Discovery of Atto 1310, an IL31 Antagonist Developed From Attobody Platform

6.24.2025

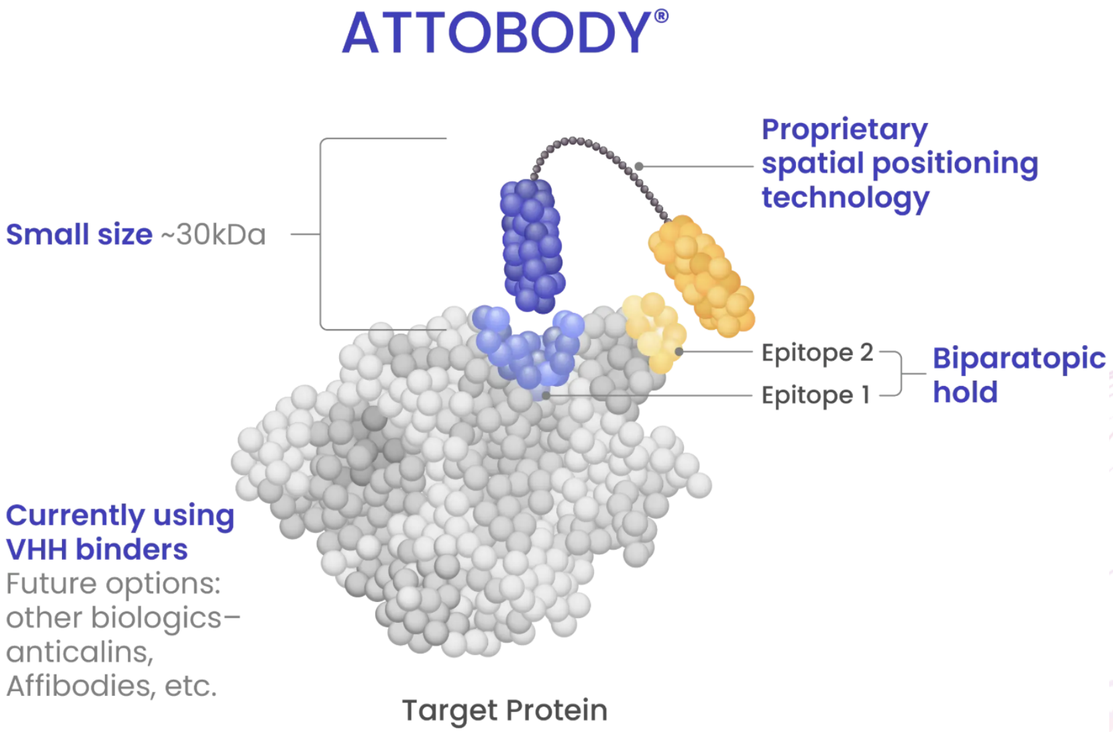
Attovia Therapeutics

ATTOBODY

ATTOBODIES are composed of two binder arms connected through proprietary spatial positioning technology. This technology orients the arms in an optimal configuration to drive desired target engagement.

Currently, our ATTOBODIES utilize VHHs as their binder arms. The VHH format is a well-understood framework that is clinically and commercially validated, naturally derived, and easily obtained.

ATTOBODIES are a flexible modality that can be used in their native form, as well as easily built out as bi- and multimers, fused to Fc-domains to modulate effector functions or extending half-life, or conjugated to various payloads.

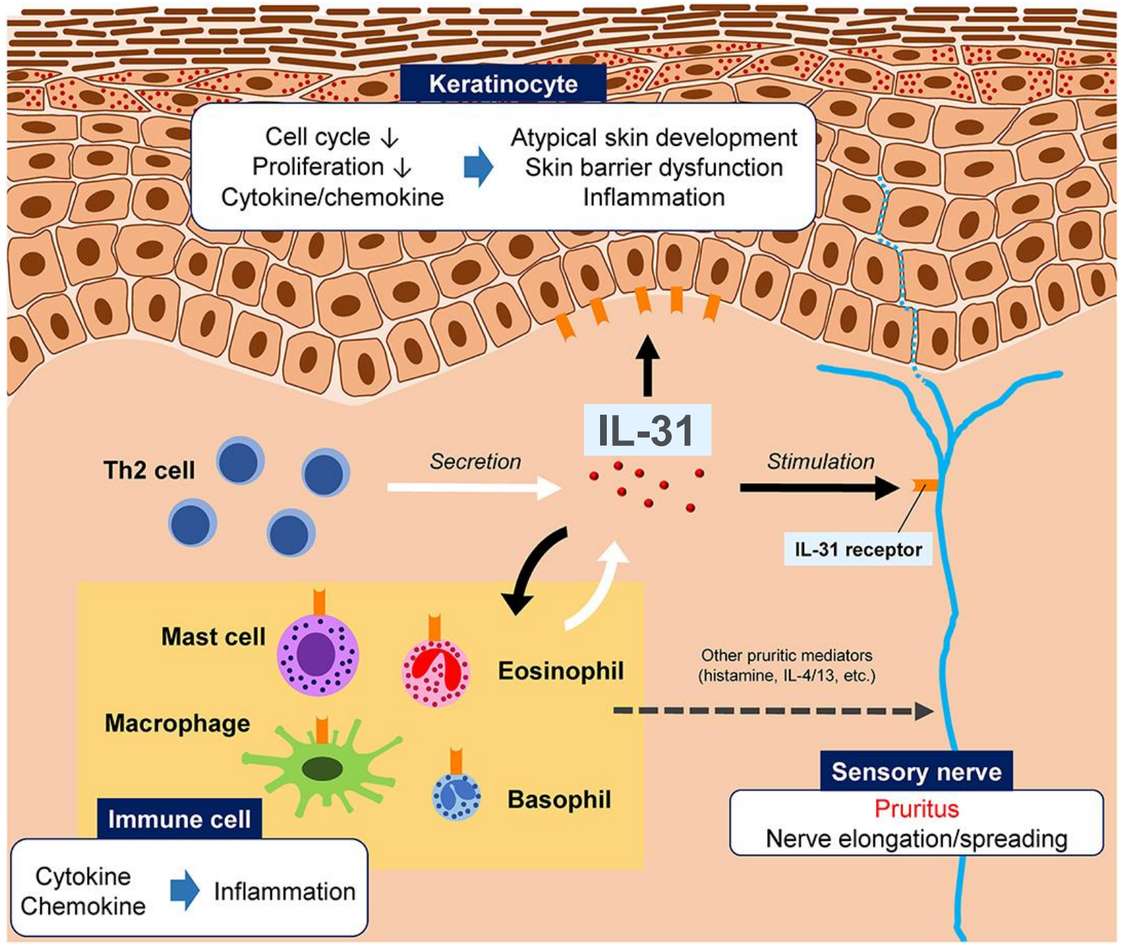


Our Pipeline

Immunology

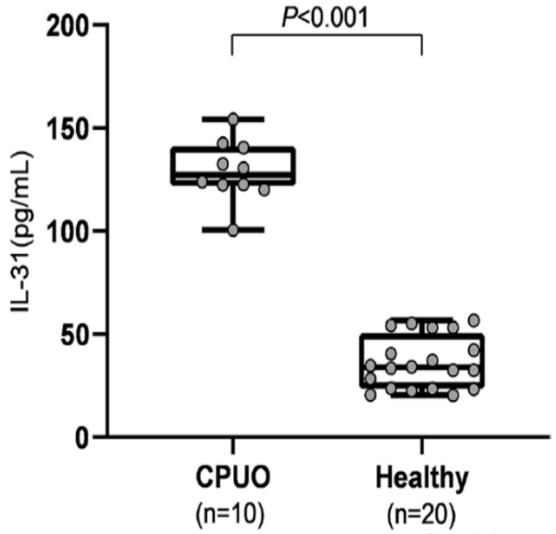
PROGRAM	TARGET	DISCOVERY	IND ENABLING	Phase 1
ATTO-1310	IL31			
ATTO-3712	IL31 X IL13			
ATTO-004	Undisclosed IBD multispecific			
ATTO-005	Undisclosed multispecific			
ATTO-006	Undisclosed multispecific			

IL31 is an attractive target for pruritic indications that lack effective treatments



Kabashima and Irie, Frontiers in Medicine 2021

Serum IL-31 discriminates CPUO patients from age-matched controls



Salao et al., Biomark insights. 2020

Attovia Discovery Platform

Yeast and Phage display,
SPR and HT-SPR

Affinity, Epitope (HT-SPR),
Developability
Function (Cell Biology)

