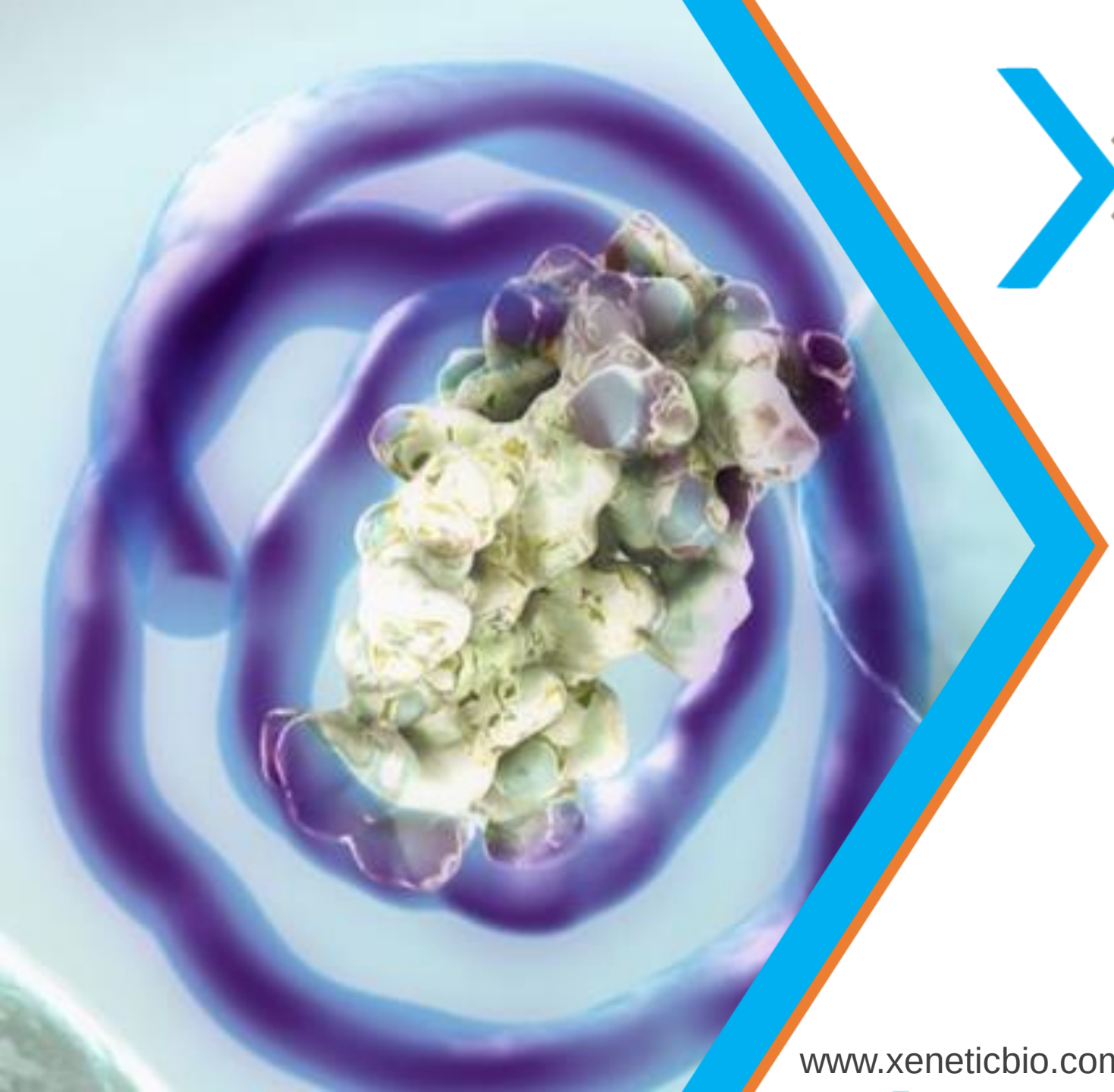


Xenetic BIOSCIENCES

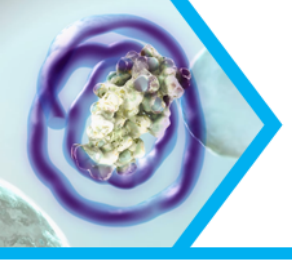
Enhancing Lives with Transformative Therapies

PolyXen™ Technology

May 1, 2018

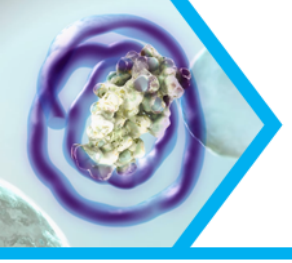
PolyXen™:
A Polysialylation Technology for Enhancing Therapeutic Proteins and Its Clinical Application

PEGS Boston April 30-May 4, 2018



Forward Looking Statements

This presentation contains "forward-looking statements," as that term is defined under the Private Securities Litigation Reform Act of 1995 (PSLRA), which statements may be identified by words such as "expects," "plans," "projects," "will," "may," "anticipates," "believes," "should," "intends," "estimates," and other words of similar meaning, including statements regarding expected benefits of NGS cancer panels, the ability to accurately determine the heritable factors increasing the risk of cancer, permitting tailored treatment, screening and prevention of cancer in patients, as well as other non-historical statements about our expectations, beliefs or intentions regarding our business, technologies and products, financial condition, strategies or prospects. Many factors could cause our actual activities or results to differ materially from the activities and results anticipated in forward-looking statements. These factors include those described in our filings with the Securities and Exchange Commission, as well as the risks inherent in funding, developing and obtaining regulatory approvals of new, commercially-viable and competitive products and treatments. In addition, forward-looking statements may also be adversely affected by general market factors, competitive product development, product availability, federal and state regulations and legislation, the regulatory process for new products and indications, manufacturing issues that may arise, patent positions and litigation, among other factors. The forward-looking statements contained in this presentation speak only as of the date the statements were made, and we do not undertake any obligation to update forward-looking statements. We intend that all forward-looking statements be subject to the safe-harbor provisions of the PSLRA.



Overview

- Clinical-stage biopharmaceutical company focused on discovery, research and development of next-generation biologic drugs and novel orphan oncology therapeutics

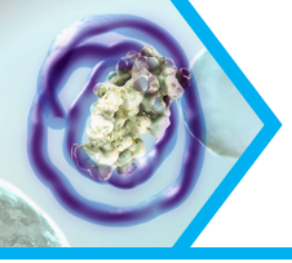
- PolyXen™ - proprietary polysialic acid (PSA) drug delivery platform expected to drive near term licensing revenue
  - Enables next generation biologic drugs by improving their half-life and other pharmacological properties

- XBIO-101 (sodium cridanimod) - lead program in Phase 2 clinical development for treatment of progesterone resistant endometrial cancer (EC)

- Out-licensing agreement with Shire for SHP656 (PSA- recombinant Factor VIII)

  for treatment of hemophilia A

- Robust IP portfolio with over 200 patents issued or allowed



Business Model

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Therapeutic Development

- Internal clinical development programs focused on repurposed drugs for oncology indications
- Develop programs through key inflection points
- Regional licensing agreements designed to de-risk development programs

Platform Technology

- PolyXen: Proprietary enabling platform technology for next-generation protein drug delivery
- Out-license opportunities to generate non-dilutive capital
- PolyXen Partnerships
  - Shire: Factor VIII (hemophilia)
  - SIIL*: EPO

