

Covington Day

Welcome to Shire's Georgia Manufacturing Facility

November 7, 2018



The Shire logo, featuring a stylized white 'S' icon followed by the word 'Shire' in a white, sans-serif font, all set against a solid blue background.

“Safe Harbor” Statement Under The Private Securities Litigation Reform Act Of 1995

Statements included herein that are not historical facts, including without limitation statements concerning future strategy, plans, objectives, expectations and intentions, projected revenues, the anticipated timing of clinical trials and approvals for, and the commercial potential of, inline or pipeline products, are forward-looking statements. Such forward-looking statements involve a number of risks and uncertainties and are subject to change at any time. In the event such risks or uncertainties materialize, Shire's results could be materially adversely affected. The risks and uncertainties include, but are not limited to, the following:

- Shire's products may not be a commercial success;
- increased pricing pressures and limits on patient access as a result of governmental regulations and market developments may affect Shire's future revenues, financial condition and results of operations;
- Shire depends on third parties to supply certain inputs and services critical to its operations including certain inputs, services and ingredients critical to its manufacturing processes. Any disruption to the supply chain for any of Shire's products may result in Shire being unable to continue marketing or developing a product or may result in Shire being unable to do so on a commercially viable basis for some period of time;
- the manufacture of Shire's products is subject to extensive oversight by various regulatory agencies. Regulatory approvals or interventions associated with changes to manufacturing sites, ingredients or manufacturing processes could lead to, among other things, significant delays, an increase in operating costs, lost product sales, an interruption of research activities or the delay of new product launches;
- the nature of producing plasma-based therapies may prevent Shire from timely responding to market forces and effectively managing its production capacity;
- Shire has a portfolio of products in various stages of research and development. The successful development of these products is highly uncertain and requires significant expenditures and time, and there is no guarantee that these products will receive regulatory approval;
- the actions of certain customers could affect Shire's ability to sell or market products profitably. Fluctuations in buying or distribution patterns by such customers can adversely affect Shire's revenues, financial conditions or results of operations;
- failure to comply with laws and regulations governing the sales and marketing of its products could materially impact Shire's revenues and profitability;
- Shire's products and product candidates face substantial competition in the product markets in which it operates, including competition from generics;
- Shire's patented products are subject to significant competition from generics;
- adverse outcomes in legal matters, tax audits and other disputes, including Shire's ability to enforce and defend patents and other intellectual property rights required for its business, could have a material adverse effect on Shire's revenues, financial condition or results of operations;

- Shire may fail to obtain, maintain, enforce or defend the intellectual property rights required to conduct its business;
- Shire faces intense competition for highly qualified personnel from other companies and organizations;
- failure to successfully execute or attain strategic objectives from Shire's acquisitions and growth strategy may adversely affect Shire's financial condition and results of operations;
- Shire's growth strategy depends in part upon its ability to expand its product portfolio through external collaborations, which, if unsuccessful, may adversely affect the development and sale of its products;
- a slowdown of global economic growth, or economic instability of countries in which Shire does business, could have negative consequences for Shire's business and increase the risk of non-payment by Shire's customers;
- changes in foreign currency exchange rates and interest rates could have a material adverse effect on Shire's operating results and liquidity;
- Shire is subject to evolving and complex tax laws, which may result in additional liabilities that may adversely affect Shire's financial condition or results of operations;
- if a marketed product fails to work effectively or causes adverse side effects, this could result in damage to Shire's reputation, the withdrawal of the product and legal action against Shire;
- Shire is dependent on information technology and its systems and infrastructure face certain risks, including from service disruptions, the loss of sensitive or confidential information, cyber-attacks and other security breaches or data leakages that could have a material adverse effect on Shire's revenues, financial condition or results of operations;
- Shire faces risks relating to the expected exit of the United Kingdom from the European Union;
- Shire incurred substantial additional indebtedness to finance the Baxalta acquisition, which has increased its borrowing costs and may decrease its business flexibility;
- the potential uncertainty among our employees, customers, suppliers, and other business partners resulting from the announcement by Takeda Pharmaceutical Company Limited on May 8, 2018 of a recommended offer for Shire under the U.K. Takeover Code; and

A further list and description of risks, uncertainties and other matters can be found in Shire's most recent Annual Report on Form 10-K and in Shire's subsequent Quarterly Reports on Form 10-Q, in each case including those risks outlined in "ITEM1A: Risk Factors", and in Shire's subsequent reports on Form 8-K and other Securities and Exchange Commission filings, all of which are available on Shire's website.

All forward-looking statements attributable to us or any person acting on our behalf are expressly qualified in their entirety by this cautionary statement. Readers are cautioned not to place undue reliance on these forward-looking statements that speak only as of the date hereof. Except to the extent otherwise required by applicable law, we do not undertake any obligation to update or revise forward-looking statements, whether as a result of new information, future events or otherwise.



Agenda

Welcome

Plasma-Derived Therapies
Business Overview

Plasma Technical Operations
Overview

Q&A

Small Group Rotation

Carlos Soto

Covington Site Head

Kasha Witkos

Immunology Franchise Head

Paul Blanchfield

US Immunology Head

Matt Walker

Technical Operations Head

Susan Brown

BioLife Head

Adrian Murphy

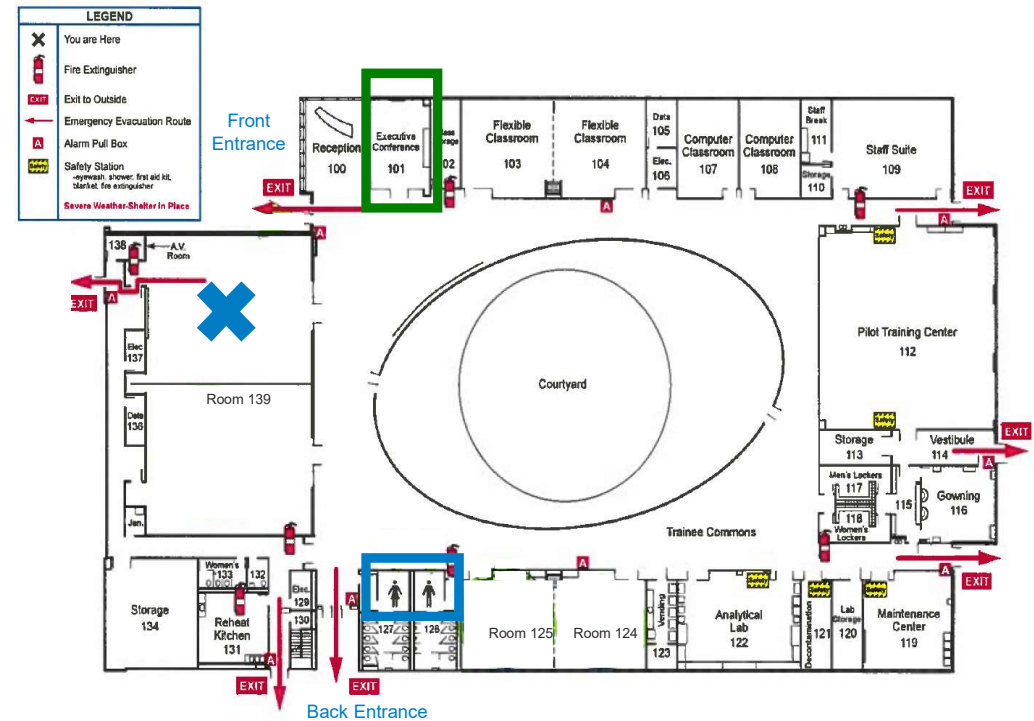
Plasma Operating Unit Head



Georgia BioScience Training Center



- Strong Public-Private Partnership with the state of Georgia



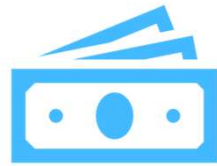
October 2012



Georgia Manufacturing Facility



Increases Shire's capacity for **PLASMA-DERIVED THERAPIES**



Investment of **\$1 BILLION+**



Manufacturing campus covers **1 MILLION+ FT²**



Georgia site will employ **~1,500 EMPLOYEES** at full ramp up

Schedule



June 2018



Magnitude of scale



8,775,000
Hours worked
on site



2,600
Peak workforce
(p/per day)