Immunogenicity
Characterization after
engineering

Choose the option best suited for your application

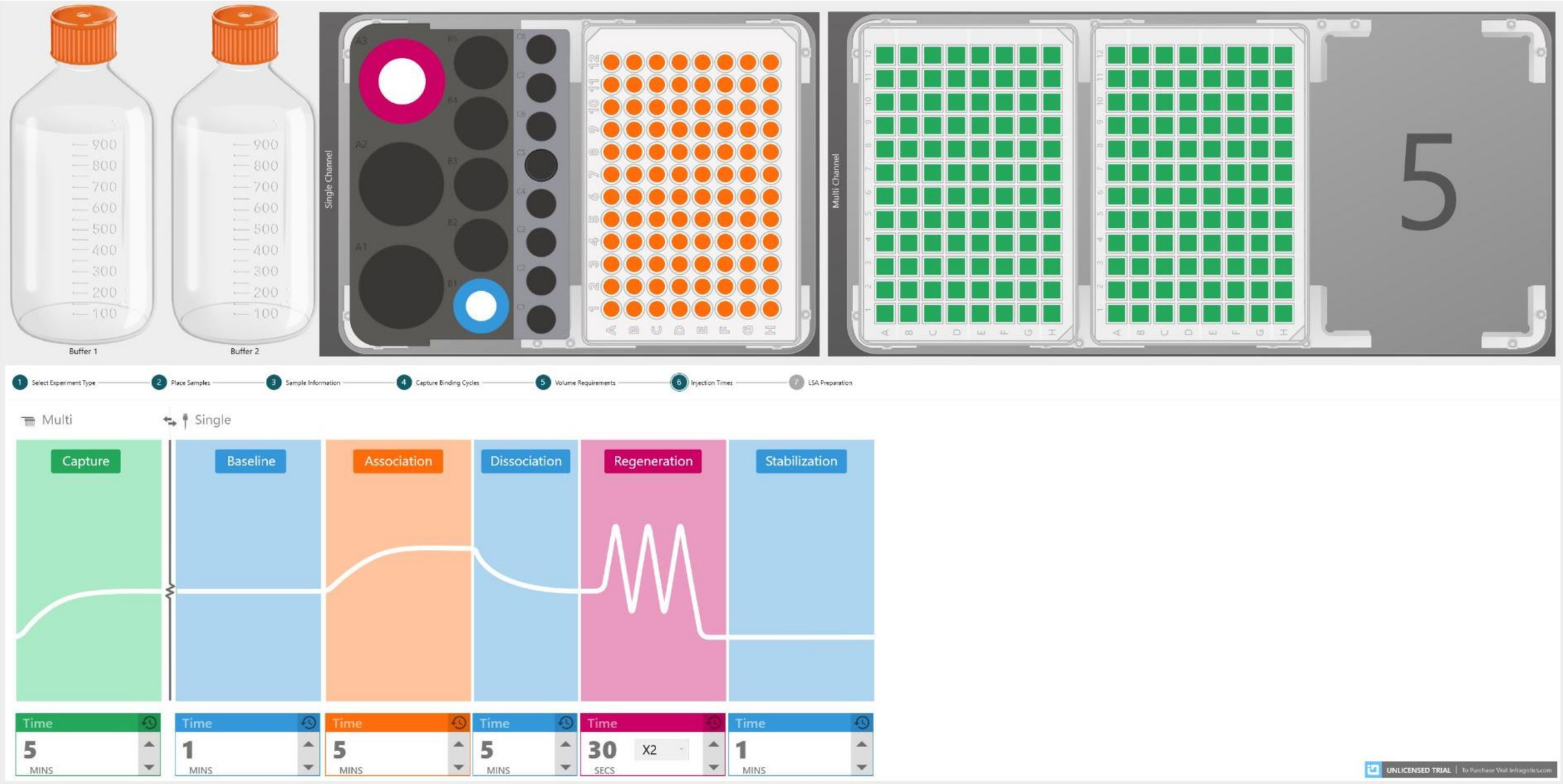
LSA

- Market leader in high-throughput antibody characterization
- Detailed antibody kinetics at the earliest stages of drug discovery
- Epitope binning at a meaningful scale
- Characterization directly from crude material

LSA^{XT}

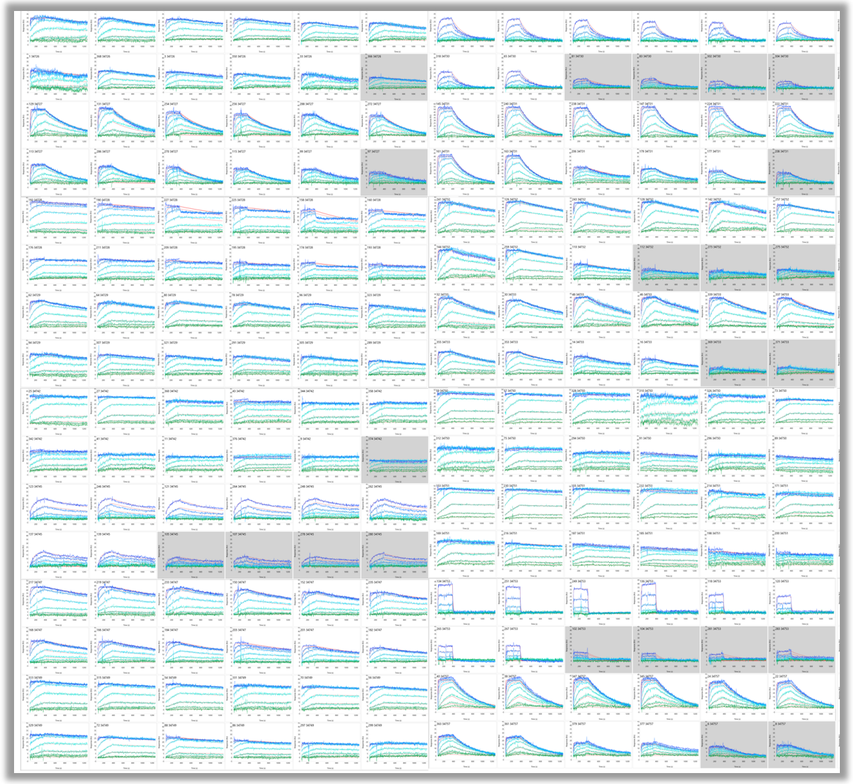
- All the benefits of LSA plus enhanced data quality for the most demanding applications
- Rapid kinetics and weak binders such as FcγRs and cytokine panels
- Small analyte formats such as peptides, TPDs, and molecular glues

Navigator: The LSA's intuitive control software

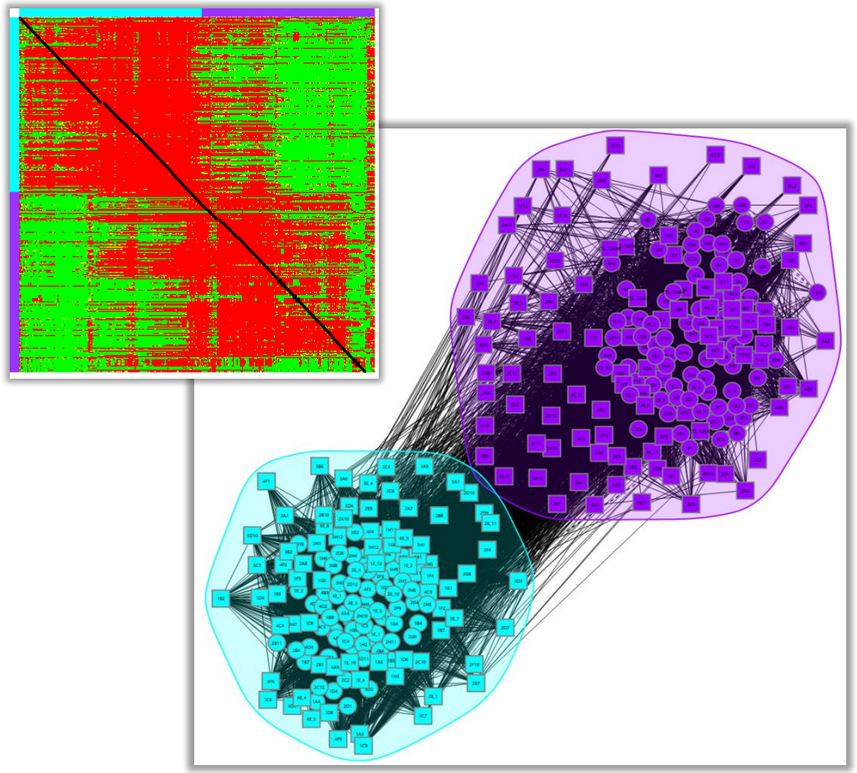


Dedicated analysis **s**oftware

kinetics

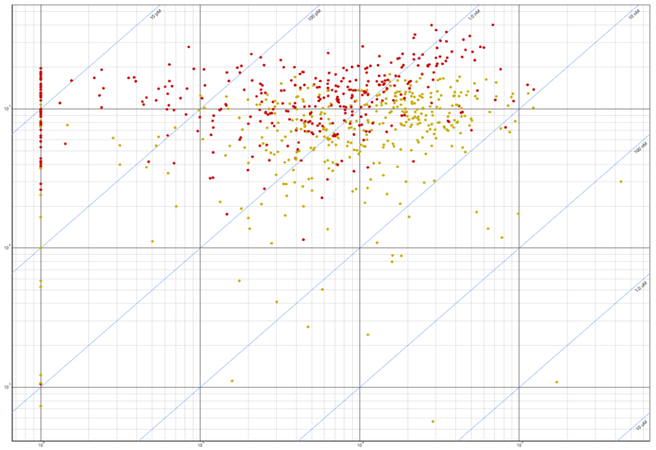


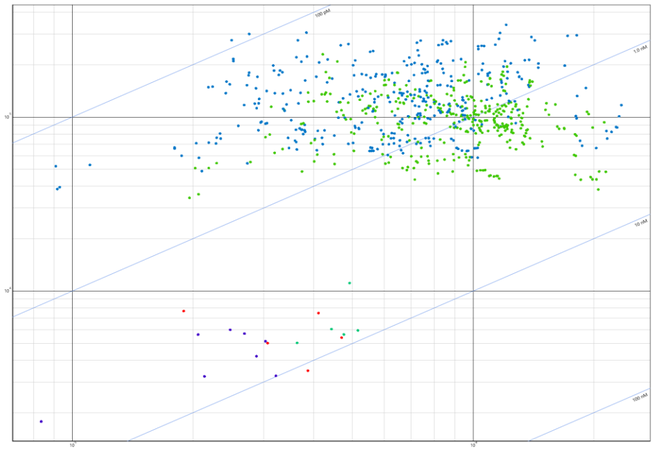
epitope

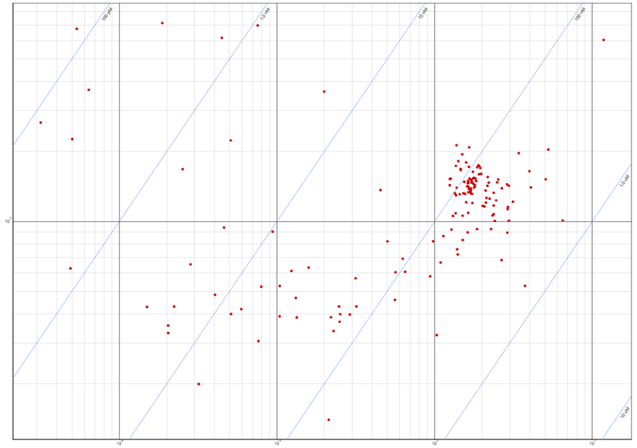


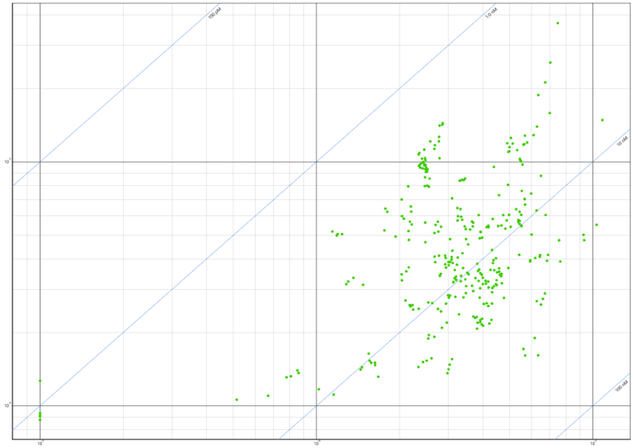
HT-SPR (crude sample and recombinant proteins)