Shire

SERUM INSTITUTE OF INDIA
Cyrus Poonawalla Group

*Serum Institute of India

PolyXen PSA Technology Platform

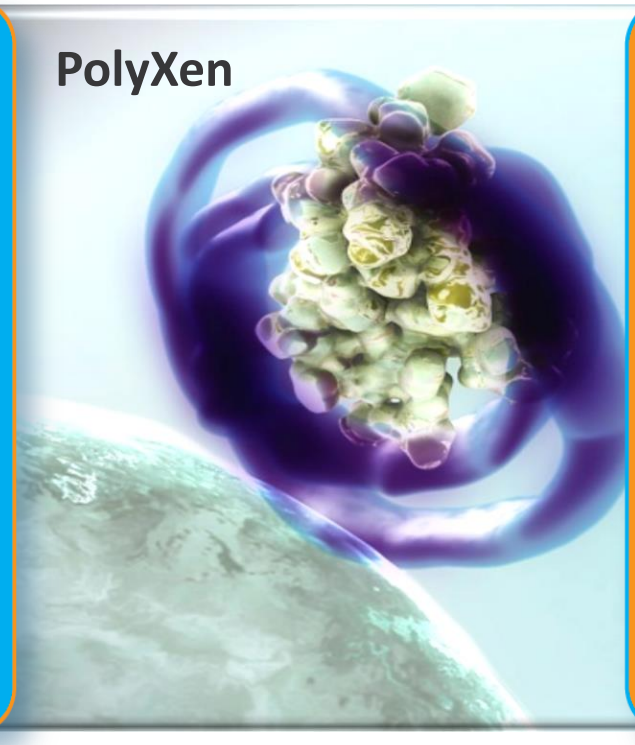
- Advantages of PolyXen Technology
- cGMP Manufacturing
- Physiochemical and Biological Properties of PSA & Polysialylated Proteins
- Clinical Use Cases

PolyXen: Enhancing Protein Drugs

- Polysialylation employs the natural polymer polysialic acid (PSA) to modulate the pharmacokinetic and pharmacodynamic properties of protein drugs
- Modelled on the multi-billion dollar success of PEGylation, which uses the synthetic polymer polyethylene glycol (PEG)

Key Features:

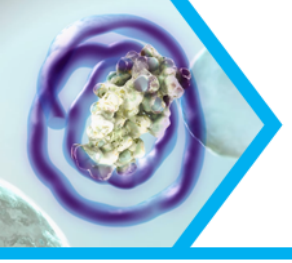
- Half-life extension
- Retention of native protein conformation
- Non-immunogenicity
- Biodegradability
- Low viscosity
- Fewer injections
- Improved protease stability
- Improved thermal stability
- Broad patent coverage



Versatile:

- Designed to improve the clinical utility of most protein and peptide drugs
- Applicable to franchise extensions as well as candidates in development
- Potential use for delivering small molecule drugs

Xenetic BIOSCIENCES



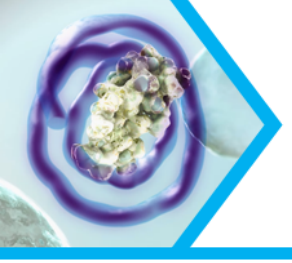
PolyXen: Commercial Proposition

Polysialylation is an alternative to PEGylation and other platforms

PEGylated drugs approved by FDA

FDA-approved PEGylated drugs.

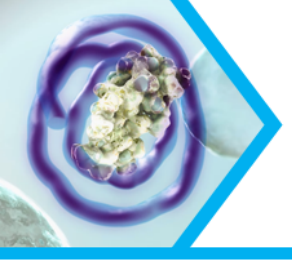
Commercial name	Drug name	Company	PEG size (Da)	Indication	Year of approval
Adagen®	Pegadamase	Enzon	Multiple linear 5000	SCID	1990
Oncaspar®	Pegaspargase	Enzon	Multiple linear 5000	Leukemia (ALL, CML)	1994
PEG-INTRON®	Peginterferon-α2b	Schering-Plough	Linear 12,000	Hepatitis C	2000
PEGASYS®	Peginterferon-α2a	Hoffman-La Roche	Branched 40,000	Hepatitis C	2001
Neulasta®	Pegfilgrastim	Amgen	Linear 20,000	Neutropenia	2002
Somavert®	Pegvisomant	Pharmacia & Upjohn	4–6 linear 5000	Acromegaly	2003
Macugen®	Pegaptanib	Pfizer	Branched 40,000	Age-related macular degeneration	2004
Mircera®	mPEG-epoetin-β	Hoffman-La Roche	Linear 30,000	Anemia associated with chronic renal failure	2007
Cimzia®	Certolizumab pegol	UCB	Branched 40,000	Reducing signs and symptoms of Crohn's disease	2008
Puricase1®/Krystexxa®	PEG-uricase	Savient	10,000	Gout	2010
Movantik	Naloxegol	AstraZeneca	339	Opioid-induced constipation	2014



Potential Limitations of PEG: Toxicity

- PEG is non-biodegradable
  - Some evidence of a low rate of enzyme-mediated oxidation
  - Aldehydes and ketones generated in the body, not eliminated by normal detoxification mechanism
- PEGylation of therapeutic proteins could lead to:
  - Accumulation in tissues – vacuolization
  - Likely problematic for protein therapeutics administered in large amounts and/or chronically
- Rheological Properties of PEG

Bendele et al., Renal tubular vacuolation in animals treated with PEG conjugated proteins, Toxicological sciences, 42 (1998) 152-157
Connors et al., Physiological effect of PEG conjugation on stroma-free bovine haemoglobin…, Artificial organ, 21 (1997) 369-378.



Potential Limitations of PEG: Immunogenicity

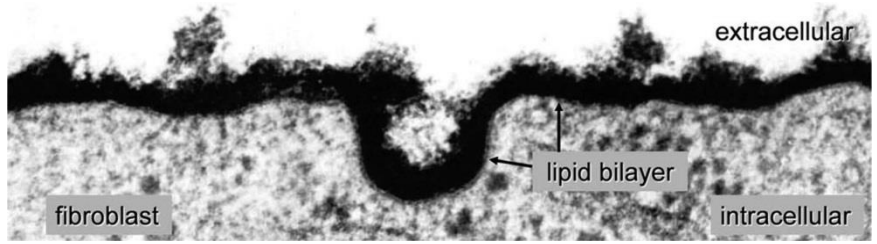
Clinical and Regulatory Considerations

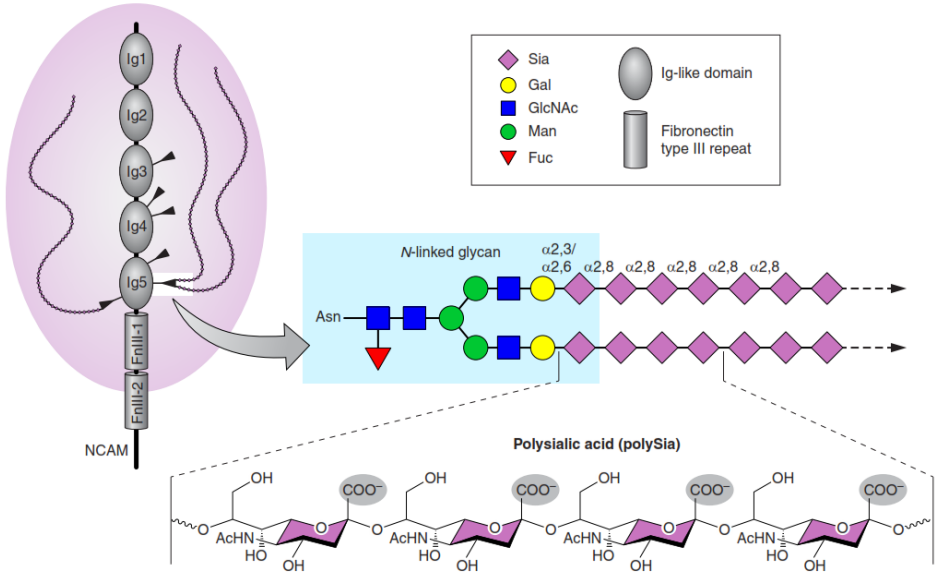
- 25-30% of patients have pre-existing anti-PEG neutralizing antibodies
- Induction of anti-PEG antibodies against PEGylated proteins (reported clinical cases)
  - PEG-asparaginase and PEG-uricase
- FDA guidelines recommend screening for anti-PEG antibodies when evaluating the potential immunogenicity of PEGylated proteins (2014)
- EMA recommends that care be used in PEGylated products for the pediatric population (2012)

