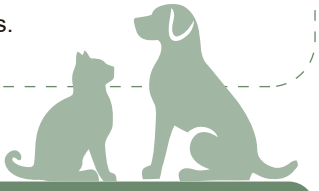
ProBio

Antibody Engineering and *in vivo* Pharmacology for Animal Drug Development

As pets increasingly become indispensable family members globally, the rising pet economy drives demand for advanced healthcare solutions. Cancer remains a critical threat, affecting 25% of dogs and 20-30% of cats in their lifetimes, with 6 million annual canine and 3 million feline cancer cases worldwide. Despite this urgency, the veterinary drug market allocates <20% to specialized pet therapeutics, leaving vast unmet needs. Bridging this gap requires innovative biologics tailored to companion animals.

Current cross-species antibody therapies face critical limitations: while 70-80% sequence homology exists between human and pet disease targets, human-derived antibodies rarely achieve functional equivalence in pets. Chimeric antibodies often trigger immunogenicity, compromising efficacy and safety. Species-specific monoclonal antibodies (e.g., fully canine/feline) represent the future of precision pet medicine—yet few platforms address the unique challenges of antibody caninization & felinization and animal disease models. This is where our expertise transforms possibilities into life-saving solutions.



Service Highlights

20+

caninization/felinization projects

10+

disease models of dogs and cats

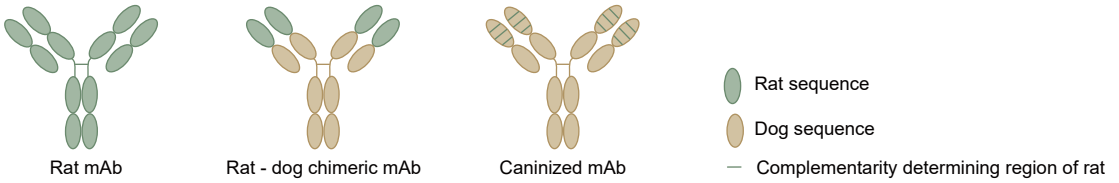
Advanced mutation strategy

- Structural modelling
- Unique precise mutagenesis library (PML) and FASEBA screening technology

Extensive experience in establishing animal models

- Multiple ready-to-use induction disease models
- Availability of spontaneous disease animal recruitment for simulating pet clinical trials

Antibody Caninization & Felinization



Schematic Diagram of Caninization & Felinization

1. Search parental sequences against IMGT/NCBI database
2. Homology modeling of parental antibody Fv fragments
3. Design stepwise incorporation of one or more back mutations in the grafted antibody sequence
4. Select one Cannie/Feline acceptor for VH/VL with the highest identity to parental counterparts
5. Compare antibody sequences near CDRs, canonical residues, loop interactions, and foundation cores

Case Study

Antibody Caninization

Antibody	ka (1/s)	kd (1/s)	KD (1/s)
Chimeric	2.07E+06	3.66E-04	1.77E-10
Variant 1	1.87E+06	3.02E-04	1.62E-10
Variant 2	1.67E+06	3.36E-04	2.01E-10
Variant 3	2.01E+06	4.66E-04	2.32E-10

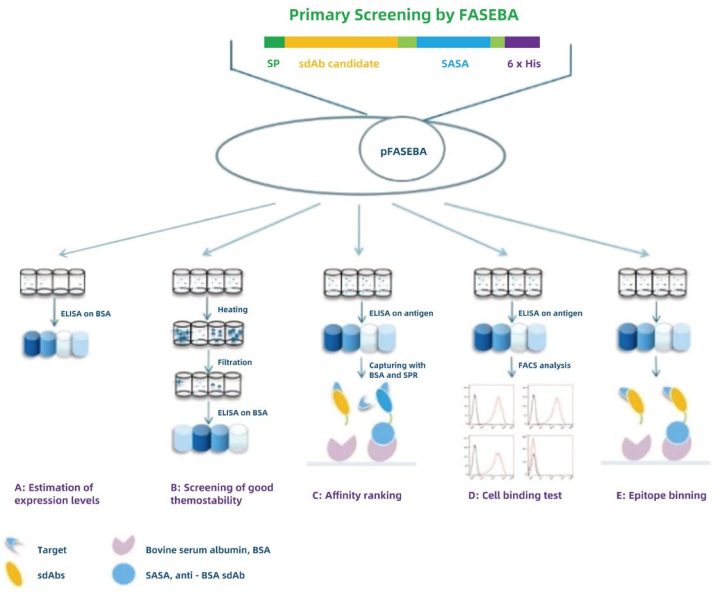
Antibody Felinization

Antibody	ka (1/s)	kd (1/s)	KD (1/s)
Chimeric	5.35E+05	2.93E-04	5.47E-10
Variant 1	5.09E+05	2.25E-04	4.42E-10
Variant 2	5.01E+05	2.46E-04	4.92E-10
Variant 3	4.48E+05	1.83E-04	4.08E-10

The antibody canonization/felinization projects were successfully delivered, and canonized/felinized antibodies with an affinity comparable to that of chimeric antibodies (10^{-10}) were obtained.