crude sample more than 8x96-well plates

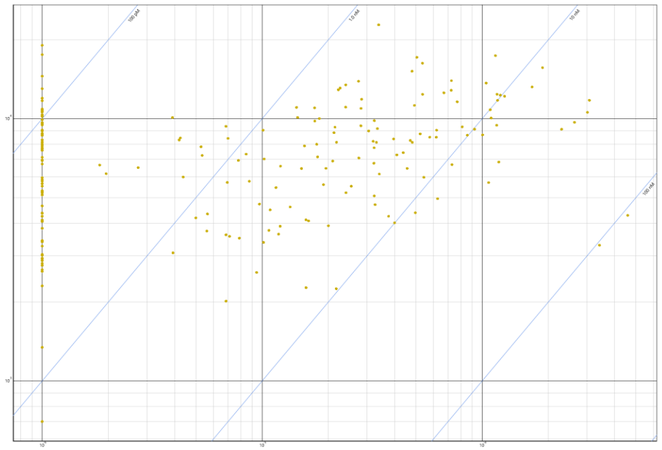


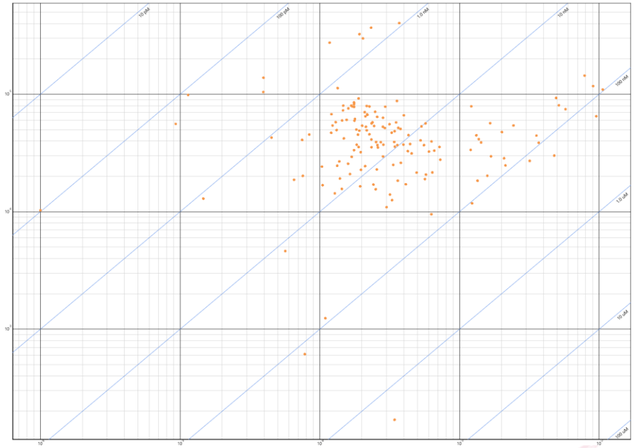






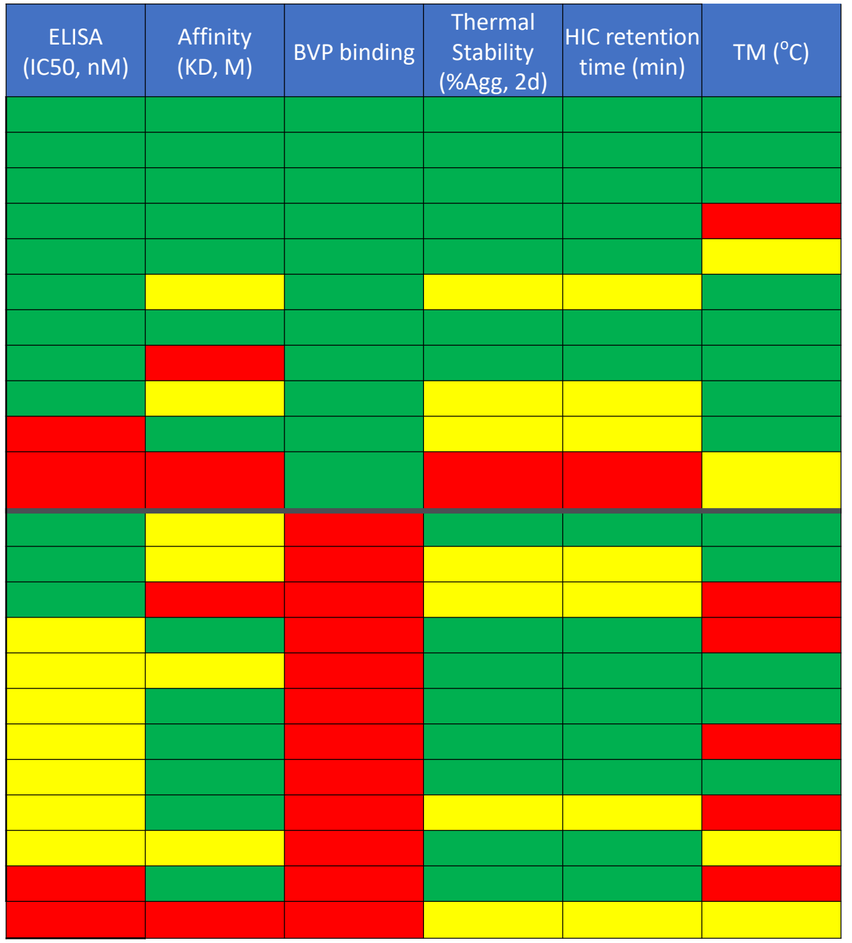
recombinant proteins (96-192 Samples)



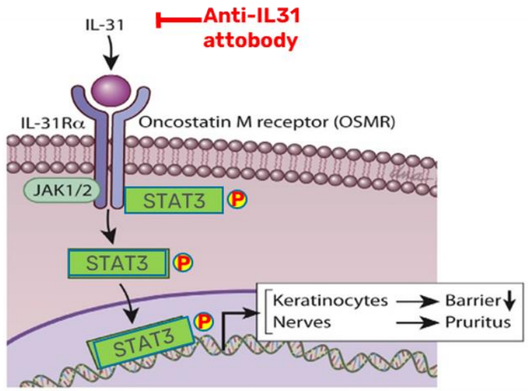


Data to select lead anti-IL31 AttoFc's

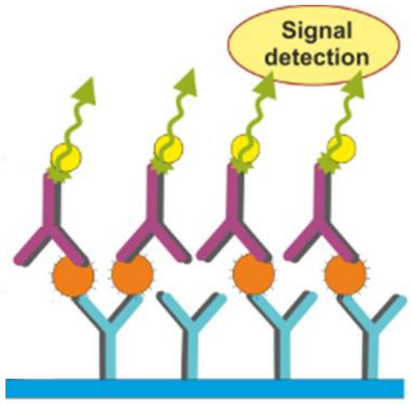
- Attobodies specific for IL31 were isolated using yeast display
- Attobodies were formatted as FC-fusions and tested for affinity and biological activity.
- Several attobodies demonstrate comparable activity to clinical benchmark
- Developability assessment



pSTAT3 assay reveals activity for top hits

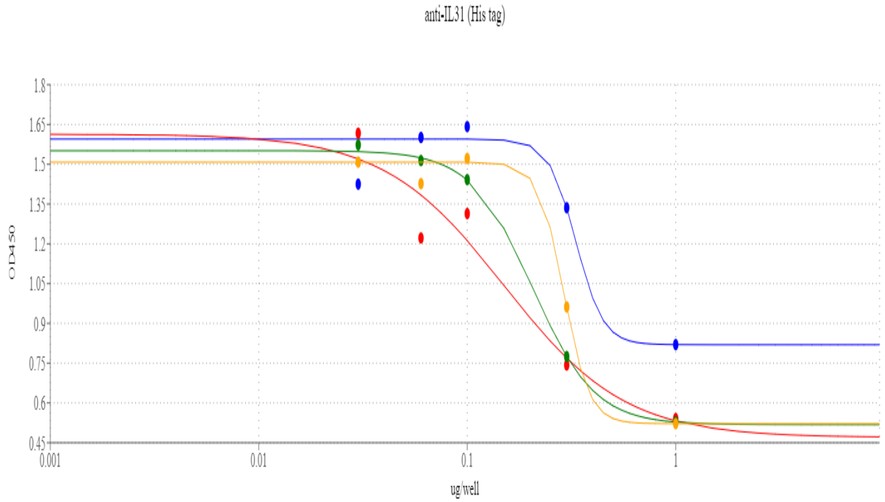


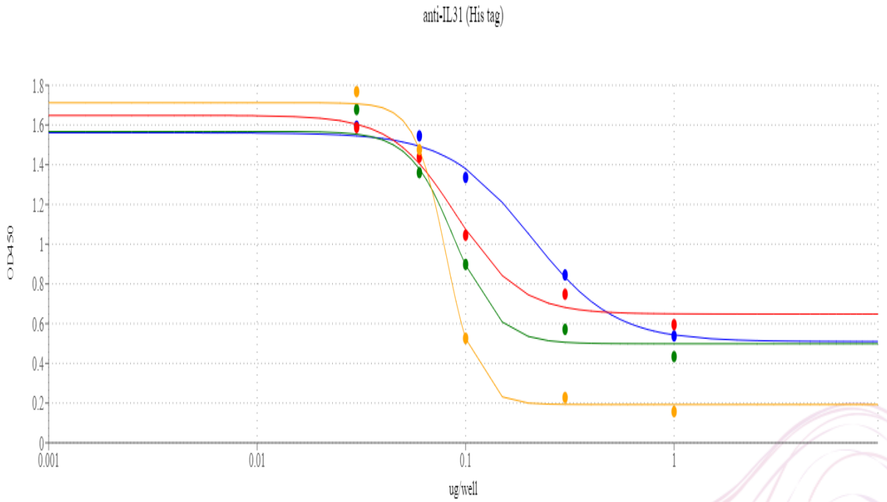
Hela cells stably transfected with human IL31R

