabbit, Miniature pig, etc.) Customized study design as per client's needs Analysis service of substances and metabolites in plasma, urine, feces Analysis service of biological samples including method development and validation
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Pathology

Pathology	<ul style="list-style-type: none"> Necropsy (Rodent, Non-Rodent) Slide Preparation (Tissue Trimming, Tissue Processing, Tissue Embedding, Tissue Sectioning) Staining (Routine H&E Stain, Special Stain, Immunohistochemistry) Microscopic Observation (Pathology Report, Peer Review) Digital Imaging Service (Scanning, Image analysis) Confocal Laser Scanning Microscopy (CLSM) Services 	Clinical Pathology	<ul style="list-style-type: none"> Hematology and differential counts (Measure CBC, WBC, PLT and Reticulocyte count, etc.) Coagulation tests (PT, APTT, Fibrinogen) Blood chemistry test (General List : TP, AL, B, AST, ALT and other parameters related to efficacy (e.g., HbA1c)) Urinalysis Hormone tests
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HLB bioStep Non-Clinical Services

Bioanalysis

Mass Spectrometry	<ul style="list-style-type: none"> Small molecules Biotherapeutics Peptide Fusion peptide Biomarkers 	Flow Cytometry	<ul style="list-style-type: none"> Immune cell phenotyping Immune cell functional assay Cell cycle analysis Cell apoptosis assay ROS assay Cytometric bead array Biomarker quantification Nuclear antigen quantification
Bioanalysis Service	<ul style="list-style-type: none"> DMPK Studies PK (Pharmacokinetics)/TK (Toxicokinetics) Studies Analytical Method Development and Validation Studies 	Molecular Biology	<ul style="list-style-type: none"> Protein : Ligand binding assay, ELISpot Gene (DNA & RNA) : Real time PCR (Gene expression & Biodistribution)

Korea MFDS GLP Toxicology Study

General Toxicity Study	<ul style="list-style-type: none"> Single dose study (Rodent, Non-rodent) Repeated dose study (Rodent, Non-rodent) 	Genotoxicity Study (Rodent, Non-rodent)	<ul style="list-style-type: none"> AMES test Chromosomal aberration test Micronucleus test
Local Tolerance Study	<ul style="list-style-type: none"> Skin irritation test (Non-rodent) Eye irritation test (Non-rodent) 		

Korea ME GLP Study (Hazardous Chemicals)

Environmental Hazard	<ul style="list-style-type: none"> Daphnia sp. acute immobilisation test Fish acute toxicity test Algae growth inhibition test 	Human Health Hazard	<ul style="list-style-type: none"> Acute oral toxicity study Acute dermal toxicity study Acute dermal irritation/corrosion study Acute eye irritation/corrosion study AMES test Chromosomal aberration test Micronucleus test Skin sensitization test Repeated dose 90-day oral toxicity study
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Medical Device

Bone Graft Materials	<ul style="list-style-type: none"> Beagle mandibular defect Rat calvarial defect 	Skin Care Medical Devices	<ul style="list-style-type: none"> HIFU (High intensive focused ultrasound) Filler
Anti-adhesion Agent	<ul style="list-style-type: none"> Rabbit laminectomy Intra-abdominal blunt trauma Operative incision 	Operation / Intervention Medical Devices	<ul style="list-style-type: none"> Laparoscope Robotic medical device Vascular sealing device
Wound Dressing Materials	<ul style="list-style-type: none"> Rabbit laminectomy Intra-abdominal blunt trauma Operative incision 	Biodegradation / Residual Study	<ul style="list-style-type: none"> Suture Anti-adhesion agent Filler
Hemostatic Agent	<ul style="list-style-type: none"> Mini-pig ESD, EMR Operative perforation 	ETC	<ul style="list-style-type: none"> Evaluation requiring surgical procedure Customized consultation services

