



# R&D Investor Briefing

December 05, 2018

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# Agenda

- Welcome
- Introduction and Highlights
- Seqirus
- Research & Early Development
- Commercial Market Overview, Ig & Haemophilia
  - Q&A

– *Break* –

- Clinical Development Overview
- Commercial Overview Specialty, Transplant, CSL112
- Summary
  - Q&A

Mark Dehring  
Andrew Cuthbertson  
Gregg Sylvester  
Andrew Nash  
Bill Campbell

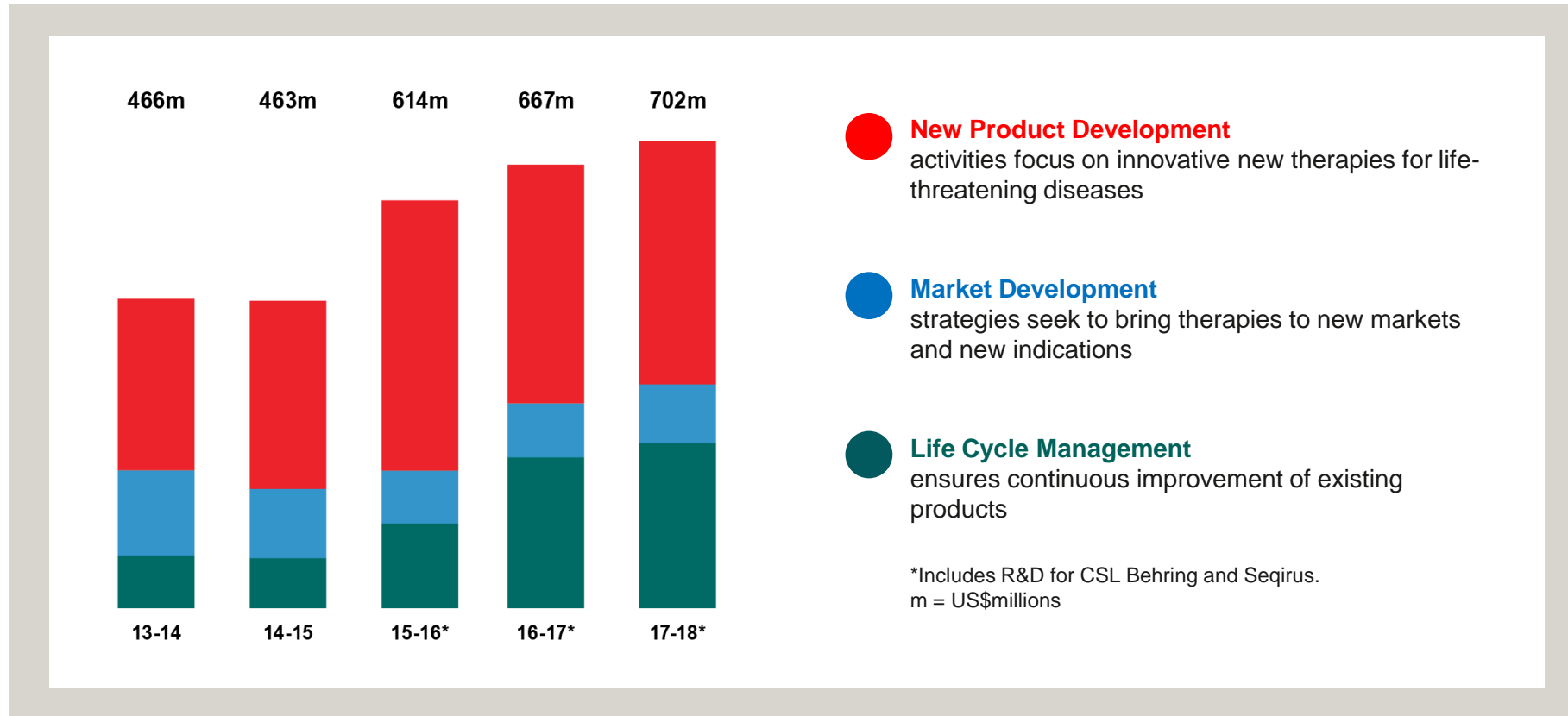
Bill Mezzanotte  
Bill Campbell  
Bill Mezzanotte

# Introduction and Highlights

Professor Andrew Cuthbertson AO  
*Chief Scientific Officer*

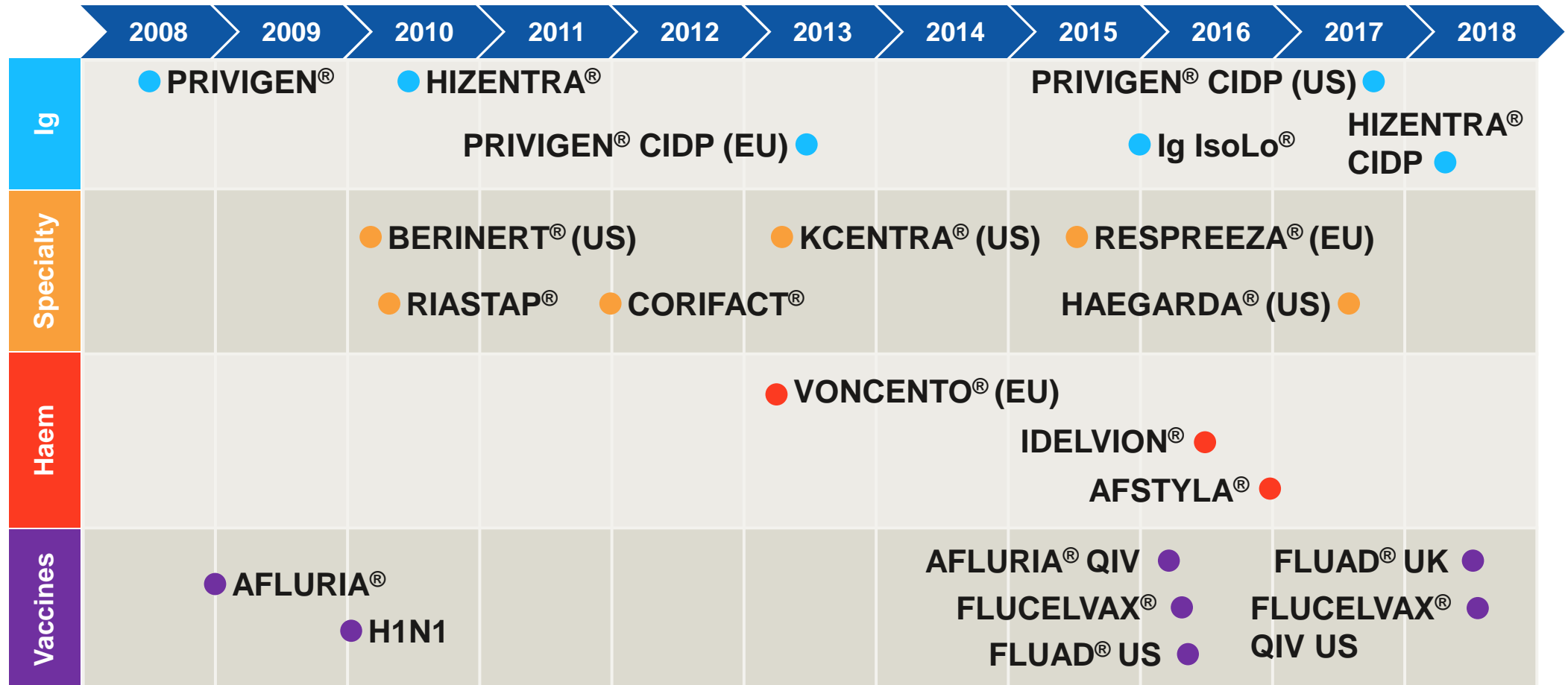


# Commitment to Research and Development

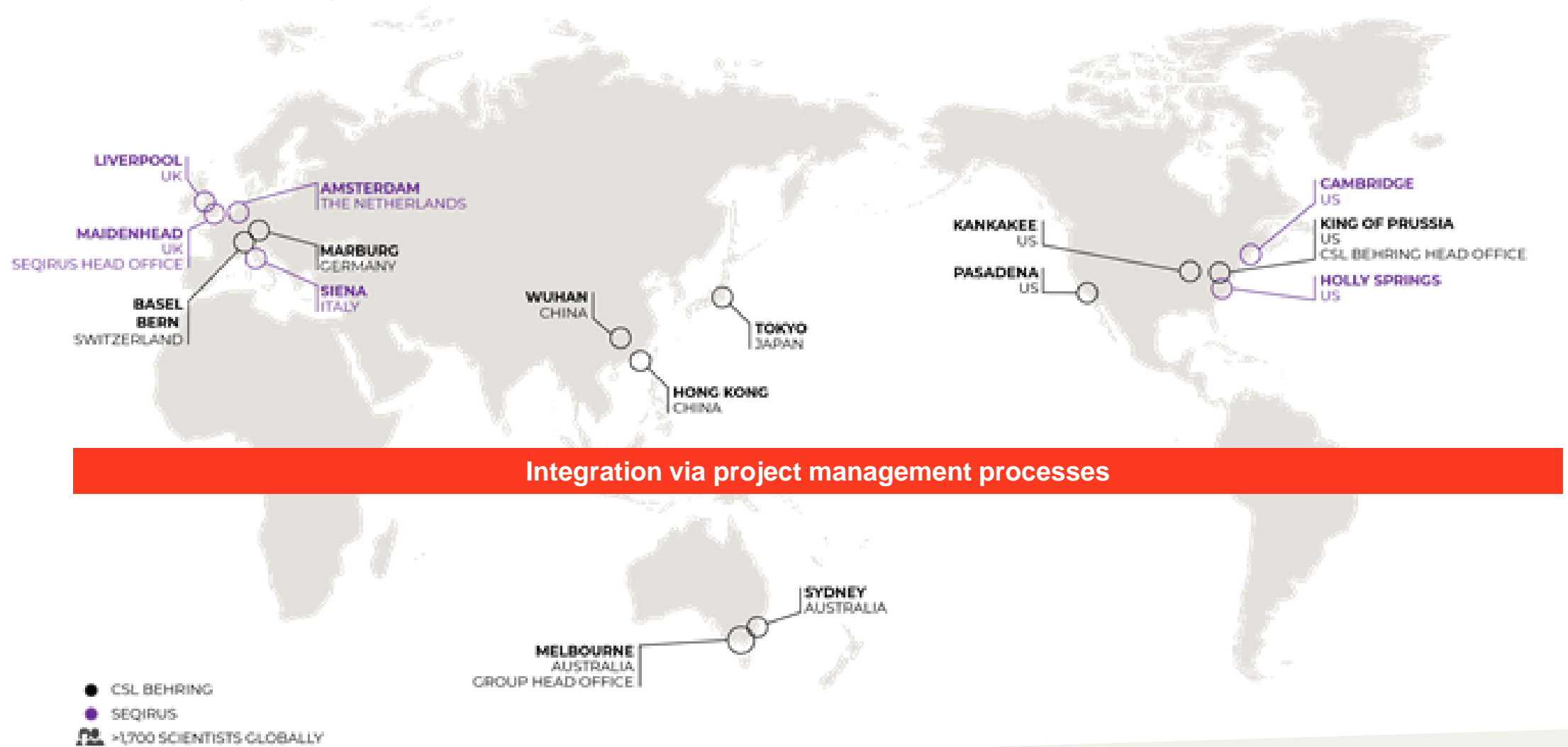


- R&D investment ~10-11% global revenue

# Key Past Launches from R&D Portfolio



# Leveraging Global Capabilities



# R&D Portfolio - December 2017

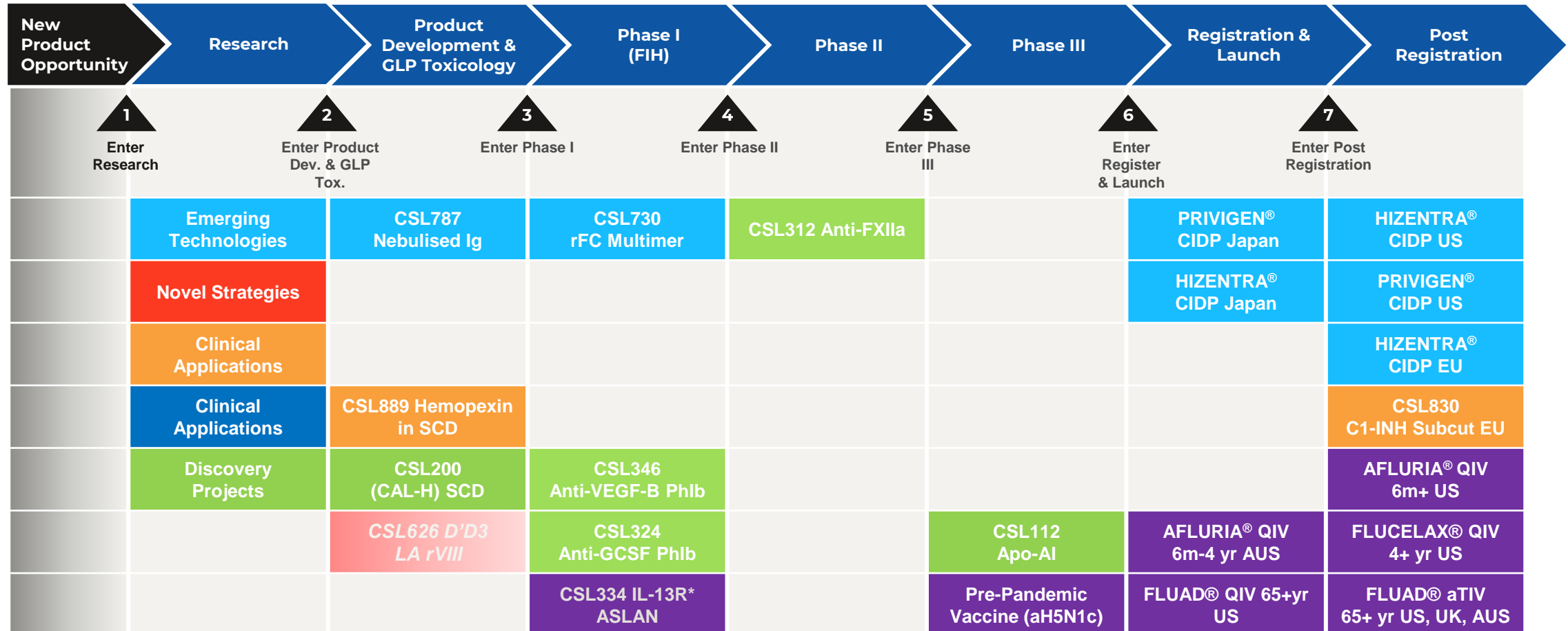
	RESEARCH	PRE-CLINICAL	PHASE I	PHASE II	PHASE III	REGISTRATION	COMMERCIAL / PHASE IV
Life Cycle Management / Market Development	Clinical Applications	C1-INH New Indications			PRIVIGEN® Japan	HIZENTRA® CIDP	PRIVIGEN® CIDP US
		Fibrinogen New Formulations			HIZENTRA® IIM		KCENTRA® Japan
		Haptoglobin/Hemopexin		CSL964 AAT GvHD Prevention		CSL830 C1-INH Subcut EU	HAEGARDA® US
		CSL640 rIX-FP subct			PRIVIGEN® CIDP Japan	AFLURIA® QIV 5-17 AUS	FLUAD® TIV 65+ US, UK
					CSL842 C1-INH AMR		FLUCELAX® QIV 4+ US
							AFLURIA® QIV 5-17 US
New Product Development	Emerging Technologies	CSL730 rFc Multimer			clazakizumab* Transplant		IDELVION®
	Novel Strategies	CSL626 D'D3 LA rVIII	CSL312 Anti-FXIIa	Mavri GM-CSFR-AZ*	pdFVIII Ruide		AFSTYLA®
	Discovery Projects	CSL334 IL-13R* ASLAN	CSL324 Anti-G-CSF				
	Clinical Applications	CSL311 Anti-BC	CSL346 Anti-VEGF-B		CSL112 apo-AI		
		P. gingivalis/POD* OH-CRC					

Core Capabilities: Immunoglobulins | Haemophilia | Specialty Products | Breakthrough Medicines | Vaccines & IP | Transplant

\*Partnered Projects



# Progress Through Stage Gates in 2018



Core Capabilities: [Immunoglobulins](#) | [Haemophilia](#) | [Specialty Products](#) | [Breakthrough Medicines](#) | [Transplant](#) | [Vaccines & IP](#)

# R&D Portfolio - December 2018

	RESEARCH	PRE-CLINICAL	PHASE I	PHASE II	PHASE III	REGISTRATION	COMMERCIAL / PHASE IV
New Product Development	Emerging Technologies	CSL787 Nebulised Ig	CSL730 rFc Multimer	CSL312 Anti-FXIIa in HAE	Clazakizumab* Transplant		IDELVION®
	Novel Strategies	CSL311 Anti-BC	CSL324 Anti-G-CSF	Mavri GM-CSFR*	pdFVIII Ruide		AFSTYLA®
	Discovery Projects	CSL200 (CAL-H) SCD	CSL346 Anti-VEGF-B		CSL112 Apo-AI		FLUAD® aTIV 65+ yr US, UK, AUS
	Haptoglobin	CSL889 Hemopexin in SCD	CSL334 IL-13R* ASLAN		FLUAD QIV 65+ yr		FLUCELAX® QIV 4+ yr US
	Clinical Applications	P. gingivalis/POD* OH-CRC			Pre-Pandemic Vaccine (aH5N1c)		CSL830 C1-INH Subcut EU
Life Cycle Management / Market Development	Clinical Applications	C1-INH New Indications			PRIVIGEN® ID Japan		PRIVIGEN® CIDP US
		Fibrinogen New Formulations			HIZENTRA® IIM	AFLURIA® QIV 6m-4 yr AUS	HIZENTRA® CIDP
					CSL842 C1-INH AMR	PRIVIGEN® CIDP Japan	KCENTRA® Japan
					CSL964 AAT GvHD Prevention	HIZENTRA® CIDP Japan	HAEGARDA® US
							AFLURIA® QIV 6m+ US

Core Capabilities: **Immunoglobulins** | **Haemophilia** | **Specialty Products** | **Breakthrough Medicines** | **Transplant** | **Vaccines & IP**

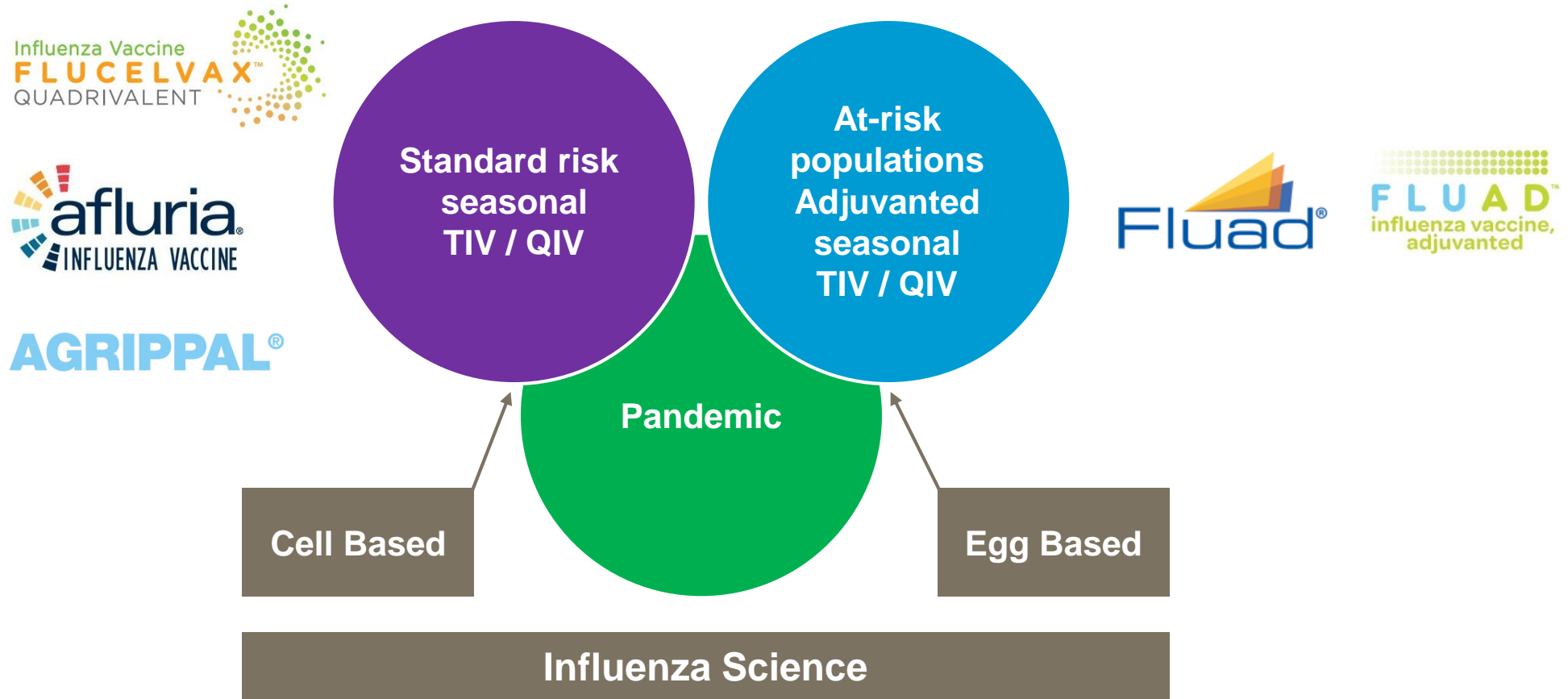
\*Partnered Projects

# Seqirus R&D

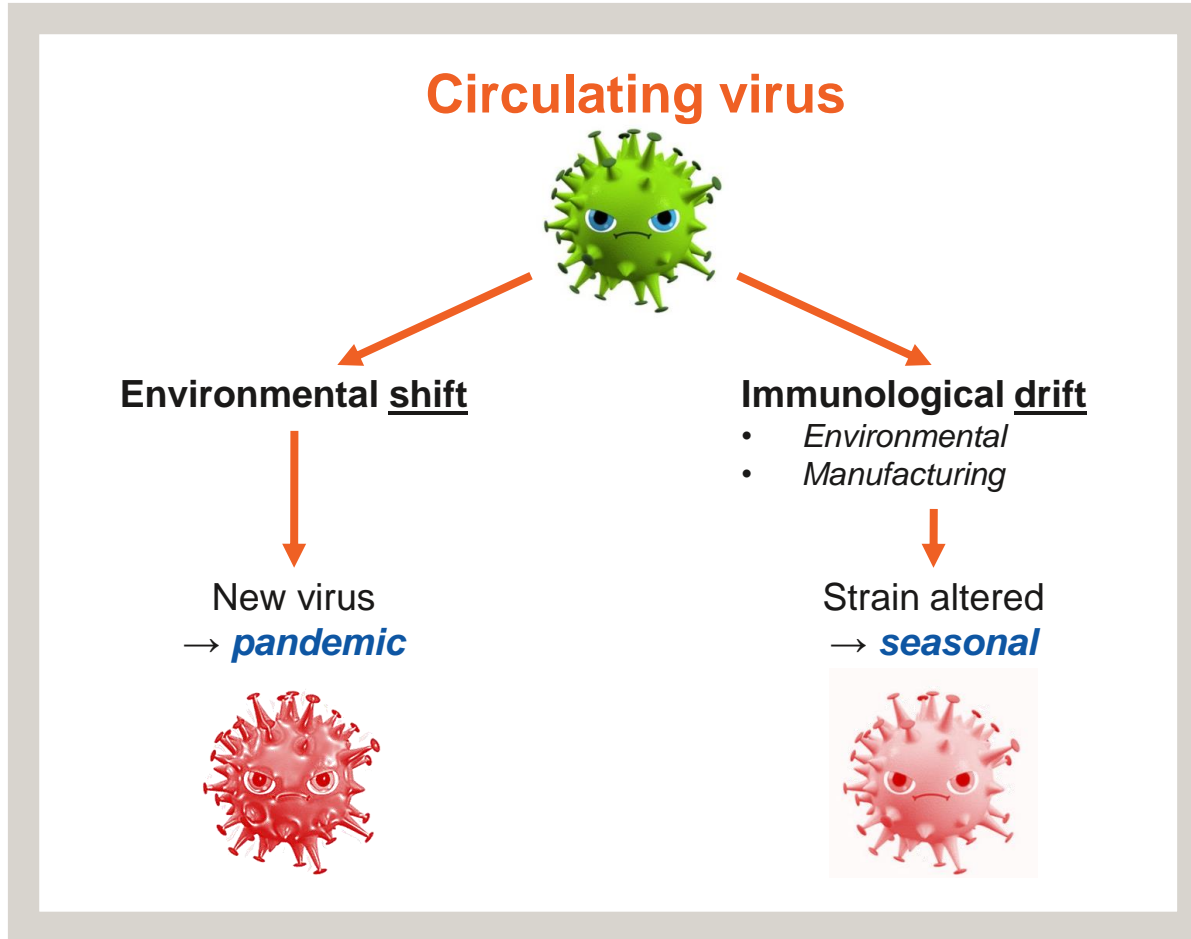
Dr Gregg Sylvester  
*Vice President Medical Affairs*



# Seqirus Influenza Vaccines



# Influenza Viruses Mutate in Various Ways



## ***Yearly seasonal vaccine***

4 strains

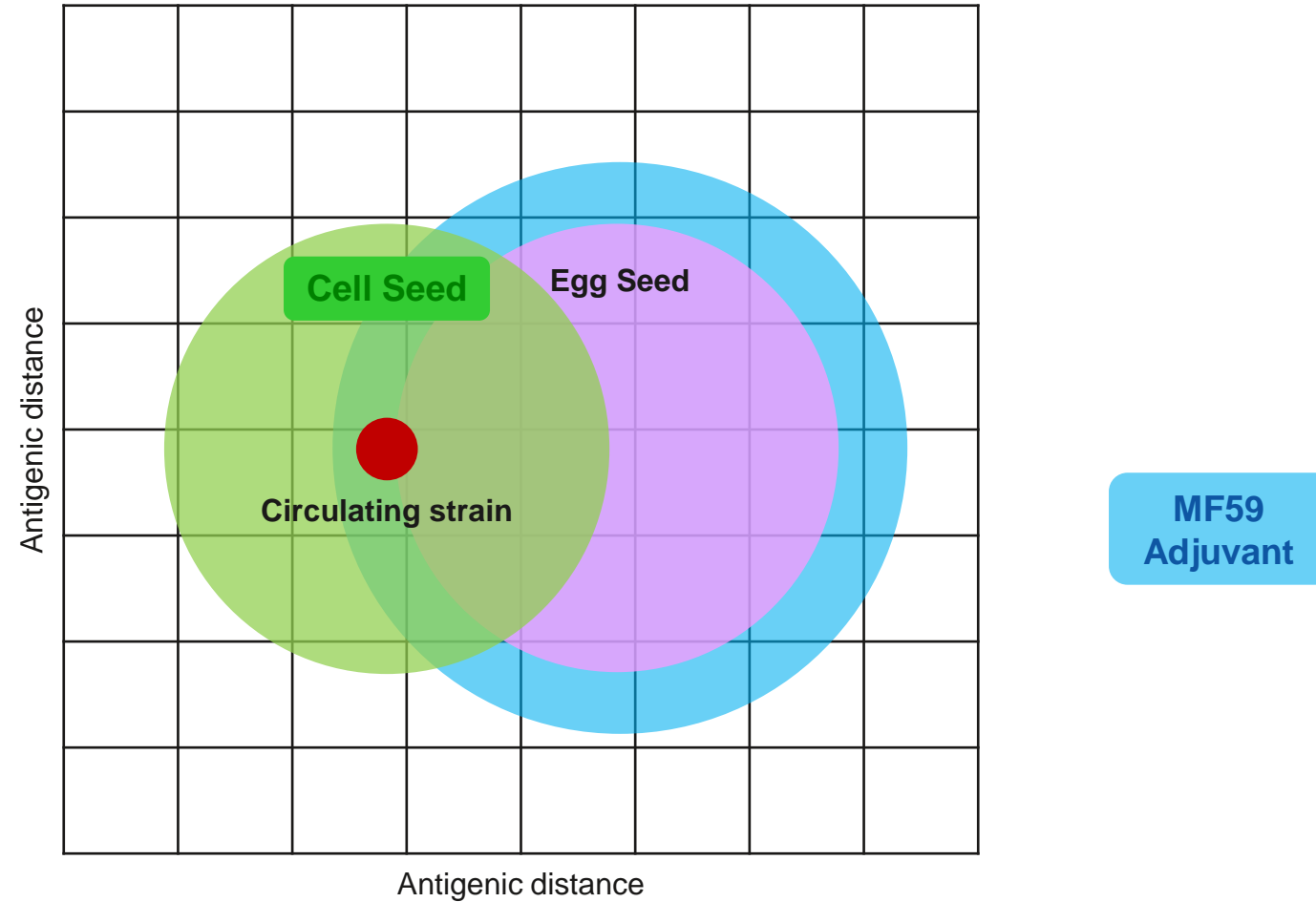
2 x “A” – H3N2, H1N1

2 x “B” – B/Victoria, B/Yamagata

Usually vary season to season

- Southern Hemisphere vs Northern Hemisphere

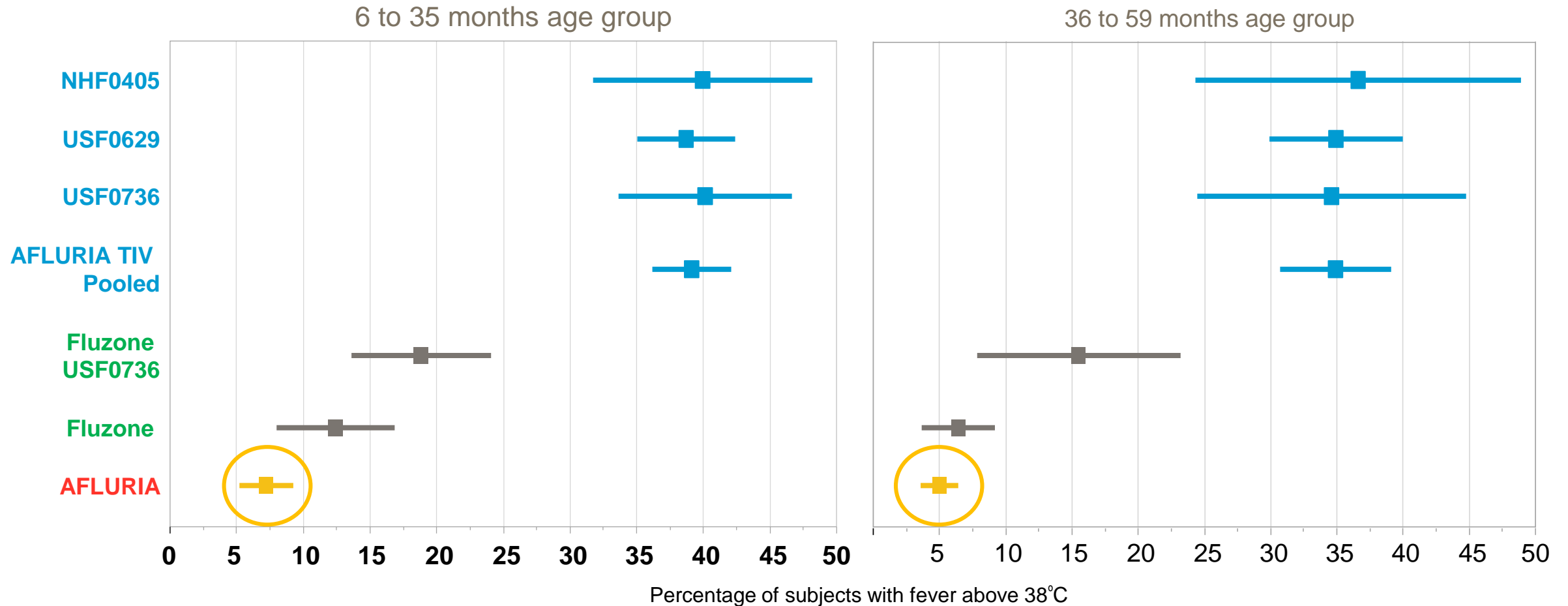
# Seqirus Technologies aim to Enhance Influenza Vaccines