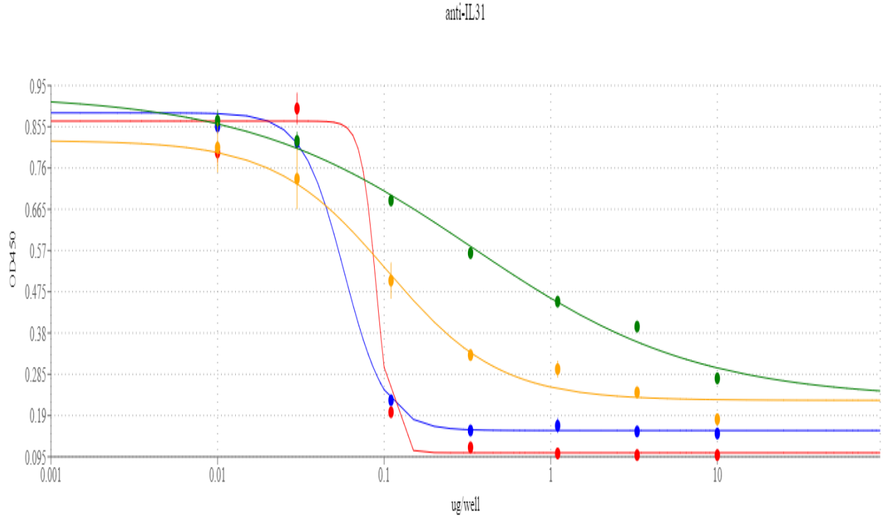


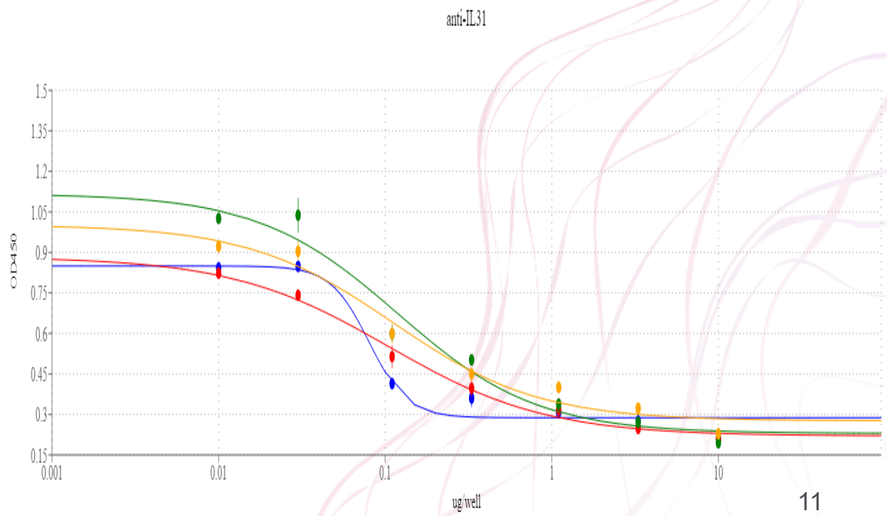
Detect:
Phospho-Stat3

Capture:
Total Stat3

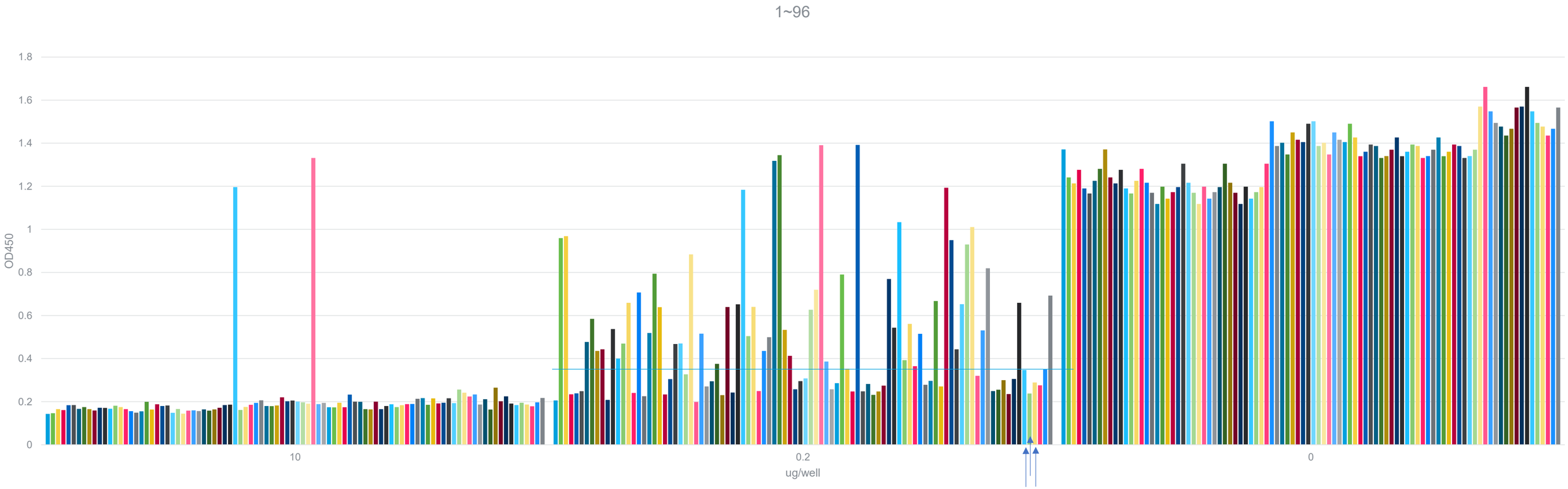








Multiple AttoFc passed preliminary potency assessment



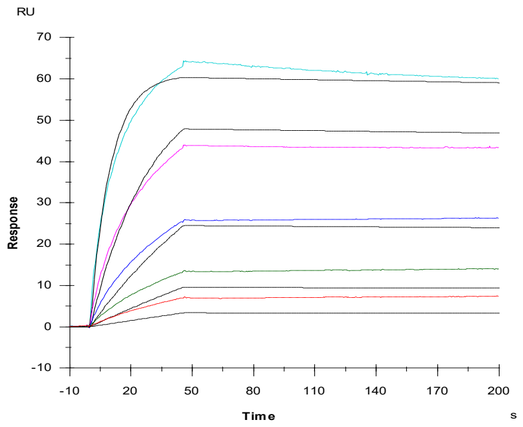
- AttoFc were tested at high vs low concentration to assess activity
  - 2 AttoFc showed no inhibitory activity, even at high concentration
  - 37 of 91 AttoFc inhibitied IL31-induced pSTAT3 on par with reference Ab when tested at low concentration
- Top 37 AttoFc were re-tested to establish IC50 for IL31 inhibitory activity

Four AttoFc were identified as top hits from discovery and characterization campaigns

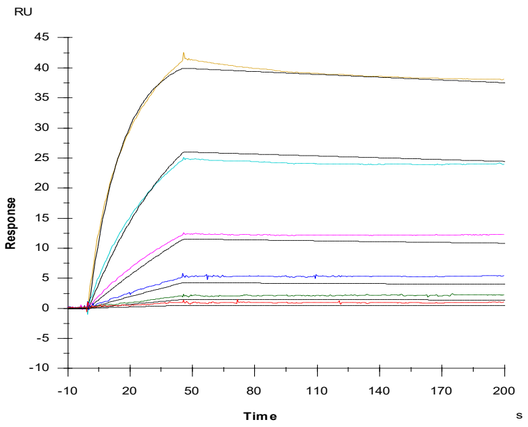
Clone	ELISA (IC50, nM)	Affinity (KD, pM)	TM (oC)	BVP binding	HIC retention time (min)	Thermal Stability (%Aggregation, 2d)
A01						
A02						
A03						
A04						

All lead AttoFc are stable through 3x freeze/thaw cycles
Lead AttoFc show minimal change in affinity after freeze/thaw