**42 FOOTBALL
FIELDS**
of building area



63,000
Cubic yards of
concrete



9,000
Tons of steel



2,000,000
Pounds of
ductwork



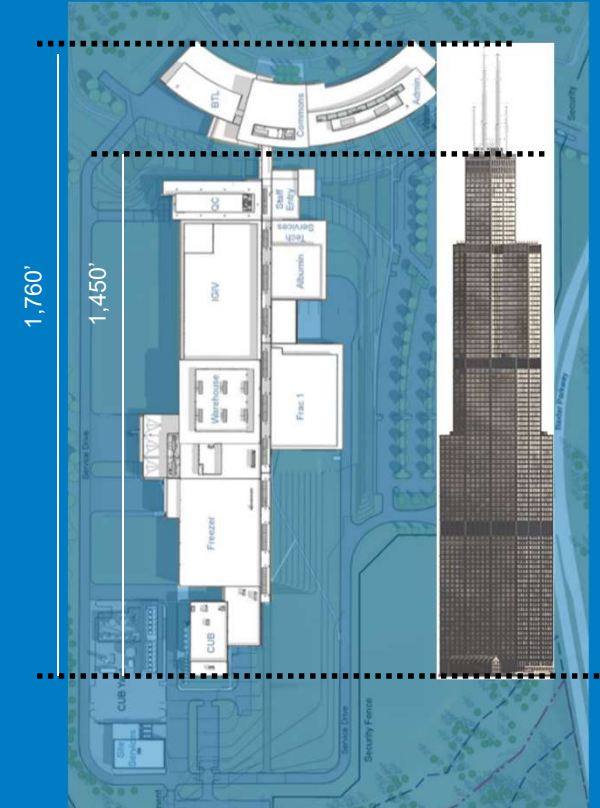
86 miles
of piping



1,400
Pieces of
equipment



30,000
Instruments



Shire's
Georgia
Manufacturing
Facility

Willis (Sears)
Tower
Chicago, Illinois

What we will manufacture – Therapies from proteins



GAMMAGARD

Immunoglobulin product (antibodies)
Treats primary immune deficiency disorders



FLEXBUMIN

Treats burns and trauma victims;
plasma volume replacement therapy



* FDA Submissions and approval related Georgia manufacture of products

Shire Georgia is vertically integrated

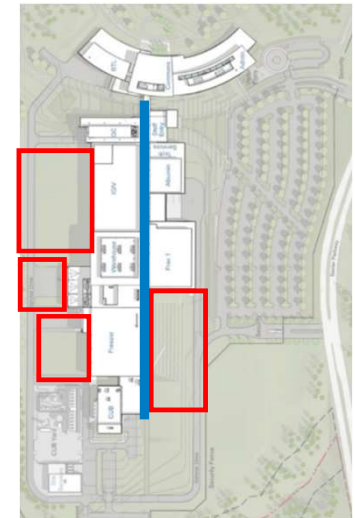
Fully integrated end-to-end production site



- ~900 employees today / ramp up plan in place
- Site includes already approved BioLife testing and storage facility

Flexible design for future expansion

Fractionation capacity, million liters



Georgia site video

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Our personalized approach to supporting patients



Intelligent Care for Life Patient Pledge




Your lifelong journey with immunodeficiency is unique and personal. We think your treatment should be too.

As life moves on, you need support that can grow and change with you. From newborn diagnosis screening to services and treatments from childhood to old age: at Shire, we believe your journey is our journey. Working in partnership with patients and their caregivers, we offer a personalised, human approach to therapies, services and devices.

That's why we do what we do: Intelligent Care for Life.



Clinical uses of plasma products span four primary categories

	Description	Uses
Immune globulin (IG) 	<ul style="list-style-type: none"> Aids in the destruction of foreign molecules Main function of the humoral immune system 	<ul style="list-style-type: none"> IV/SCIG — congenital antibody deficiencies, neurologic, hematology — 350+ diseases Hyperimmune — target antigens of specific conditions
Albumin	<ul style="list-style-type: none"> Maintains intravascular colloid osmotic pressure Can compete with non-protein based volume replacement solutions such as starches, Ringer's Lactate, or saline 	<ul style="list-style-type: none"> Albumin — Fluid loss, sepsis/septic shock, plasma exchange, burn therapy, renal dialysis
Coagulation 	<ul style="list-style-type: none"> Replaces missing factors in the clotting cascade due to deficiencies or dysfunctions 	<ul style="list-style-type: none"> Factor VIII/IX – Hemophilia A/B vWF — Von Willebrand Disease AT-111 — excessive clotting Factor II, V, VII, X, XI, XIII & fibrogen — deficiencies for blood loss or congenital
Other replacement therapies 	<ul style="list-style-type: none"> Plasma proteins used to treat extremely rare diseases Orphan drug designation with additional therapies expected 	<ul style="list-style-type: none"> AAT/AIPI — COPD, cirrhosis, jaundice CI-INH — Hereditary Angioedema

Today's focus

Most plasma-derived therapies (e.g., polyvalent IG) **cannot be made in a lab**. These therapies can only be created from donated human plasma from healthy volunteers

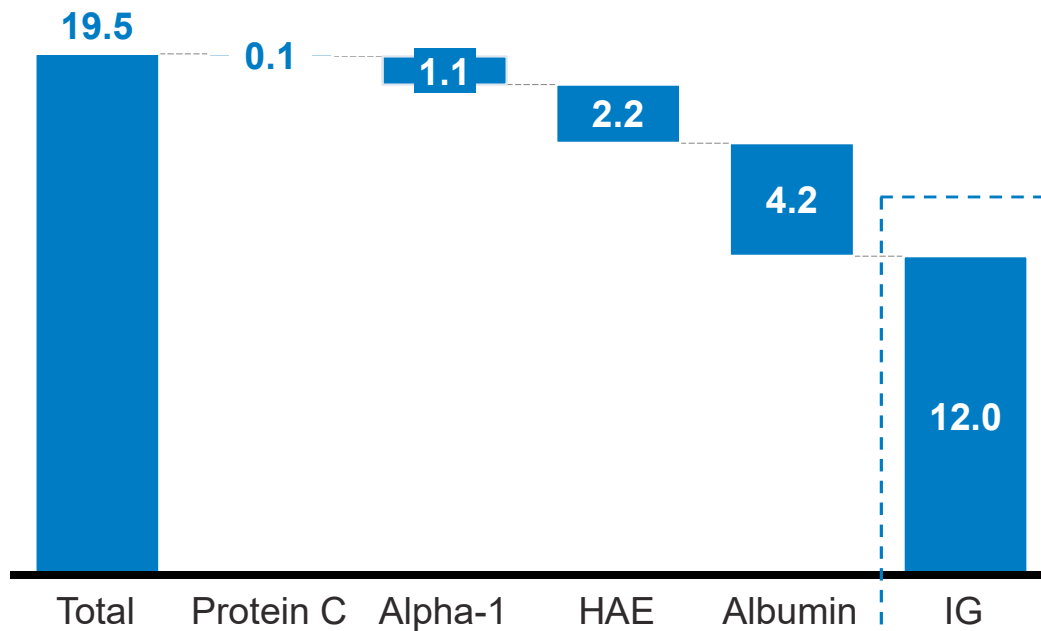


Note: Indications vary by country; see local product labeling

Global Immunology Market: Opportunity for growth

Immunology market size

2018e, USD billion



Y/Y growth

~7%

n/a

6%

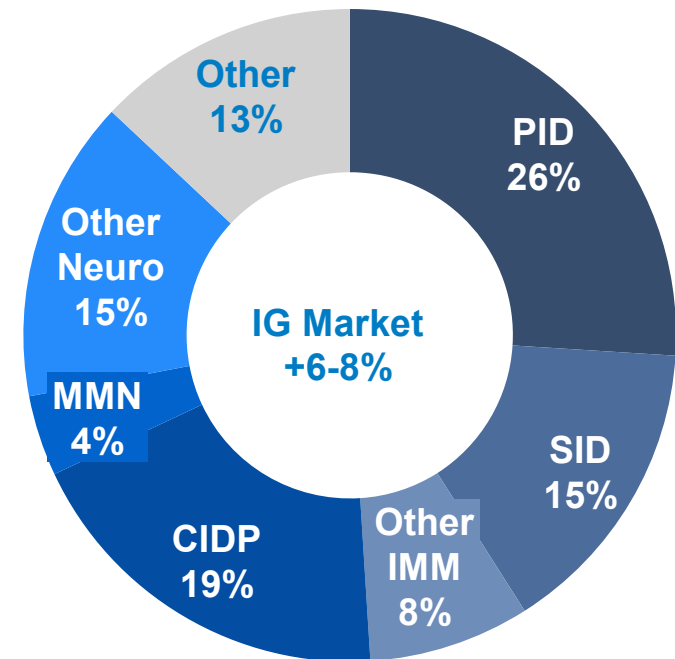
7%

6%

8%

IG market by TA (US & EU)

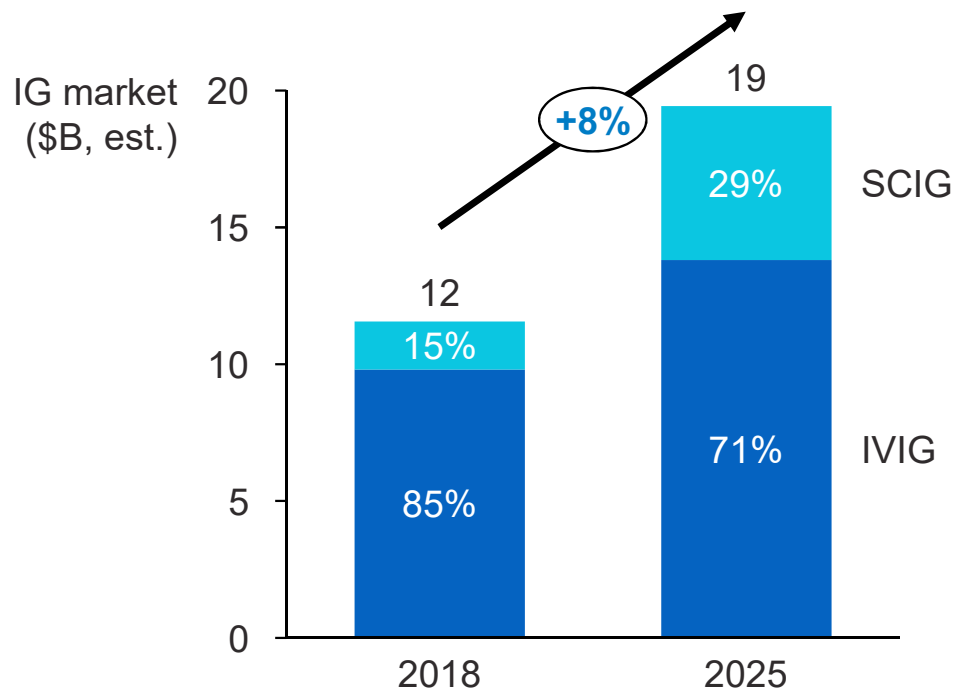
2018e forecast, percentage



SOURCE: 2016 WW MRB Report, 2017 US MRB Report, & Internal estimates

IG market is expected continue to grow ~8% per year

Total IG Market Overview



SCIG Market

- 15% of the current IG market but growing faster than IVIG
- Today SCIGs are currently approved for PID and SID (INT)
- Key marketed products: Hizentra™ (2010), HyQvia* (2013), Cuvitru* (2016/ 2017)