# Milestones in 2018

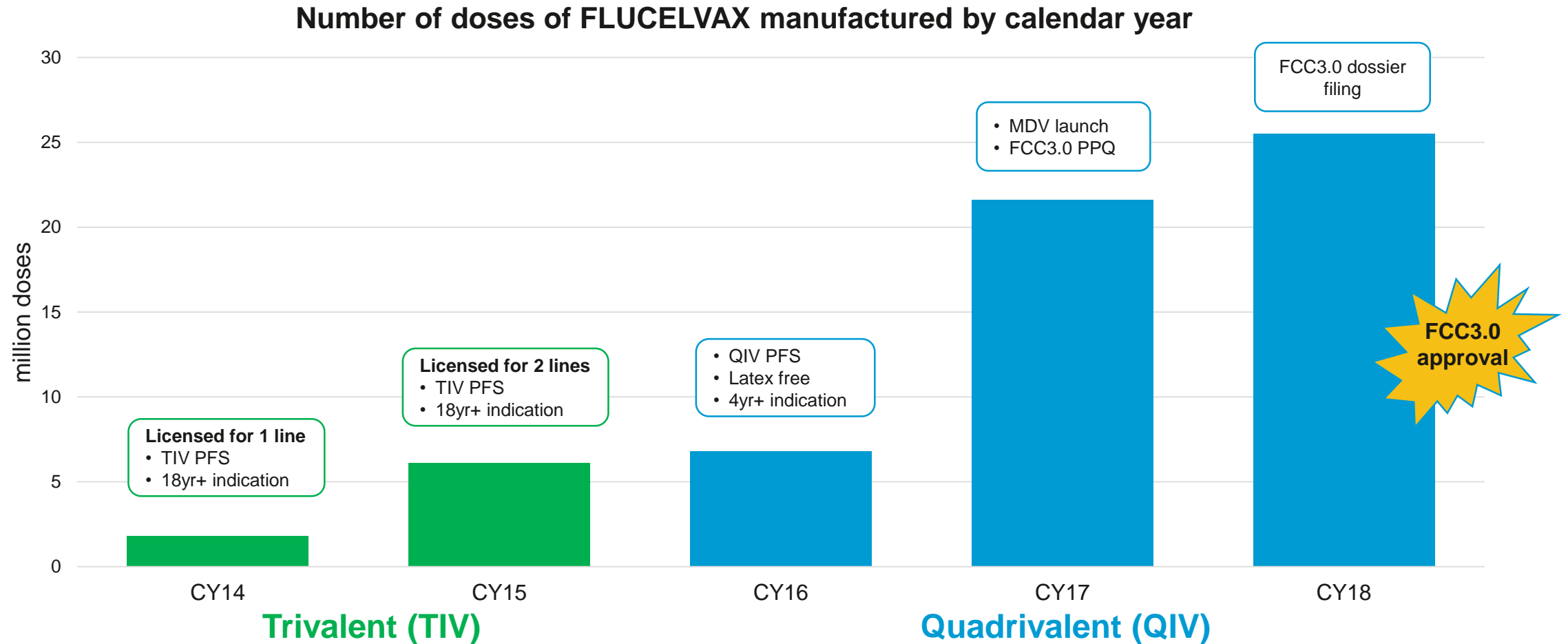
- AFLURIA QIV
  - US approval for 6M-4yrs
- FLUCELVAX QIV
  - US approval of major process improvement (“FCC3.0”)
  - European positive opinion
  - Positive effectiveness data compared with egg-based vaccines in US 2017-18 season
- FLUAD
  - Completion of US registration QIV trial for 65yrs+
  - Positive TIV effectiveness data compared with non-adjuvanted vaccines
- Pre-Pandemic vaccine (MF59-adjuvanted H5N1 cell = aH5N1c)
  - Clinical program completed

# Successful completion of AFLURIA QIV program





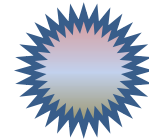
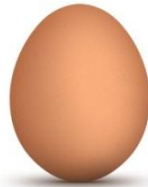
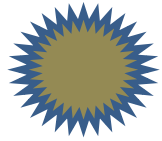
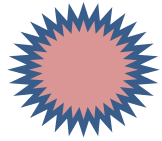
# Improvements in FLUCELVAX manufacturing output



# Vaccine Seed Adapts to Grow in Eggs

## Adaptation Required in Generation of Egg Seed

Seasonal strain



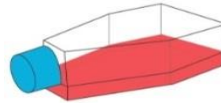
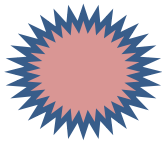
Selection based on

- seasonal HA and NA
- high growth properties

High growth donor strain

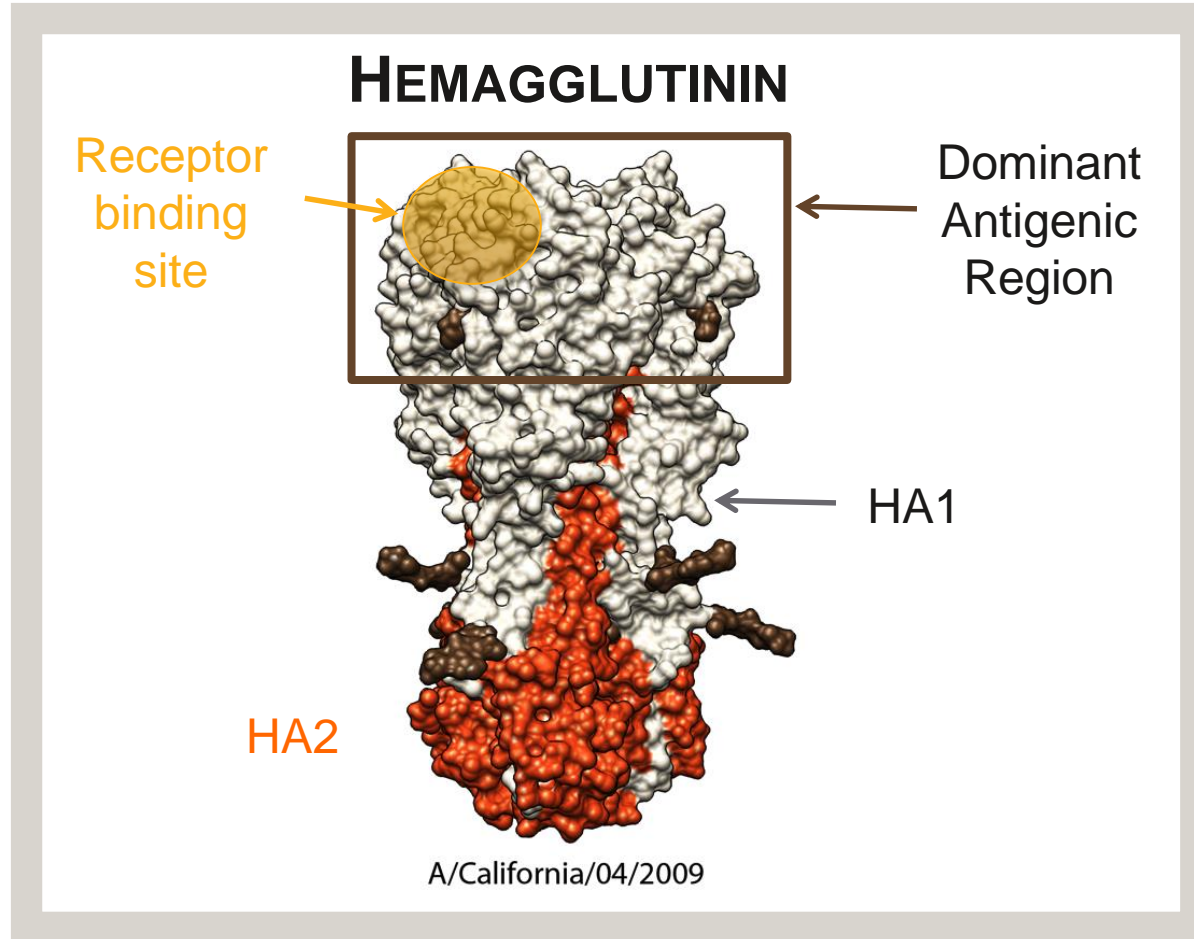
## No Adaptation Required in Generation of Cell Seed

Seasonal strain



High yielding viruses  
selected as cell seed  
(grown in MDCK)

# Science describes specific adaptation required for virus to grow in eggs, especially (but not only) H3N2



Evaluation of Influenza Virus A/H3N2 and B Vaccines on the Basis of Cross-Reactivity of Postvaccination Human Serum Antibodies against Influenza Viruses A/H3N2 and B Isolated in MDCK Cells and Embryonated Hen Eggs

Clinical and Vaccine Immunology June 2012 Volume 19 Number 6

Low 2012–13 Influenza Vaccine Effectiveness Associated with Mutation in the Egg-Adapted H3N2 Vaccine Strain Not Antigenic Drift in Circulating Viruses

PLOS ONE | [www.plosone.org](http://www.plosone.org) March 2014 | Volume 9 | Issue 3 | e92153

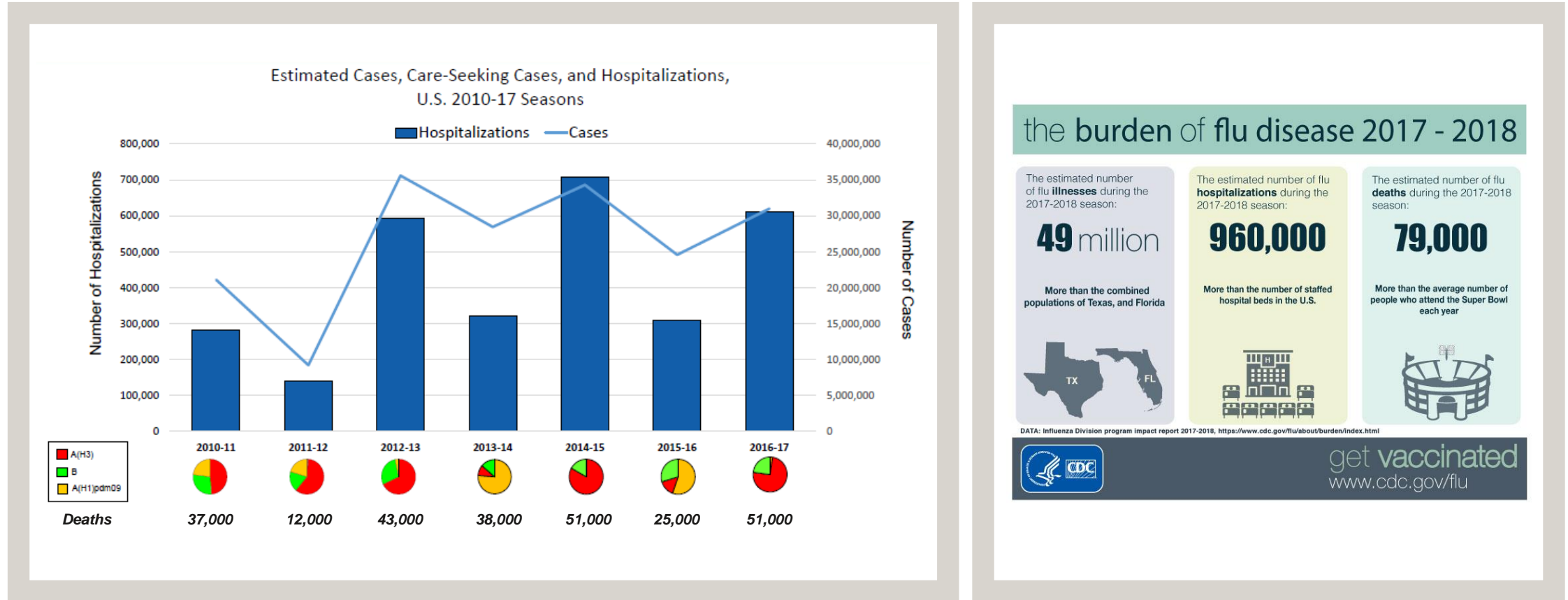
A structural explanation for the low effectiveness of the seasonal influenza H3N2 vaccine

PLOS Pathogens October 23, 2017

Contemporary H3N2 influenza viruses have a glycosylation site that alters binding of antibodies elicited by egg-adapted vaccine strains

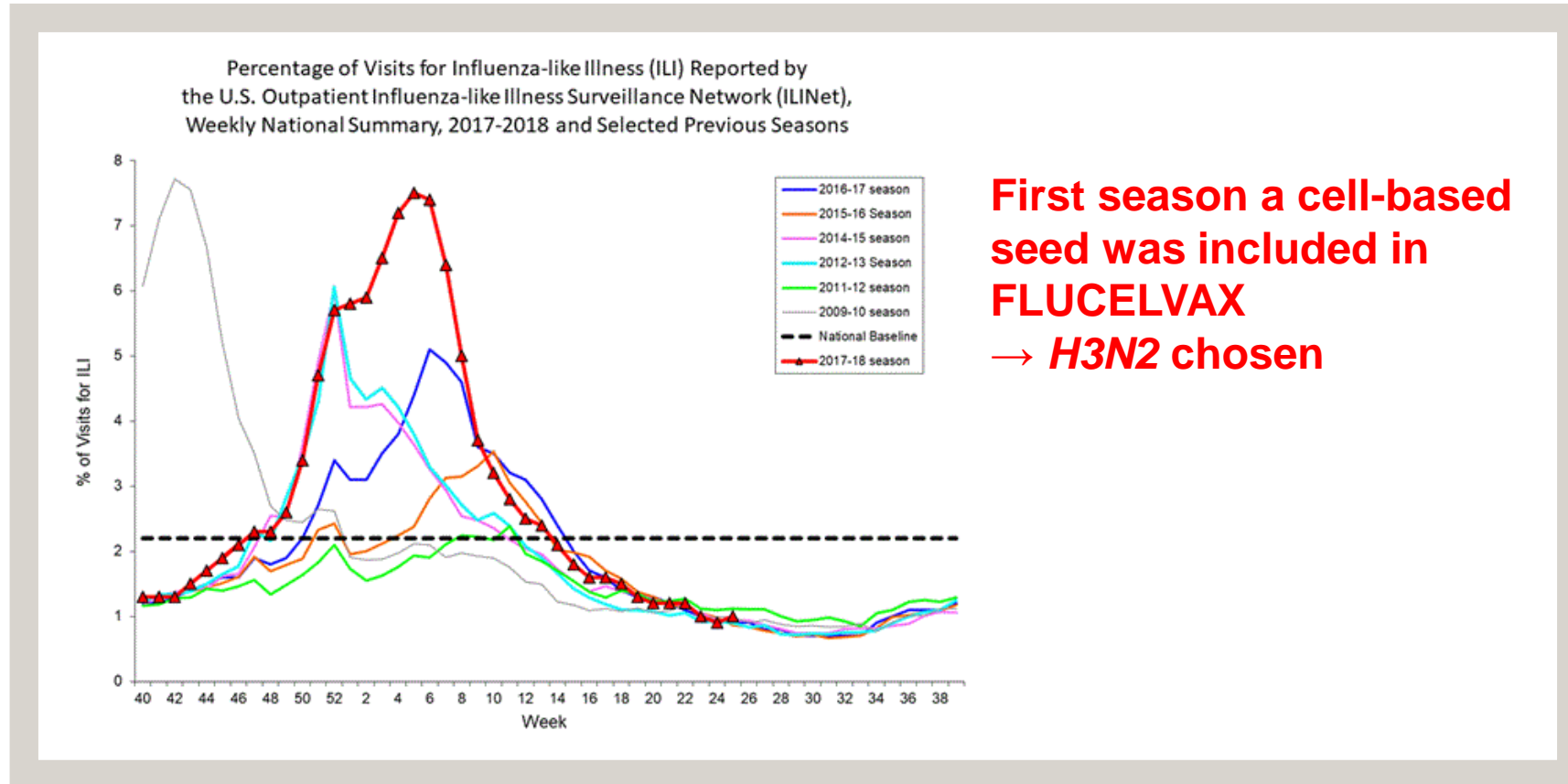
[www.pnas.org/cgi/doi/10.1073/pnas.1712377114](http://www.pnas.org/cgi/doi/10.1073/pnas.1712377114)

# H3N2-dominant seasons occur often and can be associated with a substantial health burden



Source: US data from CDC, available at [www.cdc.gov/flu/about/disease/2015-16.htm](http://www.cdc.gov/flu/about/disease/2015-16.htm)

# US 2017-18 Season was Severe and Dominated by H3N2



Source: Centers for Disease Control and Prevention, National Center for Immunization and Respiratory Diseases (NCIRD); <https://www.cdc.gov/flu/weekly/index.htm#OISmap>

# Big Data to Assess Real World Health Impact of a Vaccine

- **Randomised clinical trials** provide an estimate of **efficacy** in a controlled setting in a *well-defined population*
- **Real world vaccine effectiveness** (VE) evaluation addresses the health impact of a vaccine in the *general population*
  - *Relative VE – versus another vaccine*
  - *Absolute VE – versus no vaccine*
- We conducted a retrospective cohort study of relative VE assessment of FLUCELVAX™ QUADRIVALENT with H3N2 cell seed versus egg-based vaccines during the 2017/18 season in the USA using Electronic Medical Records (ALLSCRIPTS)

**Note:** FLUCELVAX® Quadrivalent was approved by FDA based upon demonstrated non-inferiority relative to FLUCELVAX® trivalent influenza vaccine. There have been no RCT demonstrating clinical superiority compared with egg-based or other influenza vaccines. Real World VE data not for US promotional use.

# Relative VE of **cell-** vs **egg-based** vaccines in 2017-18 US Season

- Seqirus data (ALLSCRIPTS)\*
  - → 36% (95% CI 26.1, 44.9) reduction in “influenza-like illness”
- FDA data (Centers for Medicare & Medicaid Services)^
  - → 11% (95% CI 7.5, 13.7) reduction in hospital/ER “encounters”
- Nth CA Kaiser Permanente#
  - 8% (NS) reduction in influenza A by lab test (PCR)

\* Boikos et al, Effectiveness of the Cell Culture- and Egg-Derived, Seasonal Influenza Vaccine during the 2017-2018 Northern Hemisphere Influenza Season, US National Foundation for Infectious Disease 2018 Clinical Vaccinology Course, November 2018, (Poster), Bethesda MD

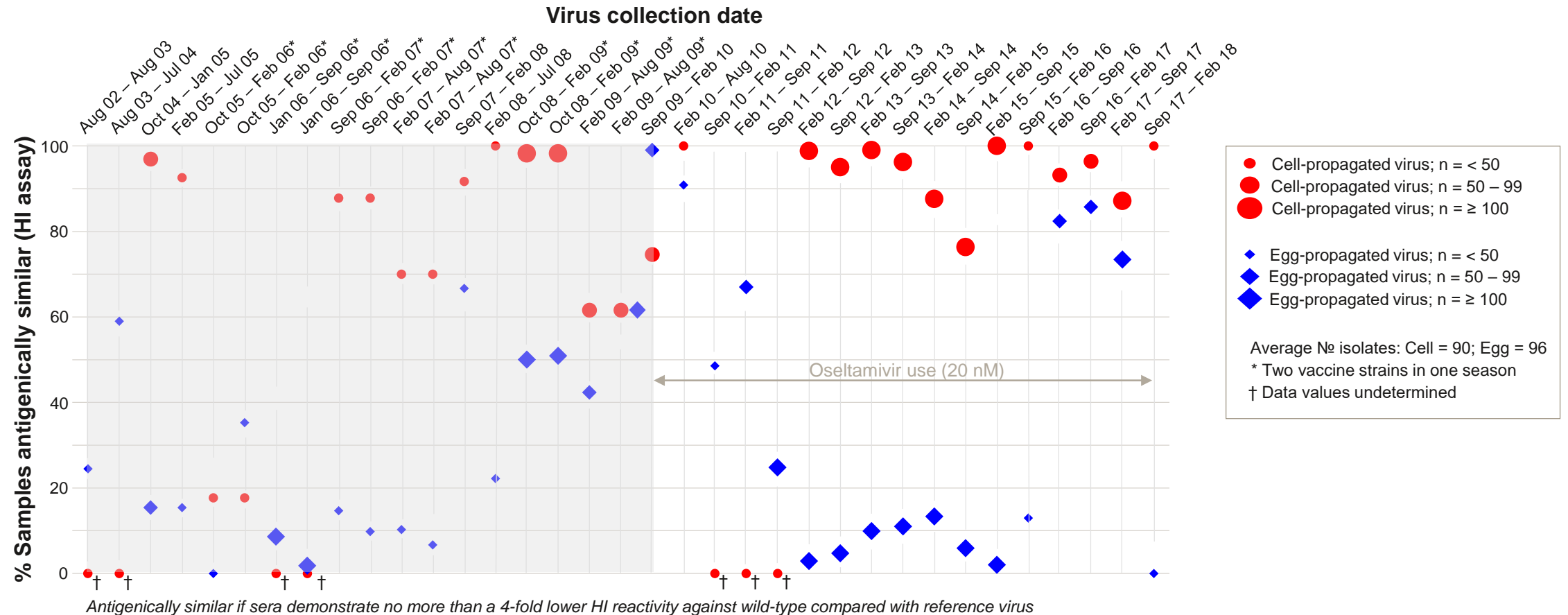
^ Lu et al, Relative effectiveness of cell-cultured versus egg-based influenza vaccines, 2017-18. Advisory Committee on Immunization Practices June 2018. <https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2018-06/flu-03-Lu-508.pdf>. Accessed 28 October 2018

# Klein et al, Vaccine Effectiveness of Flucelvax Relative to IIV During the 2017-18 Influenza Season in Northern CA. IDWeek October 2018, San Francisco, CA (Late Breaker 15).



# Francis Crick Institute (WHO) 15 year data

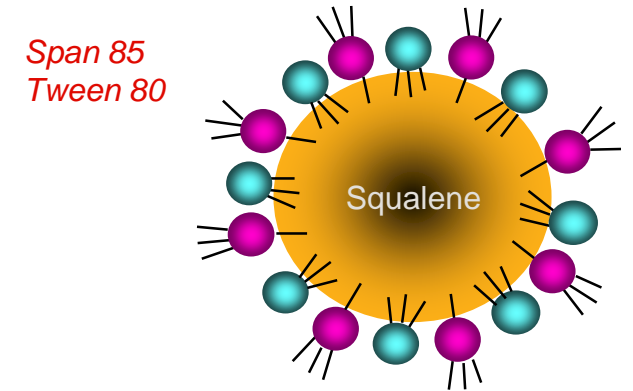
## Cell- vs egg-based “reference virus” similarity to wild-type H3N2





# MF59 Adjuvant

- Oil-in-water adjuvant
  - **Seasonal vaccine (FLUAD)** – increased and broader immunogenicity, focussed on people 65yrs and older
  - **Pandemic vaccine** – dose sparing
    - aH5N1c dose 1/12 of that required without adjuvant
- *>130 million doses administered – excellent clinical safety*



# FLUAD is Gaining Wider Usage for People 65yrs and Older

- Approved in Europe 1997, USA 2015
- Preferential recommendation for population 65years and older in UK & AUS
- Meta-analysis\* of published studies (real world data) describes effectiveness of FLUAD in prevention of lab-confirmed influenza and hospitalisation in people 65 years and older

\*Domnich et al, *Vaccine* 35:513-520, 2017

# Real World Data to Investigate the Potential Benefits of FLUAD

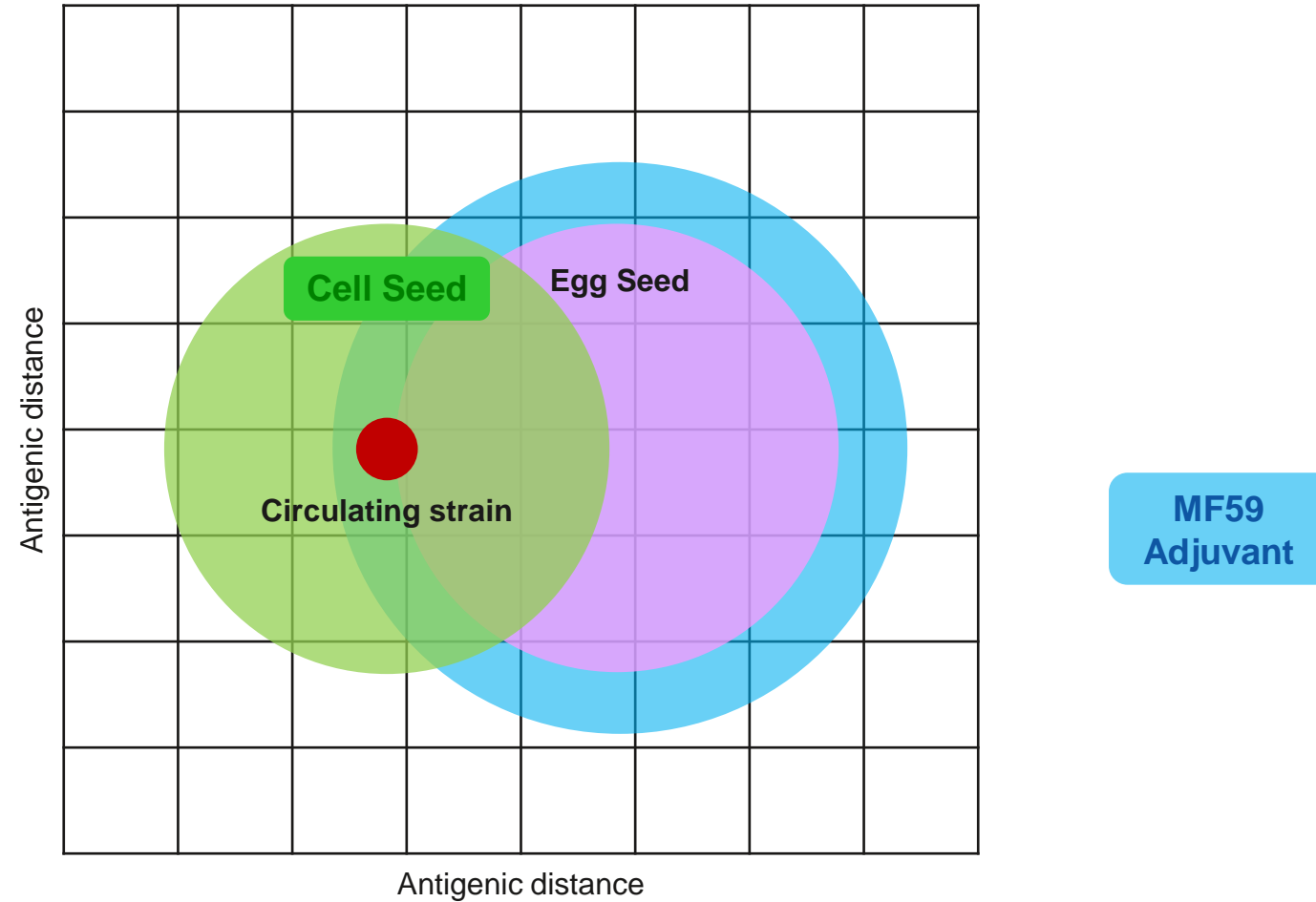
- FDA/CMS (insurance claims) data 2017/18 season
  - FLUAD showed 3% reduction in hospital/ER encounters in mismatch season\*
- Cluster Randomised Trial in Nursing Homes during 2016/17 season (interim analysis)
  - FLUAD showed 6% reduction in all-cause hospitalisation in mismatch season^
  - Previous study of similar design by same investigators with Fluzone HD – 6.7% reduction in all-cause hospitalisation in matched season#

\* Lu et al, *Relative effectiveness of cell-cultured versus egg-based influenza vaccines, 2017-18*. Advisory Committee on Immunization Practices June 2018. <https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2018-06/flu-03-Lu-508.pdf>. Accessed 28 October 2018

^ Gravenstein et al. A cluster-randomized trial of adjuvanted trivalent influenza vaccine vs. standard dose in U.S. nursing homes. IDWeek October 2018, San Francisco, CA (Poster 996)

# Gravenstein et al. Comparative effectiveness of high-dose versus standard-dose influenza vaccination on numbers of US nursing home residents admitted to hospital: a cluster-randomised trial. *Lancet Respir Med* 2017 Sep;5(9):738-746.