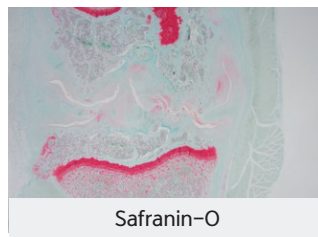
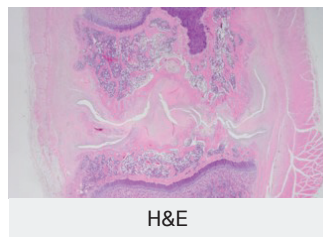
Non-clinical Efficacy Study Services

CRO business at a global level, equipped with expert human resources and state-of-the-art facilities.

MIA-induced Osteoarthritis Model

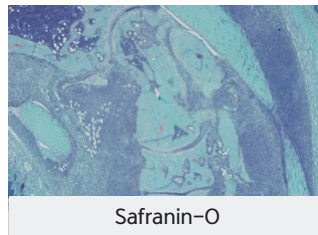
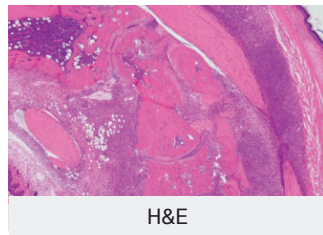
*MIA : Monoiodoacetate

- SD rat, MIA intra-articular injection
- Evaluation: Incapacitance test, Micro-CT, H&E, Safranin-O



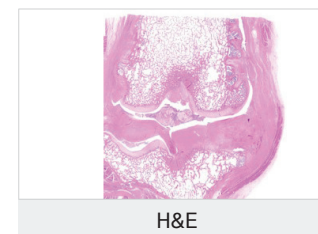
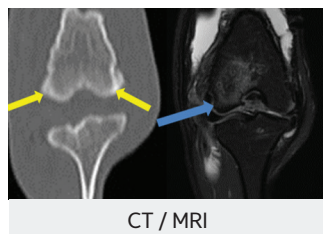
Collagen-induced Osteoarthritis Model

- DBA-1J mouse, Bovine Type II collagen injection to tail
- Evaluation: Arthritis score, Paw edema (Plethysmometer), H&E, Safranin-O



Beagle Osteoarthritis Model

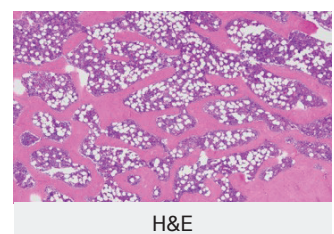
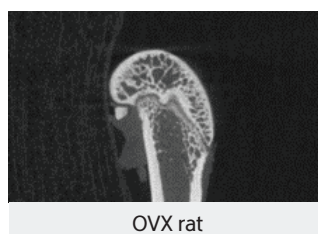
- Beagle, ACLT (Anterior cruciate ligament transection)+ Meniscectomy
- Evaluation: Incapacitance test, CT, MRI, H&E, Safranin-O, etc.



OVX-induced Osteoporosis Model

*OVX : Ovariectomy

- SD rat, Ovariectomy
- Evaluation: Serum biochemistry, ELISA, Micro-CT, H&E

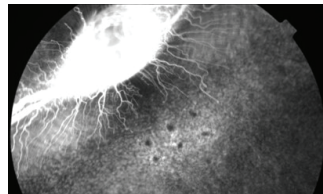


Non-clinical Efficacy Study Services

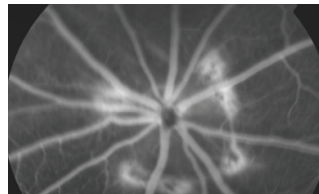
CRO business at a global level, equipped with expert human resources and state-of-the-art facilities.