IVIG Market

- 85% of current market and expected to remain largest segment in 2025
- Market with stable growth
- Top 4 players 75% of global market share, with many smaller, regional players

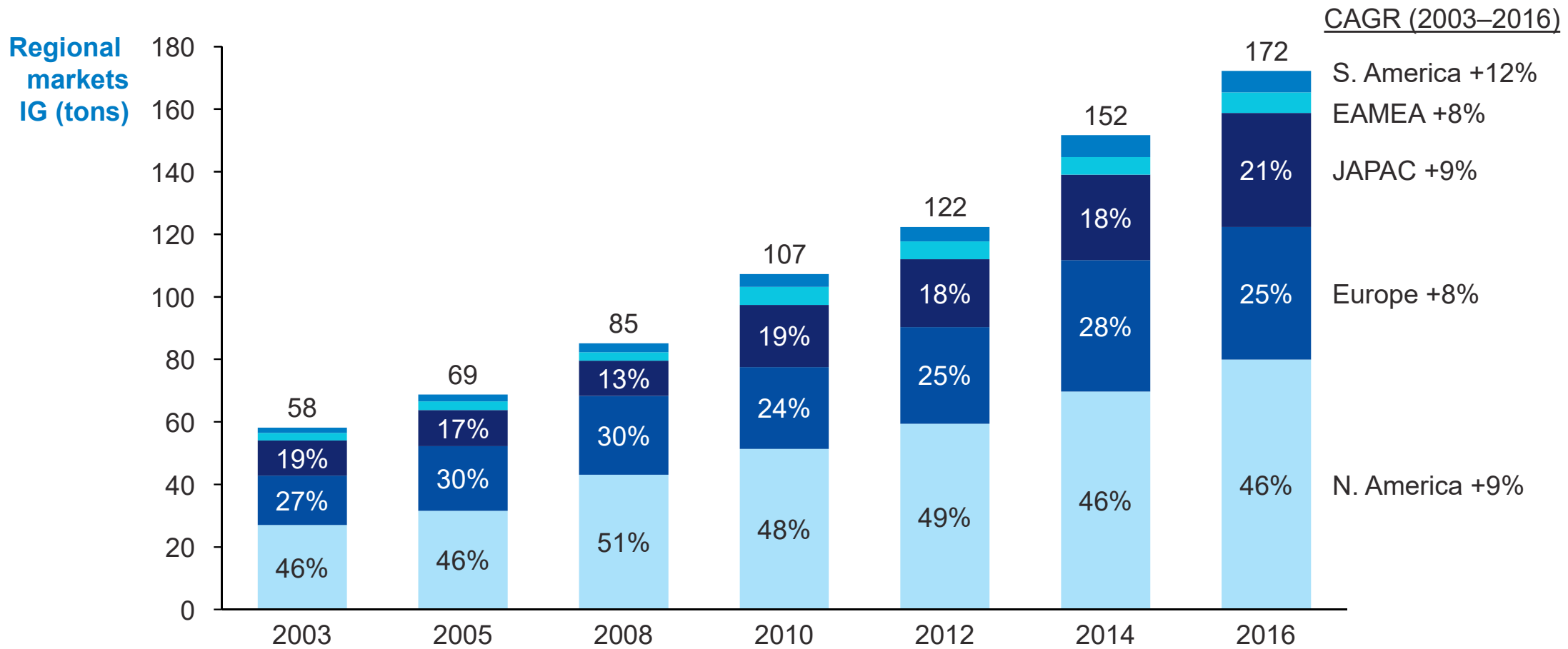


SOURCE: 2016 WW MRB Report, 2017 US MRB Report, & Internal estimates

Hizentra is a CSL product

*Indications vary by country; see local product labeling

Consistently strong growth globally



SOURCE: MRB_WW_History 2016, Internal estimates; EAMEA = Eurasia, MEA

Immunoglobulin uses

Immunoglobulin

	PI	CIDP	MMN	Other
Indication	Primary immunodeficiency	Chronic inflammatory demyelinating polyneuropathy	Multifocal motor neuropathy	Other Approved & Evidence based
Therapeutic area	Immunology	Neurology	Neurology	Multiple
Primary physician	Immunologist	Neurologist	Neurologist	Multiple
Age groups	Various	Middle age to older adults	Middle age to older adults	Various
2017 Growth	9%	9%	17%	6%

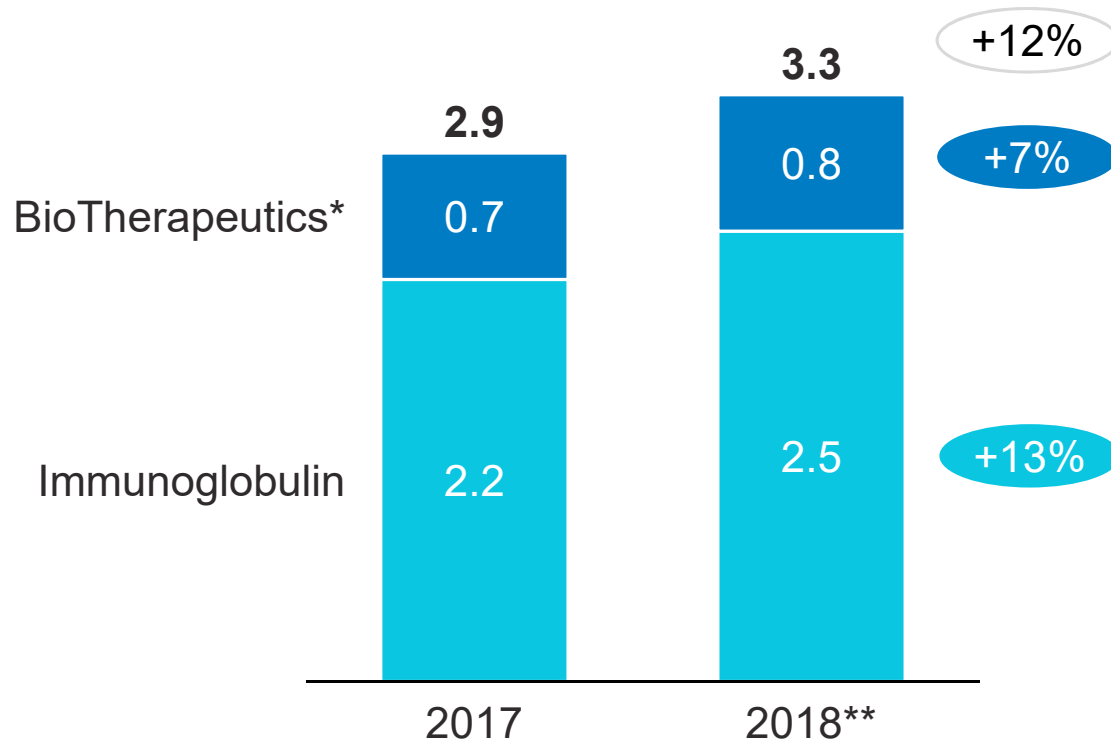


Note: Indications vary by country; see local product labeling

Double-digit growth

Immunoglobulin (IG) and Bio Therapeutics

\$MM



Key growth drivers

- Strong demand for **subcutaneous IG portfolio**
- Increasing **focus on execution** (e.g., market penetration, geographic expansion)
- Improving **patient experiences** (e.g., patient services, delivery systems)
- Approval of new **Covington**, Georgia manufacturing facility adds supply



* Bio Therapeutics excludes Prothromplex, Prothromplex T and Bebulin

** Bloomberg consensus, as of Oct 31, 2018

Broadest subcutaneous portfolio

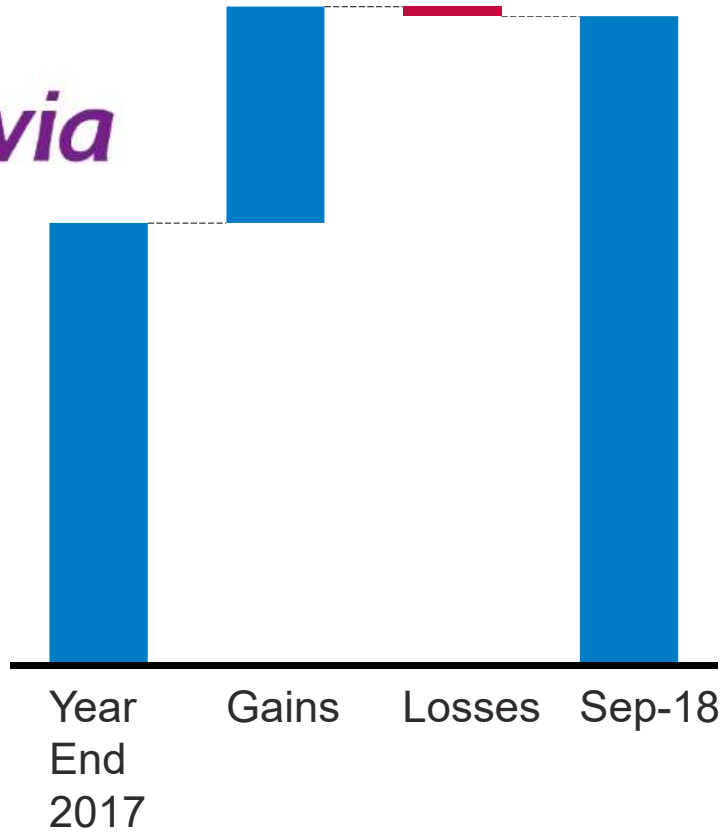
	IGIV	Self infusion available			A-1 IV	Other fractions*
		SCIG Weekly	SCIG Monthly	A-1 IV		
						