# Seqirus Technologies aim to Enhance Influenza Vaccines



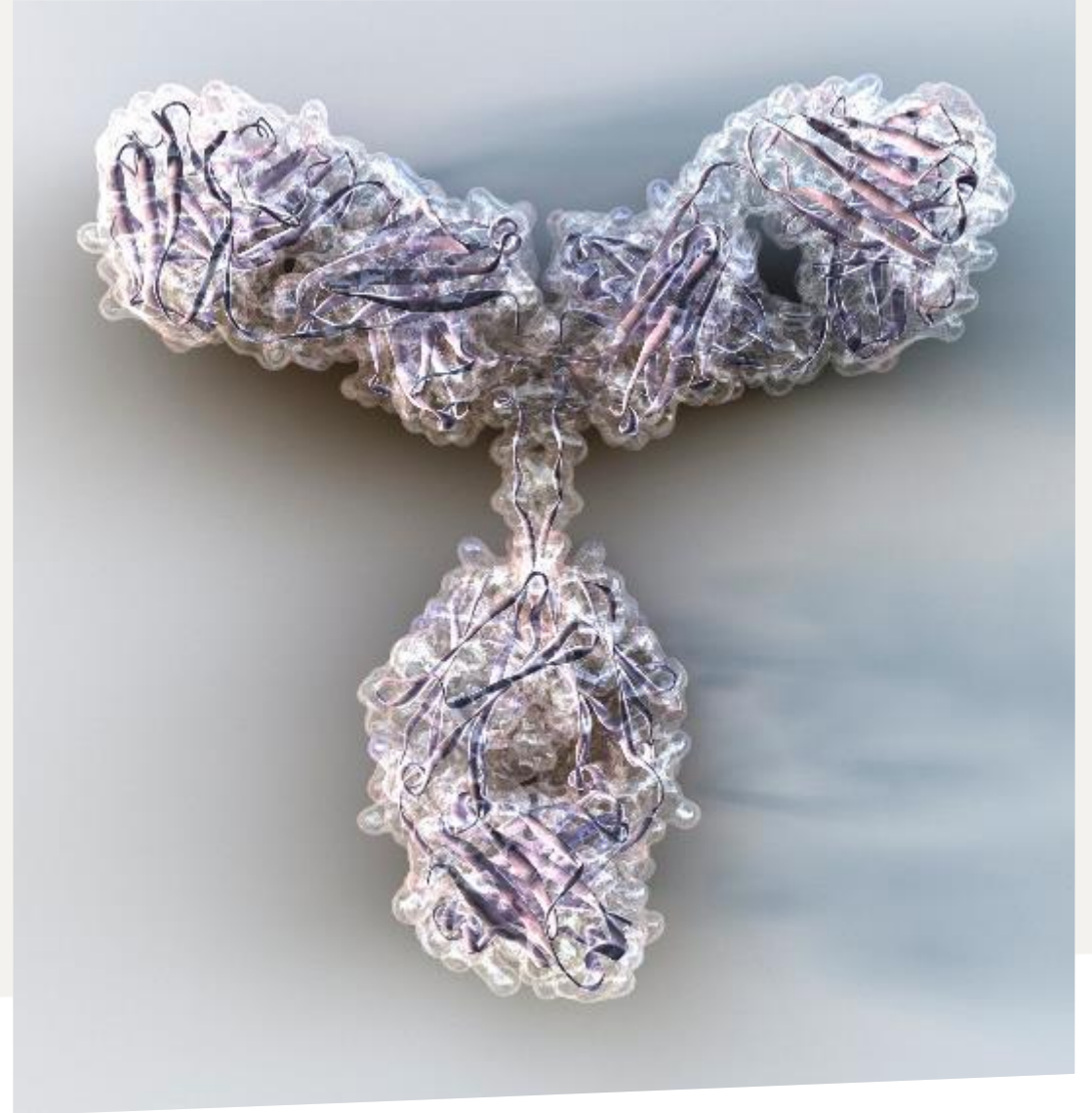
# Anticipated Milestones in 2019

- AFLURIA QIV
  - AUS approval for 6M-4yrs
- FLUCELVAX QIV
  - European approval for 9yrs+
  - AUS submission
- FLUAD QIV
  - US approval for 65yrs+
  - EU/UK and AUS submissions
- PrePandemic aH5N1c
  - US submission

# CSL Behring

## Research and Early Development Portfolios

Dr Andrew Nash  
*Senior Vice President, Research*



# Research Organisation and Portfolio

- Coordinated global project portfolio

Immunoglobulins

Haemophilia

Specialty  
Products

Breakthrough  
Medicines

Transplant

- Bio21(Parkville), Bern and Marburg
- Bio21 expansion completed
- Research capabilities: plasma and recombinant proteins, gene and cell-based therapies



Bio21 expansion



# Research Organisation and Portfolio

- Relocation of CSL Research Bern

*Swiss Institute of Translational and Entrepreneurial Medicine (SITEM)*

- Bern University and Hospital Campus
- Translational medicine, Phase I Unit
- Cell and Gene Therapy

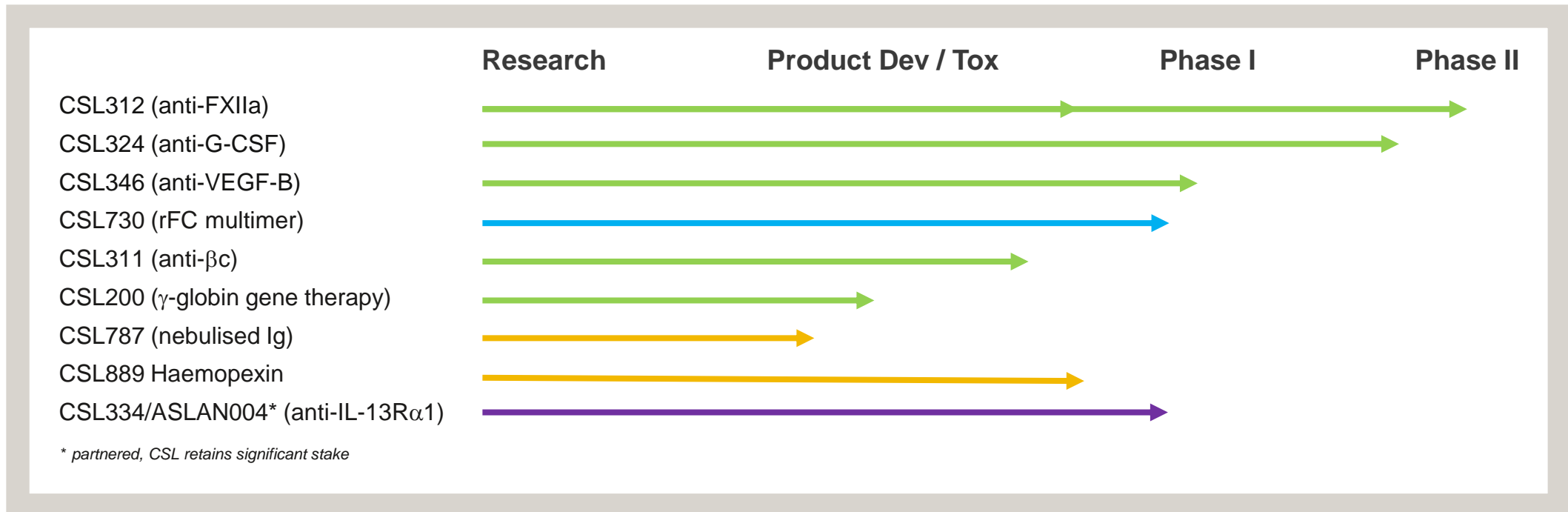


Bern relocation / expansion  
– completed by H1 2019



# Early Development Portfolio

- Portfolio of preclinical and early-mid stage clinical opportunities consistent with CSL commercial objectives
- Delivery of high quality candidates for clinical development



More detail about our pipeline projects can be found here <https://www.csl.com/research-and-development/product-pipeline>

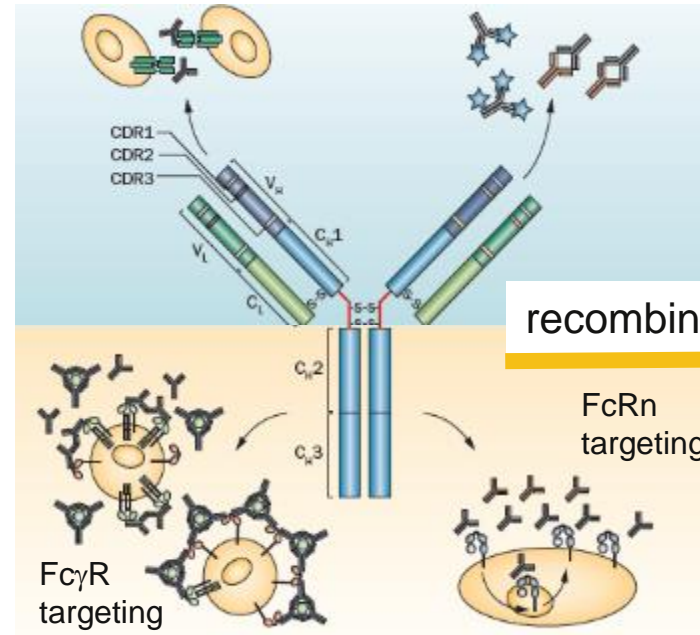
# Immunoglobulin Therapy

## Ig Fab region

- Immune deficiencies
- Autoimmune conditions

## Ig Fc region

- Autoimmune conditions



recombinant Fc multimer – CSL730

Potentially reproduces all  
Fc mediated Ig activity

From Lunemann *et al.*, *Nat Rev Immunol* 2015

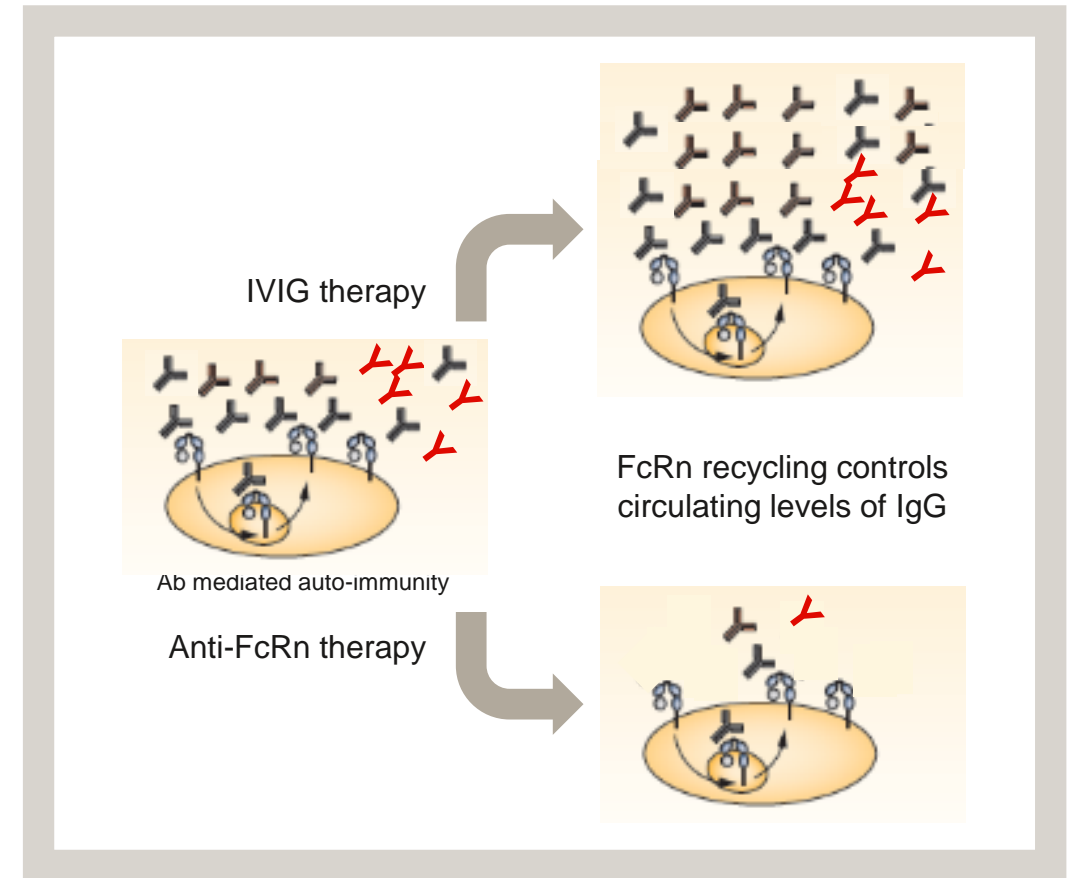
# Immunoglobulin Therapy

## Targeting FcRn – IG vs. anti-FcRn agents

- IV & SC IG therapy in autoimmune disease
- Increase in total circulating IgG
- Pathogenic auto-antibody IgG out-competed for access to FcRn
- Long term safety established

## Anti-FcRn therapy



















- Relevant for auto-antibody mediated disease only
- Blocks access of all IgG to FcRn
- Total circulating IgG reduced by up to 80%
- Long term safety implications unclear






⚡ = pathogenic auto-antibody

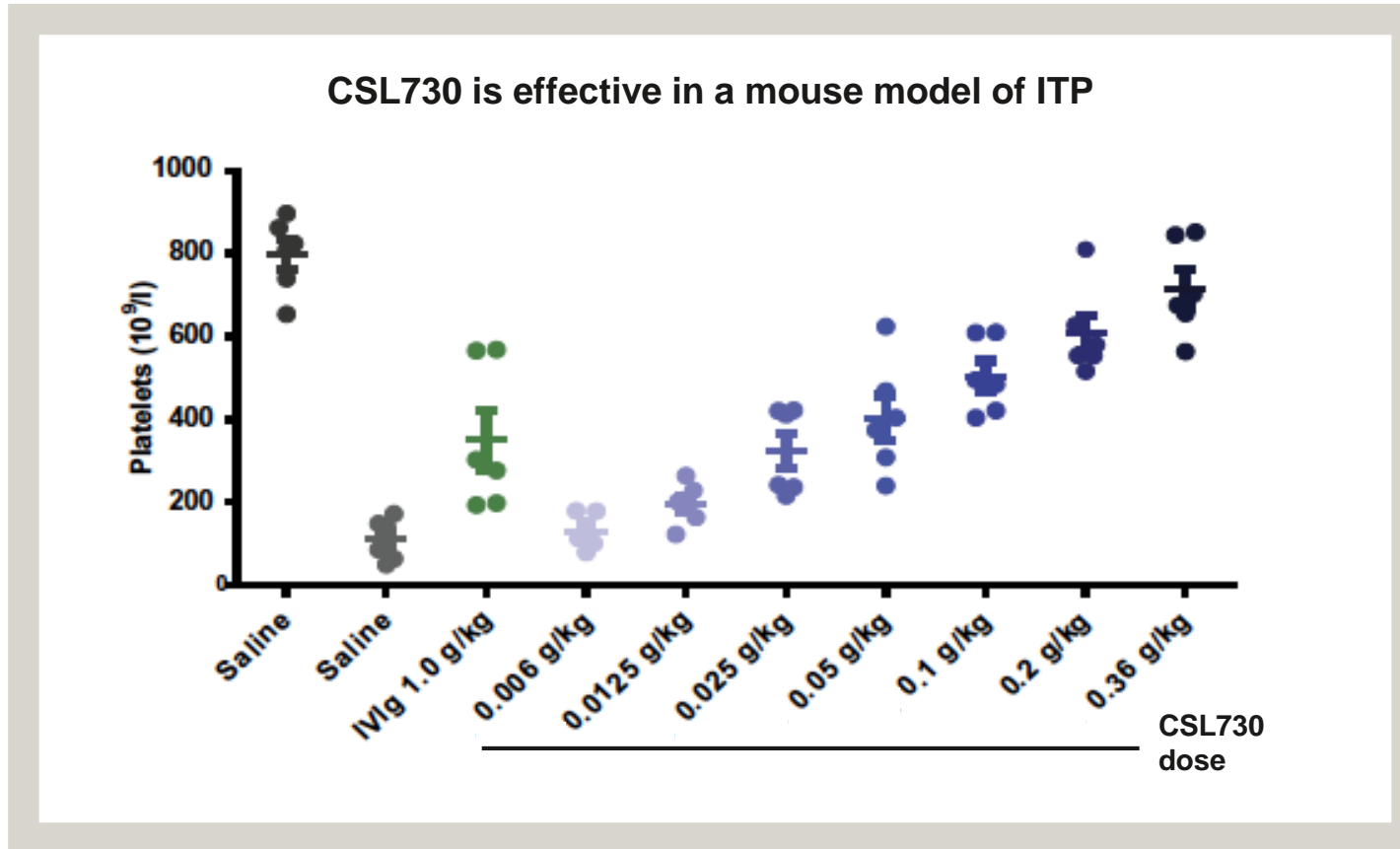
# Immunoglobulin Therapy

## Mechanism of action summary

	Pathogen Neutralisation	Reduction of Pathologic Ig	Complement Scavenging	FcγR Expression Modulation	Immune Cells Modulation	Cytokine Modulation
Ig Therapy						
IgG Fc Multimers						
FcRn Binding Agents						

 No Activity     Possible Activity     Activity

# CSL730 – Recombinant Fc Multimer



- Non-clinical safety toxicity data supports commencement of FIH studies
- Phase I study (healthy volunteers) commenced Q1 2018

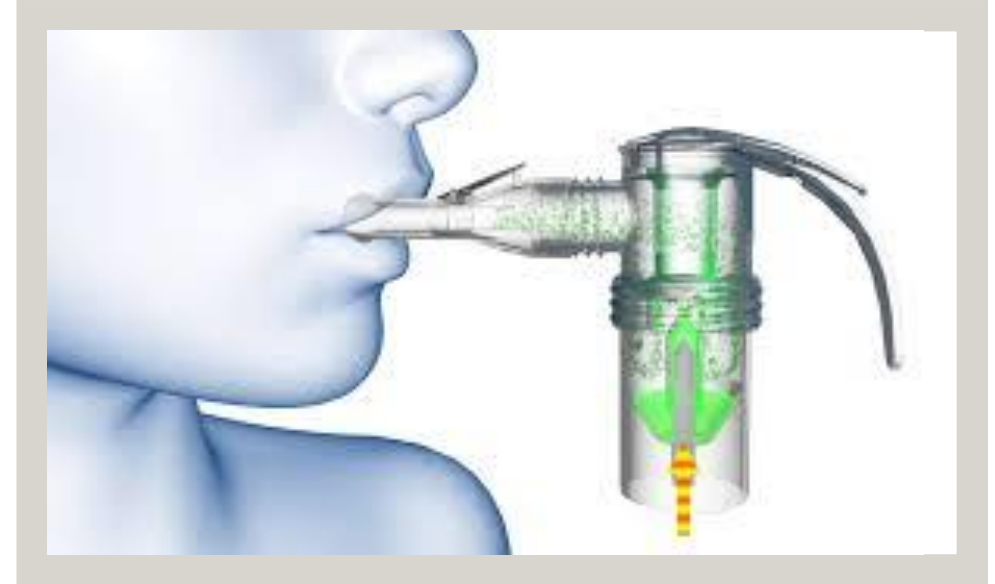
# Immunoglobulin Therapy – Expanding Benefit

## Nebulised Ig – respiratory tract infections

- Concept: Prevention of viral and bacterial infections of the respiratory tract by inhaling polyclonal immunoglobulins
- Technical feasibility demonstrated

## Potential indications for NebIg:

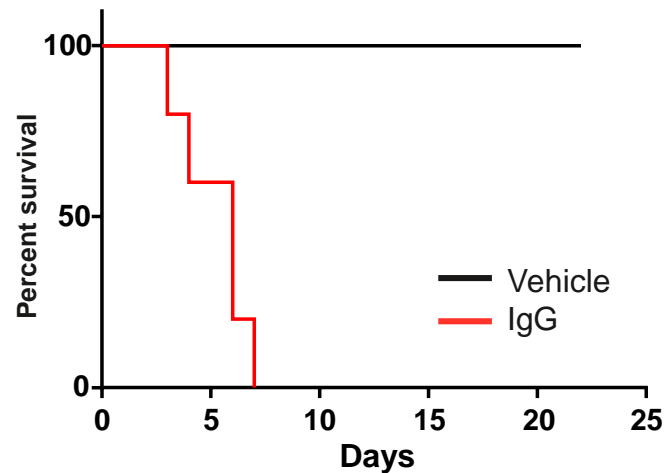
- Prevention of infections in PID patients
- Prevention of infection-related exacerbations in COPD and Bronchiectasis patients



# Immunoglobulin Therapy – Expanding Benefit

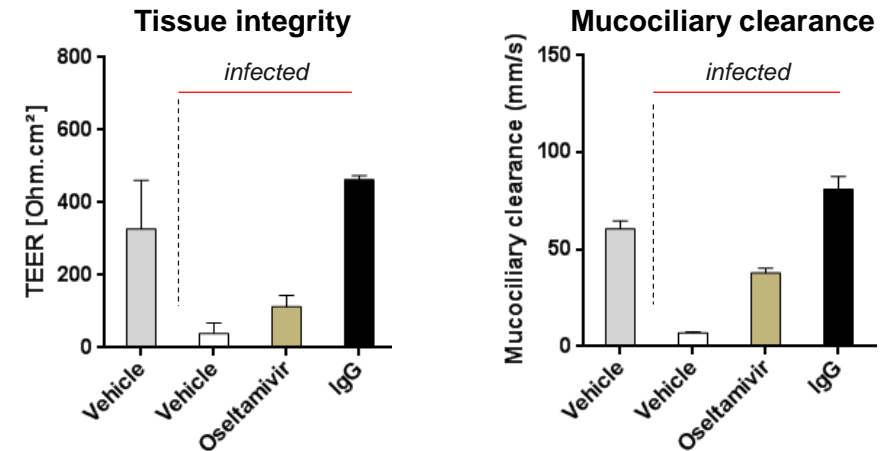
## Inhaled IgG prevents bacterial and viral infection

Mouse model of *S. pneumoniae* infection



Intranasal IgG prevents *S. pneumoniae* bacterial infection in mouse model

*In vitro* model of influenza virus infection

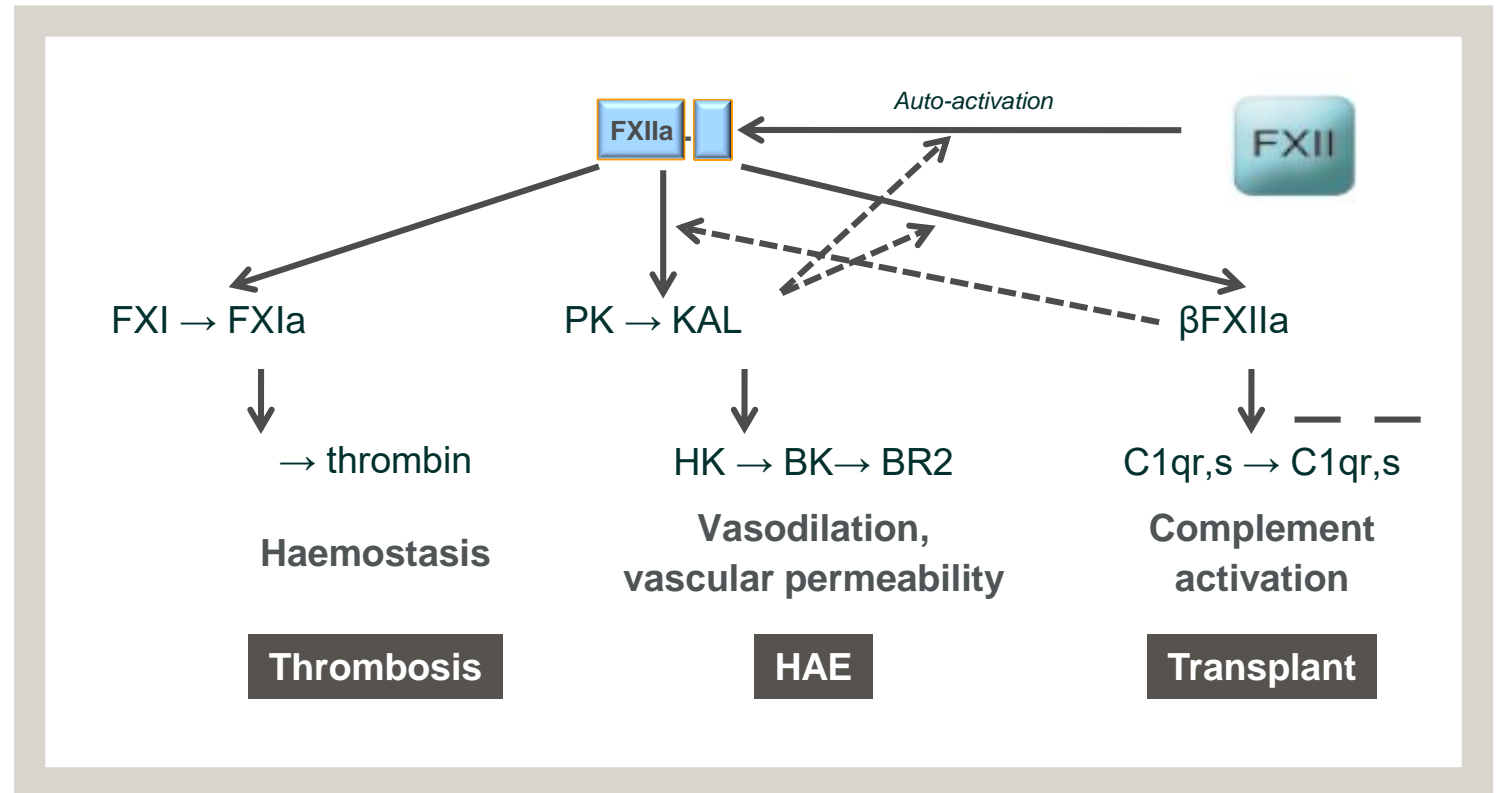


IgG preserves tissue integrity and mucociliary clearance of primary human bronchial cells after influenza virus infection

- GLP Toxicology studies in progress
- First-in-human trial planned for 2019

# CSL312 – HAE and Thrombosis

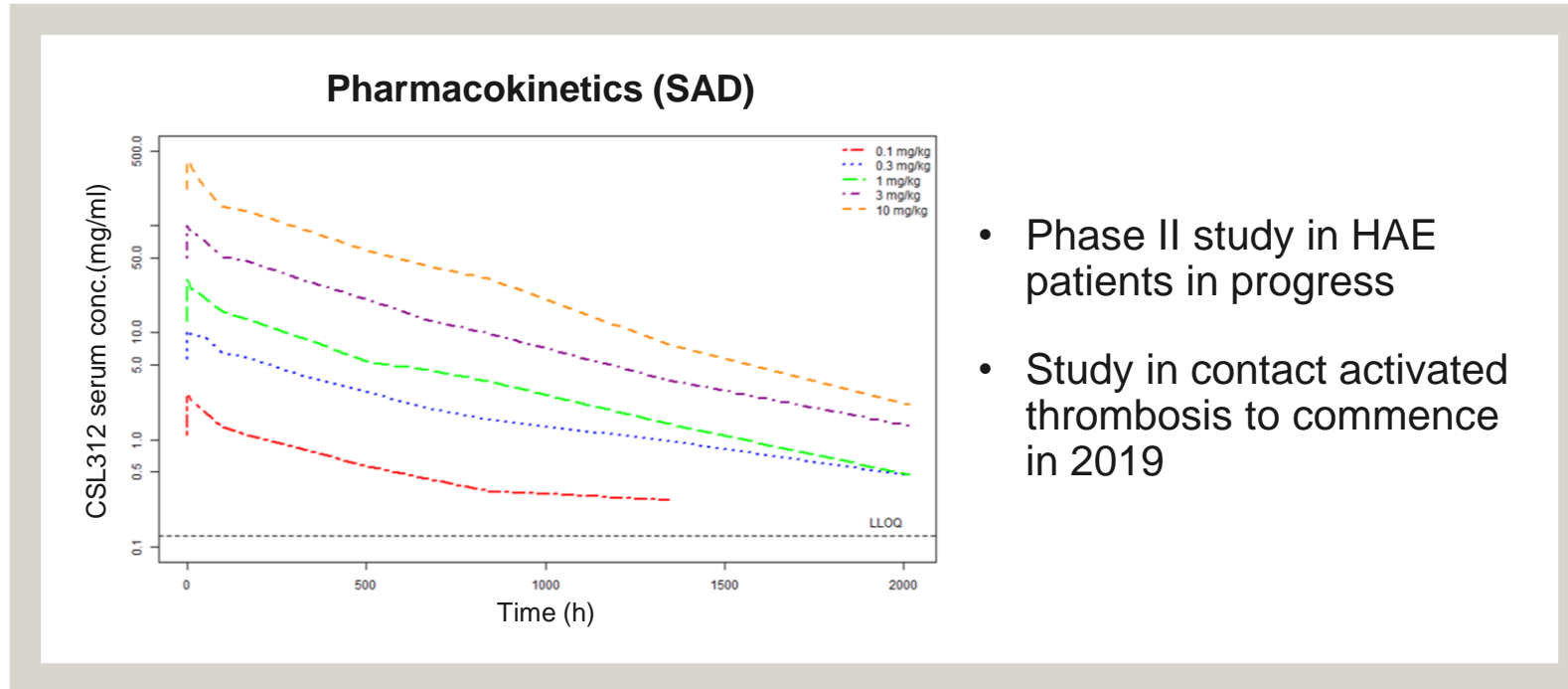
- Targeting FXIIa represents a novel approach to the treatment of HAE & contact activated thrombosis
- Efficacy in multiple animal models and translational studies