Wet AMD Model

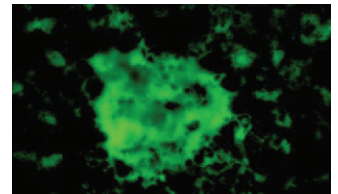
- Rabbit & BN rat, Laser-induced CNV (Choroidal Neovascularization)
- Evaluation: Fundus fluorescein angiography, Choroidal flat mount



Fundus image (Rabbit)



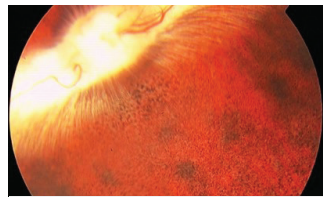
Fundus image (Rat)



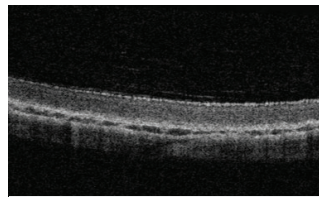
Isolectin B4 stain

Dry AMD Model

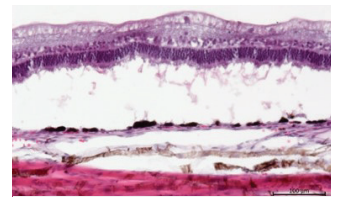
- Rabbit, Sodium iodate intravenous injection
- Evaluation: Fundus photography, OCT, H&E (Thickness of Retinal epithelium)



Fundus image



OCT



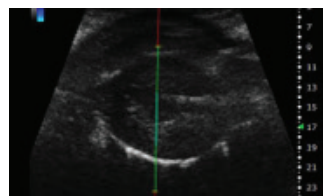
H&E

TAC & MI Models

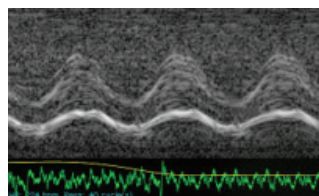
*TAC : Transverse Aortic Constriction

*MI : Myocardial Infarction

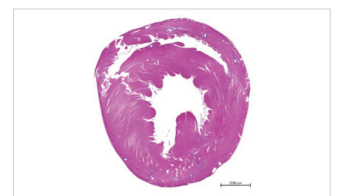
- Rat, Surgical approach
- Evaluation: Echocardiography, H&E, etc.



Echocardiography



Echocardiography



H&E

Middle Cerebral Artery Occlusion Model (stroke)

- SD rat, Probe insertion to external carotid artery
- Evaluation: Rotarod, NDS, MRI



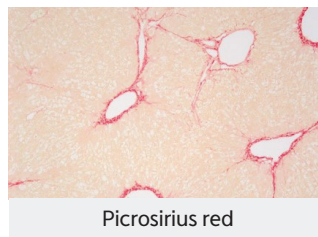
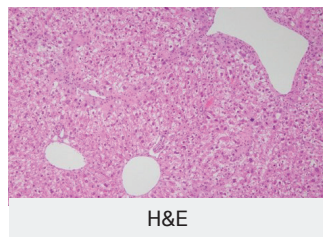
MRI

Non-clinical Efficacy Study Services

CRO business at a global level, equipped with expert human resources and state-of-the-art facilities.

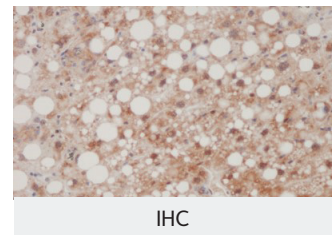
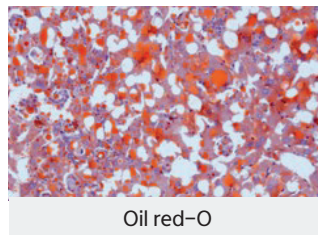
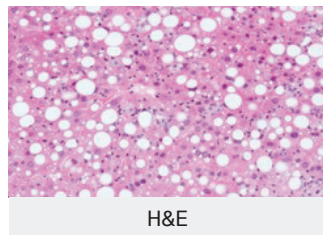
CCl4-induced Liver Fibrosis Model

- BALB/c mouse, CCl₄ intraperitoneal injection
- Evaluation: Serum biochemistry, H&E, Picrosirius red, etc.