- Lipsky, Peter E. et al., Pegloticase immunogenicity: the relationship between efficacy and antibody development in patients treated for refractory chronic goutm Arthritis Research & Therapy, 16 (2014) R60
- Jonathan K. Armstrong et al., Antibody Against Poly(Ethylene Glycol) Adversely Affects PEG-Asparaginase Therapy in Acute Lymphoblastic Leukemia Patients, Cancer, 110 (2007) 103-110

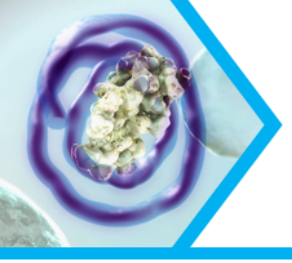
PolyXen Exploits Nature

- PolyXen employs the linear α2-8 polymer of sialic acids (colominic acid)
- Hydrophilic polymer from *E. coli* strain K1
- Natural glycan
- Negatively charged
- Highly evolved immune evasion properties
- Limited toxicity
- Sialic acid to 100KDa PSA





- Ronald L. Schnaar, Rita Gerardy-Schahn, Herbert Hildebrandt, Sialic Acids in the Brain: Gangliosides and Polysialic Acid in Nervous System Development, Stability, Disease, and Regeneration, Physiological Reviews, 94 (2014) 461-518.

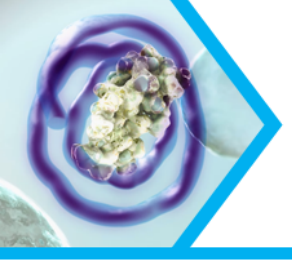


PolyXen: Patents & Patent Applications

Granted patents & patent applications covering PSA including: Use, Manufacturing, Chemistry, and New Molecular Entities

- Use of PSA for drug delivery
  - Polysaccharide B in DDS (base patent)
  - Monofunctional PSA
  - Polysialylation in SDS
- Manufacturing
  - Manufacturing of PSA
  - Fractionation of PSA
  - Endotoxin Removal
- Modalities of attachment
  - NHS functional PSA
  - NHS amino PSA fractions
  - Thiol-reactive PSAs
  - N-terminal polysialylation
- Selected PSA constructs
  - Polysialylated EPO
  - Polysialylated insulin
  - Polysialylation of non-blood coagulation factors
  - Polymer protein conjugates

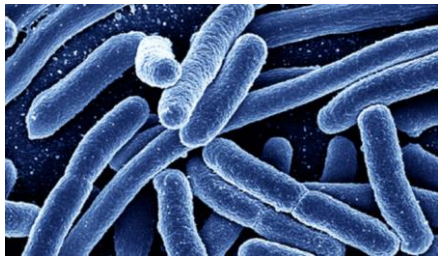
PolyXen:
Commercial cGMP Manufacturing



Serum Institute of India

- India’s leading biotechnology company
- World’s largest vaccine manufacturer by number of doses produced
- cGMP manufacturing facility accredited by World Health Organization
- Manufactures cGMP grade PSA for Xenetic and its partners