# CSL312 – HAE and Thrombosis

## First in Human (healthy volunteers) Phase I study



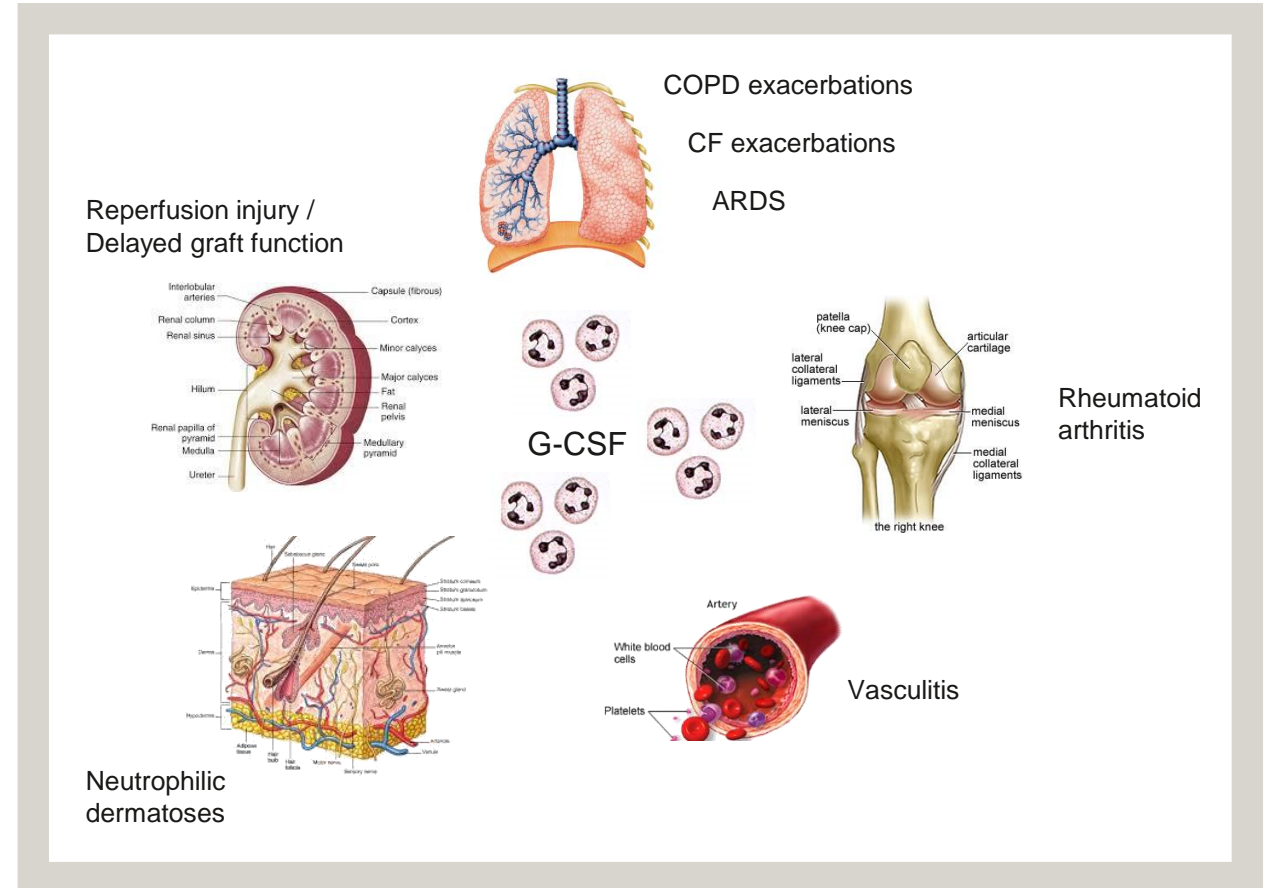
- Phase II study in HAE patients in progress
- Study in contact activated thrombosis to commence in 2019

- Safe and well tolerated
- Linear pharmacokinetics with expected pharmacodynamic effects
  - Inhibits FXIIa mediated activity in a dose dependent manner

# CSL324 – Neutrophil Mediated Inflammation

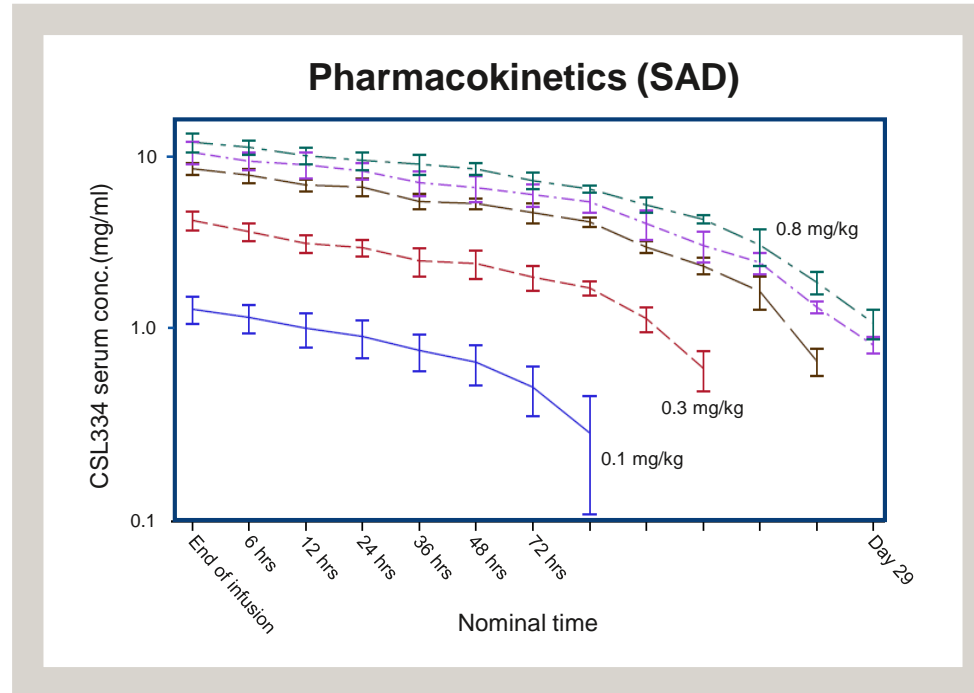
## G-CSF / Neutrophils / Inflammation

- Neutrophils – contribute to protective mechanism against infections
- Neutrophil numbers and activity under control of Granulocyte Colony Stimulating Factor (G-CSF)
- Excessive activated neutrophils can cause chronic severe inflammatory diseases
- Targeting G-CSF represents a novel approach to the treatment of inflammatory diseases
- Efficacy in multiple animal models and translational studies



# CSL324 – Neutrophil Mediated Inflammation

First in Human (healthy volunteers) Phase I study



- Safe and well tolerated
- Linear PK with target saturation and expected pharmacodynamic effects
  - *ex vivo* STAT 3 and *in vivo* G-CSF challenge

# CSL324 – Neutrophil Mediated Inflammation

Phase Ib study in neutrophilic dermatoses commencing Q2 2019

## Hidradenitis Suppurativa (Acne Inversa)

- Chronic, inflammatory, recurrent, debilitating skin disease of the hair follicle
- Lesions are painful, unsightly, odorous, with devastating effect on the patients QOL
- Prevalence 1-4% of the general population
- Unmet need – Adalimumab is not effective in all patients, and does not always have a durable response



## Palmoplantar pustulosis

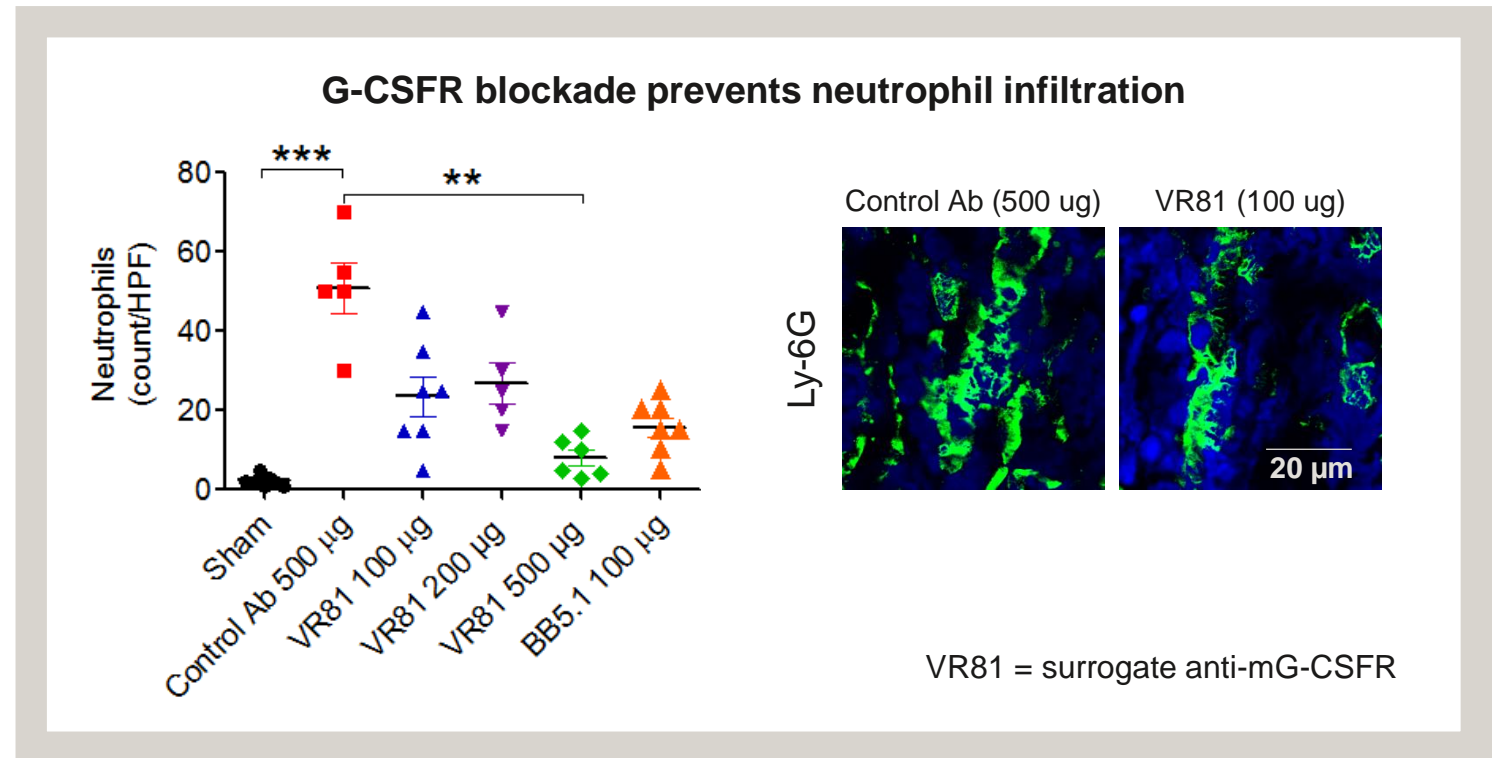
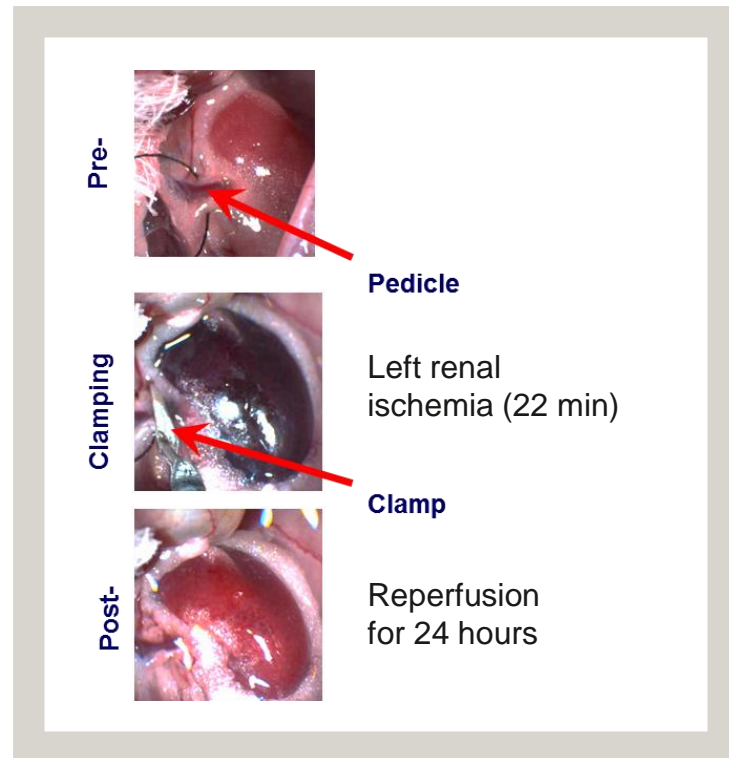
- Characterised by a chronic eruption of sterile pustules on palms and soles – filled with neutrophils
- The lesions are usually painful and decrease patients QOL
- Prevalence data limited – very rare
- Unmet need – SoC topical steroids, phototherapy and systemic Methotrexate, cyclosporine



# CSL324 – Neutrophil Mediated Inflammation

Kidney graft reperfusion injury

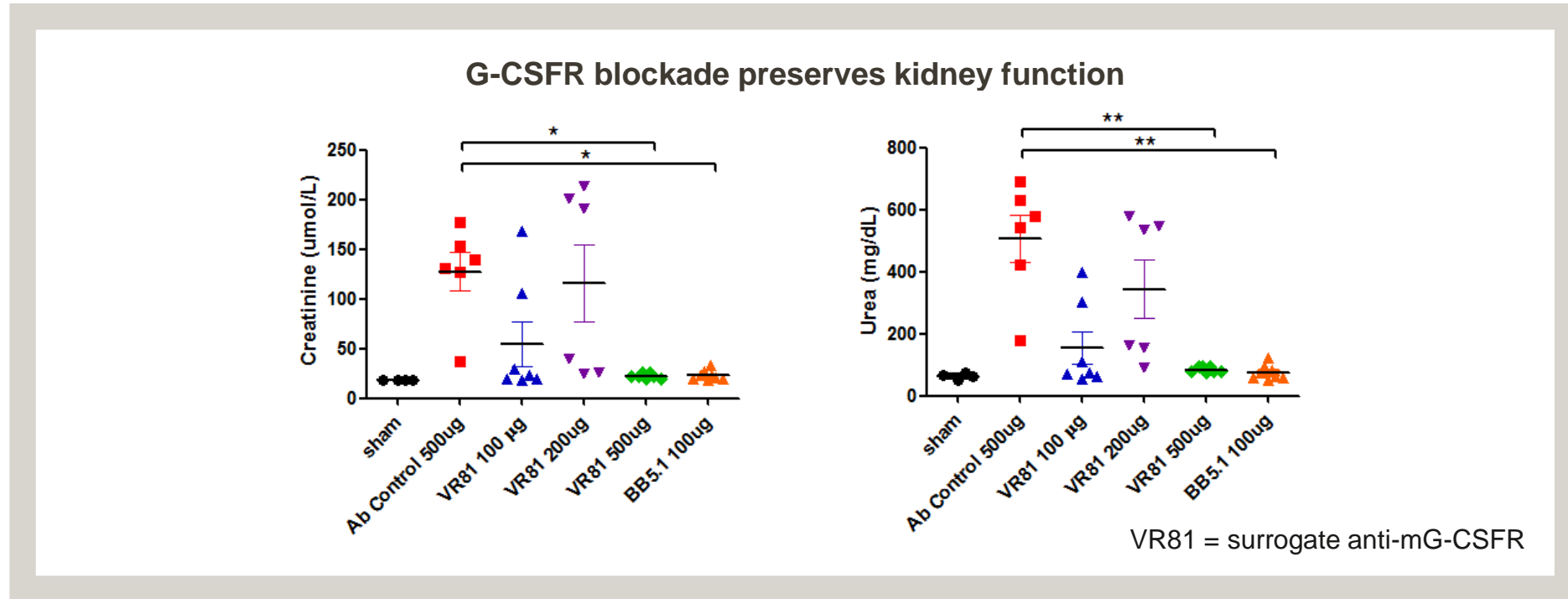
- G-CSFR blockade protects against renal Ischemia Reperfusion Injury (IRI) in a mouse model



# CSL324 – Neutrophil Mediated Inflammation

Kidney graft reperfusion injury

- G-CSFR blockade protects against renal IRI in a mouse model



Opportunity for CSL324 in solid organ transplantation

# Research and Early Development

- Expanding capacity and capability across global Research sites
  - New projects leveraging Calimmune gene and cell therapy technologies

- Continuing to innovate in areas of business strength

Immunoglobulins

Haemophilia

Specialty  
Products

- Developing new opportunities in areas of unmet need

Breakthrough  
Medicines

Transplant

- Creating and progressing a sustainable portfolio of early stage opportunities



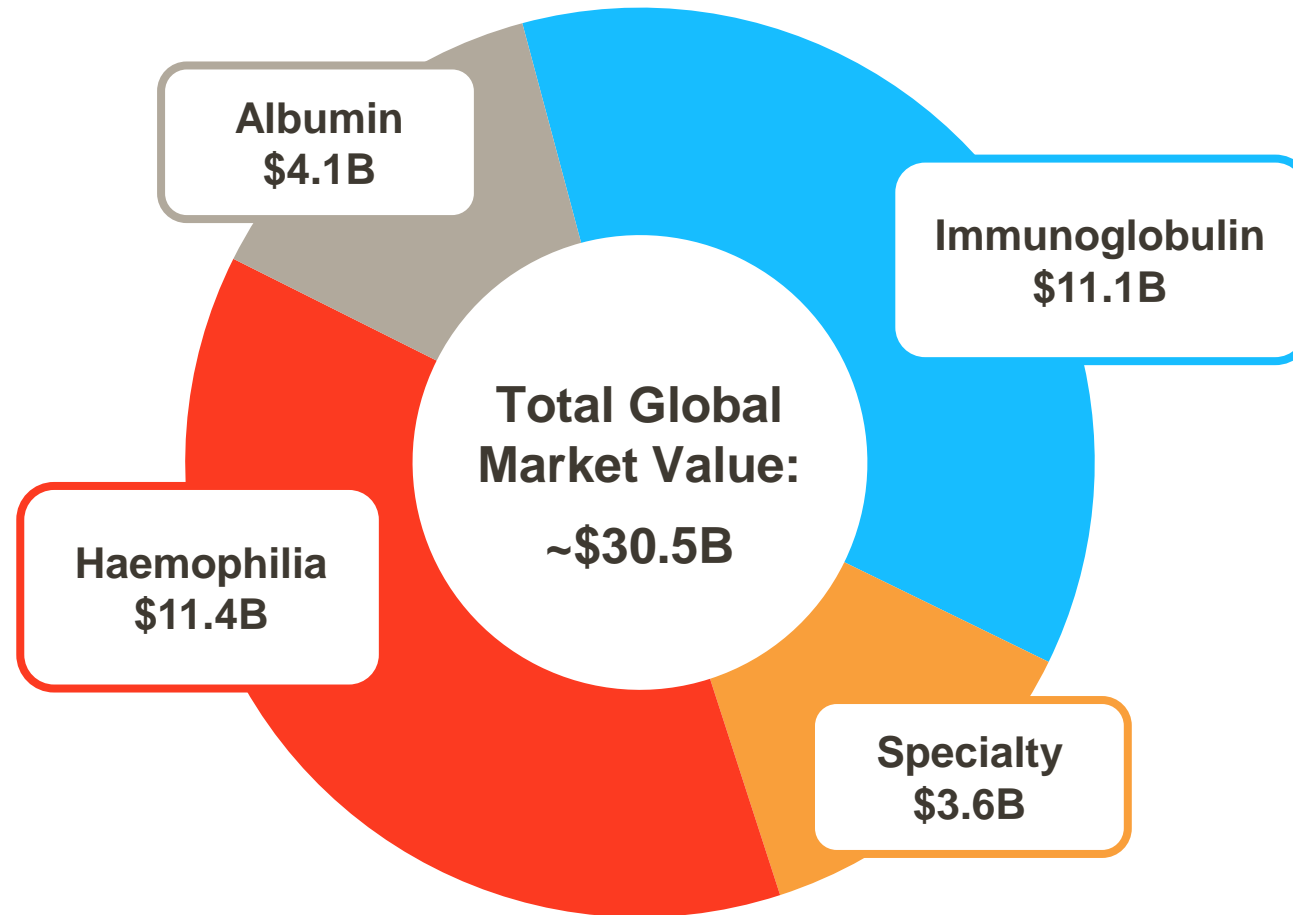
# Commercial Market Overview

Mr Bill Campbell  
*Executive Vice President & Chief  
Commercial Officer*



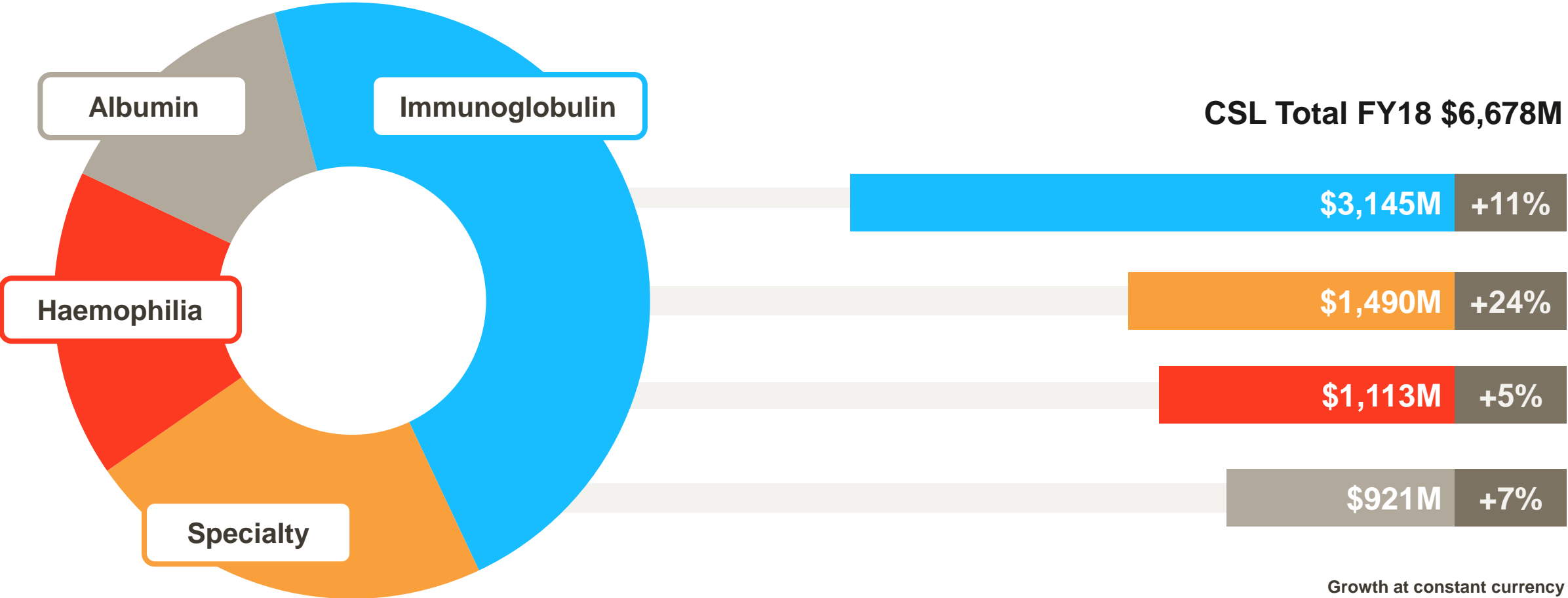


# Targeted Protein Therapeutic Market

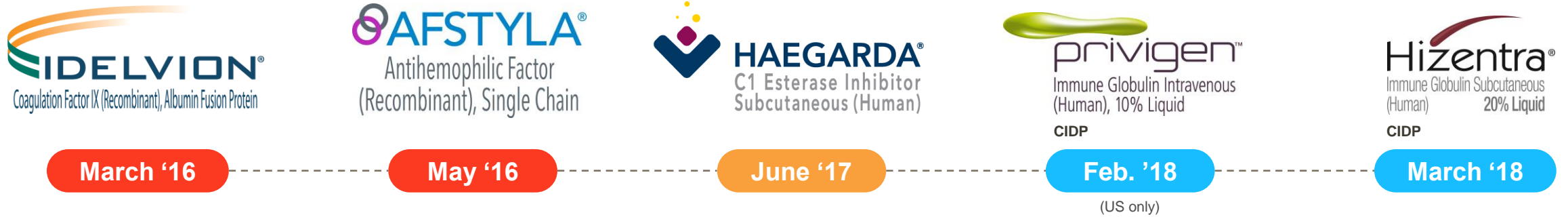


Source: Global Market Research, Analyst Reports, Company Annual Reports, Haemophilia mkt includes Inhibitor mkt

# CSL Portfolio



# New Product Launches



Launch date denotes first country to launch globally

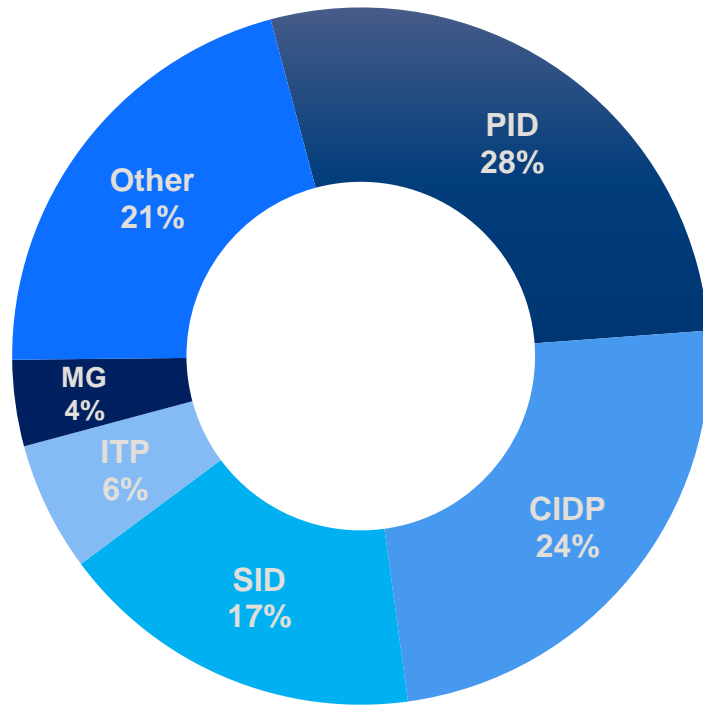
**5 major launches** in 24 months  
Some of the **most successful** launches in the industry  
**Significant contribution** to the business now...in future

R&D Productivity

Commercial Excellence

# Immunoglobulin Market

**Global IG volume by indication**  
**9% Growth**

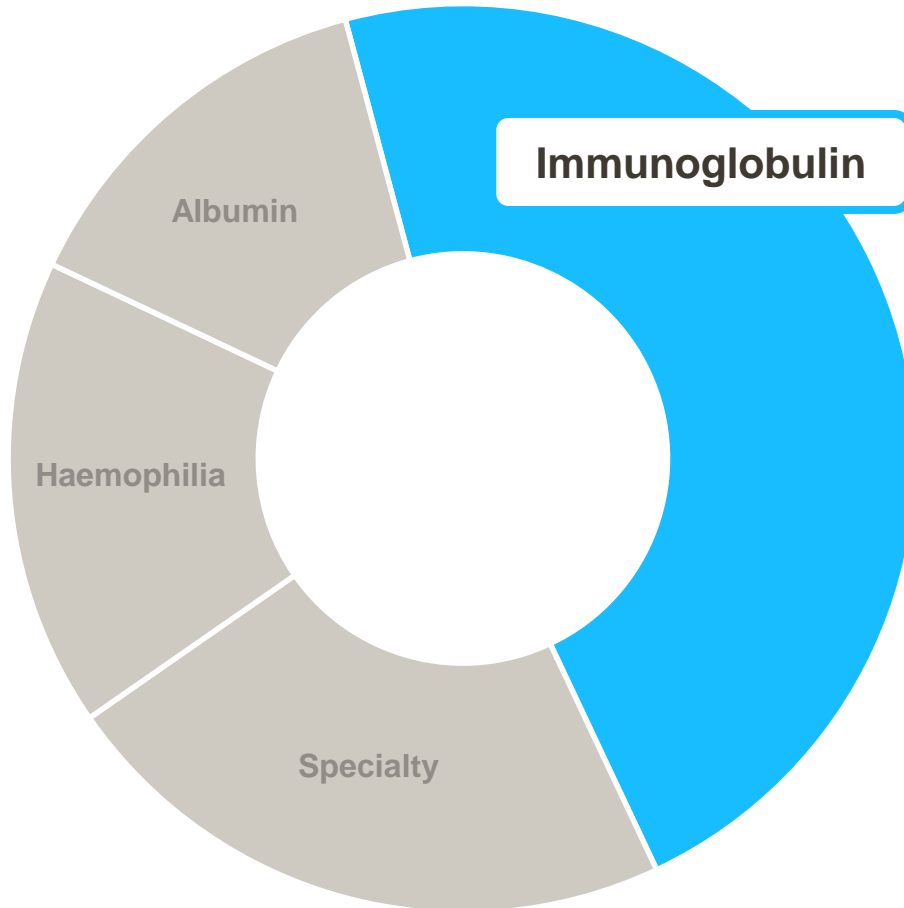


Source: Data on file

## Growth Drivers

- Enhanced diagnosis in PID, CIDP
- Immunotherapy driving SID growth
- Increasing per capita use in emerging markets
- Continued market supply tightness

# CSL Portfolio: Immunoglobulin

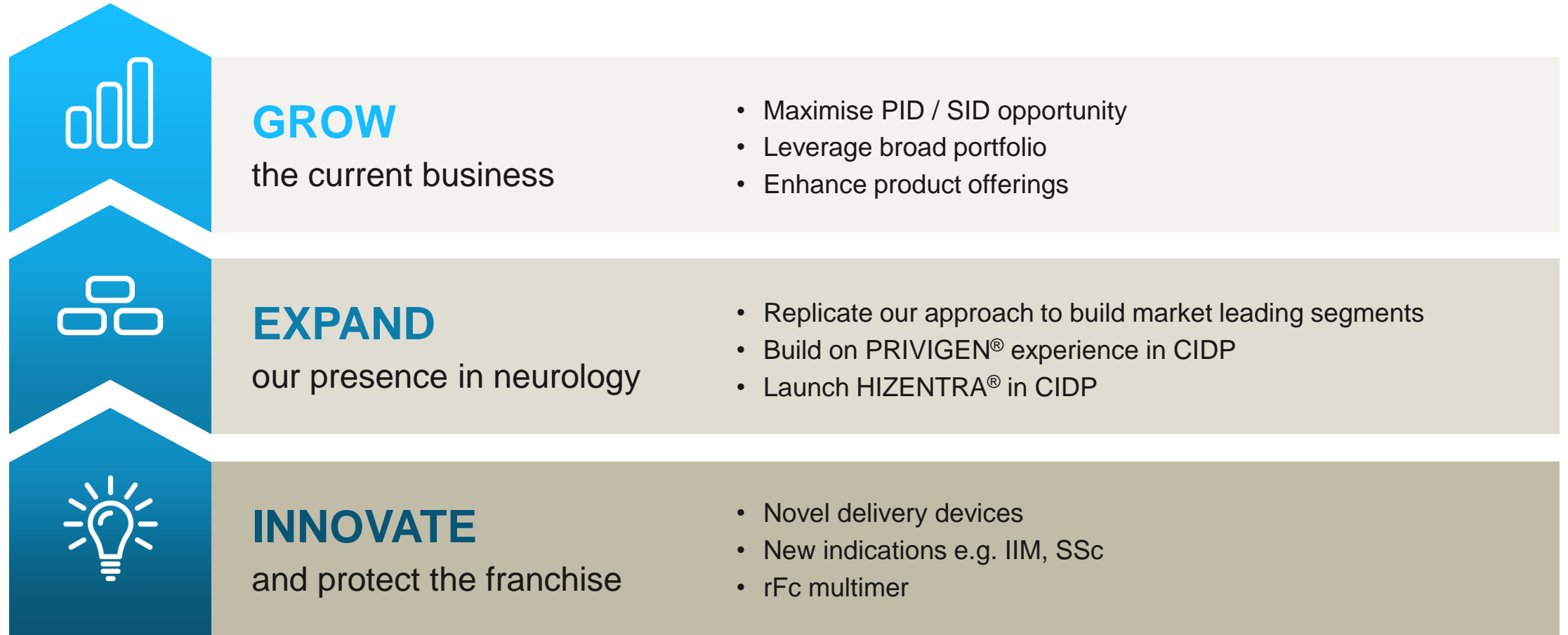


**FY18 \$3,145M +11%**

- Above market volume growth
- Expansion in PID, SID, CIDP
- Balanced growth across all regions
- Continued life-cycle investments