						
						
	✓	✓		✓	✓	✓
	✓	✓		✓	✓	✓
	✓	✓		✓	✓	✓



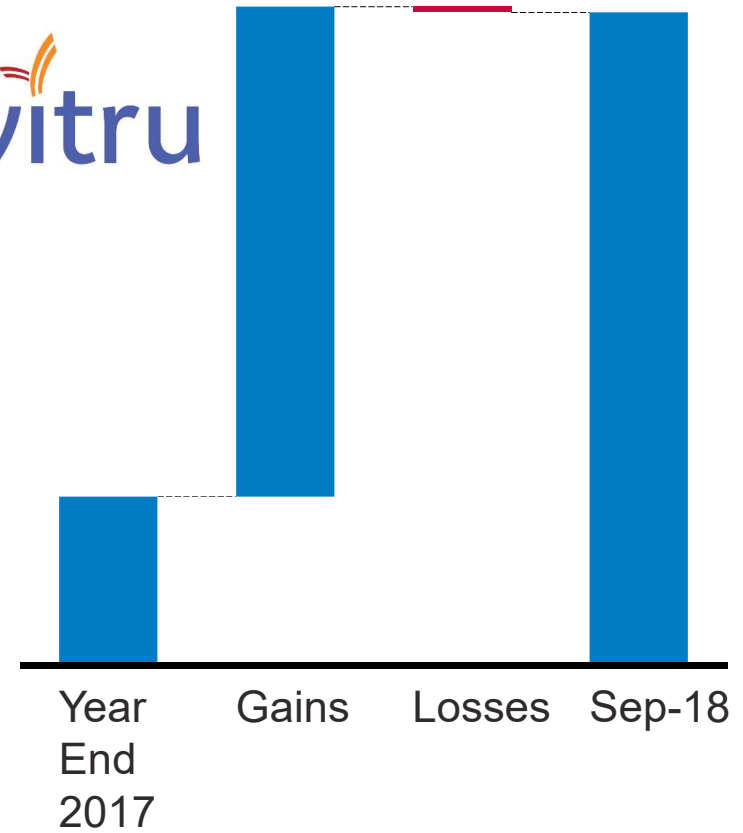
* Includes Albumin, Protein C, pdFVIII, Hyperimmunes, other bleeding disorders, etc.
 Note: Indications vary by country; see local product labeling

High patient retention

HyQvia



Cuvitru



Note: CW39 data, weekly pt tracker

Impact of FcRn technology

FcRn technology

- IgG auto-antibodies are directed against the patients' own tissues for IgG mediated autoimmune diseases
- Blocking FcRn induces IgG clearance in diseases driven by IgG auto-antibodies
- Anti-FcRn could play a role in the treatment of IgG autoimmune conditions (immune modulatory)

Opportunity for Shire

- Shire has invested in PRIM technology* which is well-positioned thanks to broader specificity than anti-FcRn

Durability of IG market

- While the anti-FcRn class has shown promise, questions remain about long-term safety vs IG
- Immunodeficiency cannot be addressed by anti-FcRn
- Continued demand growth expected in all indications

Strategic flexibility

- Any potential impact on the IG market could partially be compensated by selling the relevant IG elsewhere in other markets



* Press release Jan 2018 regarding partnership with AB Biosciences
SOURCE: Shire competitive intelligence, R&D, BD

Our pledge to patients



Intelligent Care for Life Patient Pledge

Your lifelong journey with immunodeficiency is unique and personal. We think your treatment should be too.

As life moves on, you need support that can grow and change with you. From newborn diagnosis screening to services and treatments from childhood to old age: at Shire, we believe your journey is our journey. Working in partnership with patients and their caregivers, we offer a personalised, human approach to therapies, services and devices.

That's why we do what we do: Intelligent Care for Life.



Shire Plasma Derived Therapies are well positioned for continued success



Robust demand growth expected to continue



Shire has a **broad, differentiated portfolio**

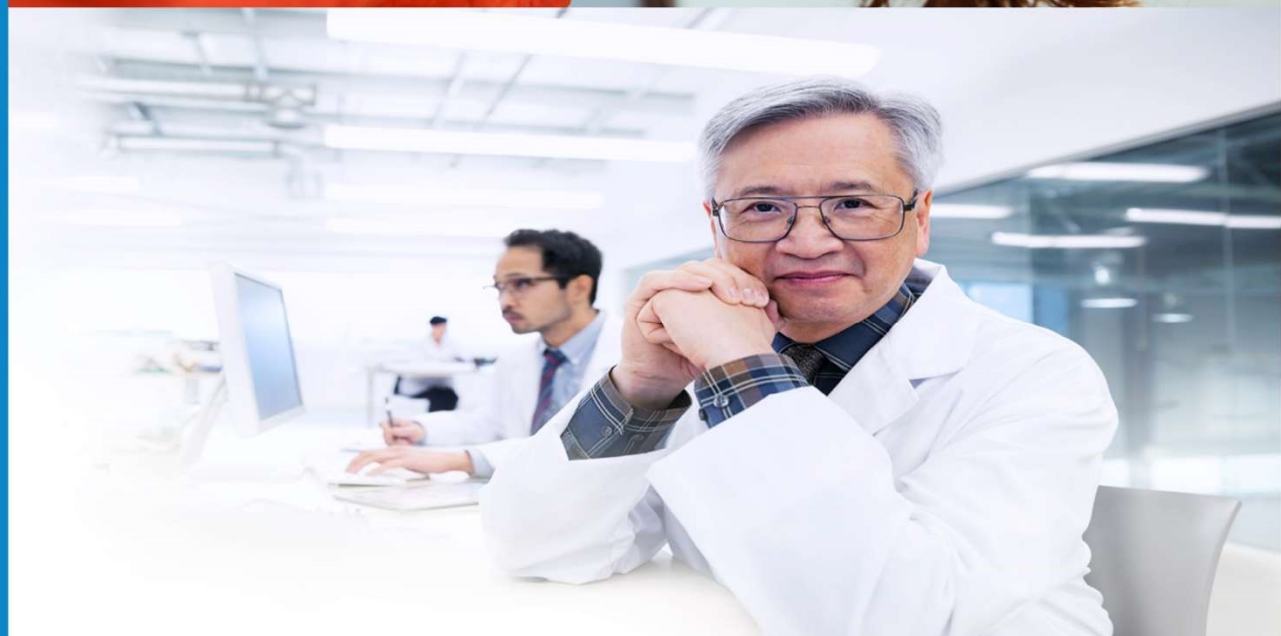
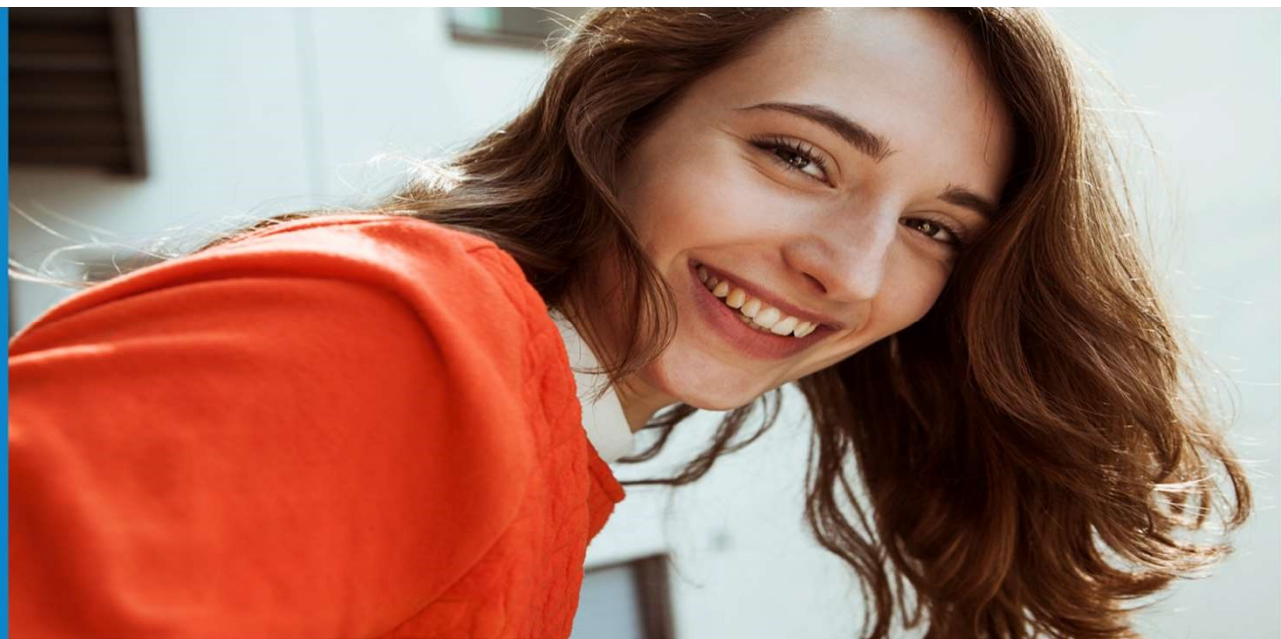