Manufacturing of PSA-Protein Conjugates



Fermentation

Purification

Polysaccharides

Activation

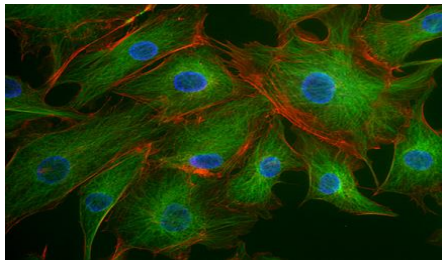
Purification

Conjugation

Purification

PSA-Protein Conjugates

Formulation



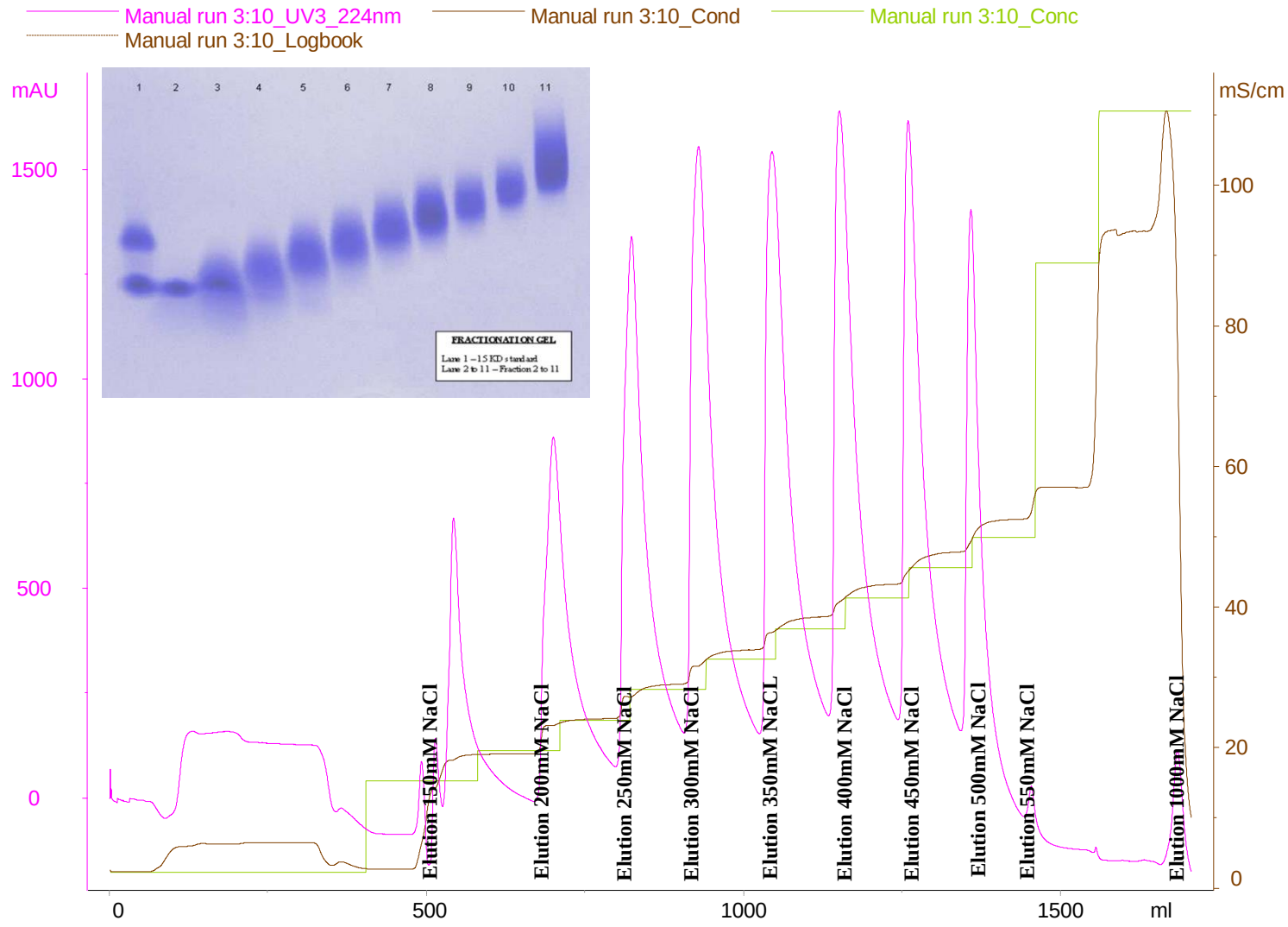
Fermentation

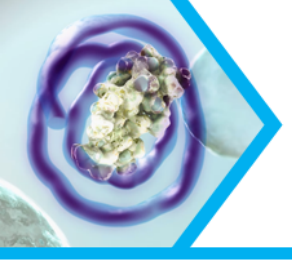
Purification

Protein

- PSA chains can vary in length
- Conjugation can be site-directed or random

Controlled Fractionation of PSA by Acid Hydrolysis & AEX





Release Specifications of Oxidized PSA

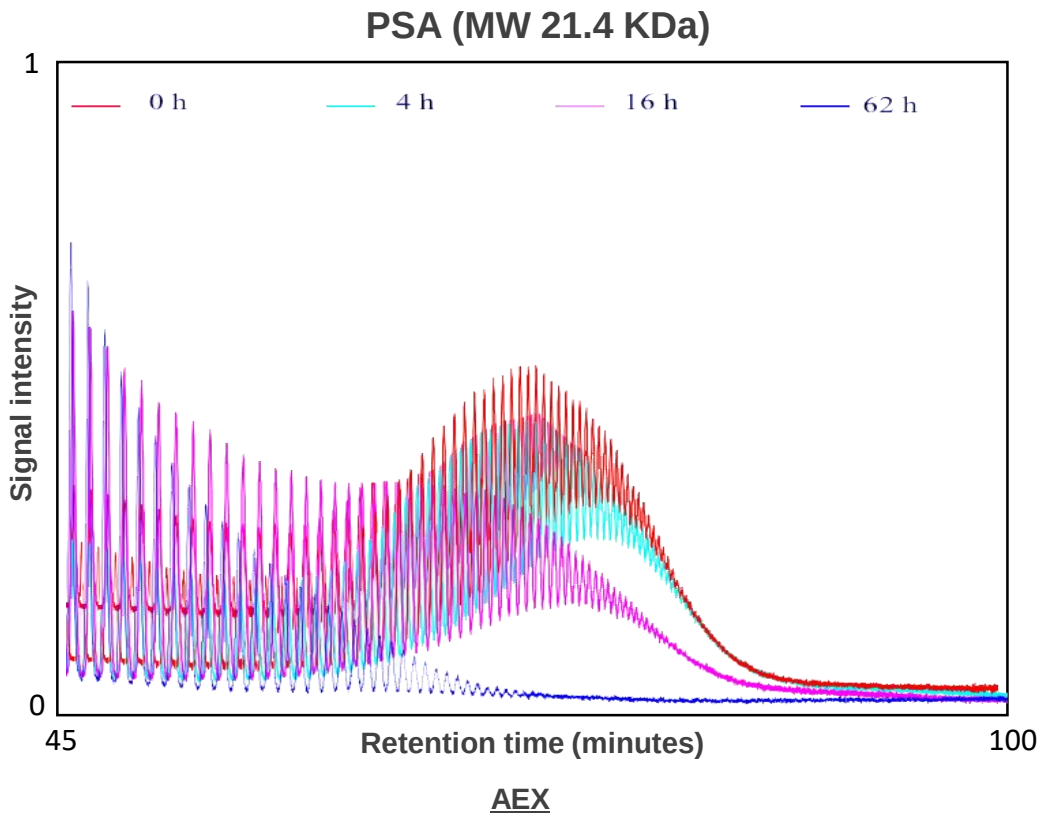
No.	Parameter	Method of Analysis	Specifications
1	Appearance	Visual inspection	White or ivory white powder, freely soluble and free from particulate matter when dissolved in water
2	Loss on drying	Thermogravimetric	Not more than 5%
3	Absolute molecular weight	Gel permeation chromatography (GPC) using Viscotek	MW ± 15%
4	Polydispersity index		1.00-1.10
5	Purity	GPC	Not less than 95%
6	Chemical functionality	Glucose assay	80-120%
7	pH	pH meter	6–8 in WFI with a conc. of 1 mg/mL
8	Structural identity	NMR	Spectrum identical to that of alpha 2,8-linked polysialic acid
9	Phosphate content	AMES method	Not more than 1.3 mole PO_4/mole PSA
10	Heavy metals	European pharmacopeia method	Report value in ppm
11	Endotoxin content	Limulus amoebocyte lysate method (KTA)	Not more than 4 EU/100 mg of PSA
12	Bioburden	Pharmacopeia method	Not more than 10 CFU/g of PSA

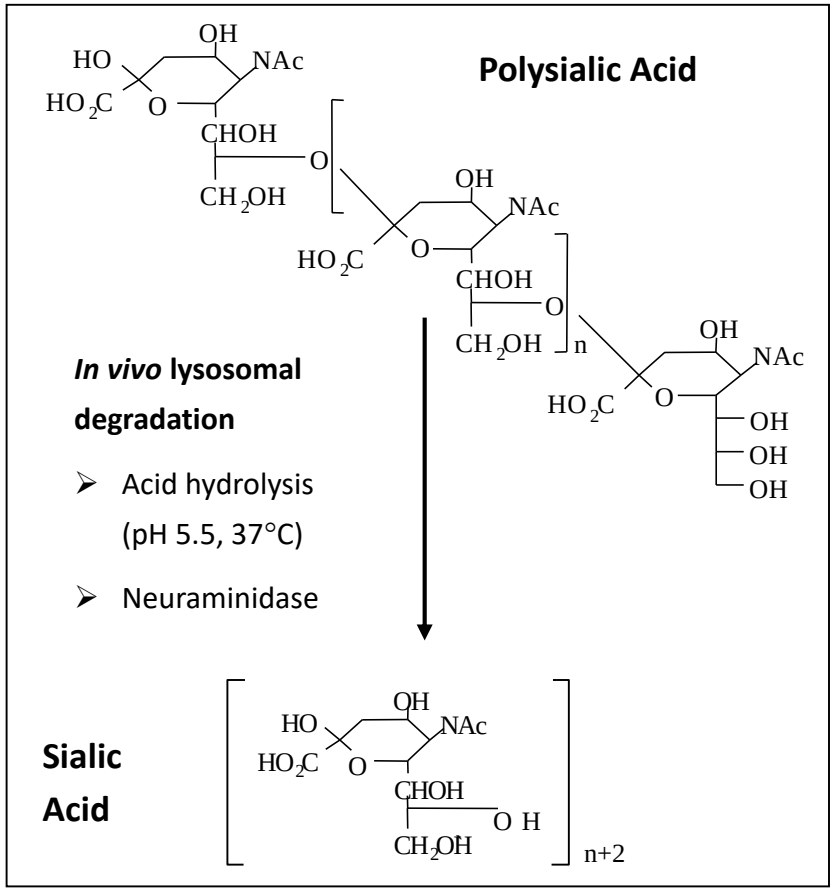
(Additional testing on GMP grade oxidized PSA for residual or process extractable impurities, O-acetylation, free amino groups, sodium content, Ca content and ethanol content may be performed if required)