**Disciplined execution**

# Immunoglobulins: Category Leadership





# Immunoglobulin Portfolio



privigen®

Privigen is a ready-to-use  
10% IVIG approved in  
**80+ countries**  
worldwide<sup>1</sup>

Proven effective and well  
tolerated with  
**10+ years**  
of patient experience

Approved for use in  
**6**  
indications\*



Used in  
**>100,000 patients**  
with chronic disease in the last year<sup>2</sup>



**100,000**  
patient-years of  
experience<sup>3</sup>

**&**

More than  
**6 million**  
exposures worldwide<sup>3</sup>

Proven efficacy and  
tolerability profile since

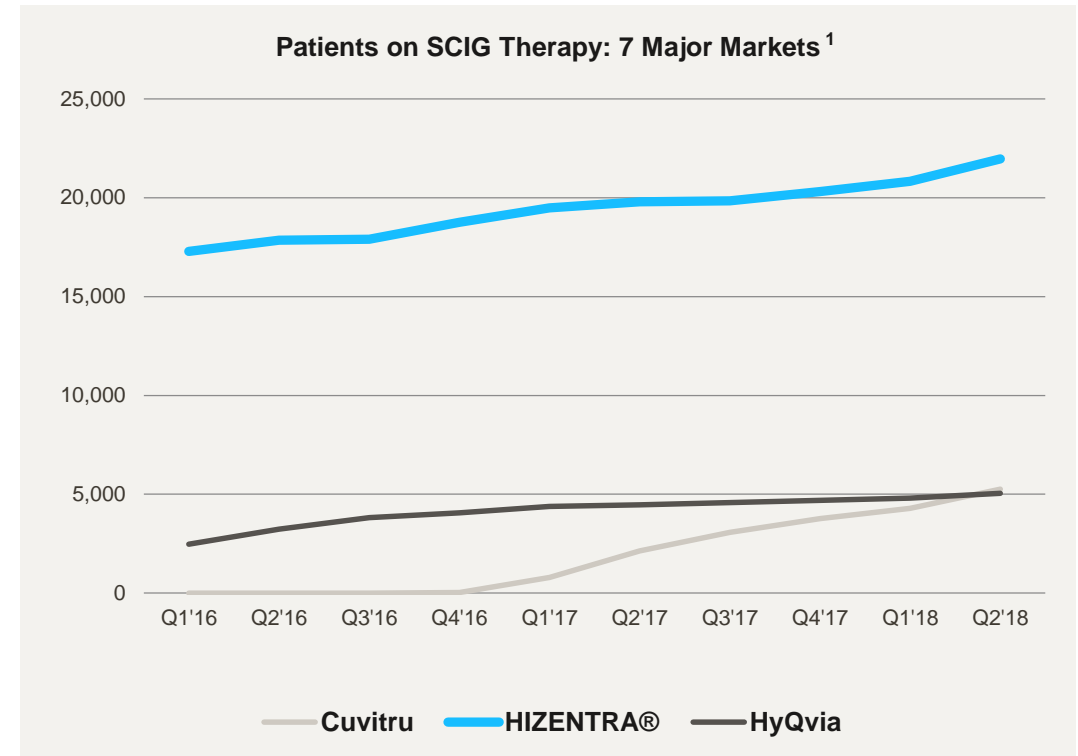
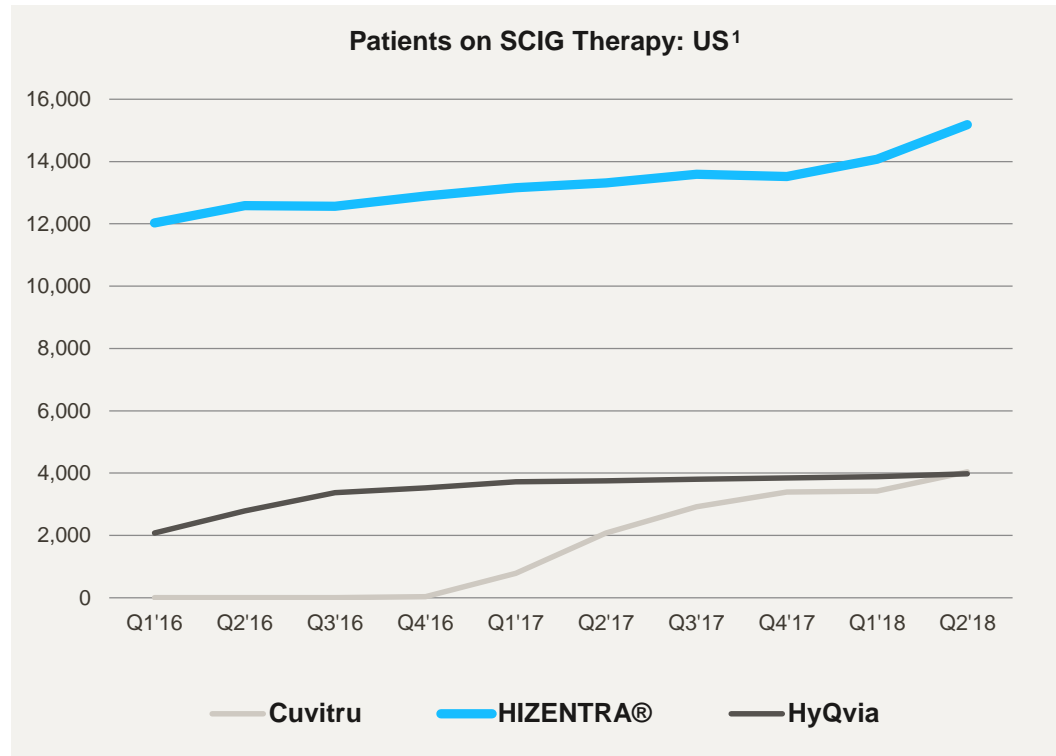
**2010**

**57 countries**

HIZENTRA® is a 20% SCIG that is  
approved in **57 countries worldwide**<sup>4</sup>

**References:** 1. Data on file. Available from CSL Behring as PRI-10015; 2. Data on file. Available from CSL Behring as DOF-PRI-10016; 3. Data on file. Available from CSL Behring as DOF-HIZ-005; 4. Data on file. Available from CSL Behring as DOF-HIZ-004  
\*PID, SID, adults with CIDP, chronic ITP, Guillain-Barre syndrome and Kawasaki disease  
All Indications are not approved in all markets

# Hizentra®: Innovator, Market Leader



Source: Data on File

Major Markets include: US, Germany, France, Spain, Italy, UK, Japan

<sup>1</sup> Not all products shown




# Hizentra® addresses unmet needs in CIDP therapy

## CIDP Update


- Early in launch cycle
- Leading indicators are positive
- Market share growth with both PRIVIGEN® and HIZENTRA®

**Significant opportunity  
for leadership with HIZENTRA®**



Experience IV-related systemic adverse reactions

**5x as many patients said they felt fewer side effects with HIZENTRA®**



Have venous access issues

**HIZENTRA® does not require venous access**



Seek the flexibility, freedom, and control of self-infusing

**8x as many patients said HIZENTRA® offers more freedom than IVIG**



Require more frequent infusions to manage their disease

**HIZENTRA® provides steady state Ig levels for continuous control**

**Source:** Data represents patients reporting a preference between IVIG in the prerandomized phase and Hizentra in the randomized phase of the phase III study of subcutaneous immunoglobulin for the treatment of chronic inflammatory demyelinating polyneuropathy (CIDP) – the PATH study



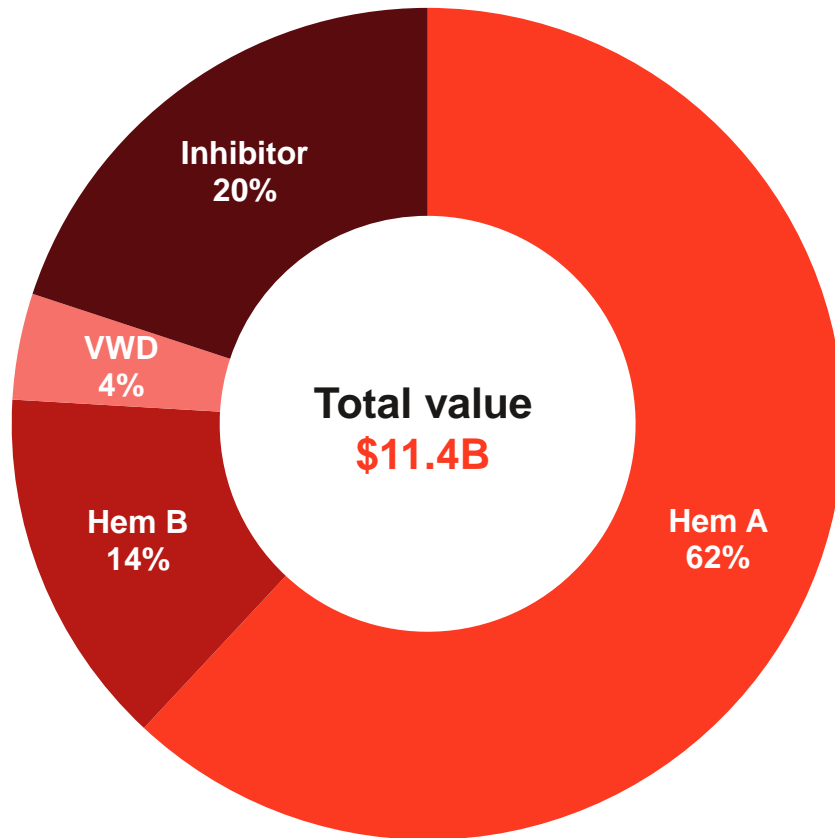
## Immunoglobulin Portfolio



- Positioned for continued growth
- Expanding market presence
- Diverse disease opportunities
- Balanced geographic footprint
- Continued life cycle investment
- Plasma collections running ahead of the market
- Early days...but very positive in CIDP

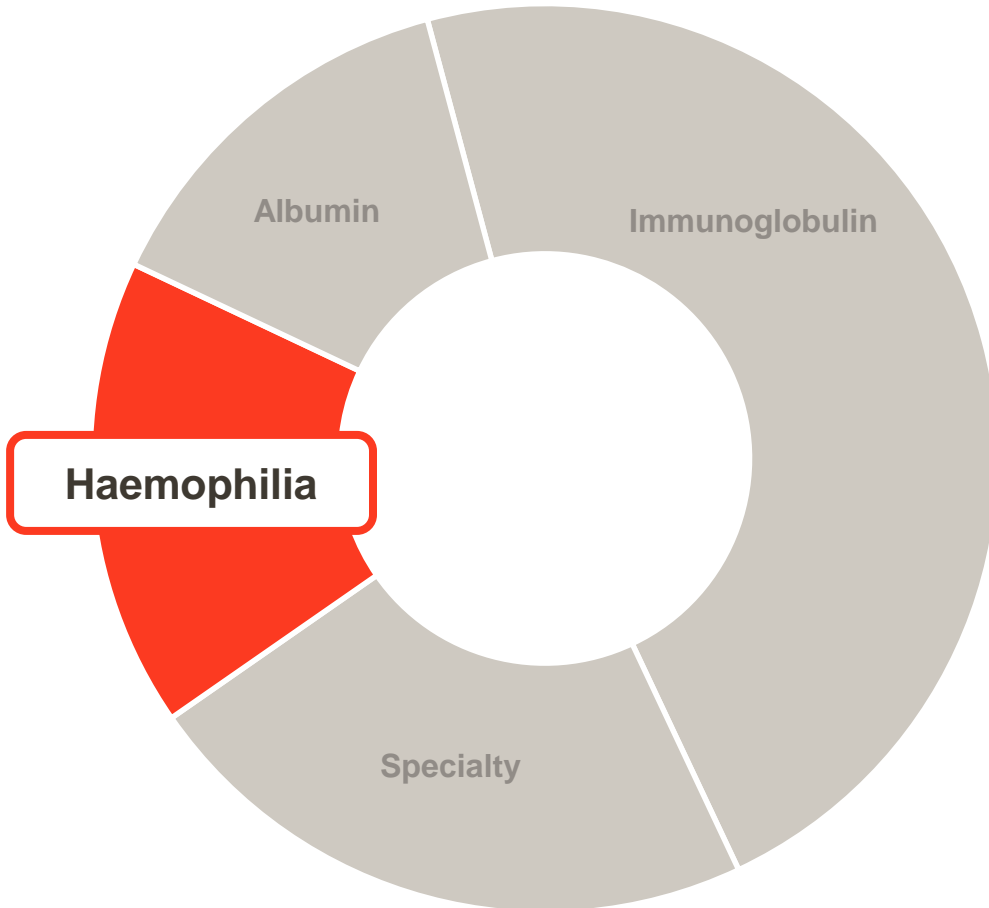
**Market Leading Therapies**

# Haemophilia Market



- Highly competitive Haem A segment
- Rapid transition of Haem B to long acting products
- 75% of patients with bleeding disorders are under or untreated
- New technologies / advancements hold great promise...

# CSL Portfolio: Haemophilia



AFSTYLA®

IDELVION®

HUMATE-P®

Beriate® P

VONCENTO®

**FY18 \$1,113M +5%**

## Haem A

- AFSYTLA®
  - Launched in 12 countries
  - Plasma-derived portfolio

## Haem B

- IDELVION®
  - Transformational Product
  - Strong growth
  - Market leadership

## von Willebrand Disease

- HUMATE-P®, VONCENTO®
  - Strong contributors to portfolio

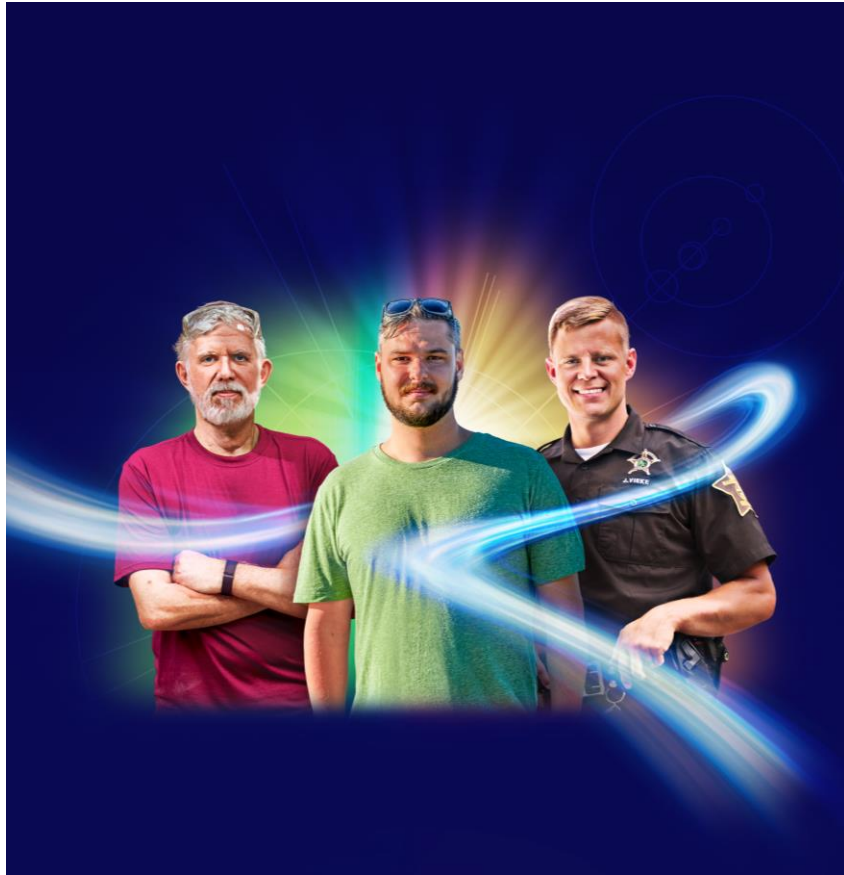
# Positioning in a Competitive Market

<b>Higher binding affinity to vWF</b>	<ul style="list-style-type: none"><li>• Unique single-chain molecular structure provides increased binding</li><li>• Enhanced binding affinity protects AFSTYLA® from degradation, extending time in circulation</li></ul>
<b>2x weekly dosing</b>	<ul style="list-style-type: none"><li>• FDA-approved for 2x or 3x weekly dosing</li><li>• Factor trough levels above 1.9% with 2x weekly dosing</li></ul>
<b>Excellent bleed protection</b>	<ul style="list-style-type: none"><li>• ZERO bleeds (median AsBR*) in all patients, regardless of age and dosing frequency</li></ul>
<b>Low annual consumption</b>	<ul style="list-style-type: none"><li>• AFSTYLA® delivers the benefits of an EHL† with the lowest annual consumption</li></ul>

\* AsBR: Annualized spontaneous bleeding rate.

† EHL: Extended half life

# IDELVION® Clinical Profile is Uniquely Differentiated



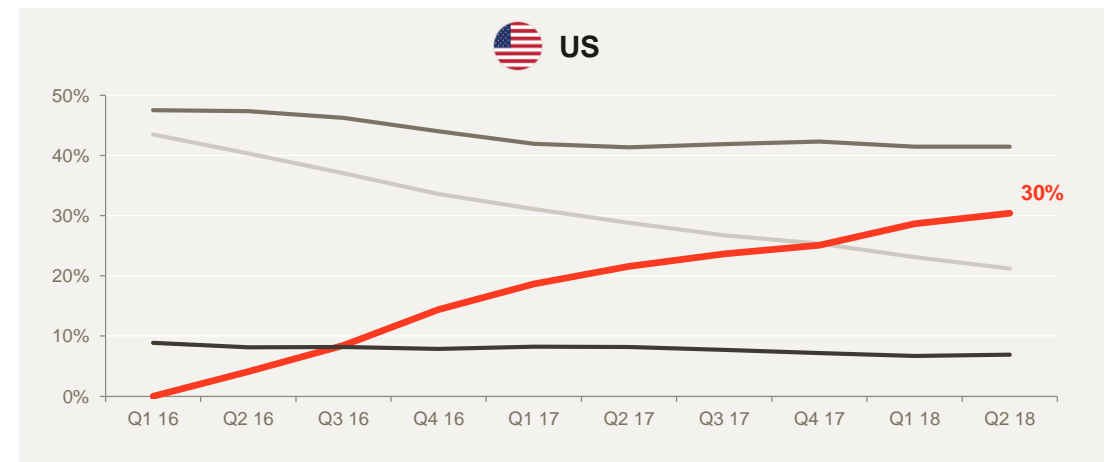
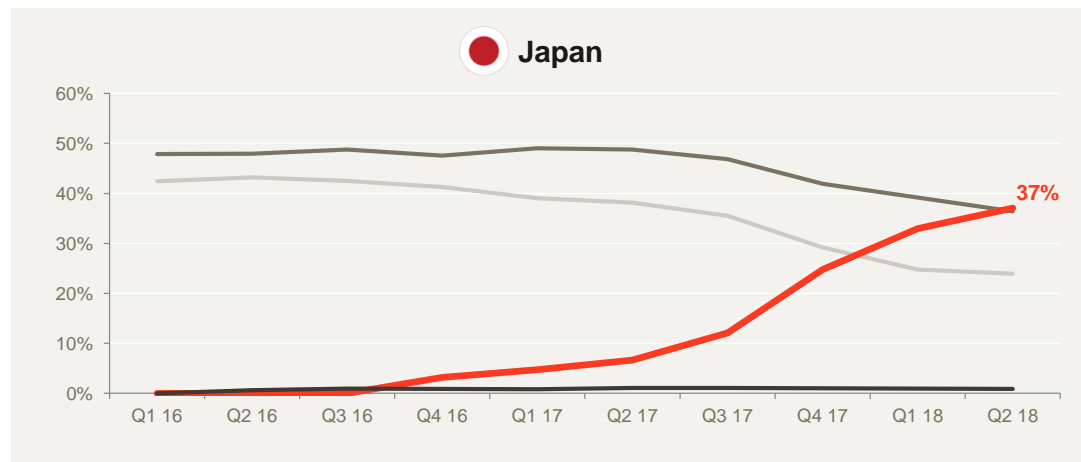
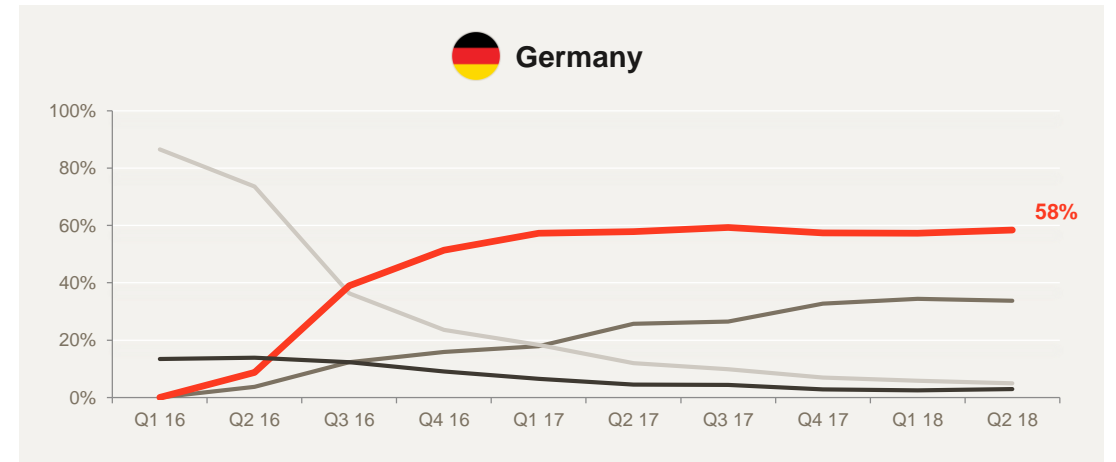
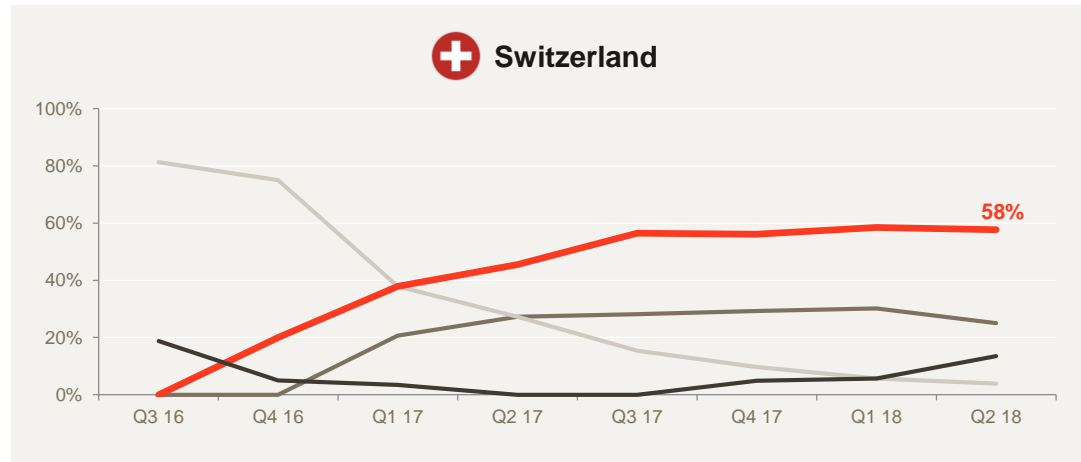
<b>0 Median AsBR</b>	<ul style="list-style-type: none"><li>• Zero median annualized spontaneous bleeding rate (AsBR) in prophylaxis</li></ul>
<b>Up to 14 day dosing*</b>	<ul style="list-style-type: none"><li>• Greater freedom from infusions</li></ul>
<b>21% Factor IX steady state trough levels†</b>	<ul style="list-style-type: none"><li>• High and sustained factor levels at steady-state with prophylactic use</li></ul>
<b>#1 Factor Choice<sup>1</sup></b>	<ul style="list-style-type: none"><li>• IDELVION is the most switched to Factor IX when changing therapy</li></ul>

\* In appropriate patients 12 years and older.

† Average FIX levels with 7-day dosing over 92 weeks in clinical trials

Reference: 1. Data on file. Available from CSL Behring as DOF IDL-002.

# IDELVION® Performance in Key Markets



Source: Data on File  
Patient share of recombinant prophylaxis in launch markets

— IDELVION®   
 — ALPROLIX®   
 — BeneFIX®   
 — All Other



# Q&A



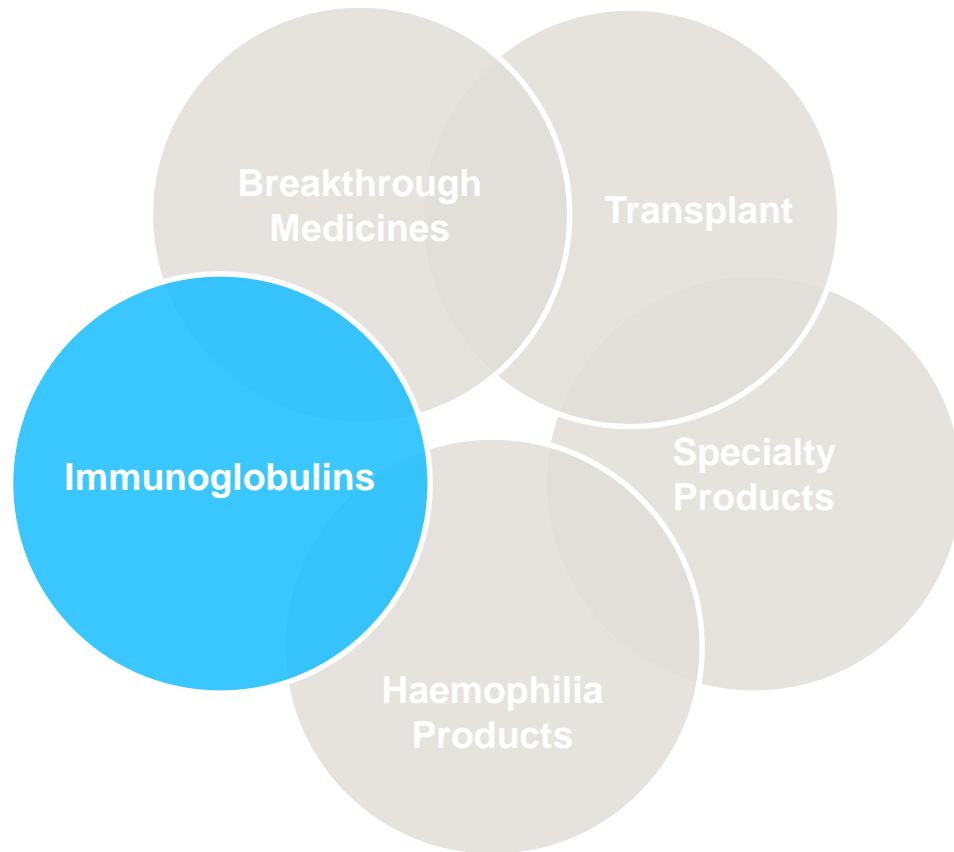


# Clinical Development

Dr Bill Mezzanotte  
*EVP & Head R&D*

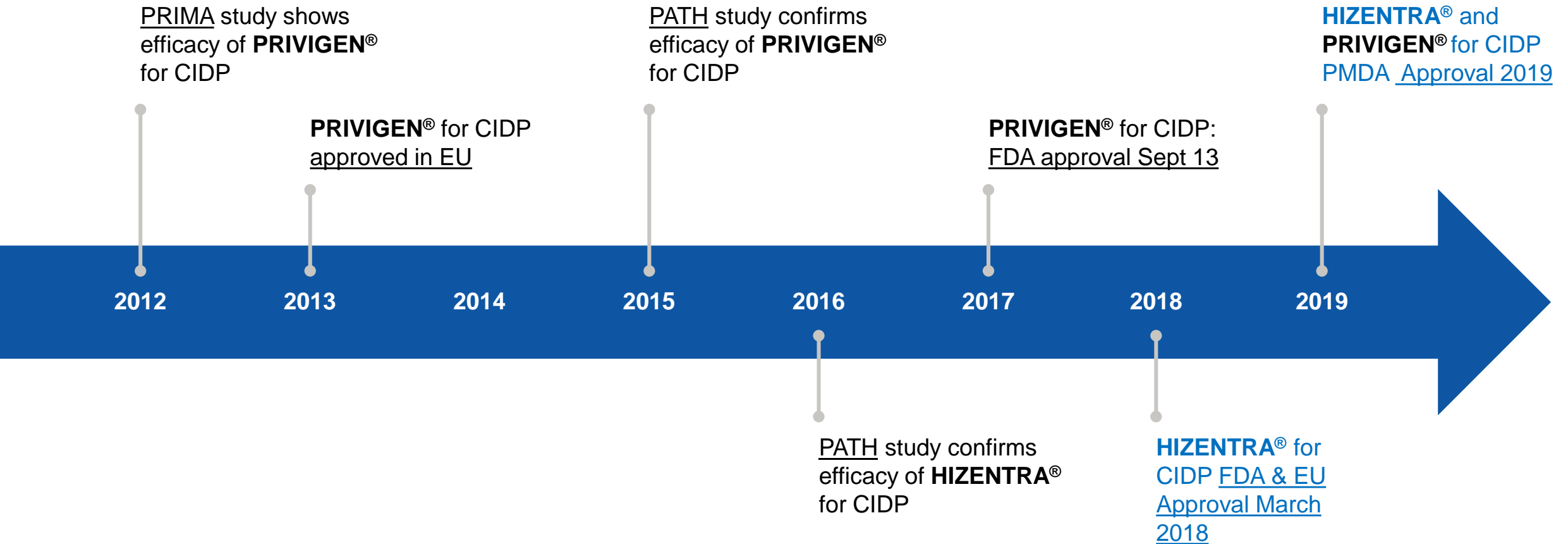


# Immunoglobulins

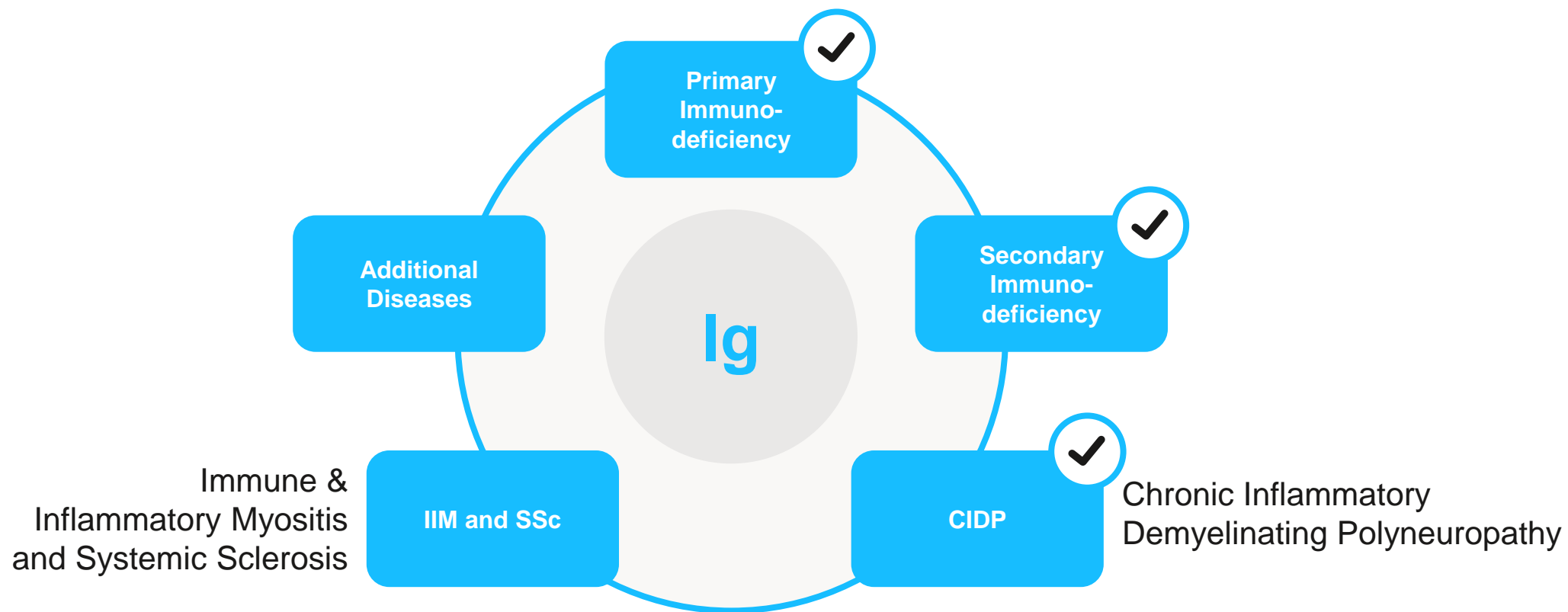


- **Maintaining leadership position through focus on:**
  - New Indications
  - Geographic expansion
  - Delivery options
- **Key Focus:**
  - HIZENTRA®
  - PRIVIGEN®