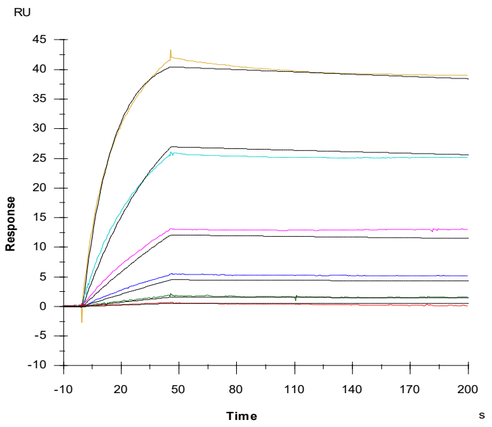
Clone A01



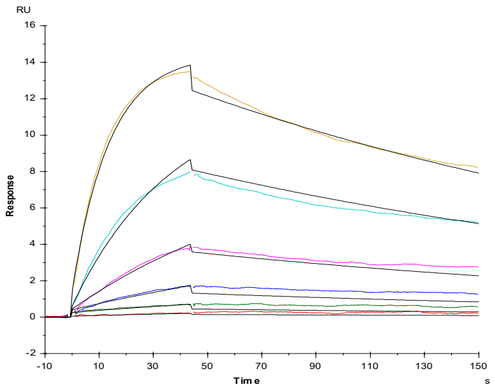
Clone A02



Clone A03

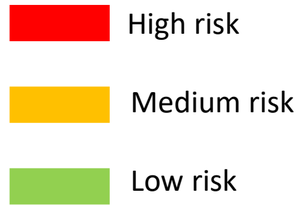


Clone A04



Snapshot of developability characterization for top AttoFc

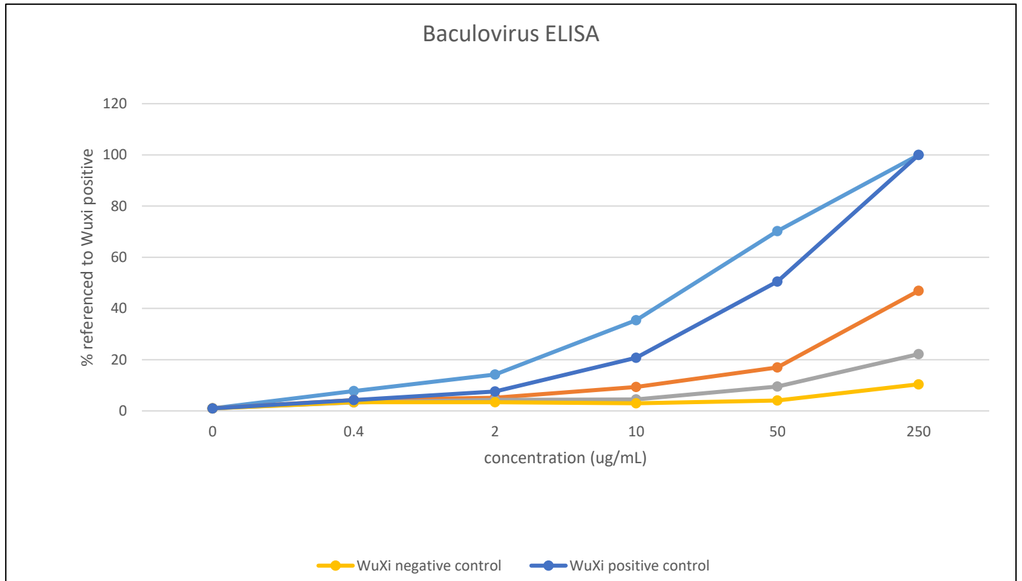
Sample	DSF Tm1 (°C)	HIC Major Peak RT (min)	BVP Binding (% C+)	ACSINS Referenced to Wuxi positive control (%)	Insulin Referenced to Wuxi positive control (%)	DNA Referenced to Wuxi positive control (%)
A01						
A02						
A03						
A04						

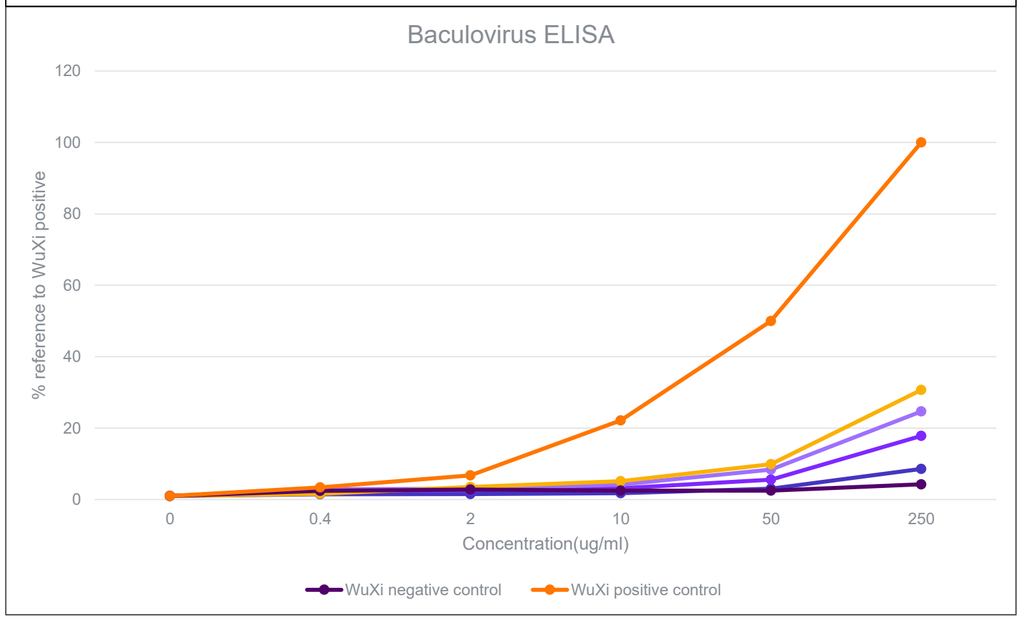


- Risk was determined by WuXi for all criteria except Tm
- HIC was determined internally

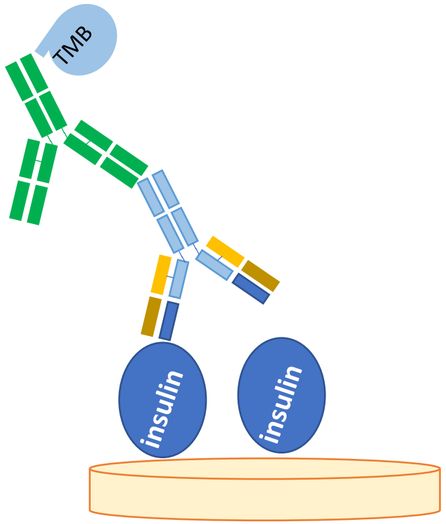
BVP ELISA suggests potential polyspecificity for some AttoFc

Name	Normalization factor*	Normalized Baculovirus score*	Referenced to Wuxi positive control (%)
	43.70	29.40	99.96
	54.35	13.80	46.91
	52.94	6.52	22.17
Wuxi negative control	50.93	3.06	10.40
Wuxi positive control	53.77	29.41	100.00
	19.13	10.74	24.67
Wuxi negative control	15.45	1.86	4.27
Wuxi positive control	16.34	43.56	100.00



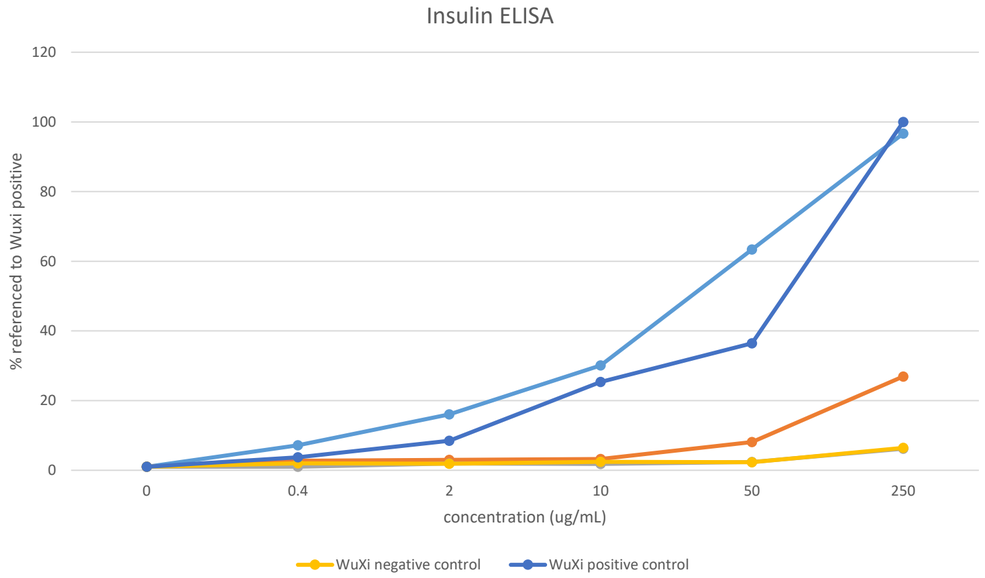


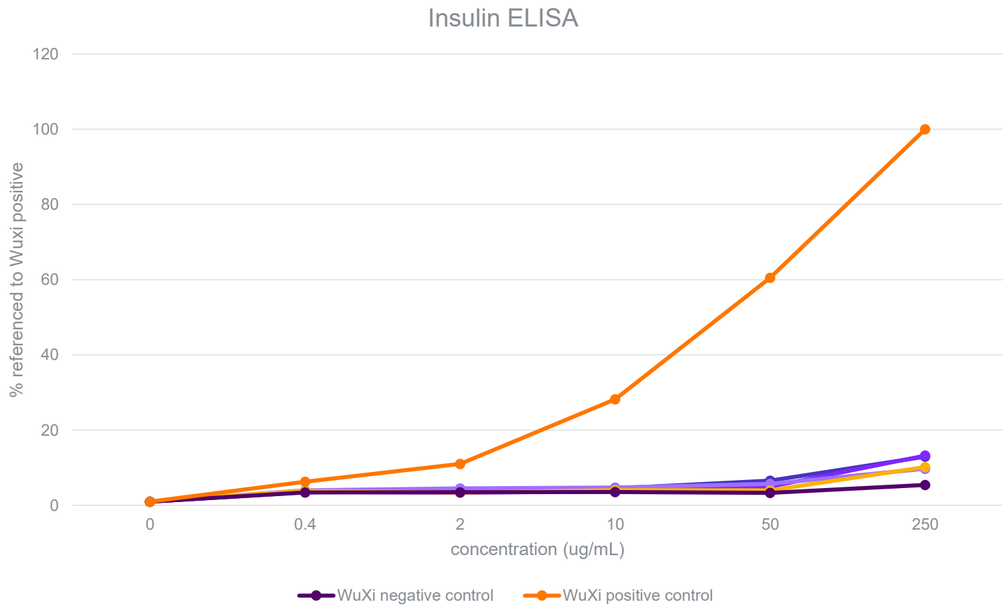
Insulin binding suggests a liability for 1-2 AttoFc



Read absorbance at 450nm

Name	Normalization factor*	Normalized Insulin score*	Referenced to Wuxi positive control (%)
	80.28	49.95	96.67
	127.66	13.91	26.93
	99.17	3.20	6.19
Wuxi negative control	116.56	3.33	6.44
Wuxi positive control	123.45	51.66	100.00
	25.19	2.90	9.74
Wuxi negative control	18.39	1.62	5.44
Wuxi positive control	18.78	29.79	100.00

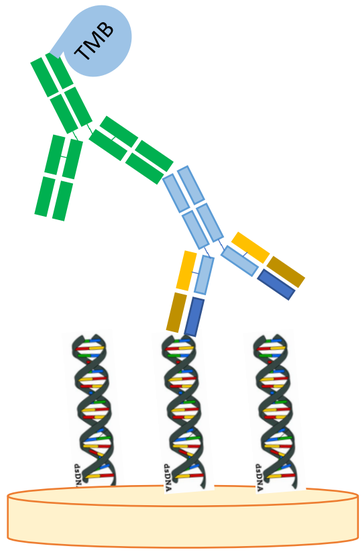




Insulin score (% referenced to Wuxi positive control):