PSA:
Physiochemical and Biological Properties

Polysialic Acid is Biodegradable

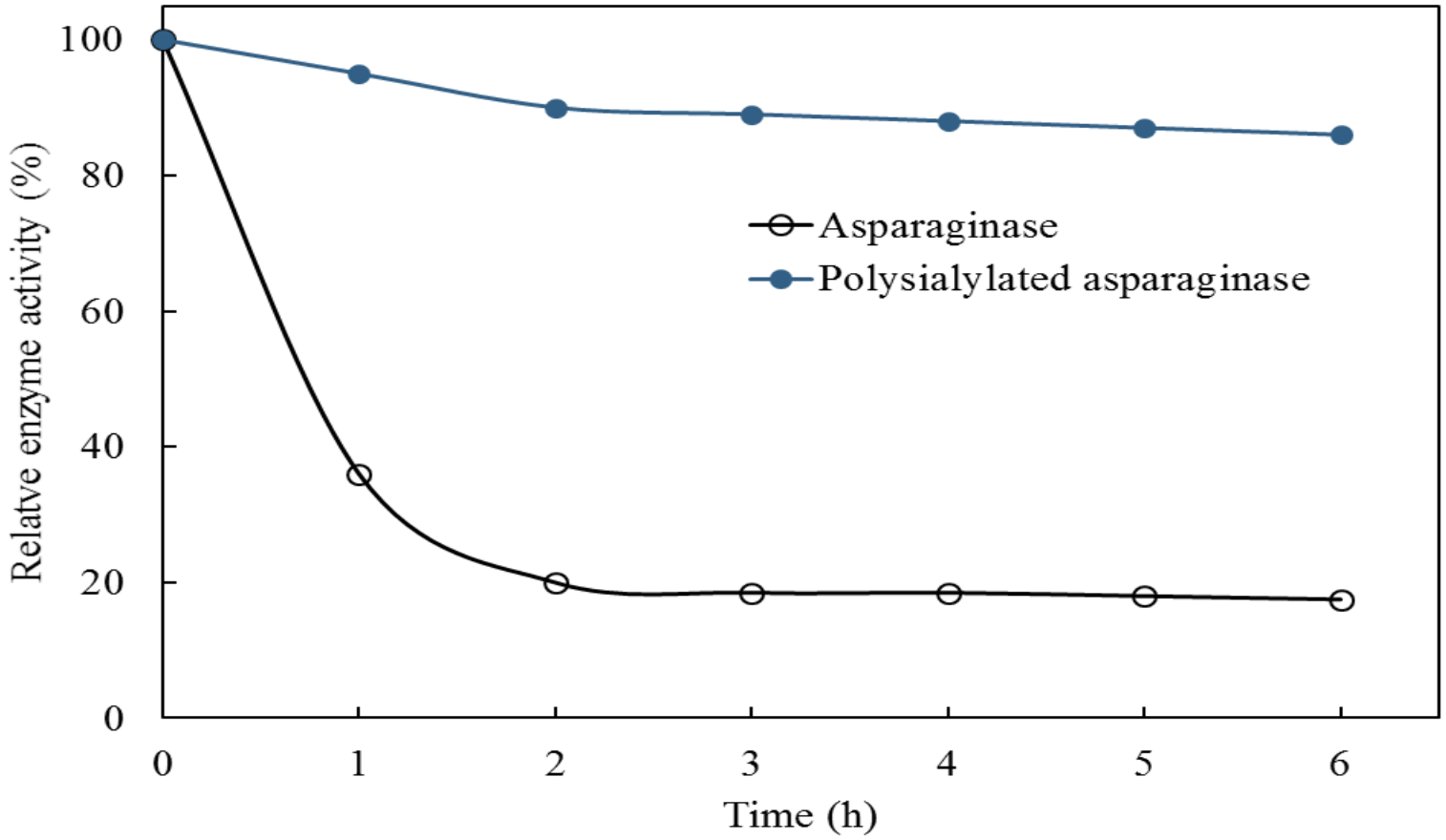
Hydrolysis of PSA in liver homogenate





Polysialylation Confers Protection Against Serum Proteases

Incubation in Fetal Bovine Serum



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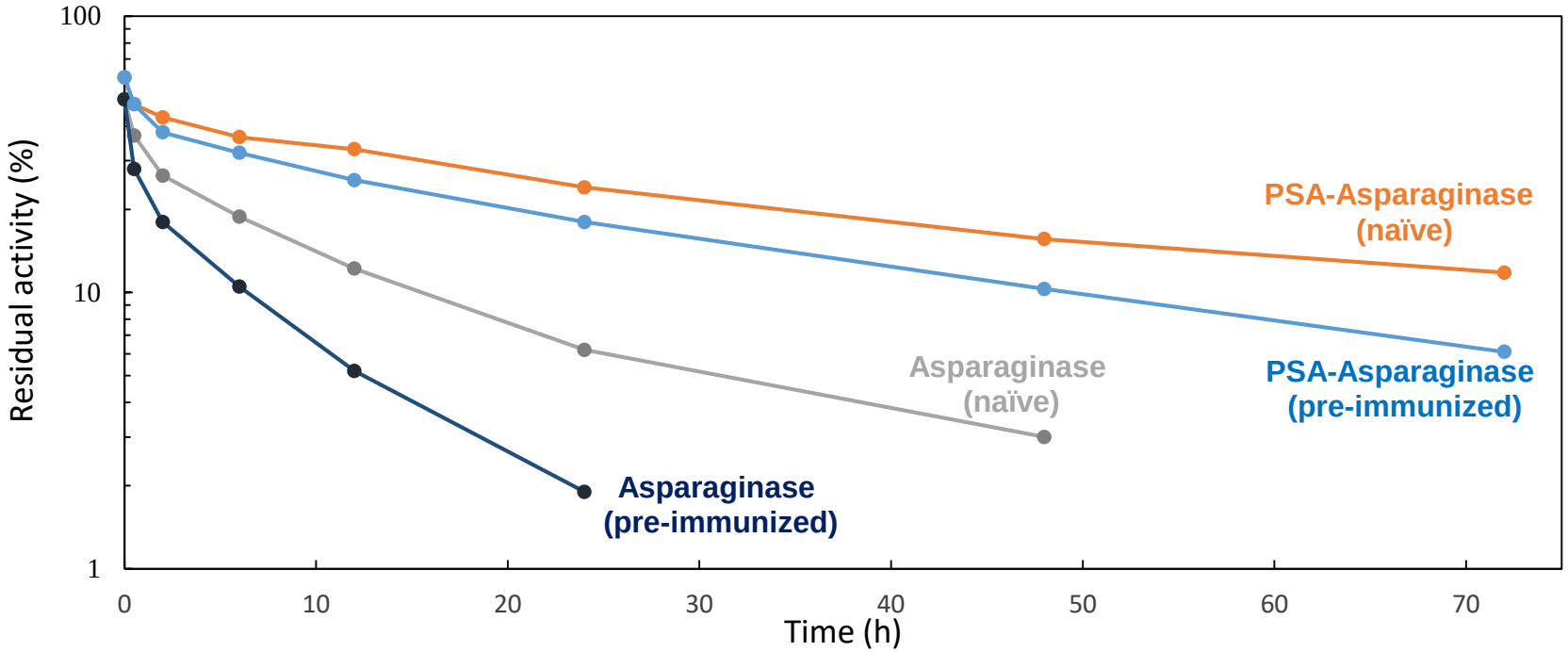
PK Profiles of PSA-Asparaginase in Presence of Antibodies

Polysialylation is effective in maintaining the PK profile of asparaginase in the presence of anti-drug antibodies

(in vivo)



Proteins	Naïve Mice		Pre-Immunized Mice	
	$t_{1/2}$, β (h)	Log IgG titers	$t_{1/2}$, β (h)	Log IgG titers
Asparaginase	15.27±1.45	n.a.	7.04±0.41	3.98±0.38
PSA-Asparaginase	37.76±1.39	n.a.	27.5±3.04	3.51±0.25