# Milestones in Ig Development for CIDP

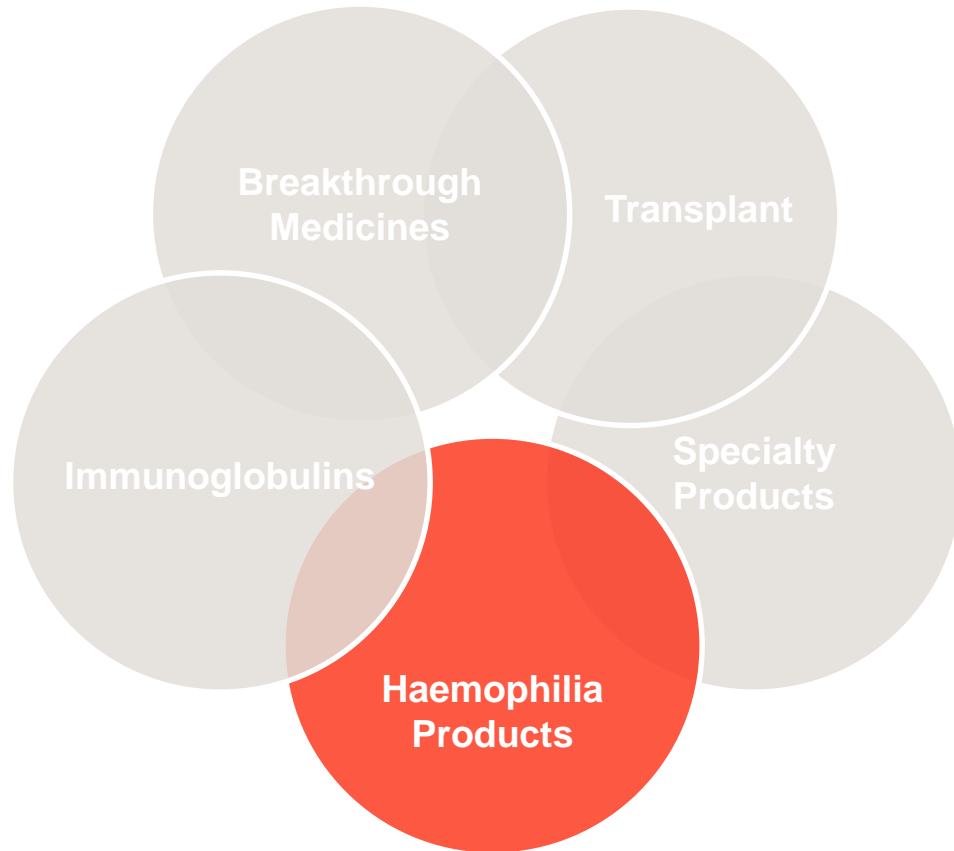


# Impact of Ig (IV & SC) in Rare Diseases



- Health Authority (FDA, EMEA, PMDA) interactions – 2018
- Trials start 2019

# Haemophilia Products



- **Supporting and enhancing plasma products and developing novel recombinant portfolio with focus on:**
  - Scientific and product innovation
  - Patient benefit
- **Key Focus:**
  - IDELVION® (rIX-FP)
  - AFSTYLA® (rVIII-Single Chain)

# IDELVION® Delivering in the Real World

## Annualised Bleed Rates in switched patients

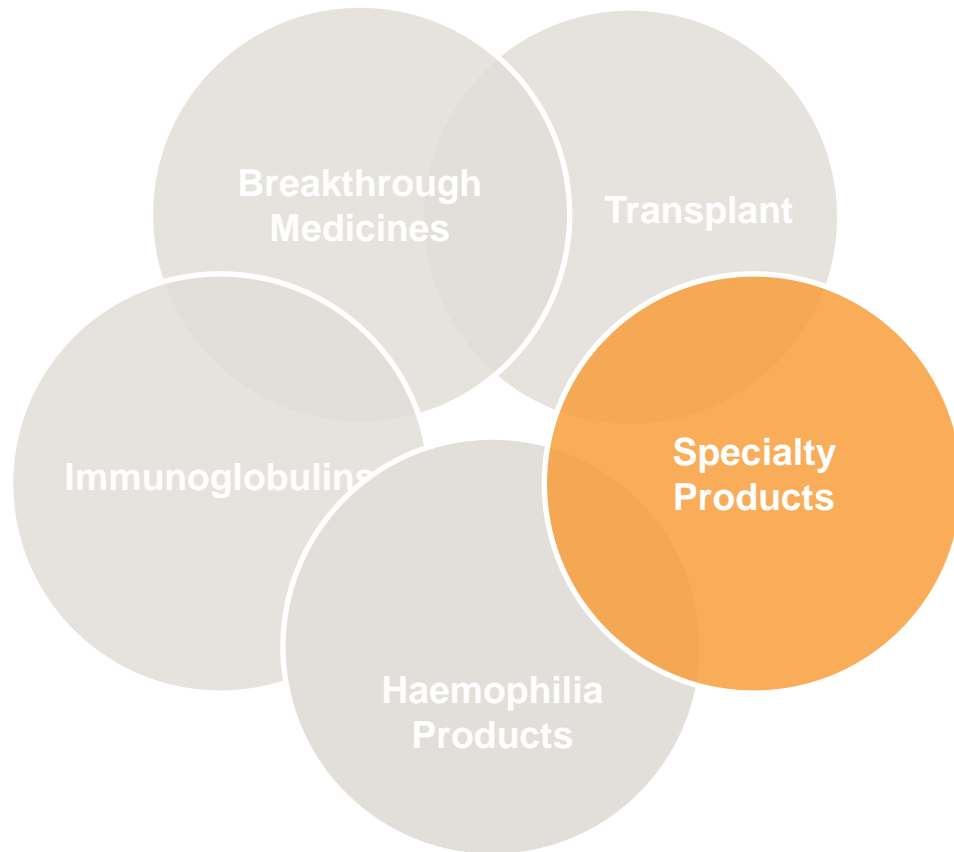
FIX product	All FIX	rFIX-Fc	IDELVION
Prophylaxis-to-prophylaxis patients mean ± SD	7.4 ± 9.1 (n=34)	8.9 ± 9.6 (n=12)	1.5 ± 4.5 (n=34)
# with zero bleed (%)	6 (17.6)	2 (16.7)	23 (67.6)

Escobar et al, ISTH July 2018

- >85% of All-FIX therapies were administered every 7 days or more frequently
- 45% of IDELVION administration was every 14 days

- Further increased dosing flexibility anticipated
  - 21-day dosing submission planned 3Q 19

# Specialty Products



- **Leveraging high quality broad product portfolio through:**
  - New markets
  - Novel indications
  - Novel modes of administration
- **Key Focus:**
  - HAEGARDA®/BERINERT®
  - KCENTRA®/BERIPLEX®
  - ZEMAIRA®/RESPREEZA®

# Hereditary Angioedema (HAE)

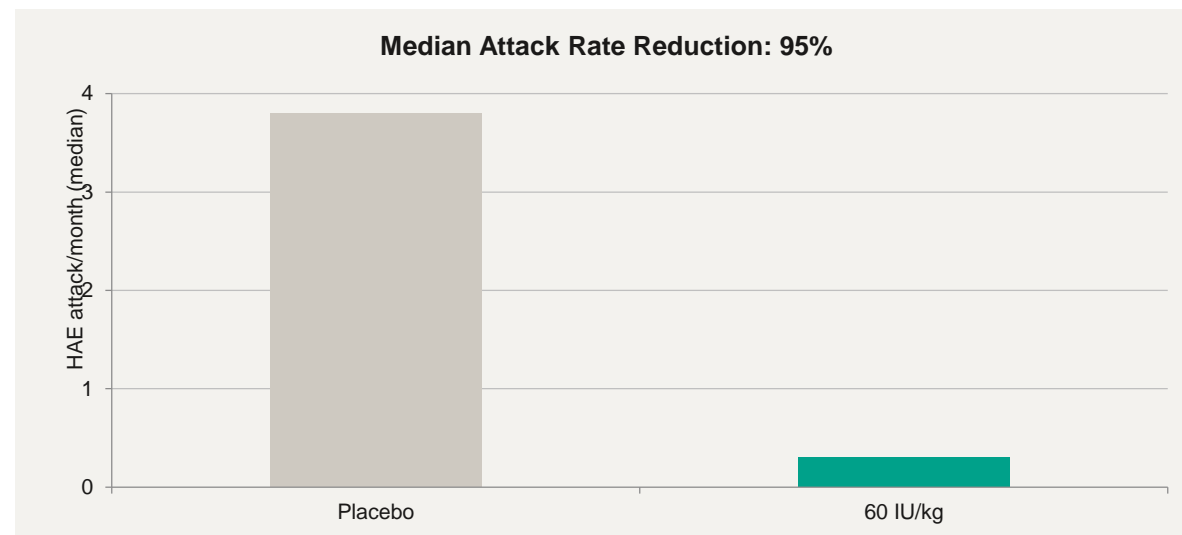
- Hereditary angioedema (HAE) is a disorder that results in recurrent attacks of severe swelling
- All body sites are associated with impairment and patients are impacted during and between attacks
- Most severe are laryngeal attacks which can require emergency interventions to protect the airway





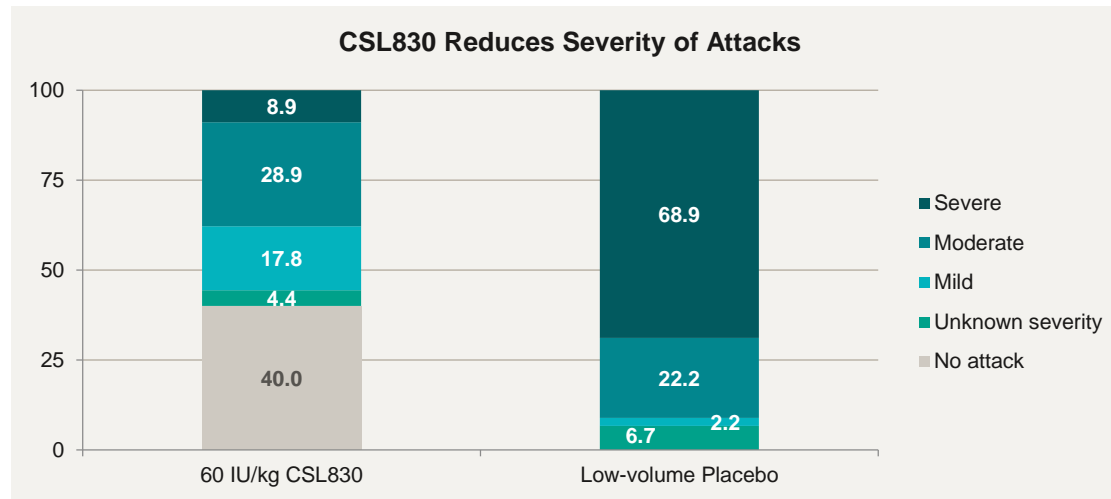
# Demonstrating Unique Benefit of HAEGARDA® **comPACT**

BASELINE	
Mean Age	39.6 ± 14.9
Female %	67
Mean # HAE attacks 3 prior months	9.8 ± 6.6
% use of HAE Prophylaxis 3 prior months	42%

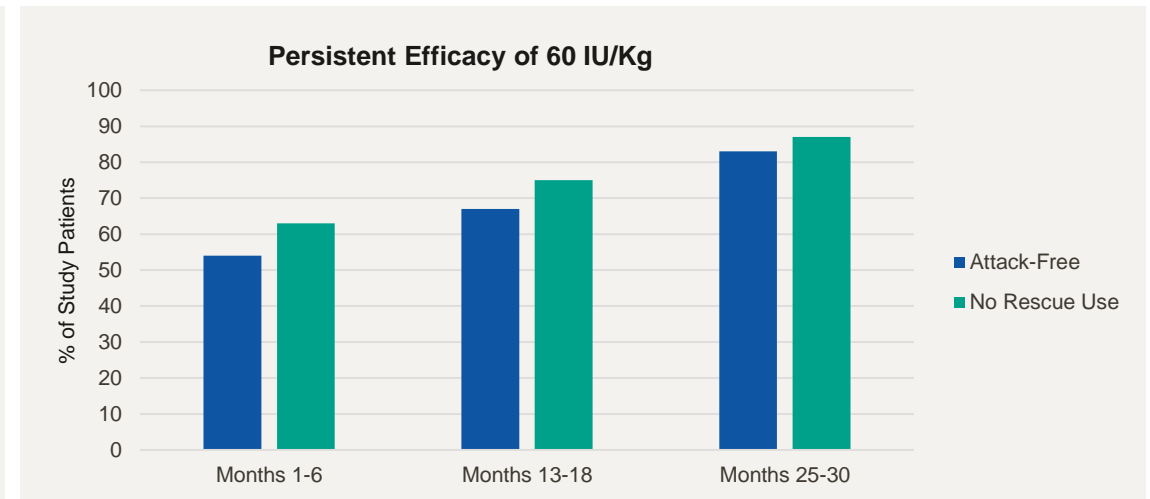


Longhurst et al NEJM March 2017

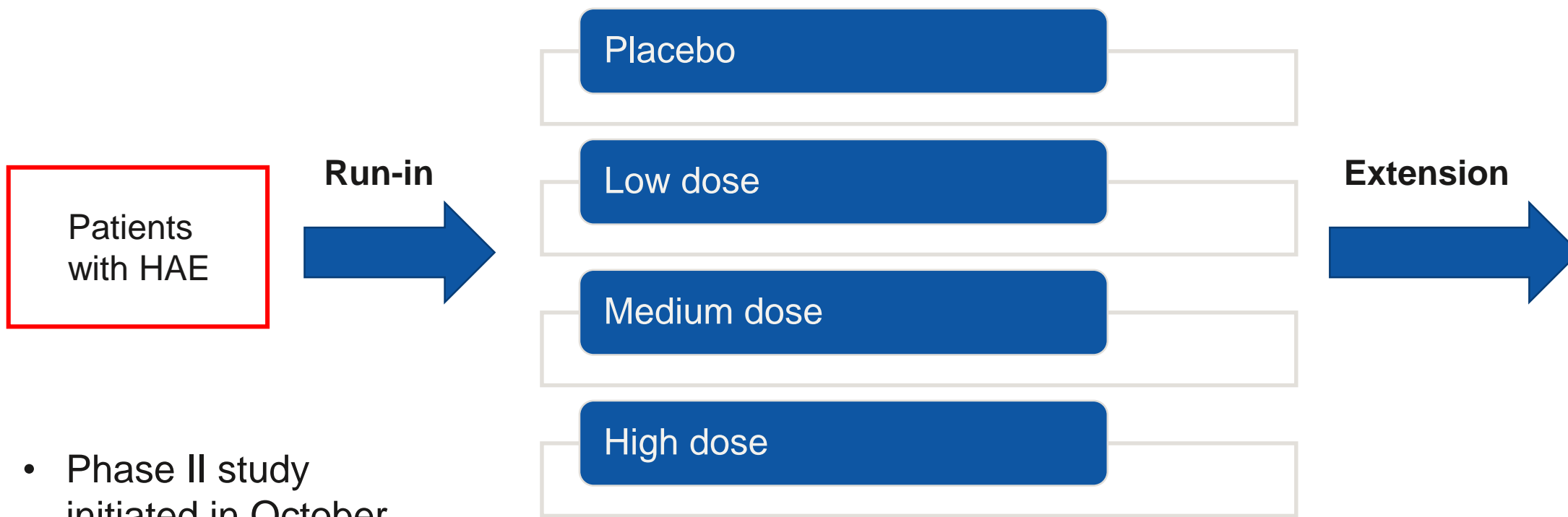
# Demonstrating Unique Benefit of HAEGARDA® **comPACT**



Longhurst et al NEJM March 2017

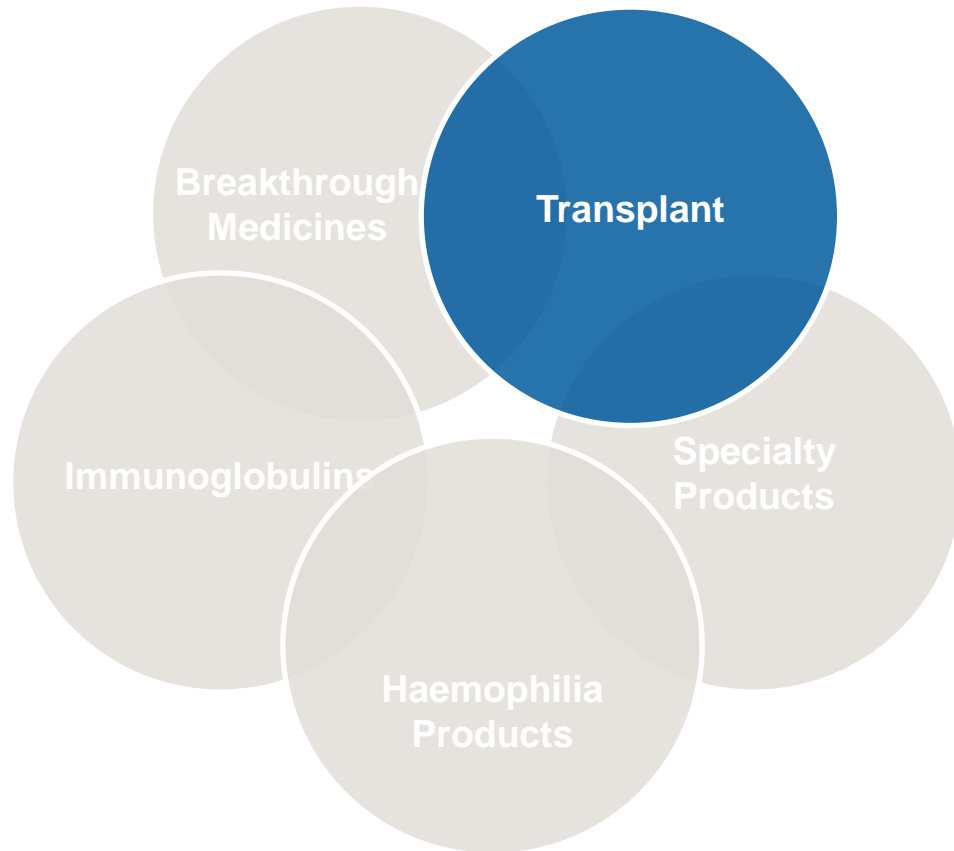


# CSL312 Anti-FXIIa in HAE



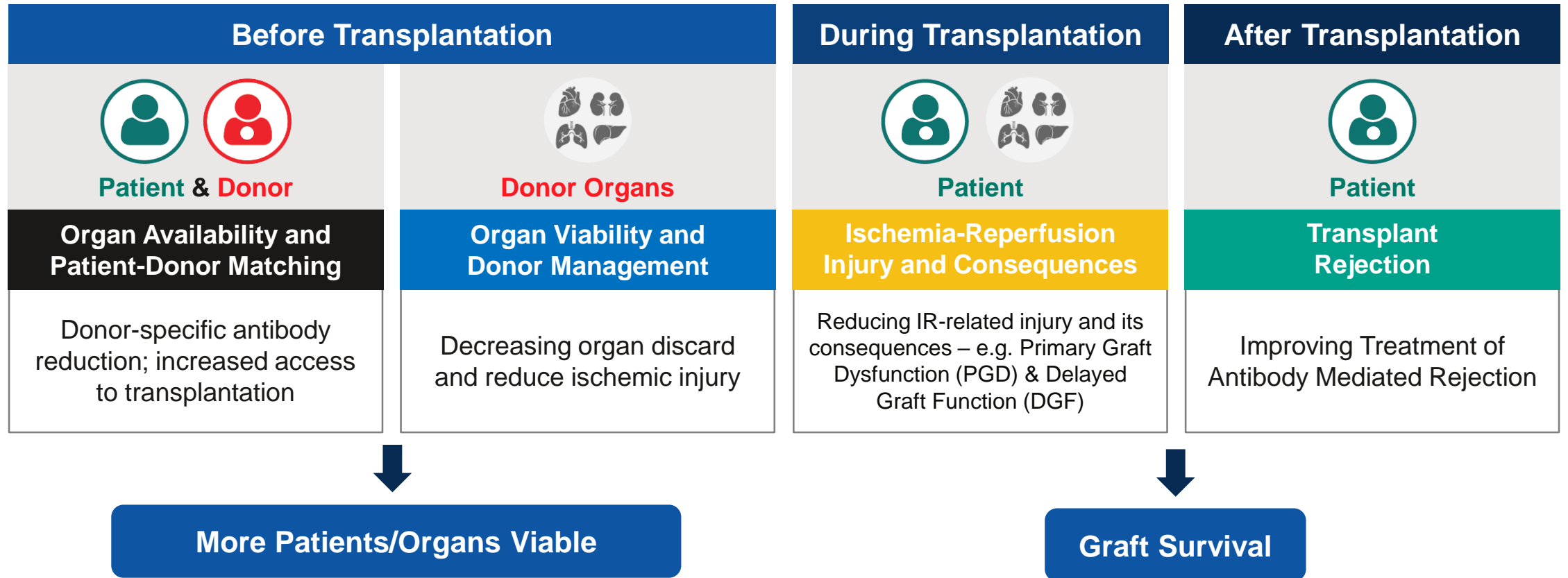
- Phase II study initiated in October

# Transplant



- **Developing CSL and other novel therapies with potential to improve transplant outcomes:**
  - Significant unmet need
- **Key Focus:**
  - C1 inhibitor (C1-INH)
  - Alpha1 anti-trypsin (AAT)
  - Anti-IL-6 / clazakizumab\*

# Solid Organ Transplant (SOT): Unmet Medical Need



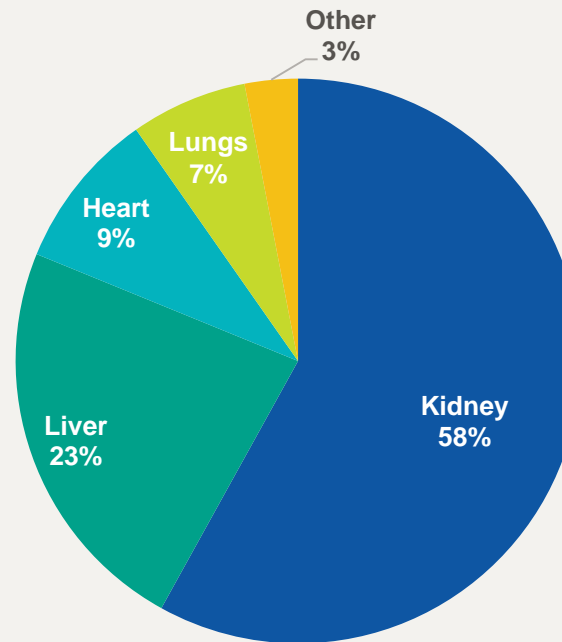
# Improving Graft Survival in Kidney Transplantation

## Ischemia-Reperfusion Injury and Consequences

### Delayed Graft Function (DGF)

- Delayed graft function (DGF - any use of HD within 7 days of KTx or slow graft function (SGF) occurs in 20-30% of cases
  - More common with deceased donors
- Patients who develop DGF have:
  - ~40% increased risk of graft loss and acute rejection
  - Higher health care costs

## Transplants by Organ Type (US - 2015)

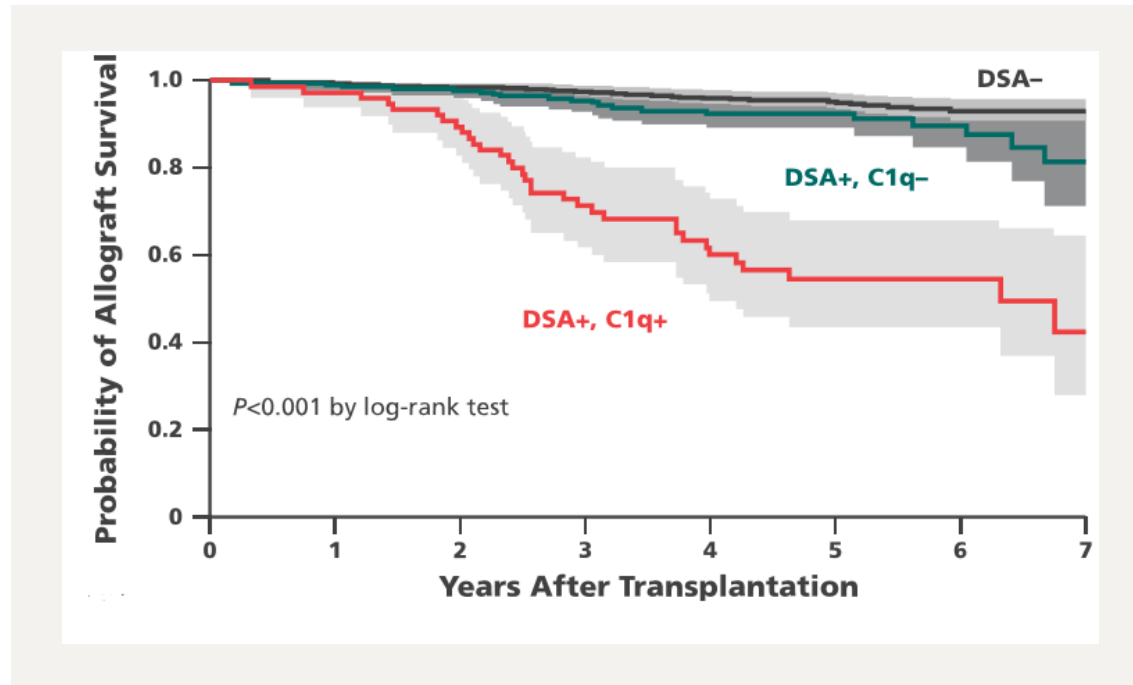


## Transplant Rejection

### Antibody Mediated Rejection

- AMR occurs in up to 5-10% of transplants acutely and up to 30% chronically
- AMR is marked by declining renal function and is associated with lower graft survival
- Patients with donor-specific antibodies are denied transplant due to the risk for AMR

# Donor-specific Antibodies (DSAs) underpin Antibody Mediated Rejection in Kidney Transplantation



## Complement-binding DSAs

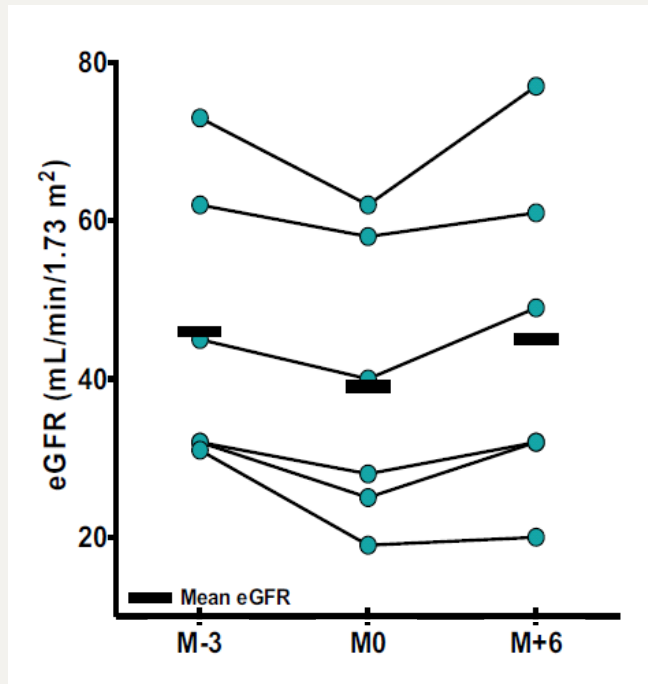
- Associated with more severe inflammation and graft injury
- C1-INH offers therapeutic option

## Non-complement-binding DSAs

- Antibody-mediated cellular toxicity
- Direct endothelial activation & proliferation
- Anti IL-6 offers therapeutic option

Loupy A, Lefaucheur C, et al. *N Engl J Med*. 2013;369(13):1215-1226

# Long Term C1 INH Administration Stabilises Graft Function in AMR Patients Unresponsive to Standard of Care



Renal Function at the time of initial AMR Dx.