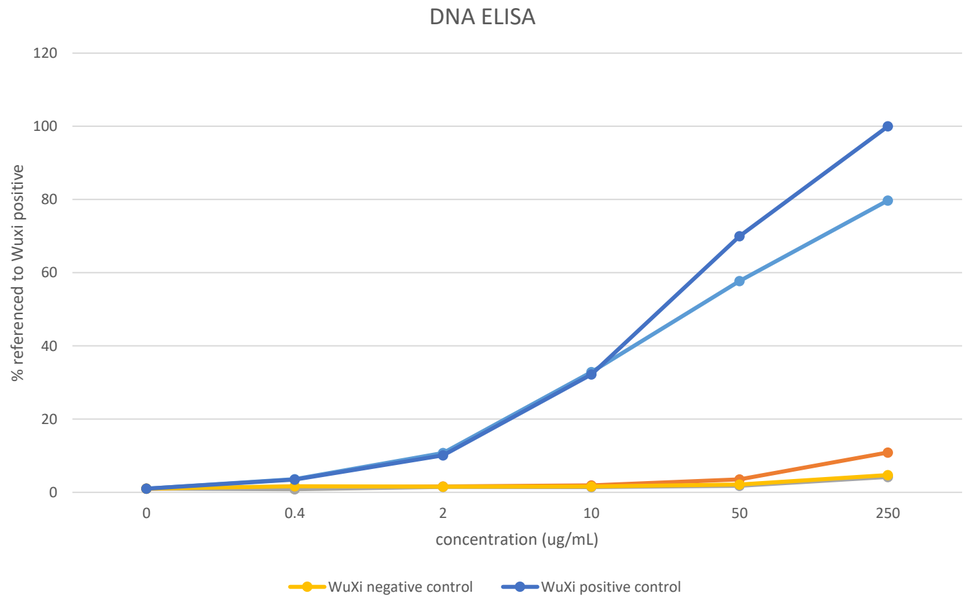
- < 25: low risk
- 25~50: medium risk
- >50: high risk

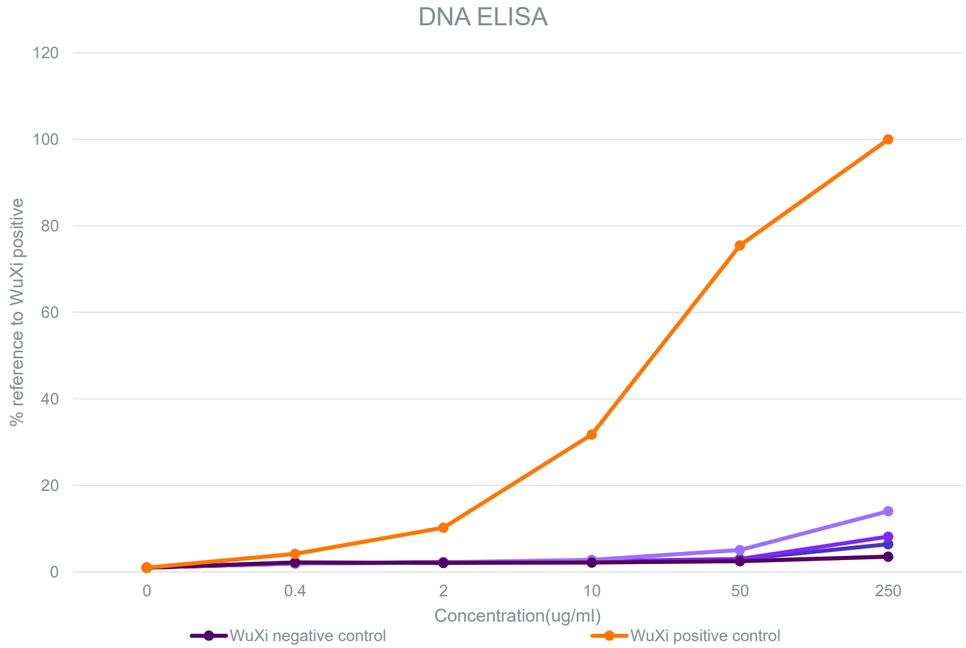
DNA binding suggests a liability for 1-2 AttoFc



Read absorbance at 450nm

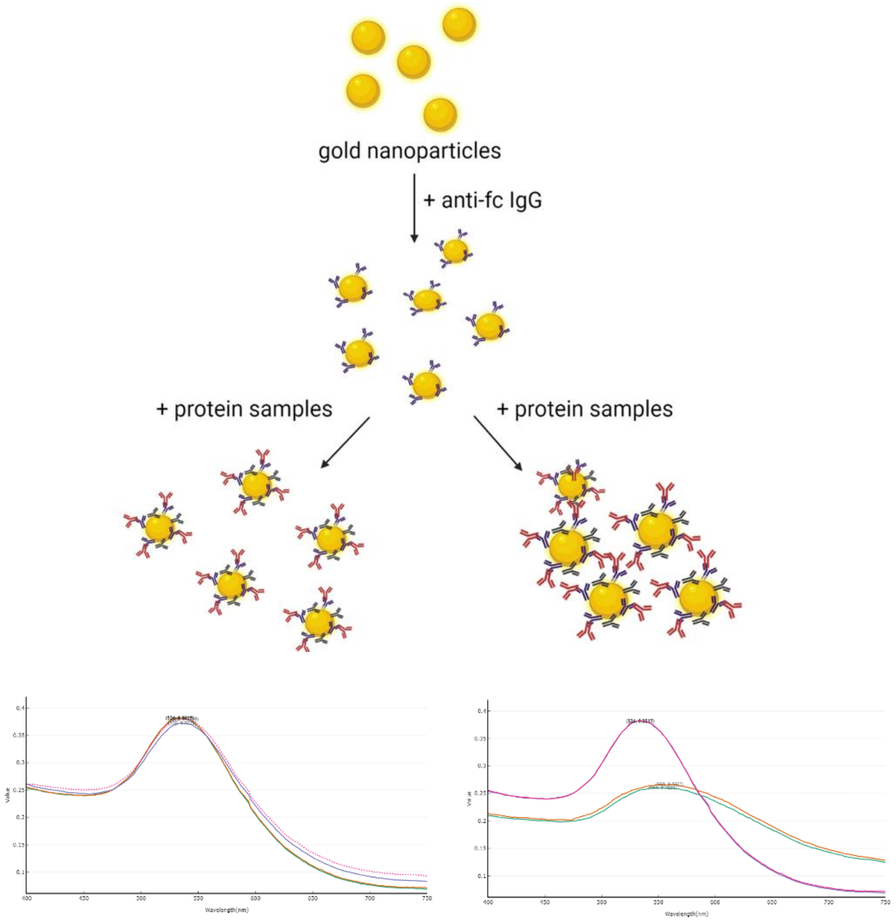
Name	Normalization factor*	Normalized DNA score*	Referenced to Wuxi positive control (%)
	46.76	57.08	79.75
	57.48	7.80	10.89
	55.48	3.01	4.21
Wuxi negative control	63.55	3.38	4.72
Wuxi positive control	58.55	71.57	100.00
	13.56	7.38	14.04
Wuxi negative control	14.61	1.86	3.53
Wuxi positive control	13.74	52.60	100.00





ACSINS data indicates low propensity for AttoFc aggregation

Assay objective: to evaluate the propensity of self-association and aggregation of antibody samples



Sample	Wavelength (nm)	Wavelength shift (nm)	ACSINS score referenced to Wuxi positive control (%)
	547	**10**	**37.04**
	542	**5**	**18.52**
	543	**6**	**22.22**
Wuxi negative control	540	3	11.11
Wuxi positive control	564	27	100.00
Blank	537		
	543	**2**	**9.52**
Wuxi negative control	530	2	9.52
Wuxi positive control	549	21	100.00
blank	528		

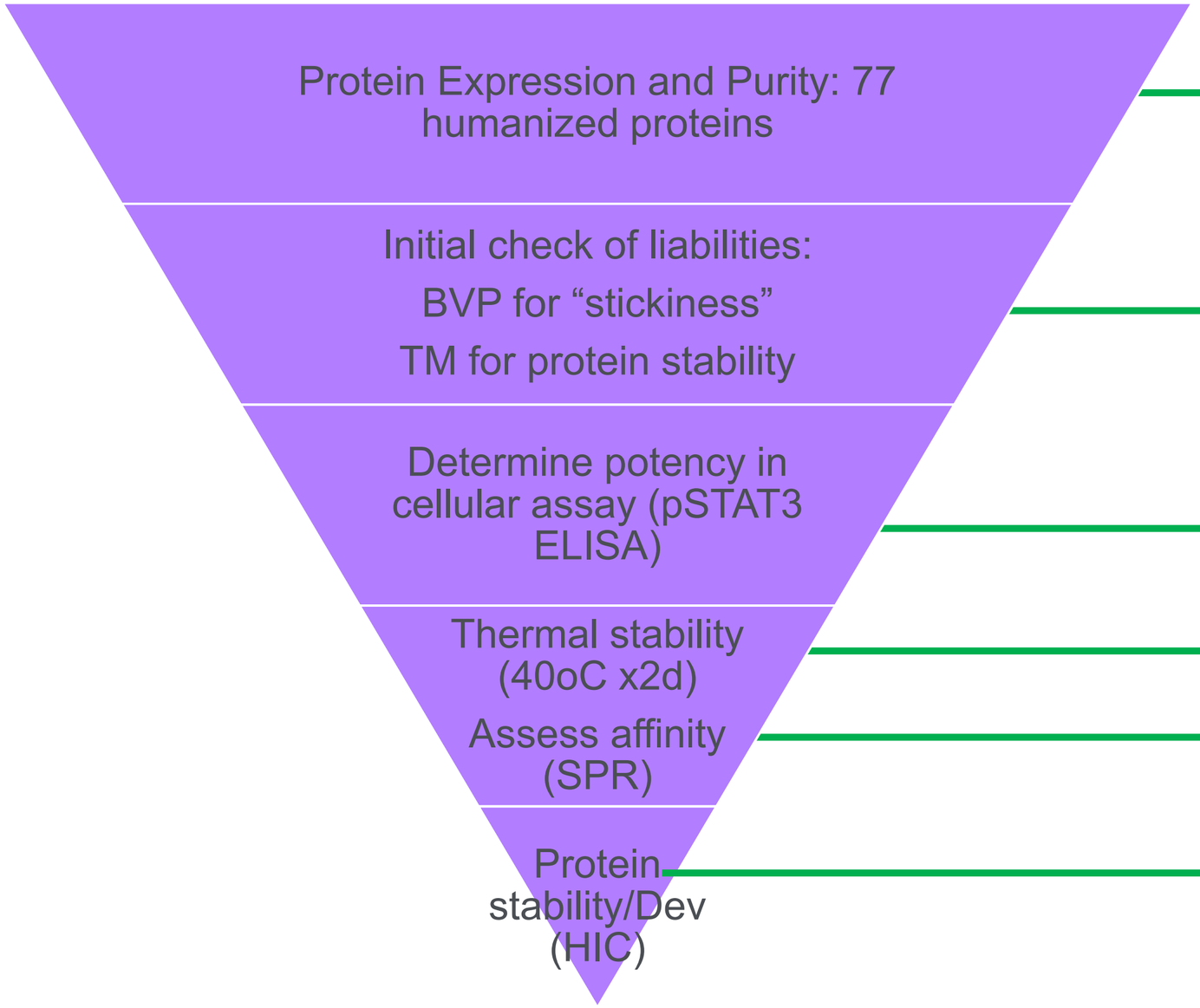
No effect detected by SEC and SDS-PAGE of AttoFc's under accelerated deamidation conditions