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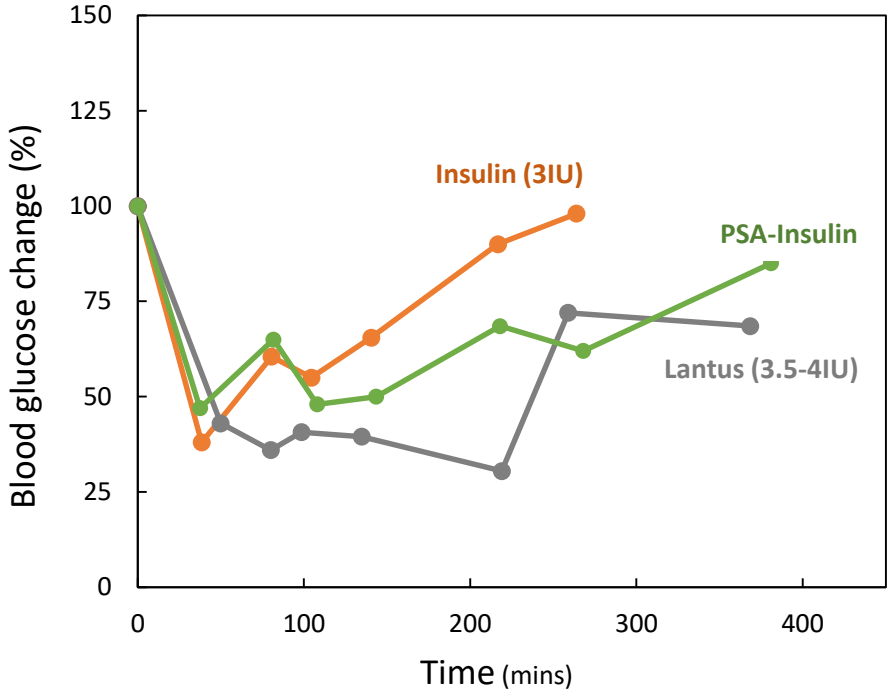
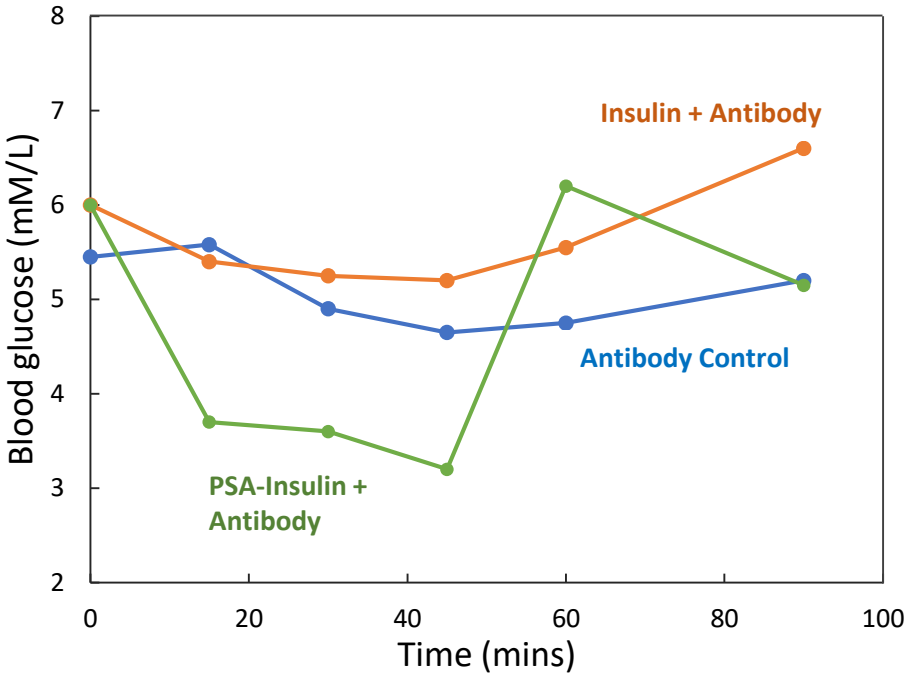
PSA Reduces Antibody Recognition

PSA-Insulin retains biological activity in presence of anti-Insulin antibodies

(in vivo)



Regulation of glucose by insulin and PSA-insulin in mice



Regulation of glucose by insulin and PSA-insulin in mice after pre-incubation with anti-insulin antibodies

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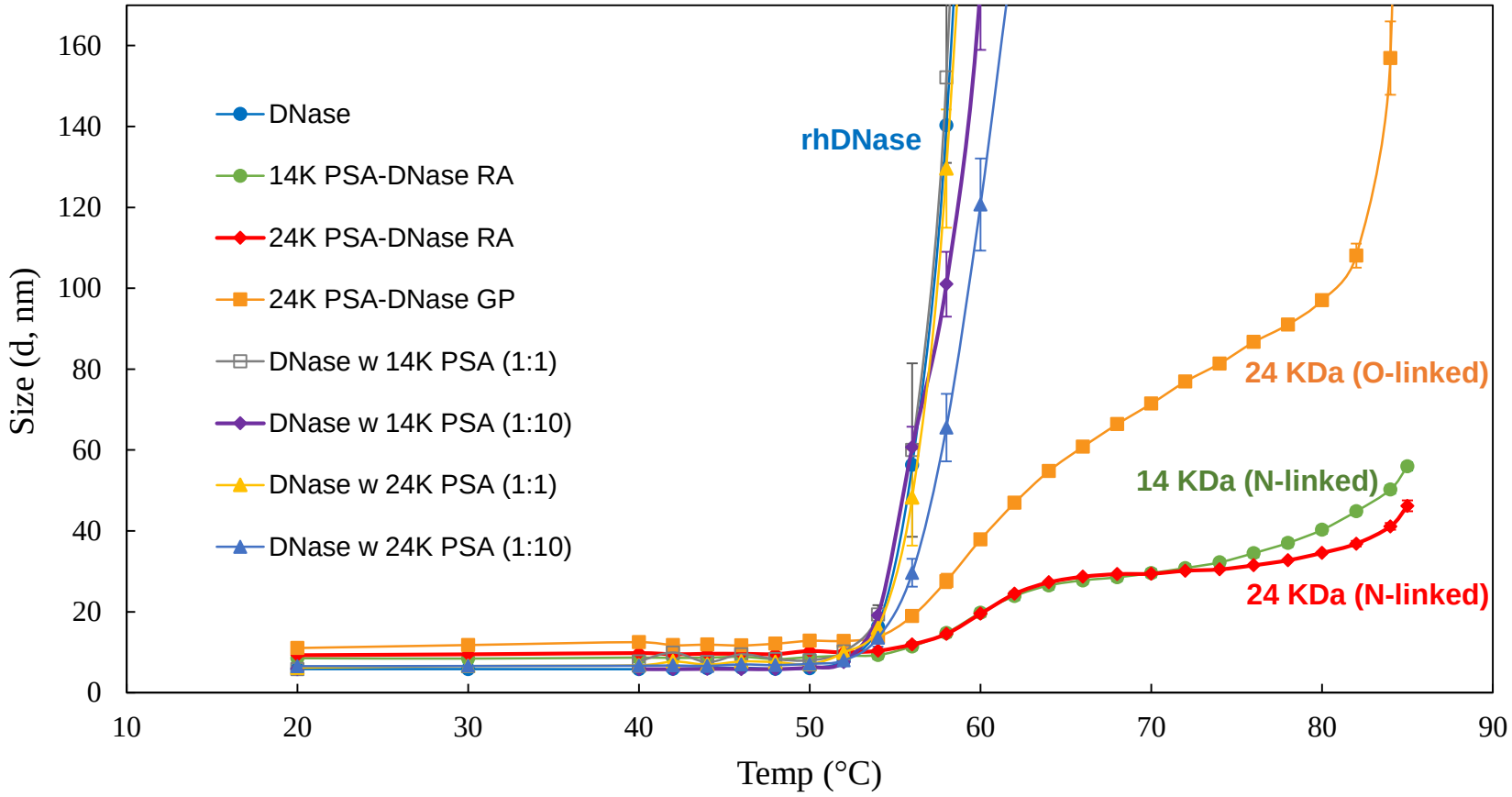
PSA-DNase: Enhanced Thermal Stability