Renal Function at the end of first-line AMR SOC.

Renal Function at the end of 6 mos. C1inh Tx.

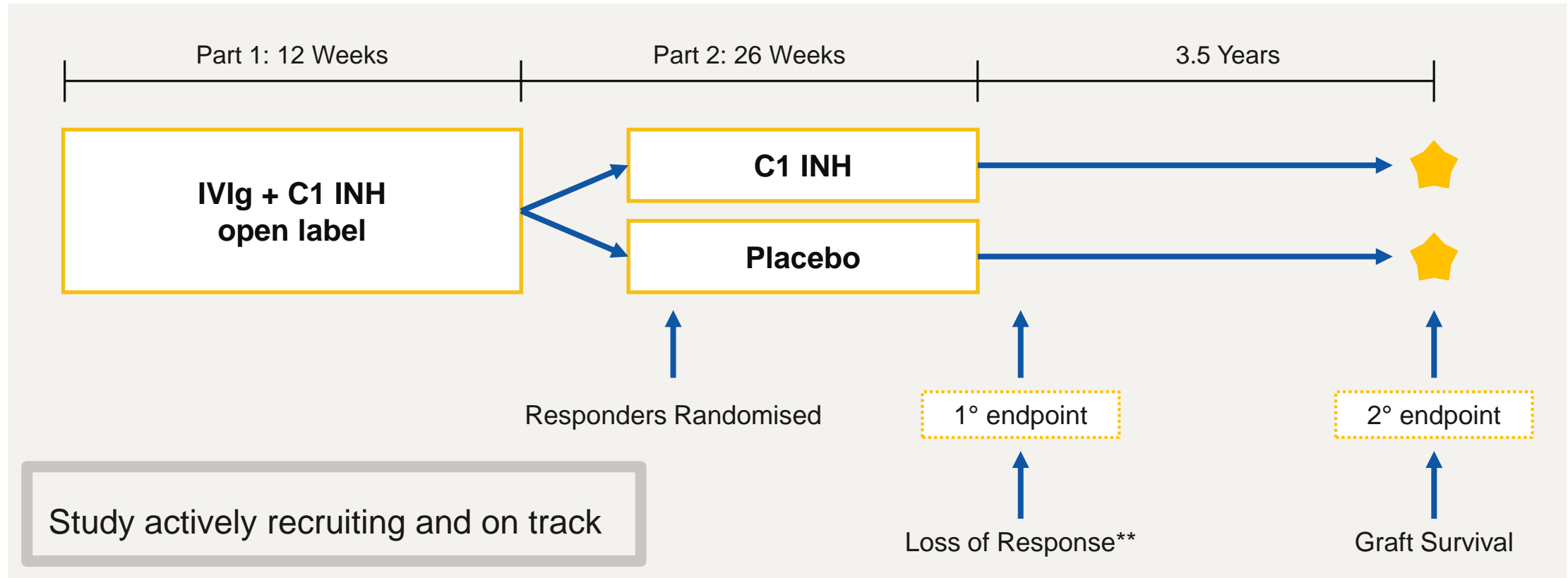
In a pilot study 6 patients with AMR, unresponsive to standard of care, were treated with C1 INH and had improved renal function (estimated Glomerular Filtration Rate, eGFR) at 6 months

Viglietti et al., Am J of Transplantation 2016



# CSL842 Phase III

## Randomised, Placebo-controlled Withdrawal



\*\*occurrence of any of the following  
Decline in renal function (eGFR)  
Allograft failure  
Subject death

# Vitaeris and CSL Strategic Collaboration in AMR

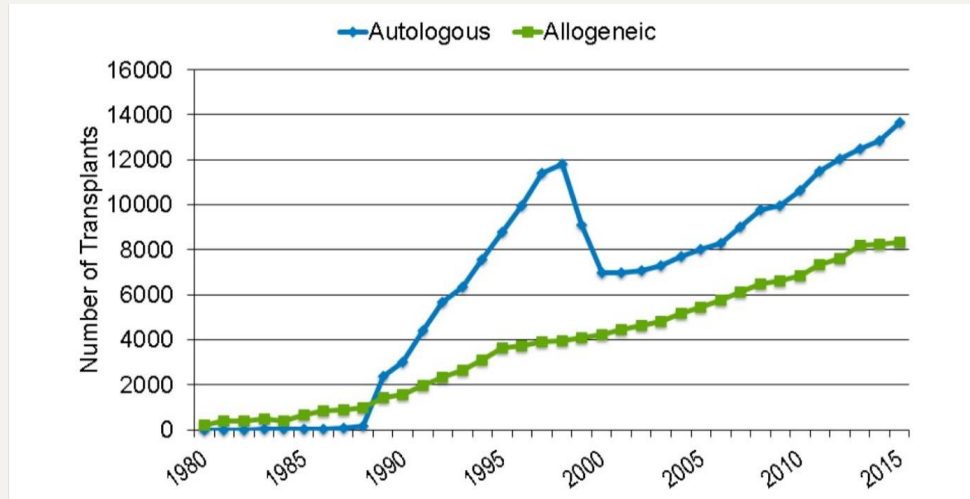
- Clazakizumab (anti-IL6) in clinical development
- Successful FDA Type C meeting
- Anticipated dosing in chronic AMR patients in 2019
- IL-6 may play a role in
  - DSA production and DSA mediated allograft injury
  - Cell-mediated rejection
  - Chronic allograft vasculopathy
- Pilot study demonstrated blocking IL-6 stabilises renal function and prolongs graft survival\*



\*Choi et al Am J Transplantation 2017

# Beyond Solid Organ Transplant: Hematopoietic Stem Cell Transplant (HSCT) and Graft versus Host Disease

## Annual HSCTs in the US



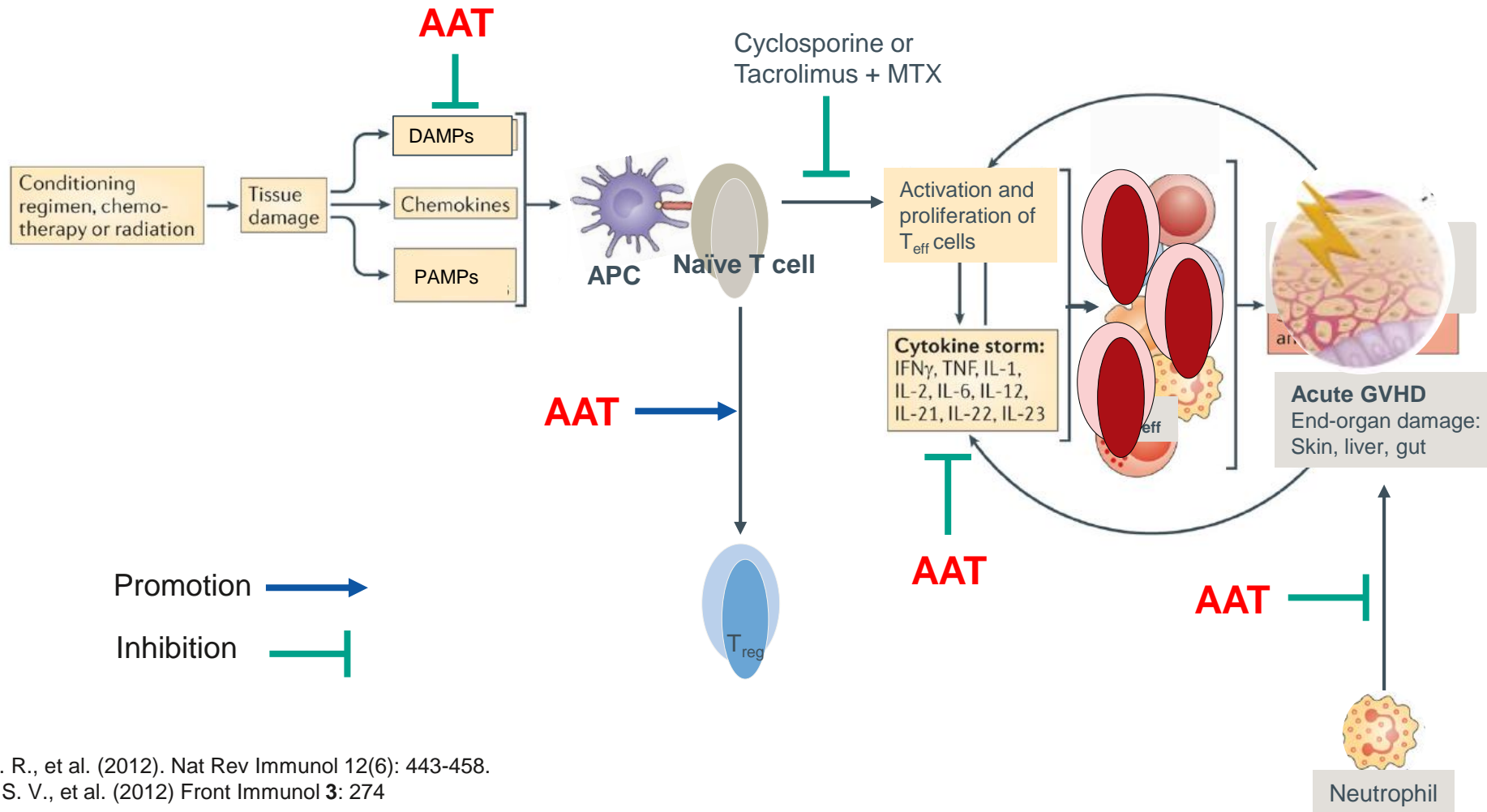
~50-60% of Allogeneic HSCT develop acute Graft versus Host Disease (GvHD)



GvHD is a common cause of morbidity and mortality in HSCT

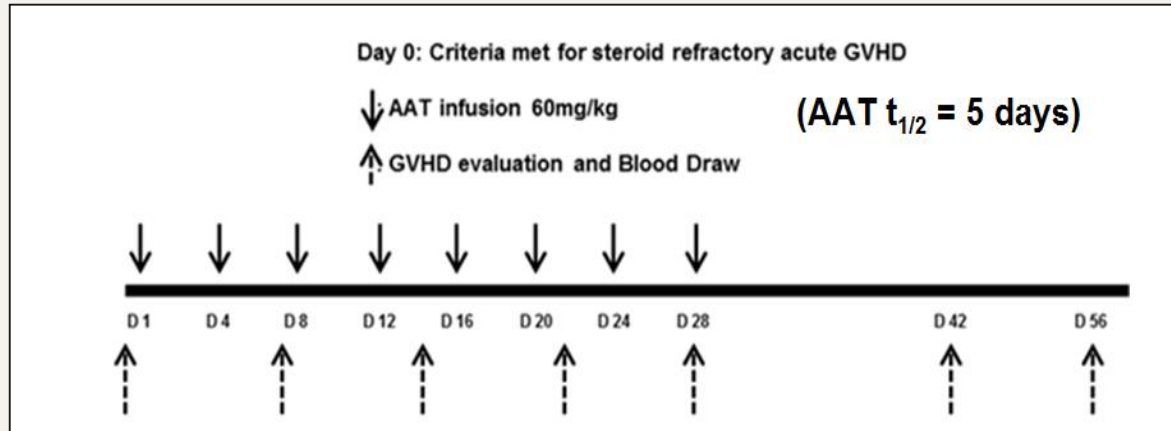
- Survival is 30% for Grade III and 10% for Grade IV
- Therapies are often ineffective or cause severe immunosuppression

# Potential Immunomodulation of Alpha-1 Antitrypsin (AAT) in Acute GVHD



Blazar, B. R., et al. (2012). Nat Rev Immunol 12(6): 443-458.  
Schmidt, S. V., et al. (2012) Front Immunol 3: 274

# Treatment of Steroid-Refractory GvHD with AAT



Mangenau et al Blood 2018

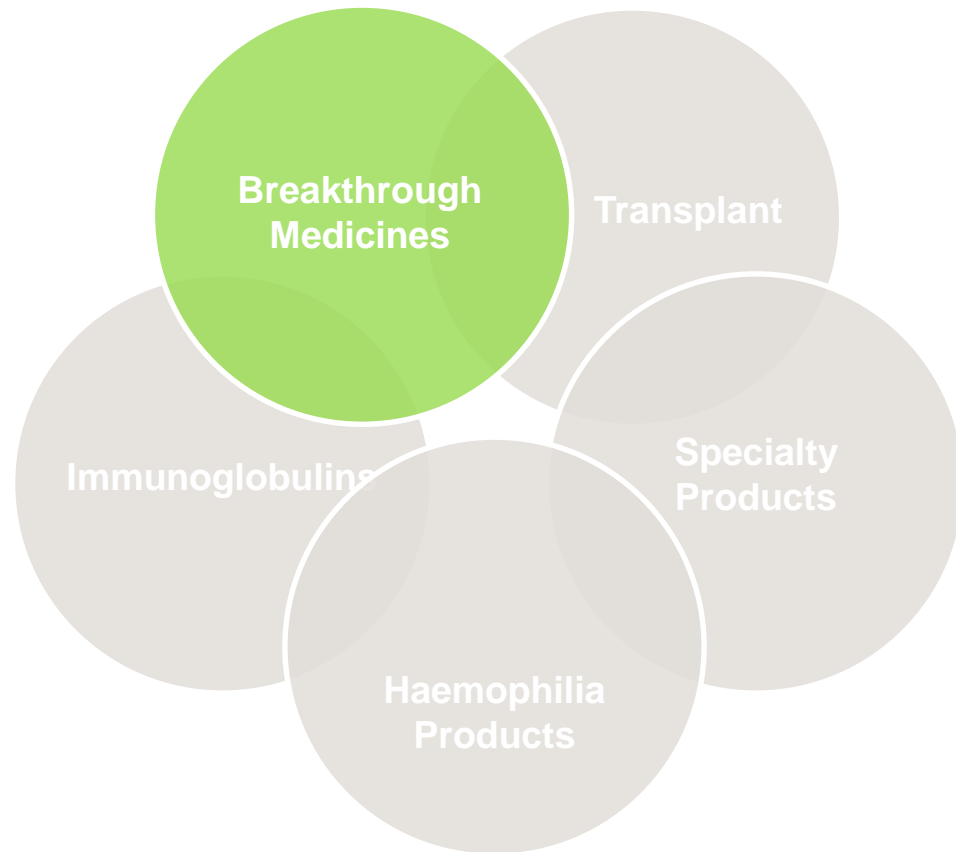
## Alpha-1 Antitrypsin (AAT)

- 40 Patients with Steroid refractory aGVHD
- Open label AAT - 60mg/kg twice weekly x 4 weeks
- Day 28 overall response rate (ORR) - 65%
  - 35% Complete Response
- Sustained responses - 73% at Day 60
- Well tolerated with low rates of infection

## CSL964 AAT GvHD Prevention

- Planned evaluations in prophylaxis of GvHD with AAT
- Study start up activities commenced

# Breakthrough Medicines

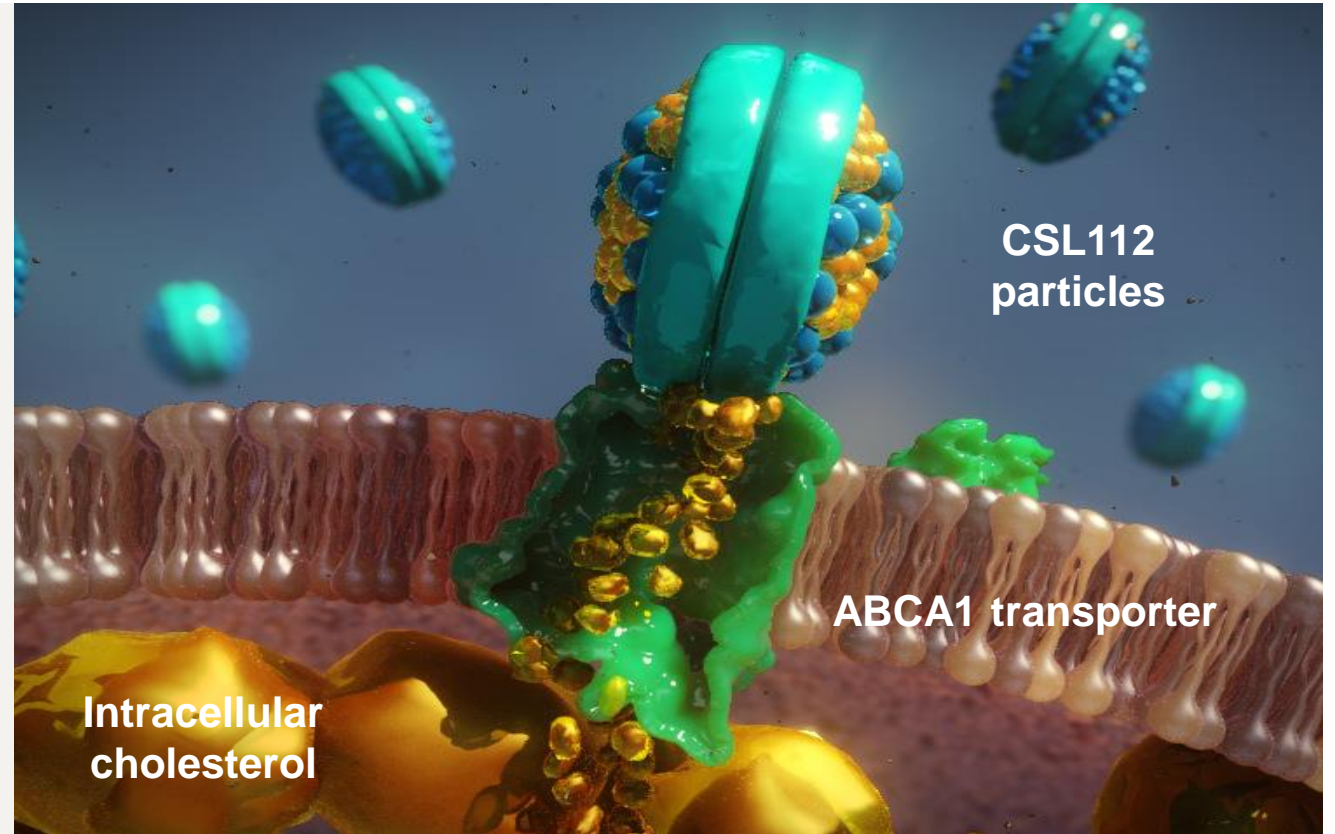


- **Leveraging clinical and technical insight in developing novel protein-based therapies:**
  - Significant unmet need
  - Multiple indications
- **Key Focus:**
  - CSL112 (ApoA-I)
  - CSL312 (anti-FXIIa mAb)
  - CSL324 (anti-G-CSFR mAb)
  - CSL346 (anti-VEGF-B mAb)
  - CSL311 (anti-BC mAb)

# CSL112 Hypothesis

CSL112 will

- be safe and well tolerated
- enhance cholesterol efflux capacity (CEC)
- acutely stabilise atherosclerotic plaques and prevent subsequent major adverse cardiovascular events (MACE) in the early, highest risk period (unique treatment period)





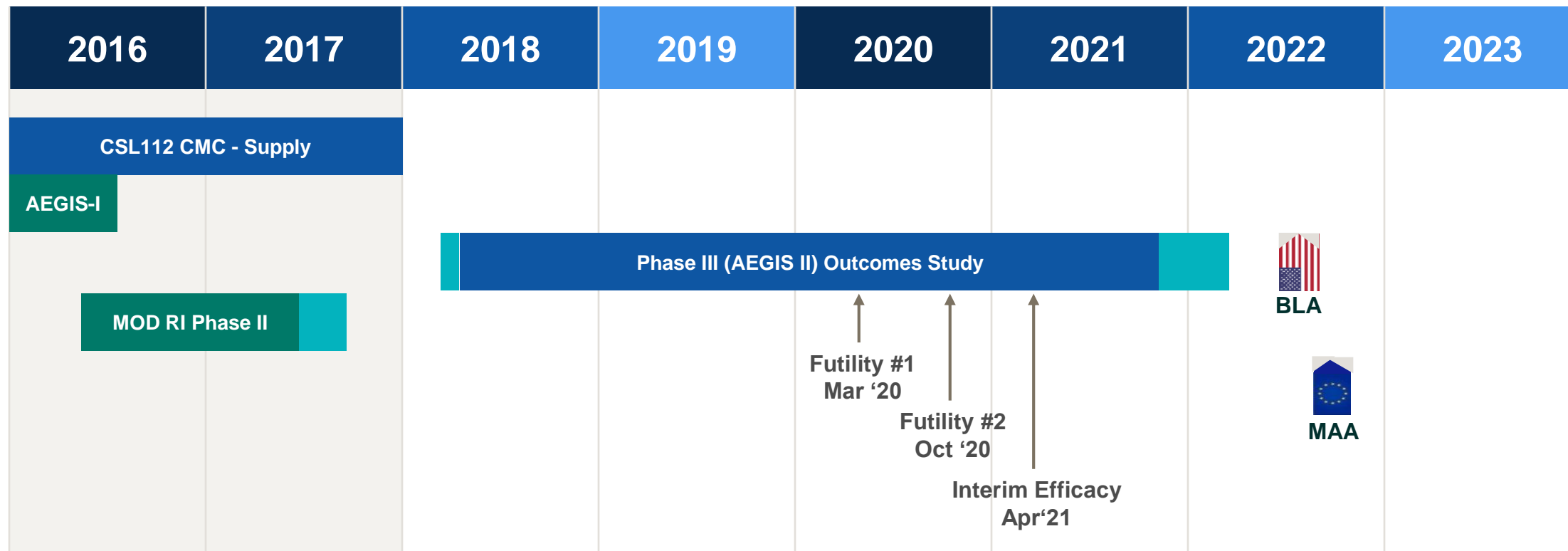
# CSL112 Phase III Study Design



- Enriched Study Population: Multi-vessel coronary artery disease and at least one of the following:
  - Age >65
  - History of MI
  - Diabetes mellitus
  - Peripheral artery disease (PAD)
- Registry data confirms enriched AEGIS-II population is associated with high early recurrent event rate and supports our trial assumptions



# CSL112 Program Timeline



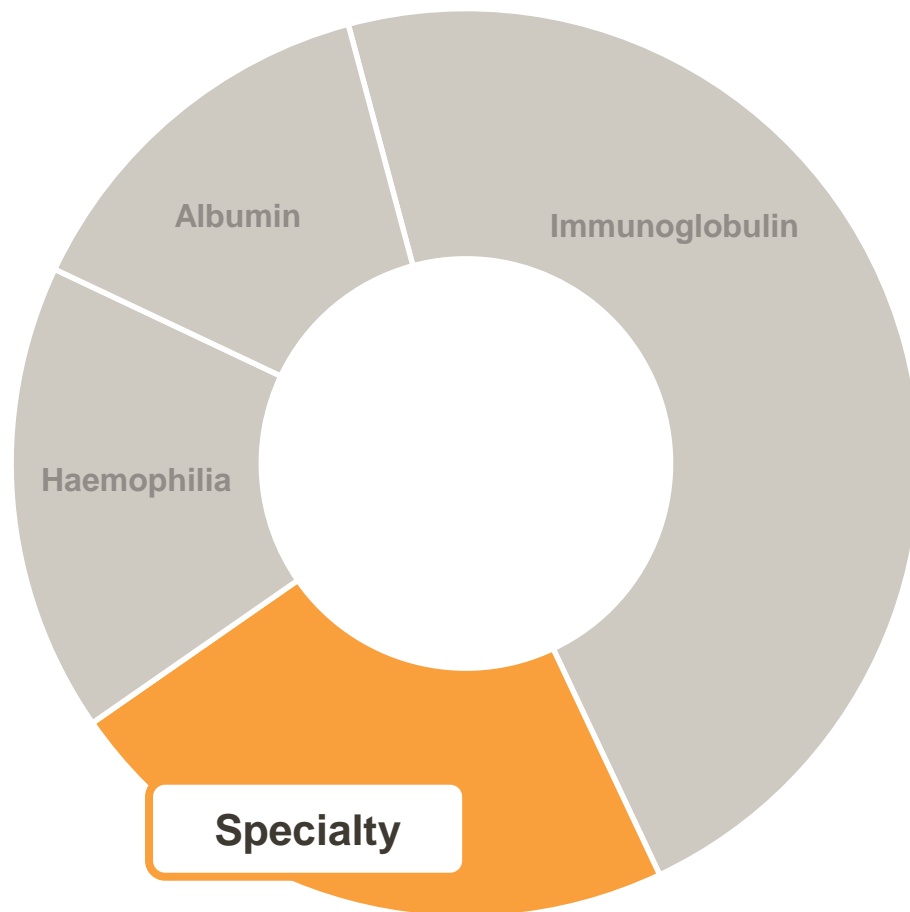
- Actively recruiting and on track
- To date, patient activity at sites supports the Registry data

# Commercial Overview Specialty, Transplant, CSL112

Mr Bill Campbell  
*Executive Vice President & Chief  
Commercial Officer*



# CSL Portfolio: Specialty



FY18 1,490M +24%

**Kcentra®**

Prothrombin Complex Concentrate (Human)



**HAEGARDA®**

C1 Esterase Inhibitor Subcutaneous (Human)

**BERINERT®**

C1 Esterase Inhibitor, Human

*On-Demand Treatment*

**RiaSTAP®**

Fibrinogen Concentrate (Human)

*Strengthens clots. Supports hemostasis.*

**Zemaira®**

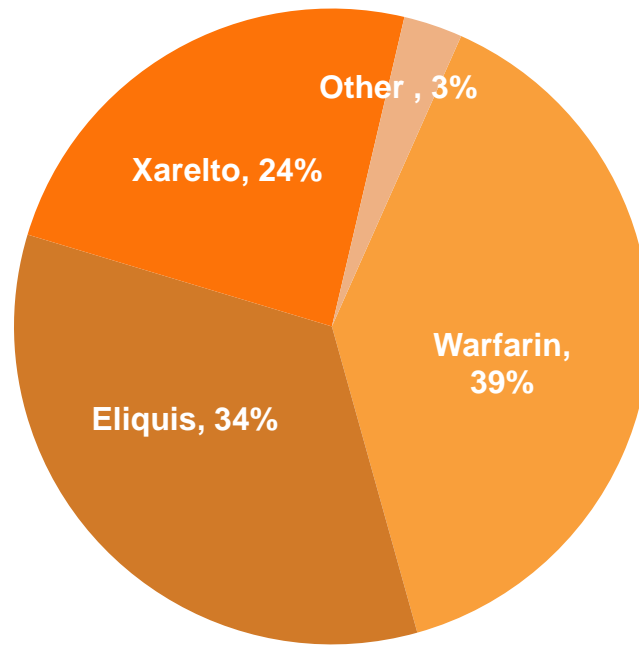
alpha<sub>1</sub>-proteinase inhibitor (Human)

**Respreeza®**

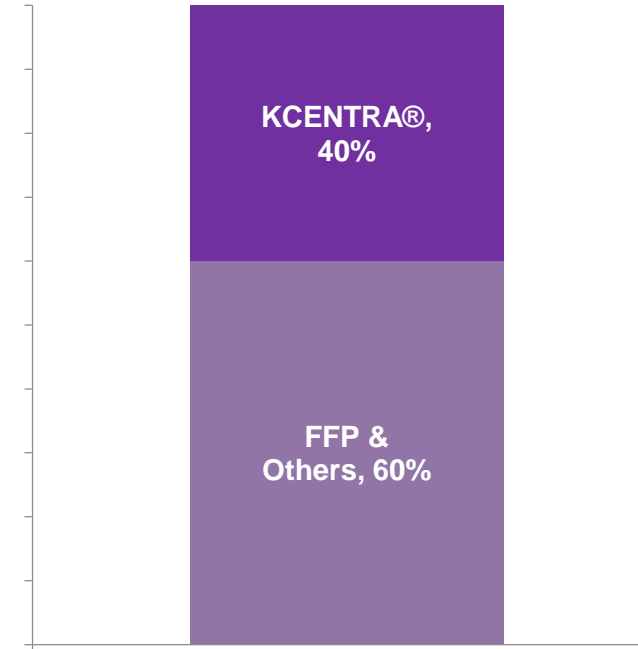
alpha<sub>1</sub>-proteinase inhibitor (Human)

# Continued Growth Opportunity for Kcentra®

Anticoagulation Market US<sup>1</sup>



Warfarin Market US<sup>1</sup>

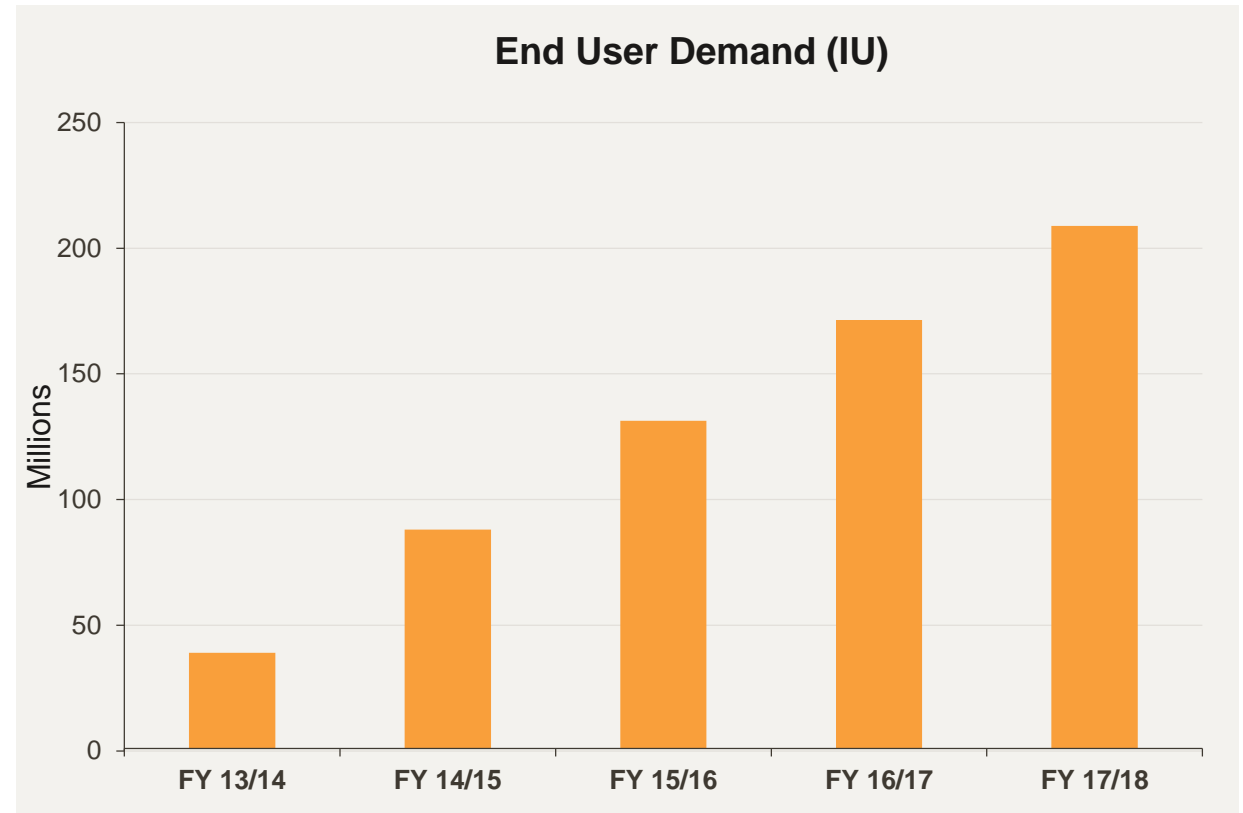


US clinical practice guidelines recommend KCENTRA® over FFP to reverse the effects of Warfarin\*

Source: 1. IQVIA NPA Market Dynamics Anti-Coagulant Patients Q3 2018

\*Neurocritical Care Society, Society of Critical Care Medicine, American College of Cardiology, American College of Chest Physicians, American Society of Gastrointestinal Endoscopy, American College of Surgeons

# Kcentra® Growth Since Launch



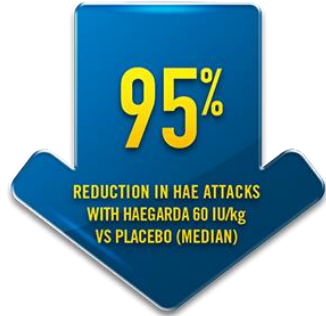
# Specialty Products – HAEGARDA®



- Transformational HAE therapy
- New patients weekly
- Strong patient, physician and prescriber engagement
- Natural C1 replacement

**#1 prescribed therapy in the US  
for prevention of HAE attacks**

# HAEGARDA®



## Established efficacy

- 95% reduction in HAE attacks
- Rescue medication reduced by >99%
- HAEGARDA® studied in patients with 3.8 attacks per month

## C1-INH for C1-INH deficiency

- HAEGARDA® replaces missing or dysfunctional C1-INH, regulating the normal production of bradykinin
- C1-INH has been used in HAE for over 35 years

## WAO Guidelines

- 2017 WAO Treatment Guidelines recommend the use of C1-INH for first line, long-term prophylaxis therapy

# Why HAEGARDA®

## Key KOL Quote

“With efficacy it is as good as it gets with HAEGARDA®. However if Lanadelumab can prove the same level of efficacy, HAEGARDA® can still clearly differentiate by its MOA, replacing the missing protein of C1-INH”

— Leading KOL

## Additional Patient Testimonials



“I never realized how much HAE limited me until it stopped being a big part of my life.”