Canine/Feline Antibody Affinity Maturation

Modelling & Design → Precise Site-Saturation Mutagenesis Library (PML) construction → FASEBA screening & SPR affinity ranking → Combinatorial library construction & FASEBA screening → Affinity matured IgG production & characteriza-tion



FA **Fast**
S **Screening of**
E **Expression**
B **Biophysical-properties**
A **Affinity**

Biacore 8K

Biacore T200

FASEBA High-throughput Screening Platform

Case Study

Feline Antibody Affinity Maturation

Antibody	ka (1/s)	kd (1/s)	KD (M)
Canine-WT	1.23E+05	1.10E-03	8.92E-09
Variant 1	2.02E+05	5.23E-05	2.59E-10
Variant 2	6.74E+05	1.87E-05	2.78E-11
Variant 3	3.80E+05	3.80E-05	5.29E-11

Feline Antibody Affinity Maturation

Antibody	ka (1/s)	kd (1/s)	KD (M)
Feline WT	6.49E+04	1.17E-04	1.80E-09
Variant 1	7.20E+04	1.09E-05	1.52E-10
Variant 2	8.43E+04	1.25E-05	1.48E-10
Variant 3	8.87E+04	4.40E-06	4.96E-11

Canine Antibody: The affinity of the canine-derived antibody was successfully increased by **302 times**, from **$8*10^{-09}$ to $2*10^{-11}$**.

Feline Antibody: The affinity of the feline-derived antibody was successfully increased by **36 times**, from **$1*10^{-09}$ to $4*10^{-11}$**.

in vivo Evaluation

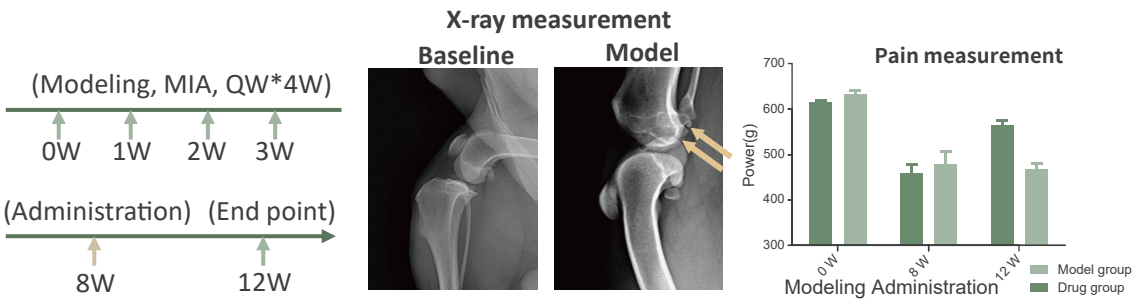
Disease models of dogs

Indication	Modeling method
Pain	Formalin induction model; Kaolin induction model
T1DM	Alloxan induction model; STZ induction model
Calculus	Hyperoxaluria model
Atopic dermatitis	MC903 induced model; Cytokine-induced pruritus model
Osteoarthritis	MIA induction model
Leukopenia	Cyclophosphamide-induced myeloablative model

Disease models of cats

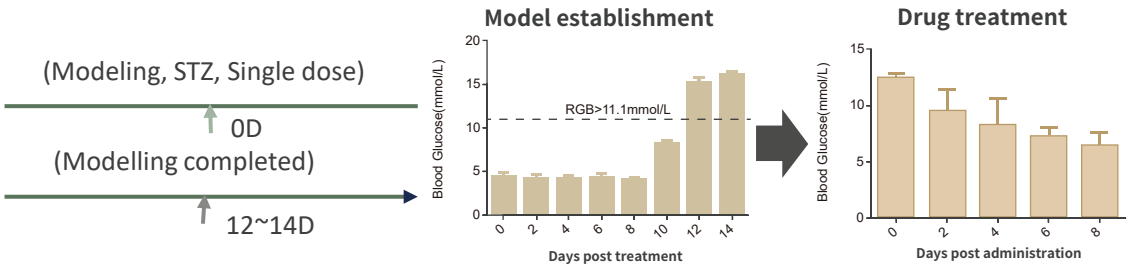
Indication	Modeling method
T1DM	STZ induction model
T2DM	High fat diet+STZ+operation
FIPV infection	FIPV infection model
Osteoarthritis	MIA induction model
Obesity	Spontaneous obese model

Canine osteoarthritis model



Based on the MIA intra-articular injection, the canine osteoarthritis model was induced and effectively alleviated by drug treatment.

Feline T1DM model



STZ was used to induce T1DM model in cats, and blood glucose was effectively reduced by drug treatment.

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