- Accelerated deamidation protocol from Lu et al., MABS 2019 vol 11., no1, p45-57
  - To analyze 131 clinical stage antibodies
  - pH8.5 X 40^{o}C X 1 week

- 3 time points: 0, 4, and 7 days

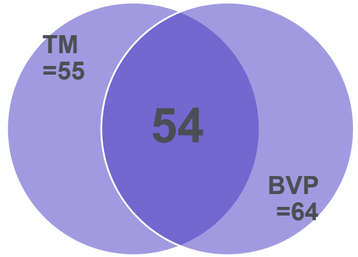
Top 3 AttoFc are concentratable to approximately 200 mg/mL

Characterization of humanized leads



67 of 77 proteins produced with acceptable expression and purity

54 proteins passed BVP and TM criteria



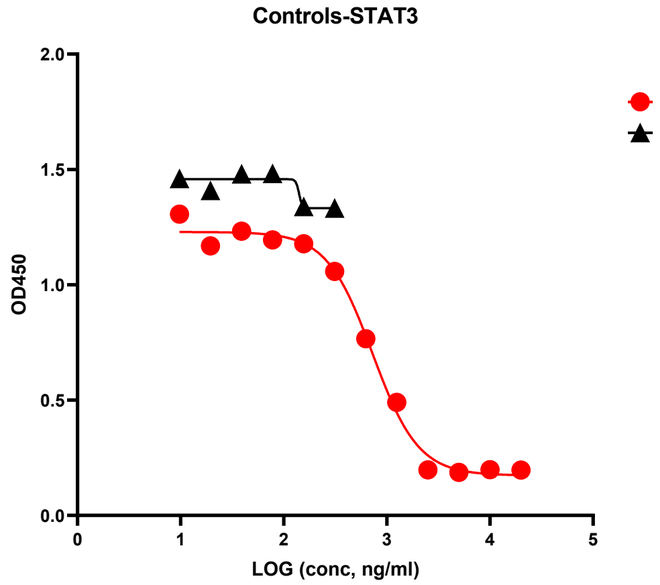
10 proteins with potency similar to WT

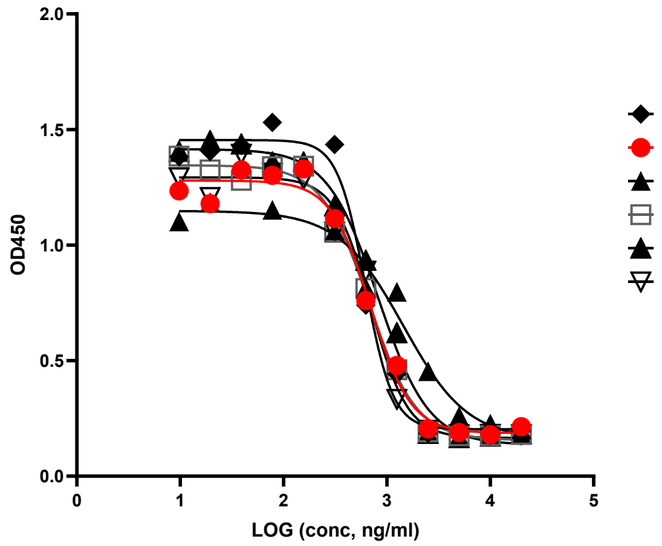
10 proteins stable at 40^{o}C x2d

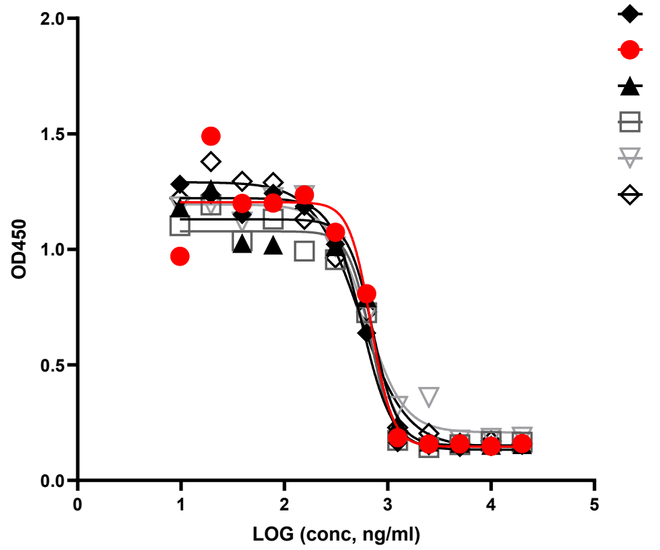
6 with desired affinity

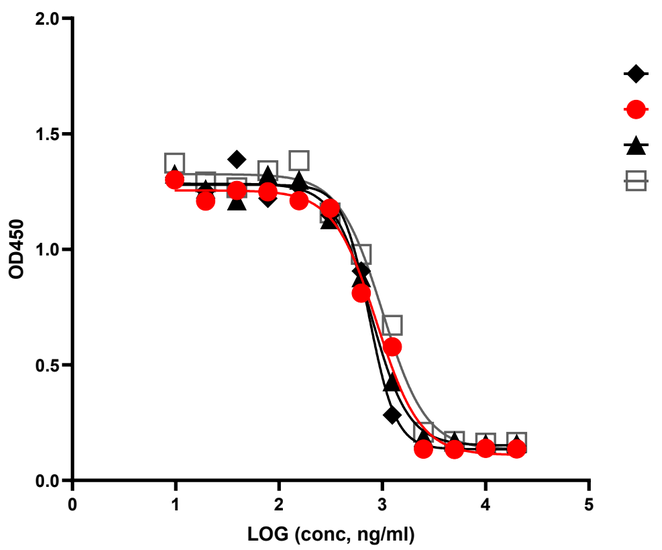
10 with similar HIC to parental

Several humanized sequence have potency similar to WT

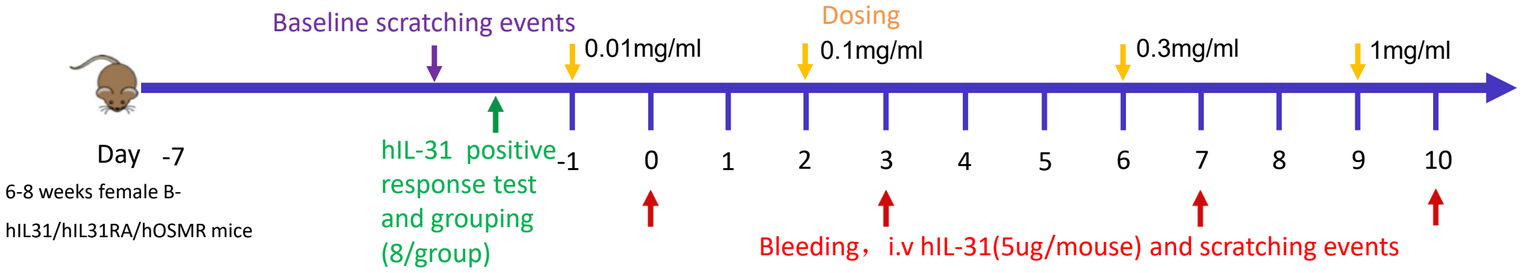


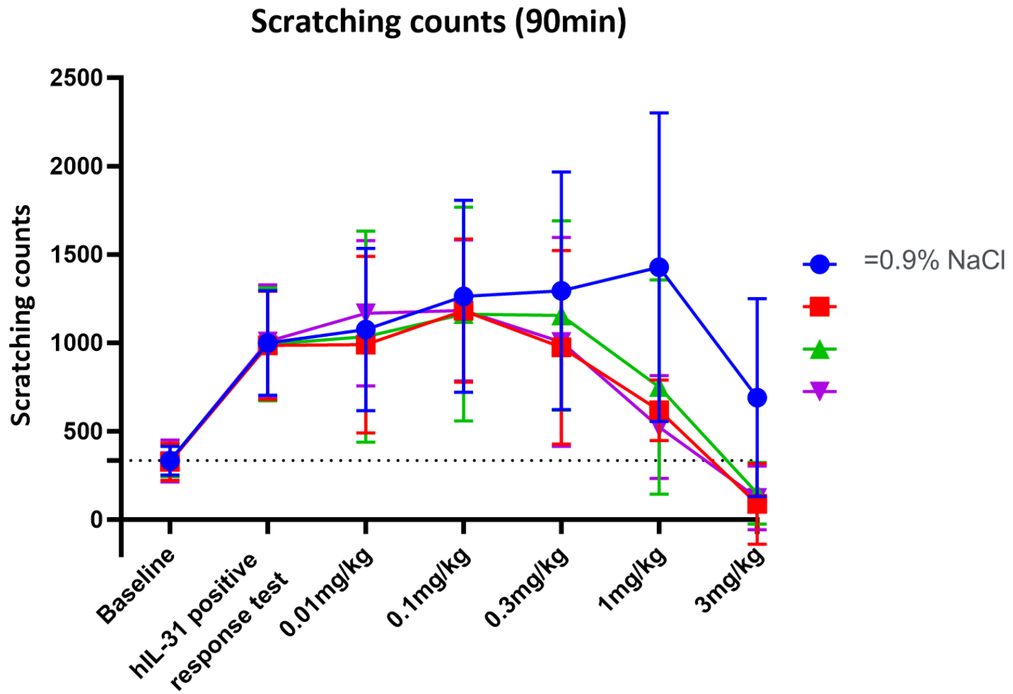






Top 3 AttoFc are efficacious in mouse pruritus model



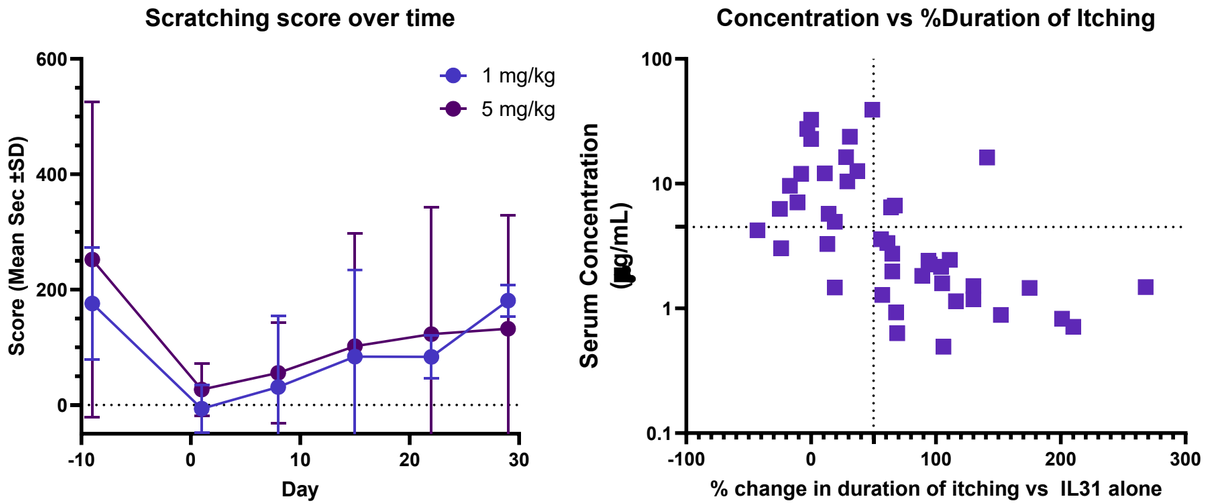


Summary:

- hIL-31 could significantly increase scratching counts of pruritus.
- 3 AttoFc could decrease scratching counts of pruritus on Day10, and 2 AttoFc showed significant difference.

ATTO-1310 demonstrates serum concentration-dependent activity in IL31-induced-itch NHP

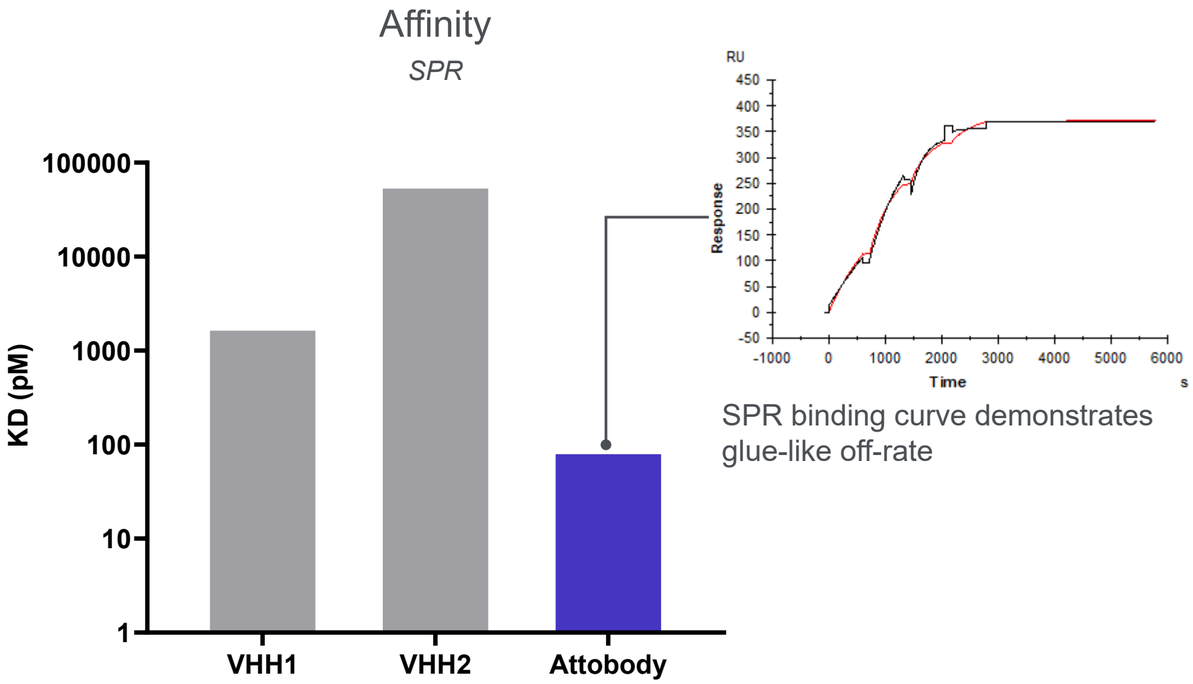
Non-human primate (NHP)