— Shari, HAEGARDA® patient



“When I started HAEGARDA®, I went longer without an attack than I had in over 18 years.”

— Stephanie, HAEGARDA® patient



“For 40 years I lived with so many limitations, until HAEGARDA®. I’m still getting used to a new way of life.”

— Melissa, HAEGARDA® patient

## Additional HCP Quotes

“From our collective experience, we gave efficacy 5. I have some Cinryze patients that still have breakthrough attacks but haven’t had any with HAEGARDA®.”

— HAE HCP

“She started HAEGARDA®...and literally her life changed. She said she owed it all to HAEGARDA®. I cried with this woman. And she didn’t have any attacks. She started HAEGARDA® and was attack free.”

— HAE HCP, MD

“Maybe the most important part of the guidelines is the emphasize of C1 inhibitors as first line. No matter how you feel about guidelines, its still number one.”

— HAE HCP, MD

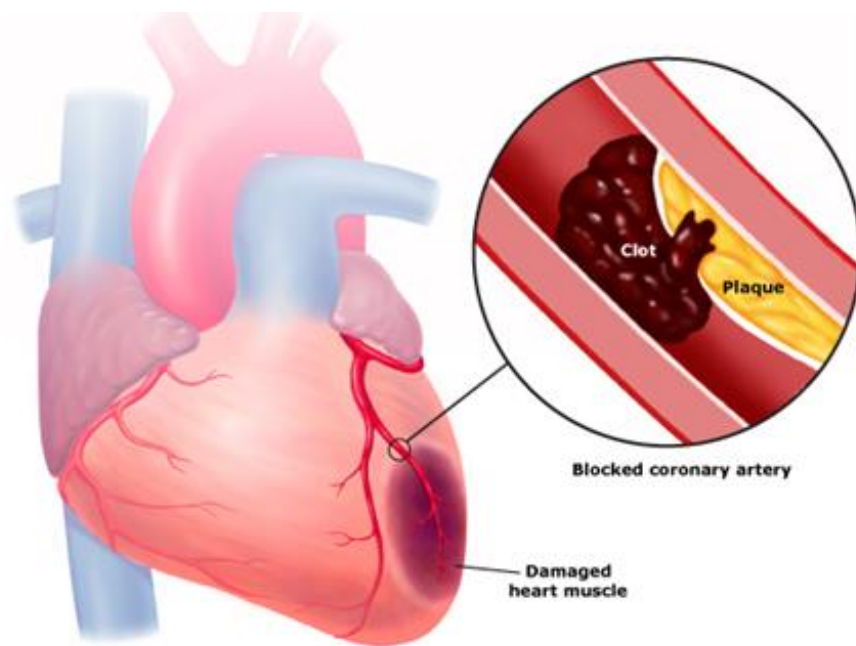
“C1-INH has been around for 35 years. It is a trusted product.”

— HAE HCP, MD



# Cardiovascular Disease (CVD)

## *High Unmet Medical Need*



- CVD remains leading cause of death globally
- In the US & Europe, 2 million MI's occur each year
- Survivors remain at high risk for early recurrent CV events
- Among high-risk populations:
  - 14% recurrence in year one
  - of these ~70% within first 90 days
- Reducing the risk of early recurrent events represents a significant unmet need

# CSL112 – Our Vision and Strategy



THE FUTURE AFTER A HEART  
ATTACK IS **LOOKING BRIGHTER**

CSL Behring Is Forging A New Path In The  
Treatment Of Cardiovascular Disease

## Vision

Establish CSL112 as a leading hospital initiated solution to prevent early recurrent CV events in post-AMI pathway of care

## Strategy

- Define the unmet need within the 90d period
- Establish the role of Apo A-I and Cholesterol Efflux
- Position CSL112 in the post AMI pathway of care
- Define the clinical and economic value of CSL112

# CSL112 – Our Journey



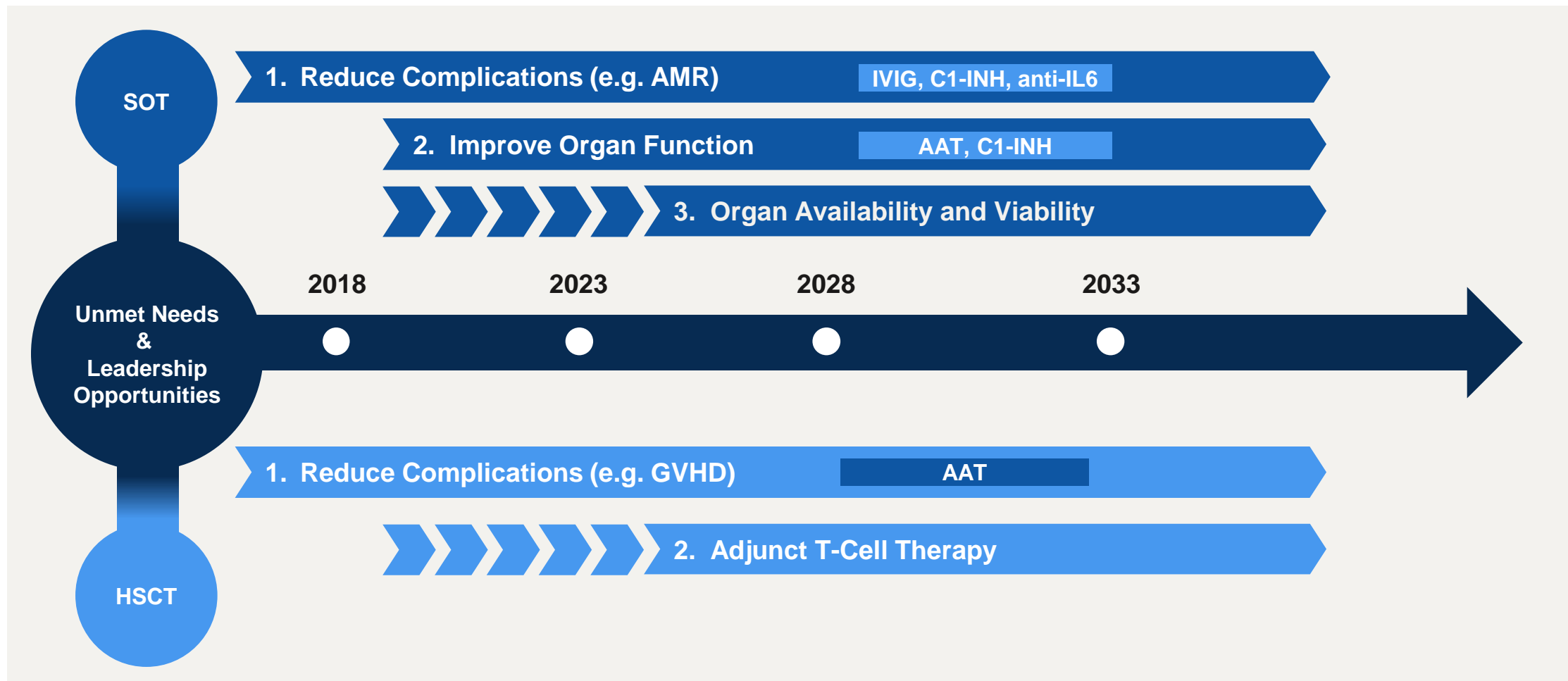
- Expanding patient focus to heart disease, the leading cause of death W/W
- Refining high-risk AMI target population and validating with real world data
- Developing insights relative to the post-MI pathway of care
- Engaging with hospitals and payors to define value proposition and pricing
- Building insight and partnerships through Advisory Boards and Scientific exchange
- Developing a global Disease Awareness educational program
- Partnering with hospitals, payers and patients to prepare the market

# Transplant Opportunity

- Two fundamental types of transplant:
  - Solid organ transplant (SOT)
  - Hematopoietic stem cell transplant (HSCT)
- Transplant is amongst the most transformative and curative therapies in all of medicine
- Utility is currently restricted due to
  - Treatment-related toxicities
  - Demand outstrips availability of healthy compatible donors
- Reducing complications could significantly increase utilisation



# Transplant Strategy



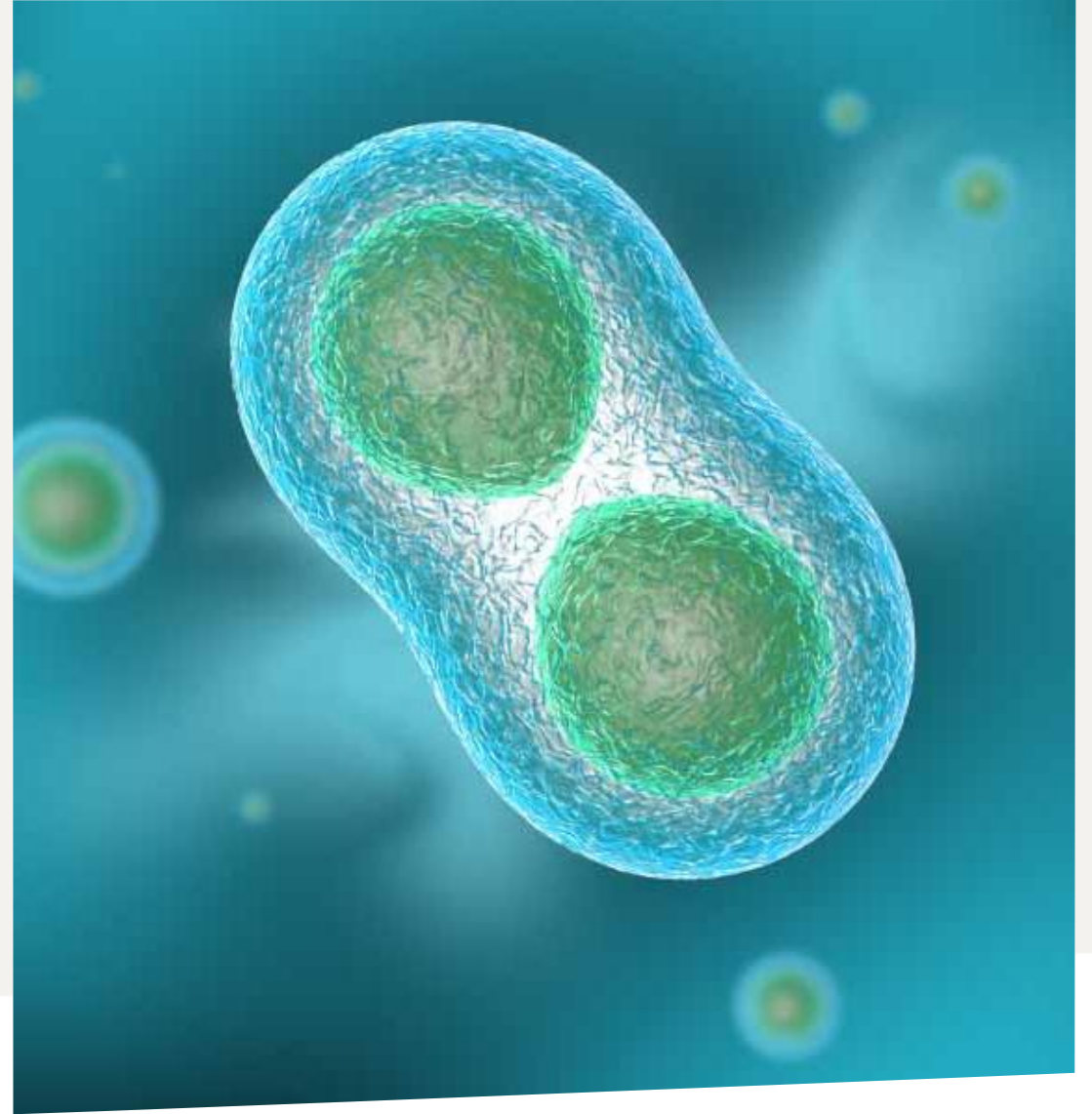
# Transplant Fit for CSL

- Significant unmet patient needs
- Multiple opportunities with current assets with proof-of-concept evidence
- Limited competition and concentrated call points
- Building on our strong foundation of plasma assets
- Potential to expand use of Hematopoietic Stem Cell Transplant





# Summary



# R&D Portfolio - December 2018

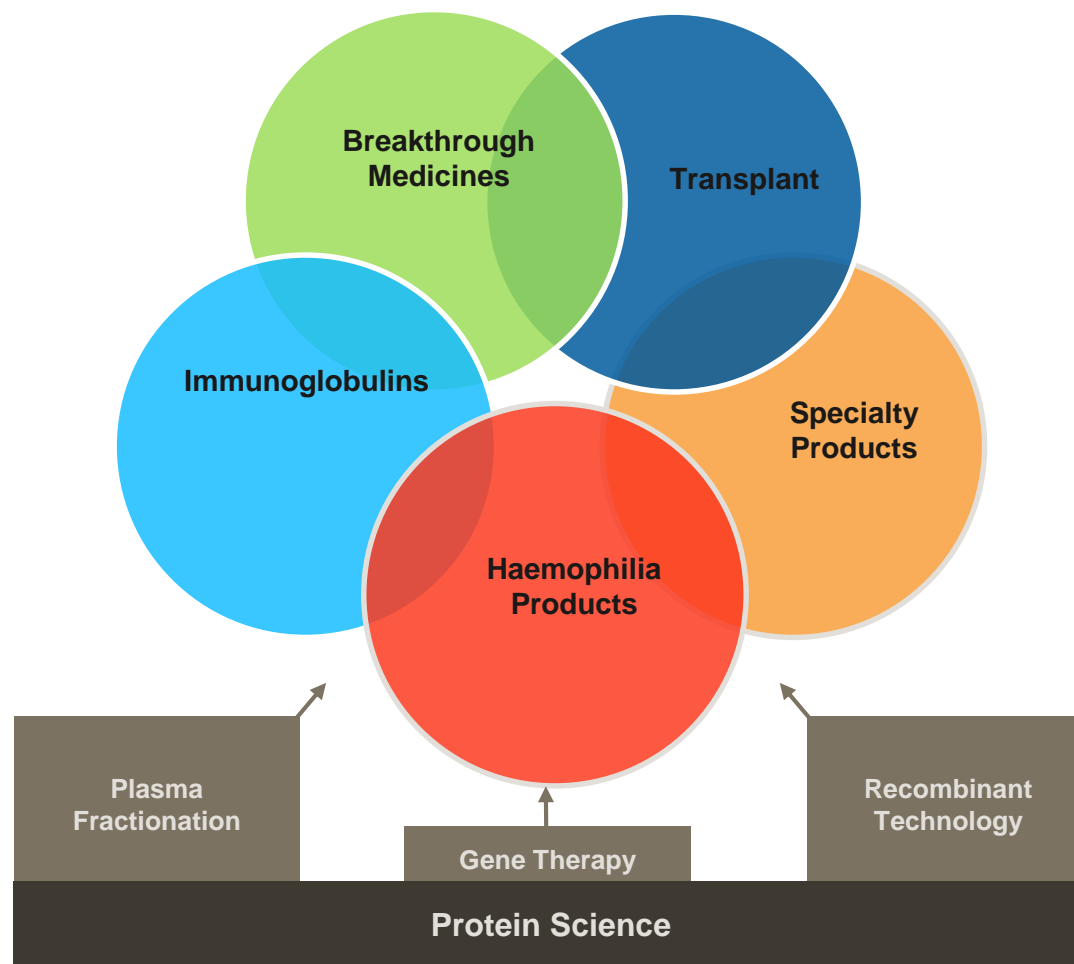
	RESEARCH	PRE-CLINICAL	PHASE I	PHASE II	PHASE III	REGISTRATION	COMMERCIAL / PHASE IV
New Product Development	Emerging Technologies	CSL787 Nebulised Ig	CSL730 rFc Multimer	CSL312 Anti-FXIIa in HAE	Clazakizumab* Transplant		IDELVION®
	Novel Strategies	CSL311 Anti-BC	CSL324 Anti-G-CSF	Mavri GM-CSFR-AZ*	pdFVIII Ruide		AFSTYLA®
	Discovery Projects	CSL200 (CAL-H) SCD	CSL346 Anti-VEGF-B		CSL112 Apo-AI		FLUAD® aTIV 65+ yr US, UK, AUS
	Haptoglobin	CSL889 Hemopexin in SCD	CSL334 IL-13R* ASLAN		FLUAD QIV 65+ yr		FLUCELAX® QIV 4+ yr US
	Clinical Applications	P. gingivalis/POD* OH-CRC			Pre-Pandemic Vaccine (aH5N1c)		CSL830 C1-INH Subcut EU
Life Cycle Management / Market Development	Clinical Applications	C1-INH New Indications			PRIVIGEN® ID Japan		PRIVIGEN® CIDP US
		Fibrinogen New Formulations			HIZENTRA® IIM	AFLURIA® QIV 6m-4 yr AUS	HIZENTRA® CIDP
					CSL842 C1-INH AMR	PRIVIGEN® CIDP Japan	KCENTRA® Japan
					CSL964 AAT GvHD Prevention	HIZENTRA® CIDP Japan	HAEGARDA® US
							AFLURIA® QIV 6m+ US

**Core Capabilities:** Immunoglobulins | Haemophilia | Specialty Products | Breakthrough Medicines | Transplant | Vaccines & IP

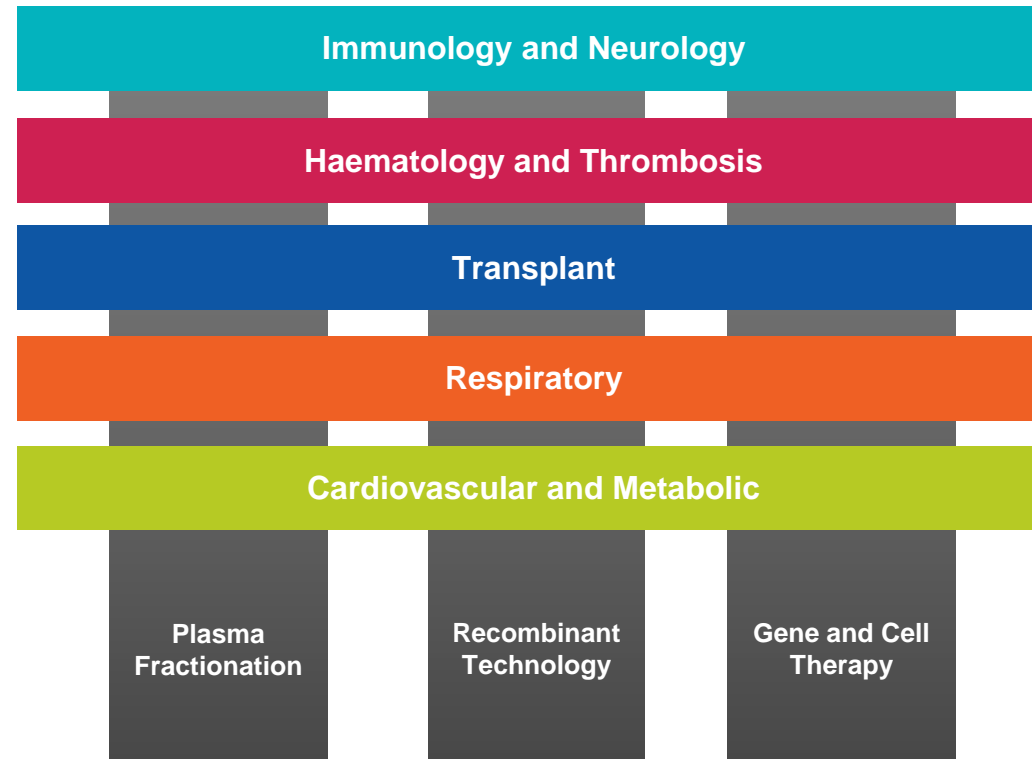
\*Partnered Projects



# Current CSL Behring Therapeutics Platform



# Future CSL Behring Therapeutic Area Framework



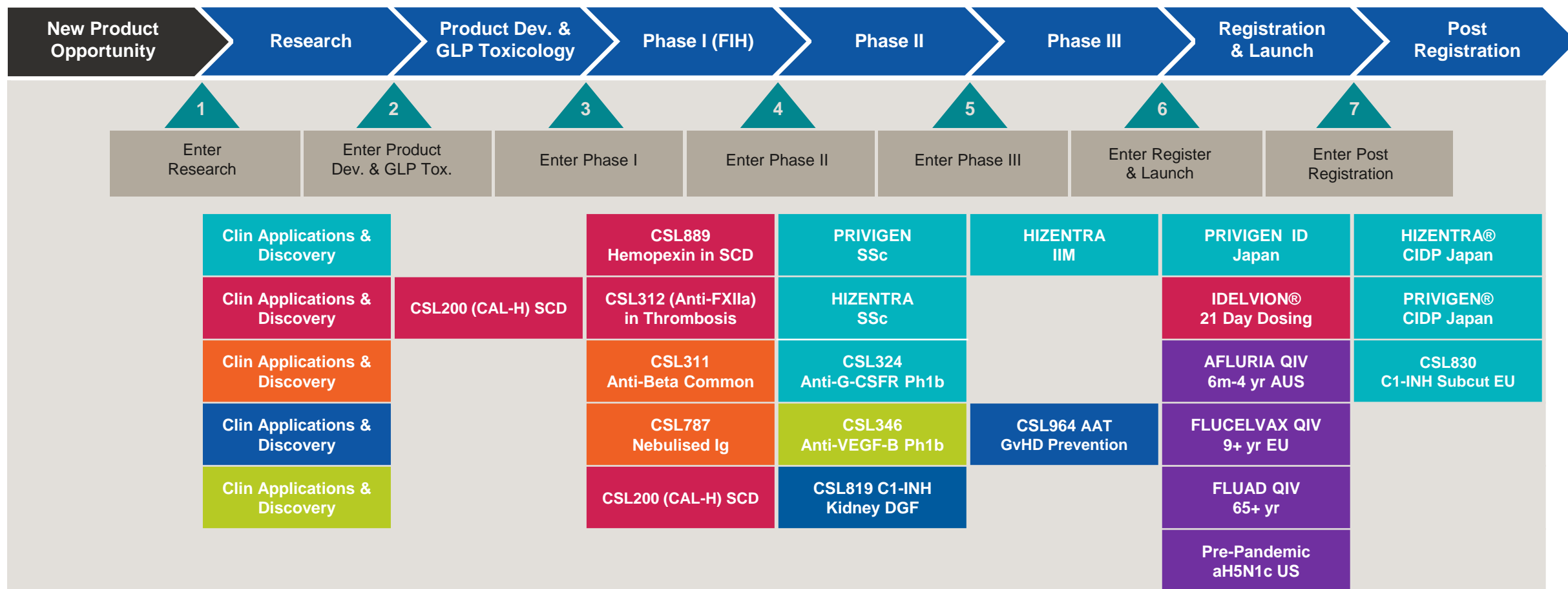
# R&D Portfolio - December 2018

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	Discovery Projects	CSL311 Anti-BC	CSL324 Anti-G-CSFR	Mavri GM-CSFR*	pdFVIII Ruide		AFSTYLA®
	Discovery Projects	CSL200 (CAL-H) SCD	CSL346 Anti-VEGF-B		CSL112 Apo-AI		FLUAD® aTIV 65+ yr
	Discovery Projects	CSL889 Hemopexin in SCD	CSL334 IL-13R* ASLAN		FLUAD QIV 65+ yr		FLUCELVAX® QIV 4+ yr US
	Discovery Projects	P. gingivalis/POD* OH-CRC			Pre-Pandemic Vaccine (aH5N1c)		CSL830 C1-INH Subcut EU
Life Cycle Management / Market Development	Clinical Applications				PRIVIGEN® PID Japan	FLUCELVAX® QIV 9+ yr EU	PRIVIGEN® CIDP US
	Clinical Applications				HIZENTRA® IIM	AFLURIA® QIV 6m-4 yr AUS	HIZENTRA® CIDP
	Clinical Applications				CSL842 C1-INH AMR	PRIVIGEN® CIDP Japan	KCENTRA® Japan
	Clinical Applications				CSL964 AAT GvHD Prevention	HIZENTRA® CIDP Japan	HAEGARDA® US
	Clinical Applications						AFLURIA® QIV 6m+ US

Therapeutic Areas: Immunology & Neurology | Haematology & Thrombosis | Respiratory | CV & Metabolic | Transplant | Vaccines & IP

\*Partnered Projects

# Expected Progress in Next 12 Months



Therapeutic Areas: Immunology & Neurology | Haematology & Thrombosis | Respiratory | CV & Metabolic | Transplant | Vaccines & IP

# Significant Target Launch Dates

2018	2019	2020	2021-2024
HIZENTRA® CIDP US/EU	HIZENTRA® CIDP Japan	PRIVIGEN® PID Japan	CSL312 (Anti-FXIIa) HAE
PRIVIGEN® CIDP US	PRIVIGEN® CIDP Japan	IDELVION® 21 Day Dosing	Hizentra® IIM
CSL830 C1-INH Subcut EU			Improved Fibrinogen
Kcentra Japan			CSL112 ApoA-I
			Clazakizumab* Transplant
			IVIg Kidney AMR
AFLURIA® QIV 6m+ US			CSL842 C1-INH AMR
AFLURIA® QIV 5-17yr AUS	AFLURIA® QIV 6m to 5yr AUS		FLUCELVAX® QIV 4+ yr AUS
FLUAD® aTIV 65+ yr UK, AUS	FLUCELVAX® QIV 9+ yr EU	FLUAD® aQIV 65+ yr US	FLUAD® aQIV 65+ yr EU

Therapeutic Areas: [Immunology & Neurology](#) | [Haematology & Thrombosis](#) | [Respiratory](#) | [CV & Metabolic](#) | [Transplant](#) | [Vaccines & IP](#)

# 2018 Highlights

## Immunology & Neurology

- Completion of CSL324 (anti-G-CSF) Phase I study
- Initiation of CSL312 (anti-FXIIa) HAE Phase II study
- Initiation of CSL730 (rec FC multimer) Phase I study
- PRIVIGEN® CIDP and HIZENTRA® CIDP approved in the US

## Haematology & Thrombosis

- Ongoing IDELVION® dosage extension study supports 21 day regimen
- Initiation of CSL200 (CAL-H) in SCD GTP Toxicology studies

## Transplant

- CSL842 C1-INH AMR Phase III actively recruiting and on track
- Successful FDA Type C meeting regarding Clazakizumab (anti-IL6) study

## Cardiovascular & Metabolic

- Initiation of CSL112 (Apo A-1) Phase III study (AEGIS-II)
- Completion of CSL346 (Anti-VEGF-B) Phase 1 study

## Respiratory

- Initiation of CSL787 Nebulised Ig GLP Toxicology studies

## Licensing & Vaccines

- AFLURIA® QIV registered in US for 6M-4years
- FLUAD® aTIV registered in UK and Australia
- FLUCELVAX® QIV positive effectiveness data compared with egg-based vaccines in US 2017-18 season
- Initiation of CSL334 IL-13R\* Phase I study by ASLAN

# Q&A