Strong execution globally is driving competitive success



US Plasma Business Review

IG and Bio Therapeutics



US Business Overview

Business Dynamics

Competitive Dynamics

Shire Strategic Priorities



Majority of US Plasma Derived Therapies: IG and Bio Therapeutics

Net Product Sales

Millions, Percentages, YOY Revenue Growth

\$2.2 BILLION

+13%

SHIRE US PLASMA DERIVED BRANDS

IMMUNOGLOBULINS

+13%

~86%



BIO THERAPEUTICS

+13%

~14%

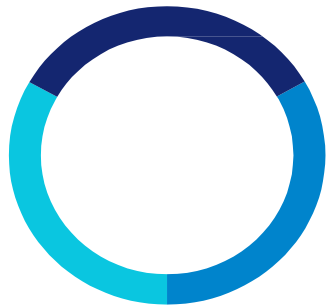


TTM Ending 2Q18



US Immunoglobulin (IG) market overview

US IG Usage by Indication *Percent of Total Volume*



~32% ● Neuro

~31% ● PI

~37% ● Other inc. SID*

Site of Care Options

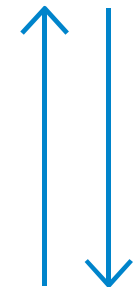


Route of Administration



Concentration

5%



20%

Shire US IG Portfolio

Cuvitru
[Immune Globulin Subcutaneous (Human)] 20%

HyQvia

GAMMAGARD LIQUID
[Immune Globulin Infusion (Human)] 10%

GAMMAGARD S/D

Concentration

20%

10% with Hyaluronidase

10%



Approved indications

Primary Immunodeficiency

Primary Immunodeficiency

Primary Immunodeficiency
Multifocal Motor Neuropathy

PI, CLL, ITP,
Kawasaki Syndrome

Route of administration



Frequency

Daily to Every 2 Weeks

3-4 Weeks

Customizable

Customizable

Primary site of care



Key differentiator

Customize without Compromise

SC Treatment Frequency

Proven Efficacious / Safe IV

Only Low IGA



These differences are important to patients / HCPs

IG strategic priorities



Hospital Portfolio



PI In The Home



Patient Services

Alpha-1 product overview & opportunities



Approved indications

Alpha1-Antitrypsin Deficiency

Alpha1-Antitrypsin Deficiency

Route of administration



Frequency

Weekly

Weekly

Primary site of care



Product medium

Liquid

Lyophilized

Key differentiator

1st Liquid / Self-Infused



Business conclusion

Enabling
fuller lives
at every turn

 Shire



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Susan Brown

BioLife Head

Adrian Murphy

Plasma Operating Unit Head



Plasma Technical Operations Overview: *Positioning Shire's Supply Chain for Future Growth*

Matt Walker, Head of Technical Operations





ARMⁱⁿaRM

Manufacturing network assessment announced in 2017

Goals

- Effectively and efficiently meet future patient demand while improving quality and compliance
- Increase utilization and improve working capital
- Accelerate speed to market

Drivers

1 *Modernize*

- 3 biologics sites to be divested based on utilization
 - New site builds continue, invest in remaining sites
-

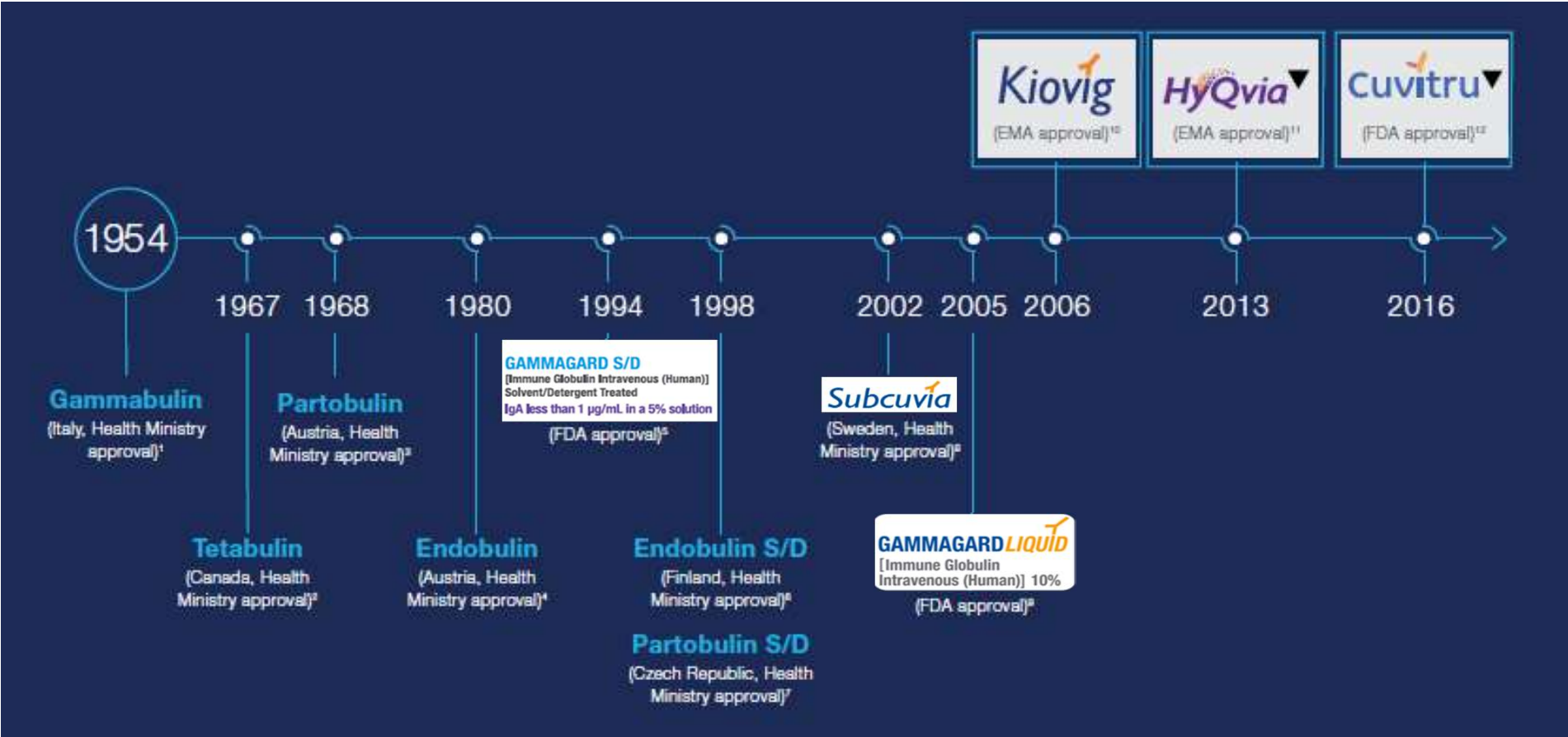
2 *Position for Growth*

- Continue with plasma production expansion at Covington - site adds ~30% capacity
 - New BioLife plasma collection sites opening to meet demand
-

3 *Enhance Capabilities*

- Focus sites on clear roles to further enhance core capabilities and improve efficiencies

A long heritage in Plasma-Derived Therapies

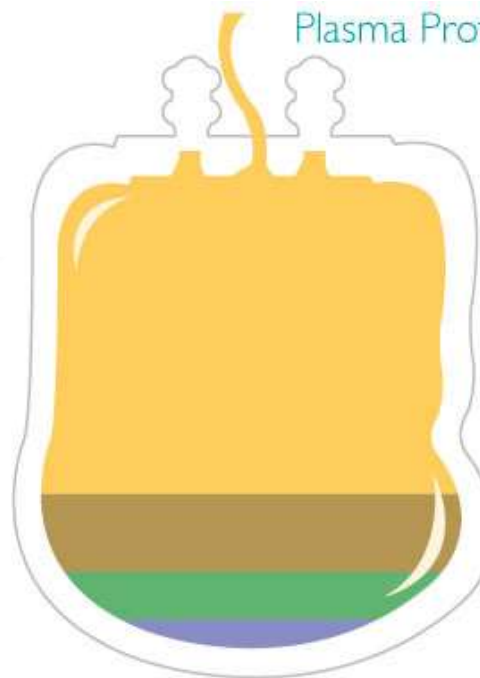
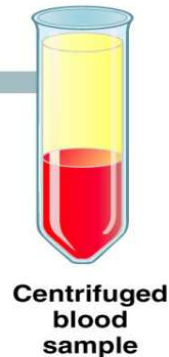


Shire Plasma Manufacturing video

What is Plasma?