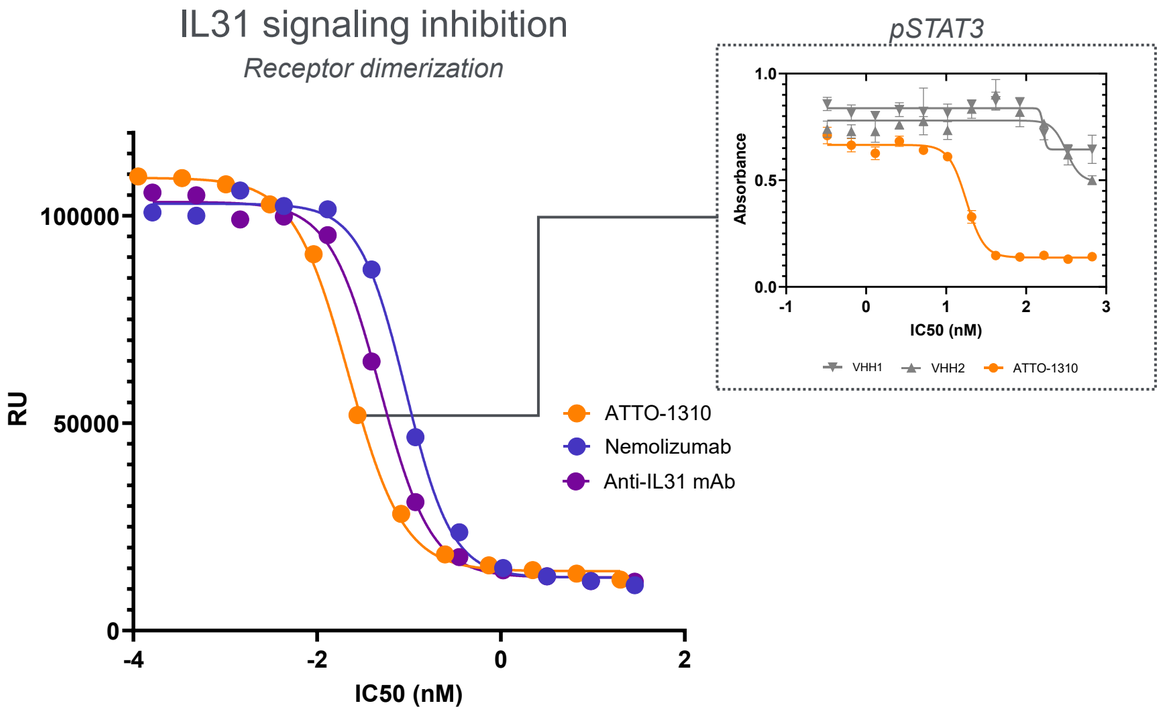
- ATTO-1310 suppresses IL31-induced pruritus in non-human primates (NHP)
- Anti-pruritic activity correlates with serum concentration of ATTO-1310
  - Efficacious concentration *in vivo* aligns with IC90 *in vitro*

ATTO-1310 binds to IL31 with high affinity and potently blocks IL31 signaling

ATTO-1310 binds IL31 with affinity up to a 1,000x higher than its VHH arms



ATTO-1310 potently blocks IL31 signaling



- ATTO-1310 demonstrates pM affinity for IL31
  - High affinity and slow off-rate of the Attobody is superior to either VHH alone
- ATTO-1310 inhibits IL31-mediated receptor dimerization and signaling in a potent, dose-dependent manner
  - Attobody suppresses IL31 even though neither individual VHH appears inhibitory

Conclusions

- Attovia has discovered and is developing ATTO-1310 for pruritic diseases
  - Utilizes our proprietary Attobody technology to bind and neutralize IL31

- ATTO-1310 demonstrates excellent affinity, potency, stability, developability and manufacturability.
  - pM affinity and inhibitory activity due to the Attobody structure
  - *In vitro* and *in vivo* efficacy against IL31-induced signaling and pruritus
  - High productivity and yield
  - Formulation and concentration suitable for subcutaneous administration

- ATTO-1310 is currently in first-in-human clinical studies