Dynamic Light Scattering:

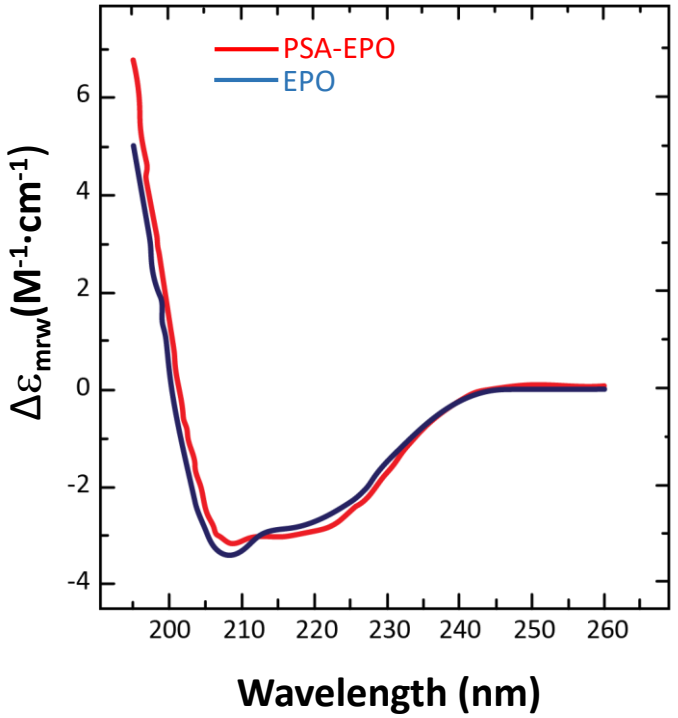
- **Polysialylation results in increased thermal stability of DNase**

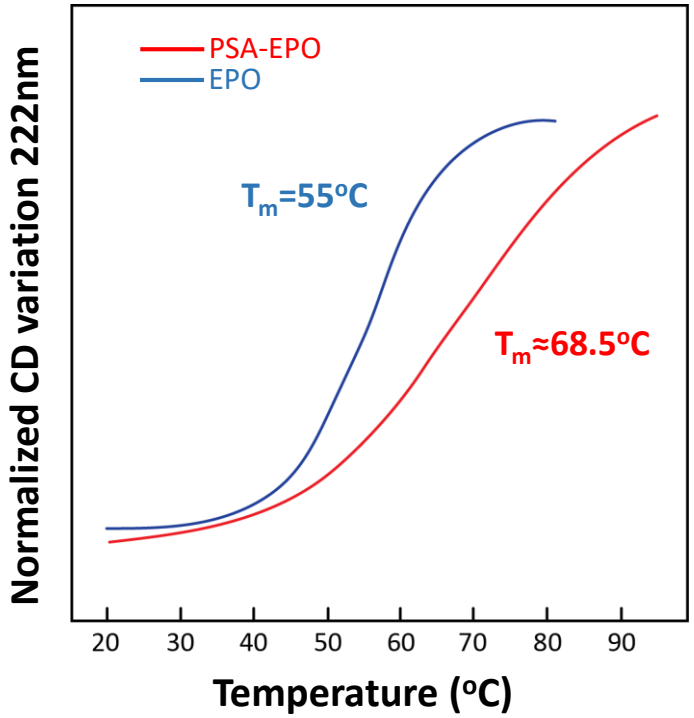


PSA-EPO: Retained Conformation and Thermal Stability

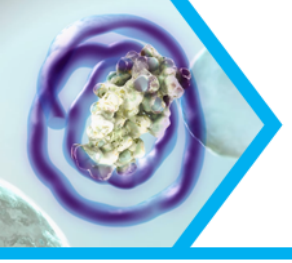
Circular Dichroism:

- **Conformation of PSA-EPO is similar to EPO**
- **PSA-EPO has higher thermal stability than EPO**





ErepoXen™ (PSA-EPO) Clinical Trial

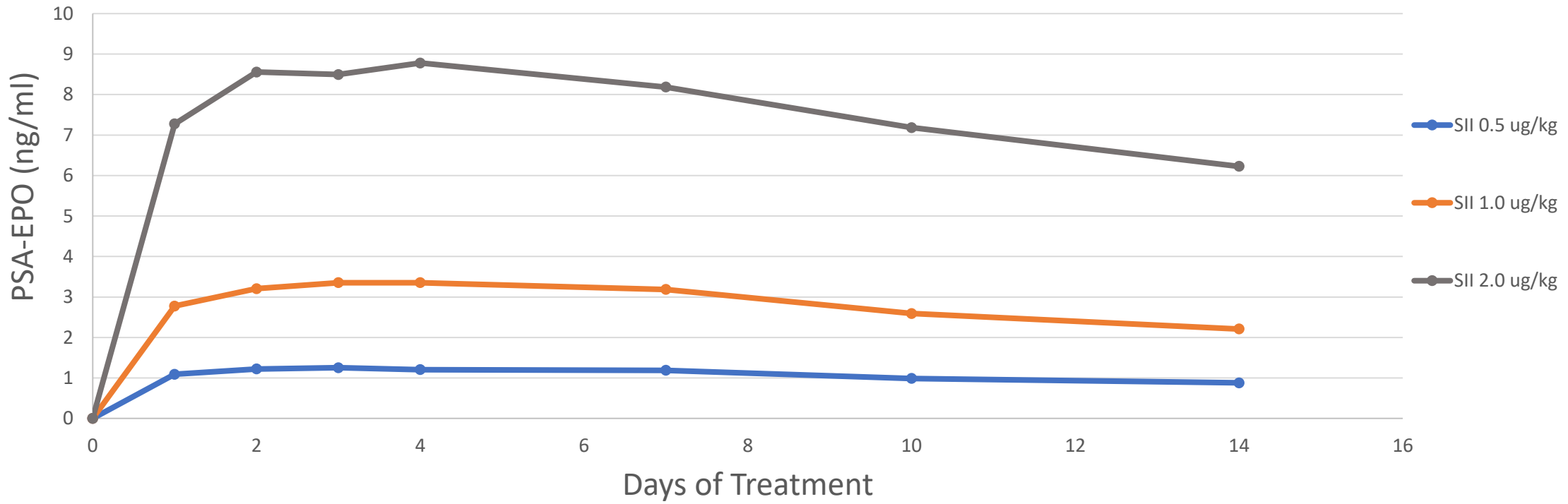


ErepoXen (PSA-EPO)

- Xenetic's most advanced in-house PSA-protein program
- Ongoing Phase 2/3 clinical trials:
  - India, Russia, Australia, New Zealand, South Africa
- Readouts include safety, tolerability, immunogenicity, efficacy
- Single dose (s.c.) Phase 1/2 completed in India (~120 subjects)
- Repeat dosing (s.c.) Phase 2 in progress in Australia & South Africa (~40 subjects to date)

PK of PSA-EPO in CKD Subjects (Phase 2)

Dose Response & PK Data (source: SIIL)



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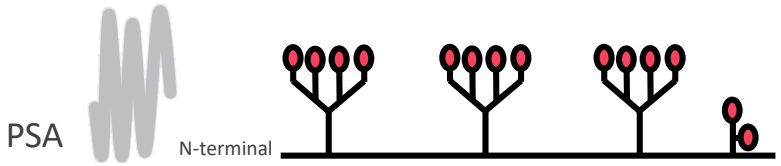
Half-Life Extension of EPO by Polysialylation



ErepoXen

~50 additional sialic acids per molecule of EPO
(compared to 8 with Aranesp)