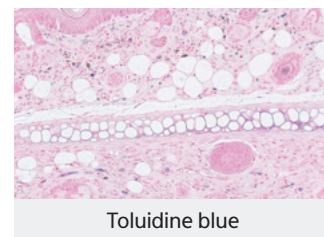
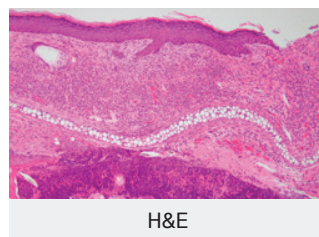
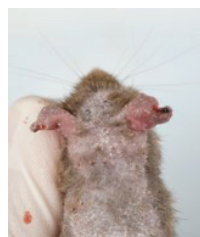
MCD or CDAHFD-induced Fatty Liver Model

- C57BL/6 mouse, MCD or CDAHFD feeding
- Evaluation: Food consumption, Serum biochemistry, H&E, Oil red-O, IHC (Immunohistochemistry)



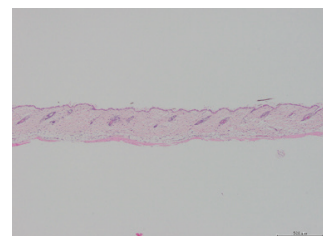
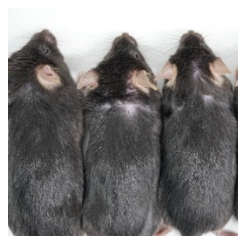
Atopic Dermatitis Model

- Nc/Nga mouse, HDM(House Dust Mite) ointment topical administration
- Evaluation: Gross scoring, Epidermal thickness (H&E), Mast cell (Toluidine blue), etc.



Alopecia Model (Anagen, Catagen)

- C57BL/6 mouse, Corticosterone (Catagen), DHT (Catagen)
- Evaluation: Image analysis, H&E (Hair follicle, Thickness of dermis)



Non-clinical Efficacy Study Services

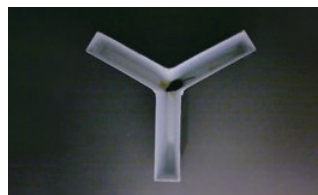
CRO business at a global level, equipped with expert human resources and state-of-the-art facilities.

Alzheimer's Disease Model

- Transgenic mouse (APP/PS1, 3xTg, 5xFAD)
- Evaluation: Morris water maze test (MWM), Y-maze test



Morris water maze



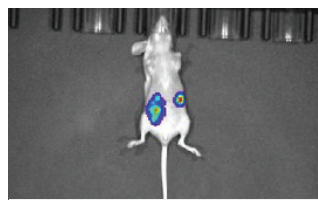
Y-maze

Cancer (Xenograft, Orthotopic, Syngeneic models)

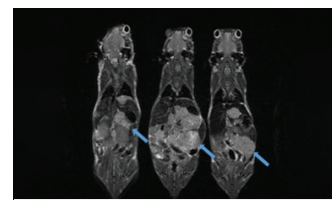
- Mouse, Cancer cell inoculation to subcutaneous space or target organs
- Evaluation: Tumor weight, Tumor size, MRI, IVIS