Plasma proteins are important in the treatment of a variety of serious medical conditions

Plasma (55%)	
Constituent	Major functions
Water	Solvent for carrying other substances
Salts (ions) Sodium Potassium Calcium Magnesium Chloride Bicarbonate	Osmotic balance, pH buffering, and nerve and muscle function
Plasma proteins Fibrinogen Immunoglobulins (antibodies)	Osmotic balance and pH buffering Clotting Immunity
Substances transported by blood Nutrients (e.g., glucose, fatty acids, vitamins) Waste products of metabolism Respiratory gases (O ₂ and CO ₂) Hormones	



Plasma Proteins and the Diseases They Treat

Albumin (25 grams*)

Shock, Burns, Adult Respiratory Distress Syndrome, Cardiopulmonary Bypass Surgery

IVIG (Intravenous Immunoglobulin) (4 grams*)

Primary Immunodeficiency Diseases, Autoimmune Diseases, Chronic Inflammatory Demyelinating Polyneuropathy, Idiopathic Thrombocytopenic Purpura

Alpha-1 Antitrypsin (.15 to .30 grams*)

Alpha-1 Antitrypsin Deficiency (Genetic COPD)

Coagulation Factors

(Factor VIII: 300 to 450 IUs, Factor IX: 180 to 200 IUs*)

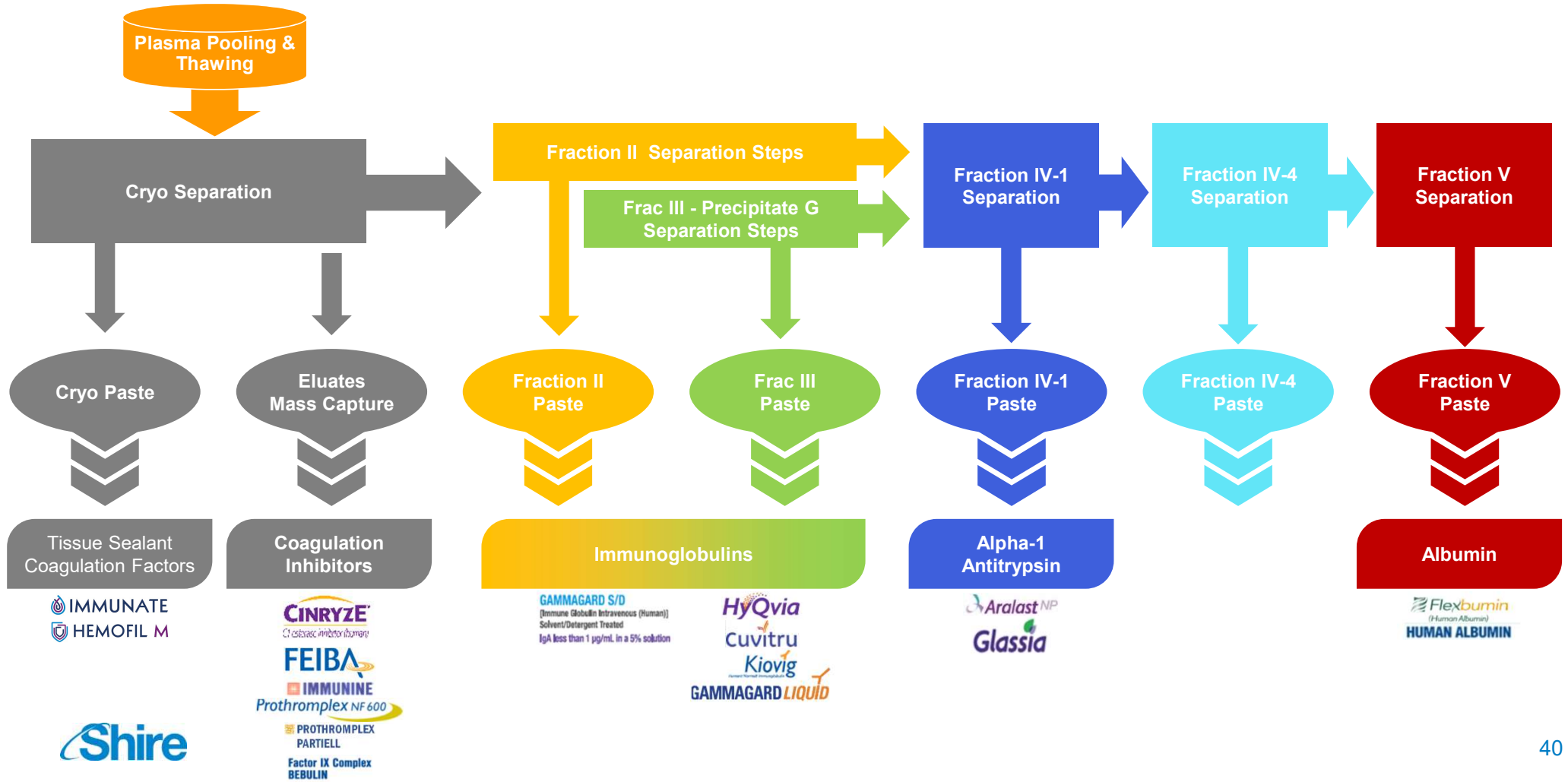
Hemophilia A & B, von Willebrand Disease, Bleeding Disorders

* Plasma Protein Yields Per Liter of Plasma

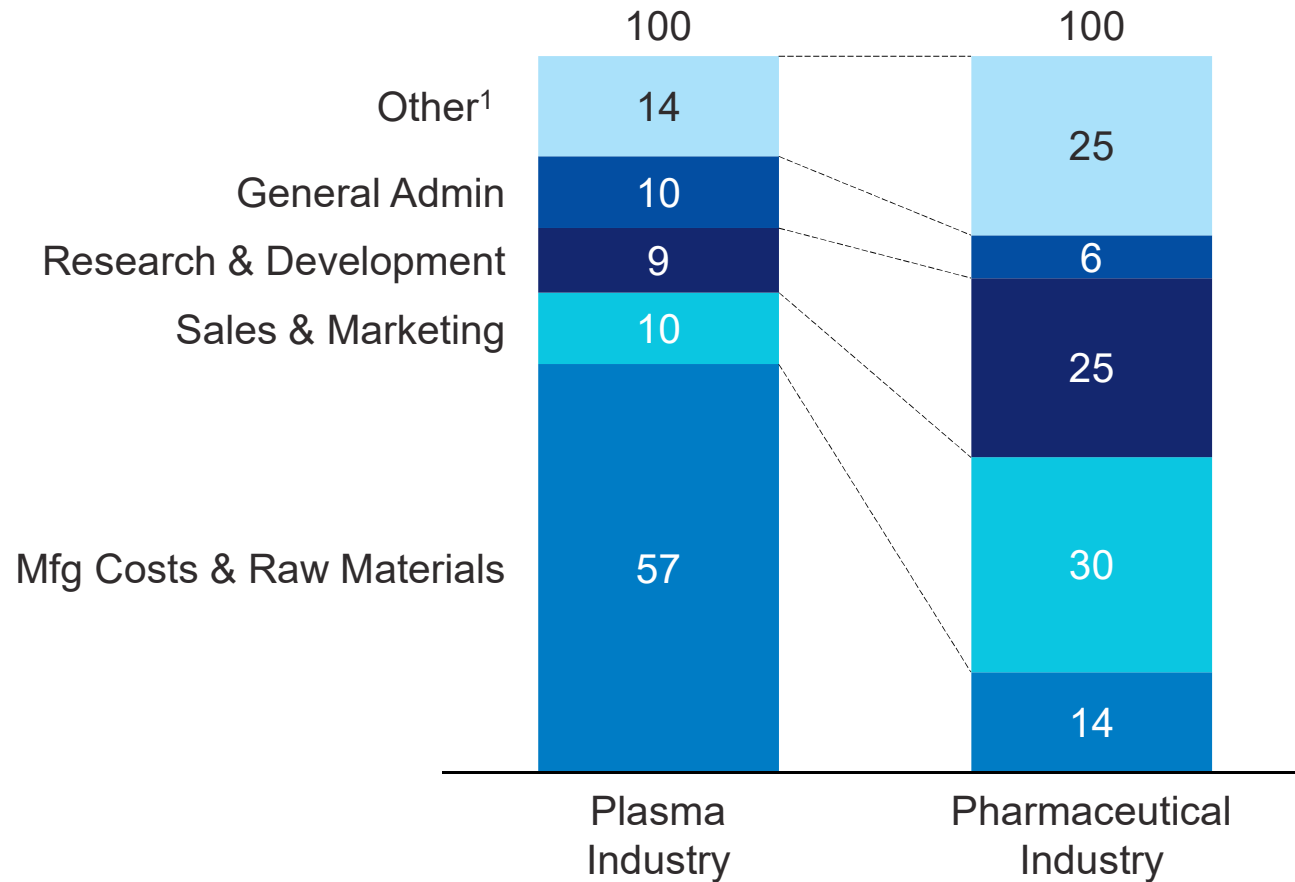
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Key Take Away: Plasma is critical for production of our product lines.