Half-life of various erythropoiesis stimulating agents in man

Company: Drug	Population	Route	Half-Life (avg. hrs.)
AMGEN: Epogen®	**Healthy Subjects**	s.c.	**20**
	PD patients	s.c.	**4-13**
AMGEN: Aranesp®	**-**	s.c.	**-**
	PD patients	s.c.	**49**
ROCHE: Mircera®	**Healthy Subjects**	s.c.	**137**
	PD patients	s.c.	**140**
XENETIC: ErepoXen®	**Healthy Subjects**	s.c.	**121**
	PD patients	s.c.	**>400**

Data for marketed ESAs referenced from company prescribing information brochure or EMA disclosure documents

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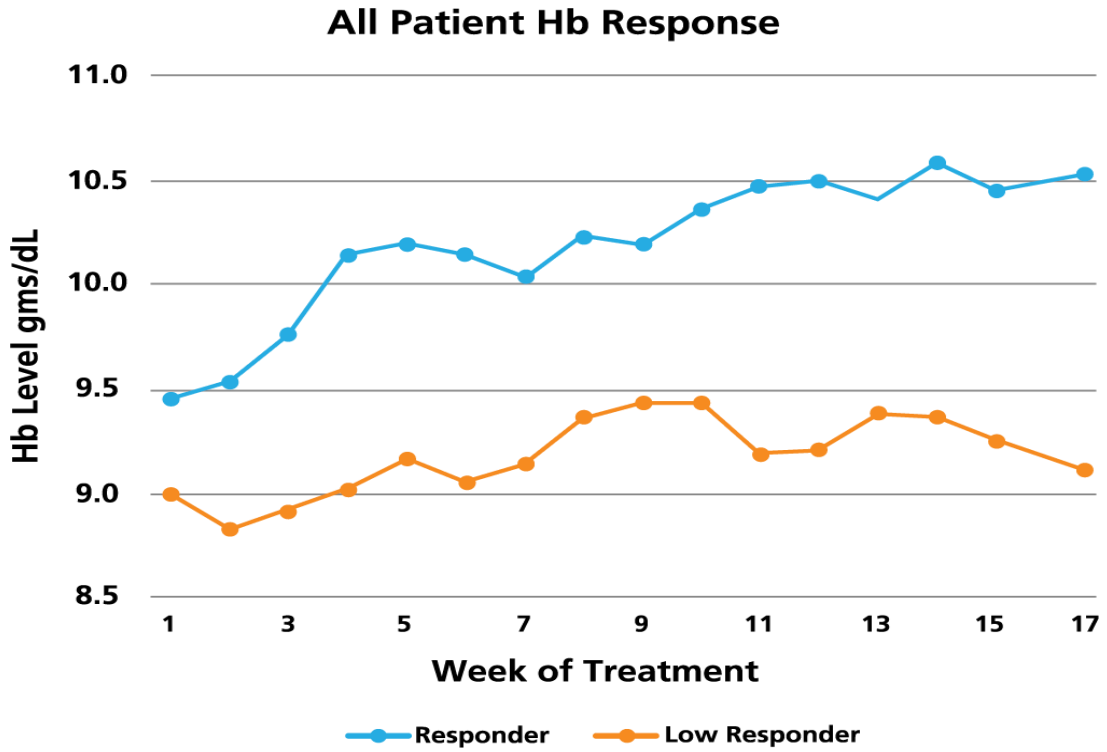
Clinical Results from ErepoXen Trials

ErepoXen Dosing:
Once every two weeks during the correction phase
Once every four weeks during maintenance

- ErepoXen is effective at increasing and maintaining Hb to therapeutic level
- No significant side effects have been observed from clinical trials
- No toxicity found in formal toxicity studies of PSA-EPO
- No PSA or PSA-EPO immunogenicity observed to date



PolyXen PSA Technology Platform: Summary

- Enables next-generation protein & peptide therapeutics
- GMP manufacturing methods established
- Clinically demonstrated to Phase 2
- Xenetic is pursuing internal programs and out-license opportunities related to:
  - New Molecular Entities
  - Lifecycle management

Thank you

For further information please contact:

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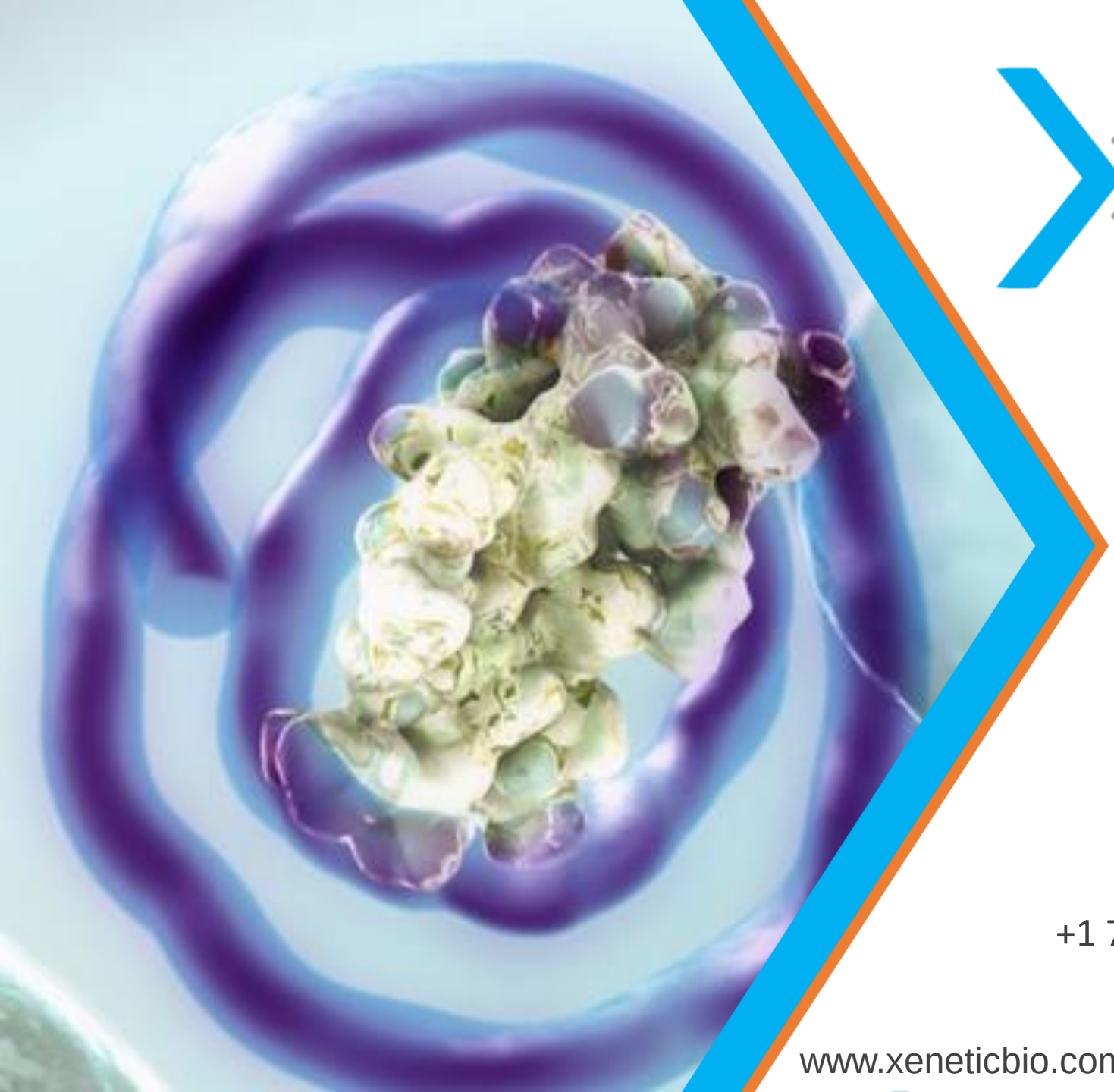

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Enhancing Lives with Transformative Therapies

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