Tumor size



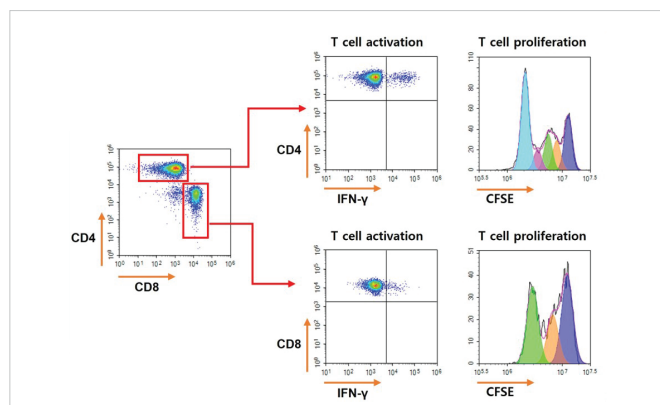
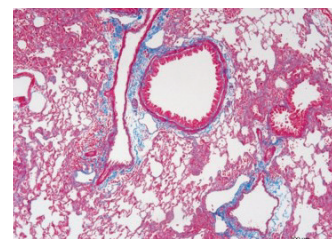
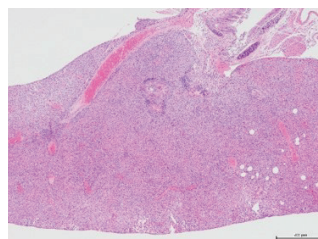
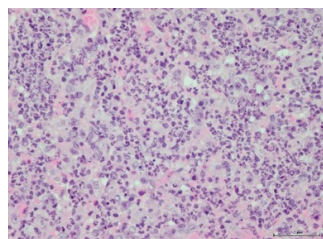
IVIS



MRI

Lung Disease

- Mouse, ARDS (LPS), Asthma (Alum/OVA), IPF (Bleomycin)
- Evaluation: FACs, H&E, Masson's trichrome, etc.

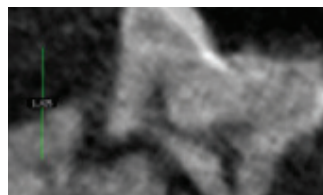


Non-clinical Efficacy Study Services

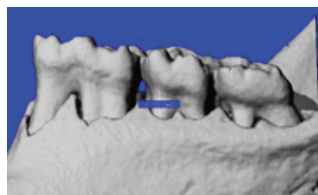
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Periodontitis Model

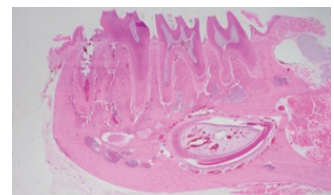
- SD rat, Premolar teeth sutured with silk
- Evaluation: Furcation involvement, Micro CT (CEJ-ABC), H&E, etc.



Furcation involvement



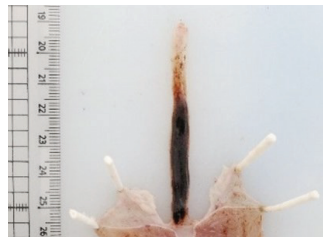
CEJ-ABC



H&E

Reflux Esophagitis Model

- SD rat, Pylorus of stomach and limiting ridge ligation
- Evaluation: Image analysis



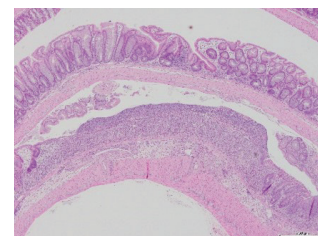
Gastritis Model

- SD rat, Indomethacin or EtOH administration into stomach
- Evaluation: Image analysis



Inflammatory Bowel Disease Model (Colitis)

- C57BL/6 mouse, DSS (Dextran sulfate sodium)-induced, ad libitum
- Evaluation: Body weight, Stool type, Bleeding, Length and weight of colon, H&E (SWISS roll)



Non-clinical Efficacy Study Services for Medical Devices

CRO business at a global level, equipped with expert human resources and state-of-the-art facilities.