Multiple products can be derived from each liter of plasma



Manufacturing cost structures of plasma-based protein therapies and of chemical-based pharmaceuticals – 2011 Industry Avg



¹ Includes General Administration in the Pharma Industry



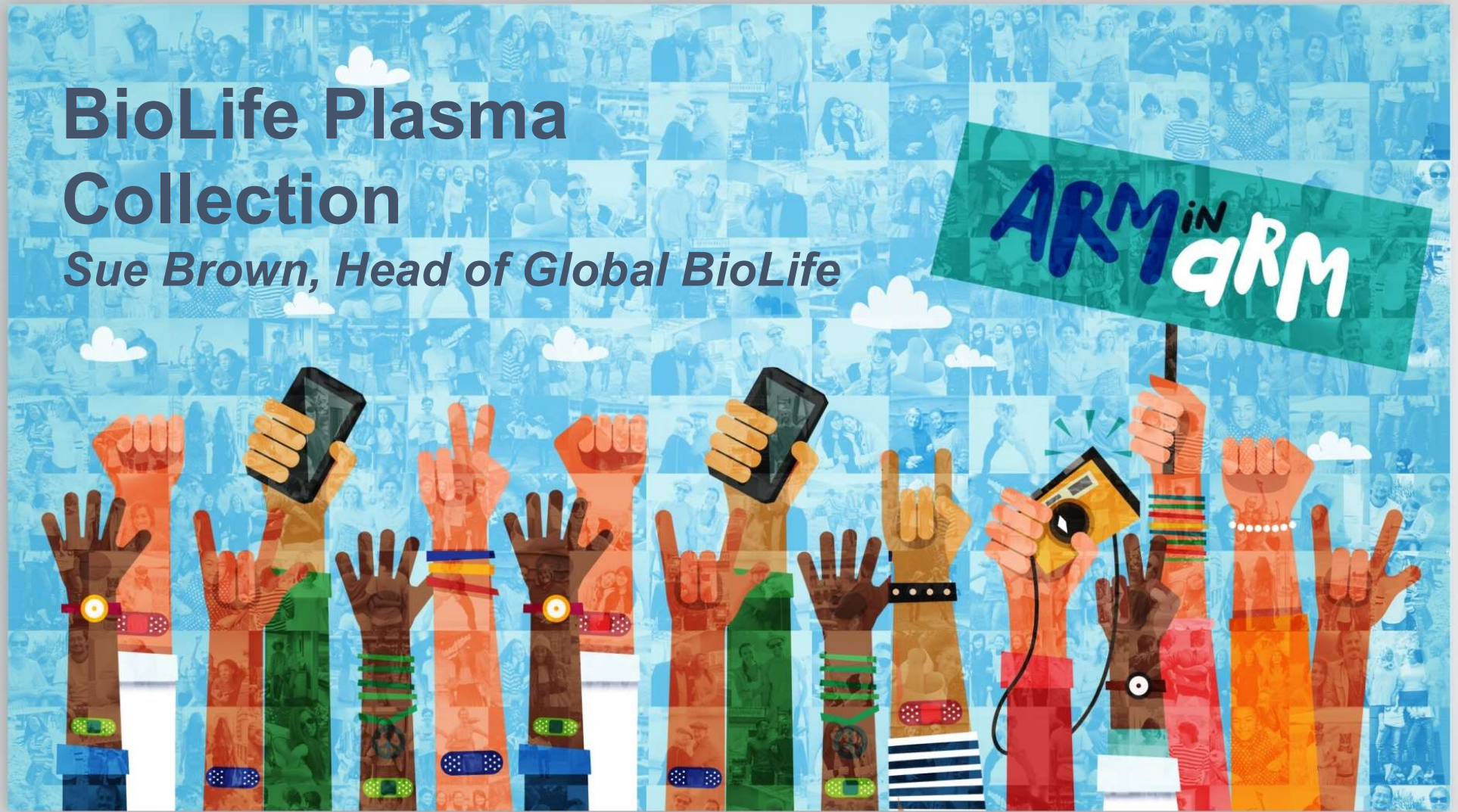
Collaboration and execution excellence is required



BioLife Plasma Collection

Sue Brown, Head of Global BioLife

ARMⁱⁿ**ARM**



It can take 1000+ donations to derive a one-year therapy for 1 patient

Estimated donations needed for one patient for one year

130



Primary immunodeficiency disease

900



Alpha 1 antitrypsin deficiency

1200



Hemophilia

ARMⁱⁿARM

BioLife Plasma Services



Our Mission:

To provide the highest-quality plasma to meet the expectations of our customers, ensuring the availability of life-saving therapies for patients.

Our Vision:

To be the leading plasma supply company in the world by continuously improving, to ensure:

- Every employee is valued and a fully engaged member of our team
- Every donor is recognized for his or her contribution and given exceptional service
- Every process is innovative and efficient
- Every customer is delighted with our performance

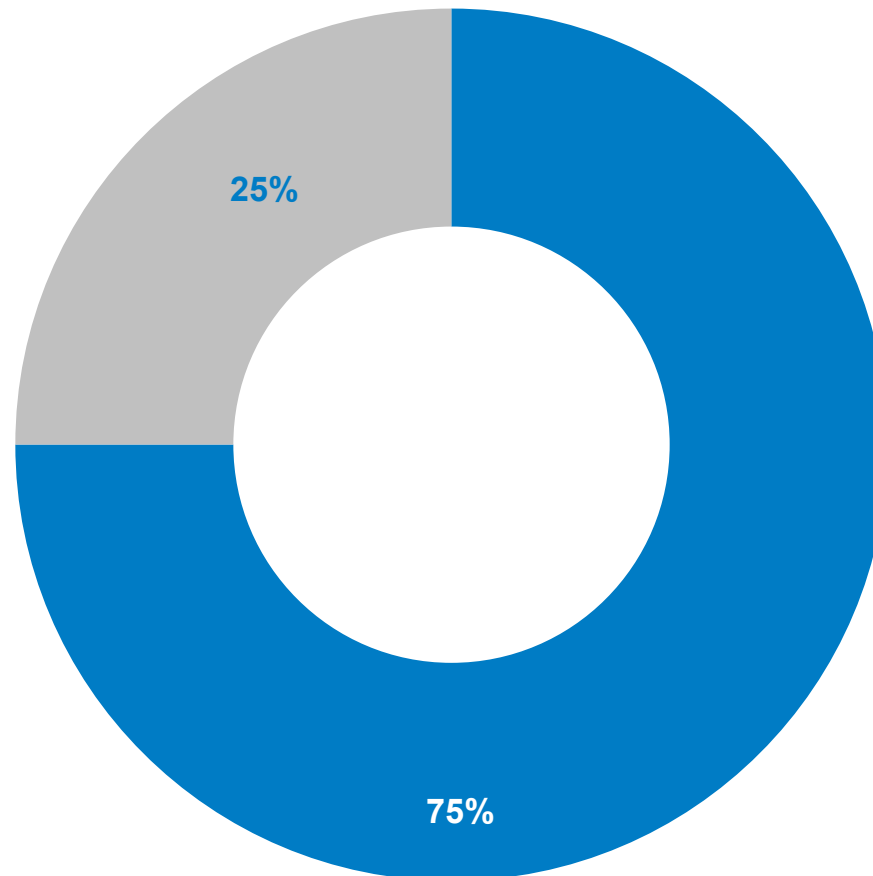
Plasma sourced through BioLife centers and third parties

Recovered Plasma

Small Bags (280 mL)



Recovered plasma is “recovered” from a whole blood donation (with donation allowed every 56 days)



Source Plasma

Large Bags or Bottles (810 mL)



Source plasma is plasma collected by plasmapheresis, returning non-plasma components back to the donor (with donations allowed twice/week in U.S.)

BioLife global operations 2018 snapshot

Global BioLife Plasma Operations

5,000 +
Global Employees



101
U.S. Centers
across 27 states



7
Centers in
Austria



3
Screening Labs



3rd Party Plasma Supplies

5 US suppliers
~50 locations



~50 EU suppliers
~130 locations across 7 countries



BioLife screening laboratories

- A sample from every plasma donation is sent to a BioLife Screening Laboratory to screen for a variety of diseases prior to being approved for use in manufacturing
- Tests are run for HIV, Hepatitis A, B & C, Parvo B19, Syphilis, atypical antibodies, proteins
- U.S. labs located in Alabama and Georgia



Organic and inorganic growth strategies



- Met target for new collection facilities in 2018 and planning to grow by double digits in 2019
- sanaplasma AG acquisition announced Sept 5
 - 14 centers in Czech Republic & Hungary
 - Entry point into owning more plasma centers outside the US to support high sales growth international markets



SOURCE: TechOps / Press Releases / Publicly available images

BioLife Productivity

Not every plasma center is created equal

- BioLife gets more plasma on average from our centers versus competitors*, which is more cost effective than opening new centers
- Our labor productivity has improved over 15% since 2015 – a result of our relentless drive for effectiveness and efficiency in centers, as well as volume leverage
- Our donor processing time of less than 70 minutes for repeat donors is a competitive advantage
- We have ramped over 70% of our new centers opened in the last 3 years to 1000 donations per week in their first year of operation