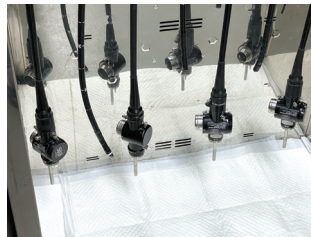
[Flagship case]



- FDA Approval for NextBioMedical's NexPowder for U.S. Sales
- A hemostatic agent in powder form applied through endoscopy to the bleeding site in the gastrointestinal tract. Non-clinical study conducted by HLB bioStep submitted to the FDA.

Endoscopic Hemostatic agent

- Pig, ESD or EMR induced bleeding model
- Evaluation: Hemostasis, Performance of medical device, Histopathology (H&E staining)



Epidermal adhesive for wound closure

- Pig, Surgical incision induced wound model
- Evaluation: Wound closure, Dehiscence, Healing, Histopathology (H&E staining)



Bone graft material

- Beagle dog, Mandibular defect model
- Evaluation: Bone defect healing, Inflammation, X-ray, CT, Histopathology (H&E, MT staining)



Medical devices for dermatological aesthetics

- Pig
- Evaluation: Visual observation, CBC, Serum chemistry, Histopathology (H&E, MT, Victoria blue, NBTC staining)



Ensuring accurate and reliable test results through the use of top-quality medical imaging equipment

Key Study Equipment



SIGNA™ Pioneer 3.0T MRI

GE HealthCare Technologies, Inc., USA

- Osteoarthritis / Orthotopic model (cancer)
- Middle cerebral artery occlusion (MCAO)



Alexion CT

Canon Medical Systems Corporation., Japan

- Osteoarthritis / Obesity
- Computed tomography angiography (CTA)



MyVet Table X500 (X-ray)

Woorien., Korea

- Osteoarthritis / Critical size or bone defect
- Pneumonia



IVIS™ Spectrum

PerkinElmer Inc., USA

- Distribution study
- Orthotopic model (cancer)



Quantum GX2 microCT System

PerkinElmer Inc., USA

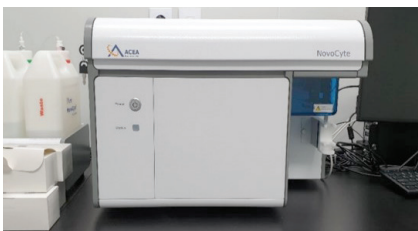
- Osteoarthritis / Critical size or bone defect
- Obesity / Sarcopenia



iNSIGHT VET DXA

OSTEOSYS, Korea

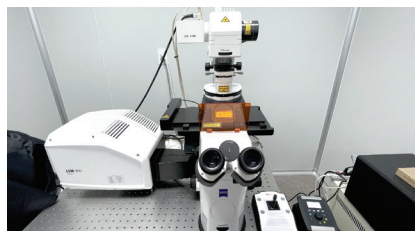
- Obesity (Bone, Fat, Lean mass)
- Sarcopenia



NovoCyte™ 3000

Agilent Technologies, USA

- Fluorescence activated cell sorting (FACS)



LSM 900 (Confocal microscopy)

ZEISS, GERMANY

- Histopathological examination
- Distribution study



Nexera / QTRAP 6500+ (LC-MS/MS)

Shimadzu Corporation., Japan / AB Sciex LLC., USA

- Biological sample analysis (PK, ADME)

Medical Device Efficacy Study Infrastructures



Operating Room

- Having the most operating rooms (4) among Korea's CROs



Evaluation Facility

- The only holder of a 3.0T MRI among Korea's CROs
- CT, Angiography system, Ultrasound system



Human Resources

- Having the most researchers (over 100) and veterinarians (over 16) among Korea's CROs

Meeting Note

Date. _____

Lined area for meeting notes

Thorough analysis, precise judgment, and intense deliberation for human health.

HLB bioStep, as a leading non-clinical CRO systematically provides customers with the non-clinical evaluation services required in the development of new pharmaceuticals and medical devices. This is achieved through our skilled experts and professionals who can deliver rapid and highly reliable results, state-of-the-art medical imaging equipment, and extensive experimental experience.



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