Plasma Manufacturing

*Adrian Murphy, Head of Plasma
Operating Unit*

ARMⁱⁿ**ARM**



A long heritage in both Europe & US



Los Angeles site history: 65 years

“Sister Site” to this Georgia facility

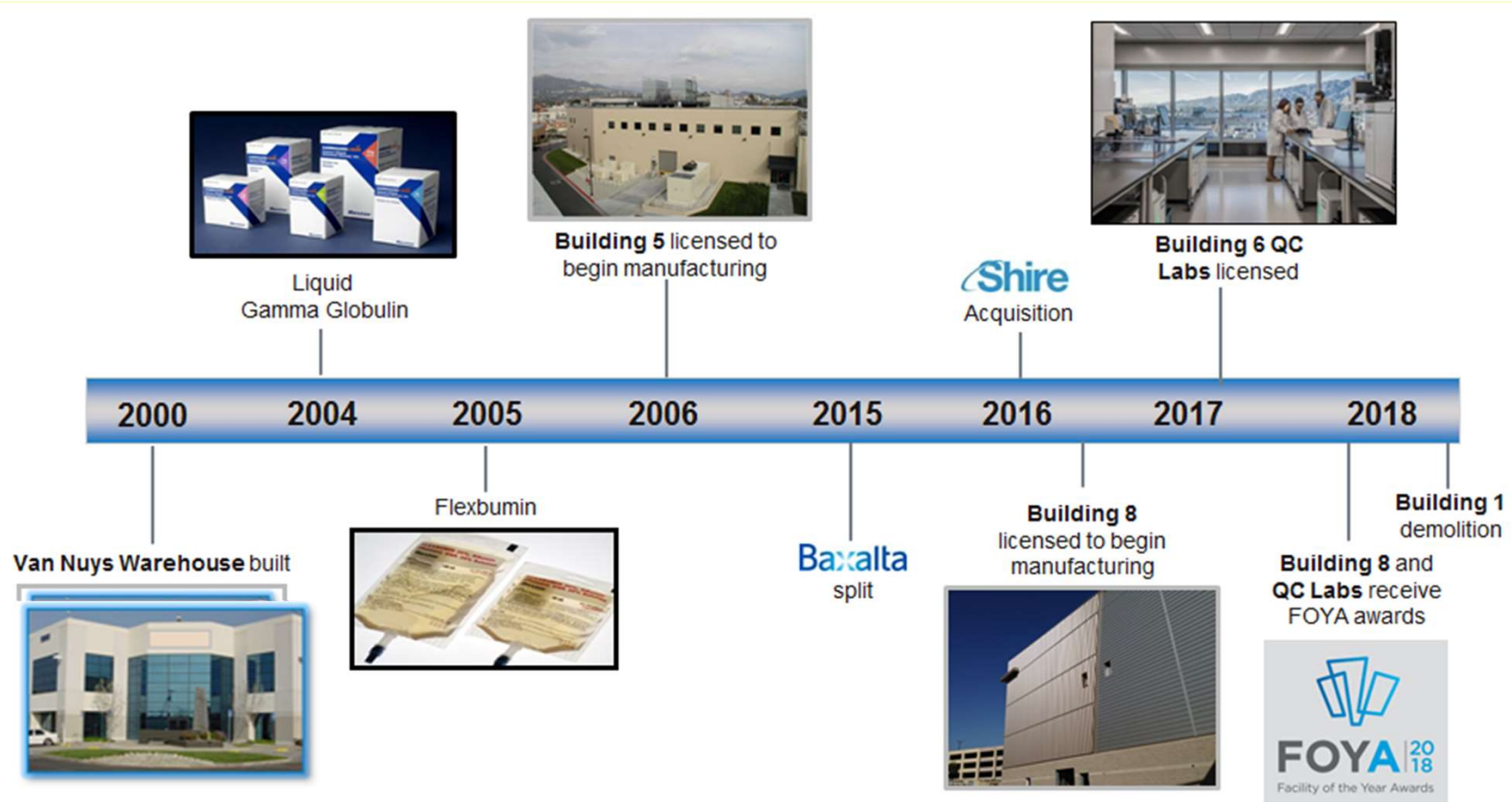
Early Years

1935 Dr. Clarence M. Hyland leaves the Los Angeles Children’s Hospital to start the Convalescent Serum Center

1940 The Convalescent Serum Center becomes **Hyland Labs**

1952 *Baxter* acquires Hyland

1953 Hyland moves into **present site**



Manufacturing overview

1. Plasma Collection



2. Receipt and Use



3. Fractionation



6. Packaging and Distribution



5. Filling



4. Purification



Manufacturing facility overview

Cryo Precipitation, Absorption and Fractionation



Los Angeles, USA



Rieti, Italy



Vienna, Austria



Sanquin, NL



Covington, USA



Downstream Processing



Lessines, Belgium



Covington, USA



Worldwide Distribution



Productivity levers unlock hidden capacity and value in existing sites

- Reducing Lost Time Incident Rate
- Reducing water consumption
- Successful quality inspections



- Improving conversion costs
- Reducing cost & supply risk through selective internalization
- Targeted capacity expansion projects at sites



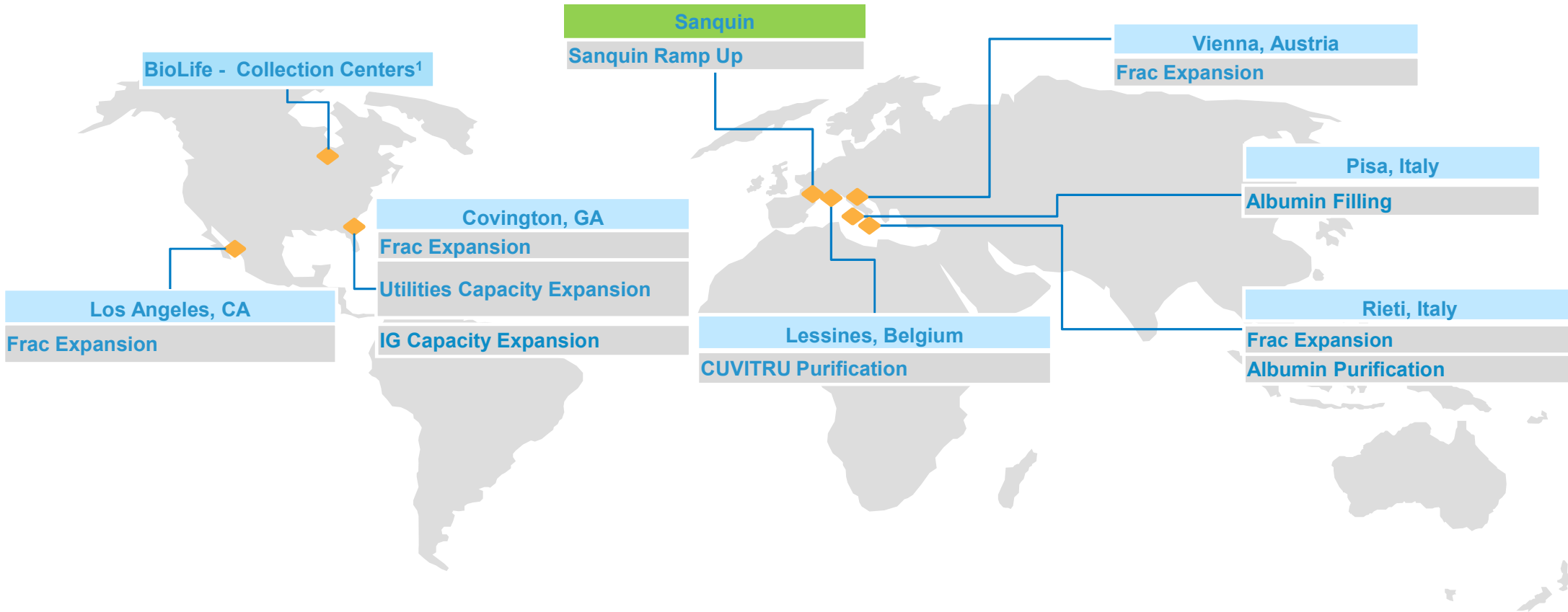
- Maximizing yield at each stage of manufacturing
- Reducing lead time, cycle time
- Optimizing supply performance



- Developing capabilities and talent
- Accelerating continuous improvement, reducing discards
- Increasing colleague engagement

Modernization and capacity expansion across the network

Internal mfg.
Outsourced sites



1 Multiple New US Based Locations

Patient-centered and multi-generation innovation in medical devices

Our Why – Understand Patient Needs

Inputs

Patient Needs:

- Patient Needs: Patient Journey
- Patient Feedback: Field & Complaints Process
- Market Research
- Brand Plans

Medical Device Strategy Planning:

- R&D Pipeline Planning
- Device Strategy Planning & Delivery

Our Vision – Serial Innovative Solutions

Diagnostics & Advanced Delivery Systems

- **At Home Diagnostics**
- **Advanced Delivery Systems**

Connected & Software Devices

- **HCP Portal & Patient App**
- **Connected Device & App**

- **More than 30 device programs in development**
- **A significant amount of Shire revenue is supported by devices**
- **Approved medical device in diagnostics, advanced delivery system and eHealth in major global markets**



Agenda

Welcome

Plasma-Derived Therapies
Business Overview

Plasma Technical Operations
Overview

Q&A

Small Group Rotation

Carlos Soto

Covington Site Head

Kasha Witkos

Immunology Franchise Head

Paul Blanchfield

US Immunology Head

Matt Walker

Technical Operations Head

Susan Brown

BioLife Head

Adrian Murphy

Plasma Operating Unit Head



Q & A



 Shire

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Small group rotations

	Group 1	Group 2
Rotation 1 1pm - 1:40pm	Life of a Batch	Lunch
Rotation 2 1:40pm - 2:20pm	Lunch	Life of a Batch
Rotation 3 2:20pm - 3:00pm	Site Tour	



The Shire logo consists of a white, stylized, curved line that forms a partial circle or swoosh, positioned to the left of the word "Shire" in a clean, white, sans-serif typeface.