

Fueling life sciences through transformative transactions

LOCUST WALK Q3 2019 REPORT

Global Trends in Biopharma Transactions

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FINDINGS AND PREDICTIONS

Introduction

Locust Walk is a global life science transaction firm. Our integrated team-based approach across capabilities, geographies, and industry segments delivers the right products, the right partners, and the most attractive sources of capital to get the right deals done for biopharma and medtech companies.

Each quarter, Locust Walk deal team members compile key statistics and trends on strategic transactions and financings. Our *Q3 2019 Report: Global Trends in Biopharma Transactions* applies the latest data to analyze current activities in the life sciences deal landscape.

In this report you can find an overview and analysis of the following across the biopharma market in the US, Europe, and Asia (Japan and China):

- Key performance indicators for the life science market
- IPO and private financing activity and performance
- Deal activity for strategic partnership and M&A
- A look ahead and our predictions of the future

Summary of biopharma findings and predictions (1/2)

US

- While the Biopharma IPO window remains open, there are signs of weakening, potentially exacerbated by political headwinds from both parties with a renewed focus on drug prices
- Biopharma indices remain sensitive to both macroeconomic and industry-specific influences, marking the second straight quarter with negative returns
- Private financings slowed in both total value and volume from Q2 2019 but investor interest in private biopharma companies remains robust
- If the financing environment becomes more challenging, anticipate an increase in licensing and M&A from both public and private companies

Europe

- Overall low appetite in the public financing market, which may explain the high volume of private financings this quarter
- In line with our prediction in Q2, EU-based companies pursuing an IPO will try to explore options in the US prior to going public in Europe unless there is strong regional angle
- A majority of capital raises in the EU market were focused on oncology, immunology, or combination assets showing continued strong VC interest in those therapeutic areas

Summary of biopharma findings and predictions (2/2)

Japan

- For Japanese biotechs, Q3 was a solid strong quarter with significant out-licensing deals
- However, the sector has faced various setbacks resulting in a flat performance in share price
- For the overall biopharma space 2019 is already proving to be an active year
- In terms of M&A, Sumitomo Dainippon (DSP) was the most active in Q3

China

- China healthcare sector stock market remains relatively stable in Q3
- 2 biopharma companies went public in Q3, raising \$558M in total
- In-license deal volume slumped, 13 in-license deals have been announced in Q3
- China passed a comprehensive “New Drug Administrative Law” on Aug 26, 2019:
 - Chinese government reiterated calls on the NMPA to prioritize pediatric drug reviews, along with drugs for rare diseases and major infectious diseases
 - Drug registration: the NMPA can now provide conditional approval to foreign approved drugs that have the potential to treat unmet, life-threatening diseases where there are no effective therapies in China. This is conditional upon the NMPA’s decision to extrapolate foreign data to Chinese subjects and if similar efficacy can be achieved, then conditional approval is granted

BIOPHARMA UNITED STATES

Biopharma United States overview (1/2)

Biopharma indices continued to fall in Q3 2019 after a weak performance in Q2 2019

- Following a weak Q2 2019, biopharma indices fell 9.3-12.6%, lagging the performance of the S&P 500
- Biopharma is feeling the impact of China-US trade war as well as indications both political parties are renewing a focus on drug pricing as a lead in to the 2020 election

Biopharma IPOs had a strong, but slower quarter in Q3 2019, indicating the IPO window remains open

- Despite the slower summer vacation period, 14 companies going public raised more than \$1,200M in proceeds
- Although total number of IPOs did not exceed Q3 2018, IPO volume was higher than 2016 and 2017, confirming public investors remain interested in biopharma IPOs
- Performance of 2019 IPOs continues to trail overall performance of biotech indices, a trend that has extended from 2017 and 2018 IPO classes and one that is not unexpected as these companies await their first major post-IPO data readouts

Biopharma United States overview (2/2)

Q3 2019 private financings fell in both total value and volume from Q2 2019

- Private financings in 2019 are on track to fall short of the highs of 2018 with fewer Series A financings and lower overall invested dollars
- Despite drop, biopharma financings remain historically robust as the asset class continues to attract investment from a wide range of investor types

Licensing and M&A volume slowed down in Q3 2019, while licensing total deal value picked up slightly

- Licensing deal volume declined as focus shifted to large value M&A deals which lead acquirers to reduce other BD activities until integration completed
- Discovery and preclinical companies attracted the highest-value licensing deals, indicating Strategics remain interested in collaborating on earlier-stage programs to help fill their pipelines

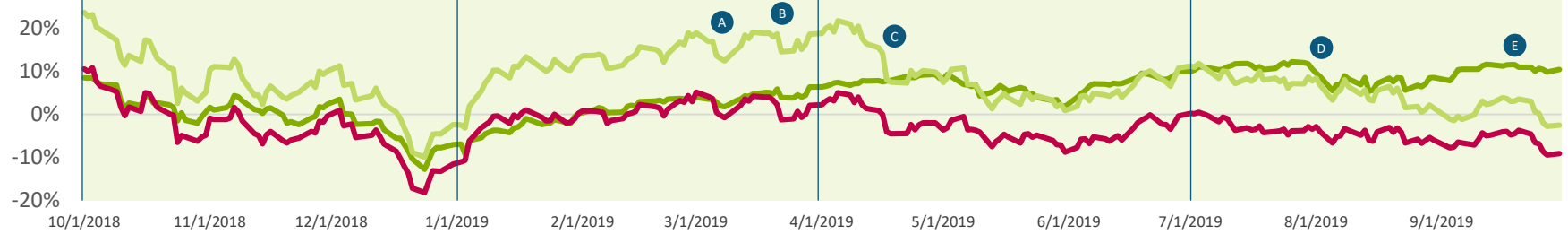
Locust Walk anticipates the private financing market and licensing volume to pick up in Q4 2019

- Locust Walk expects the volume and value of private financings and licensing deals to rebound from this quarter as companies look to secure capital and finalize deals before the close of the year
- Public companies are increasingly considering licensing as an option to finance their company instead of equity issuance, which signifies a belief that companies are undervalued and looking at all options to raise capital

Biopharma indices fell in Q3 2019, marking two consecutive quarters of decline

Performance of Key Biopharma Indices

	Q4 2018	Q1 2019	Q2 2019	Q3 2019
ΔS&P%	(14%)	12.9%	3.4%	0.4%
ΔNBI%	(22%)	14.7%	(6.6%)	(12.3%)
ΔNYSE BTK%	(21%)	21.6%	(2.4%)	(9.3%)



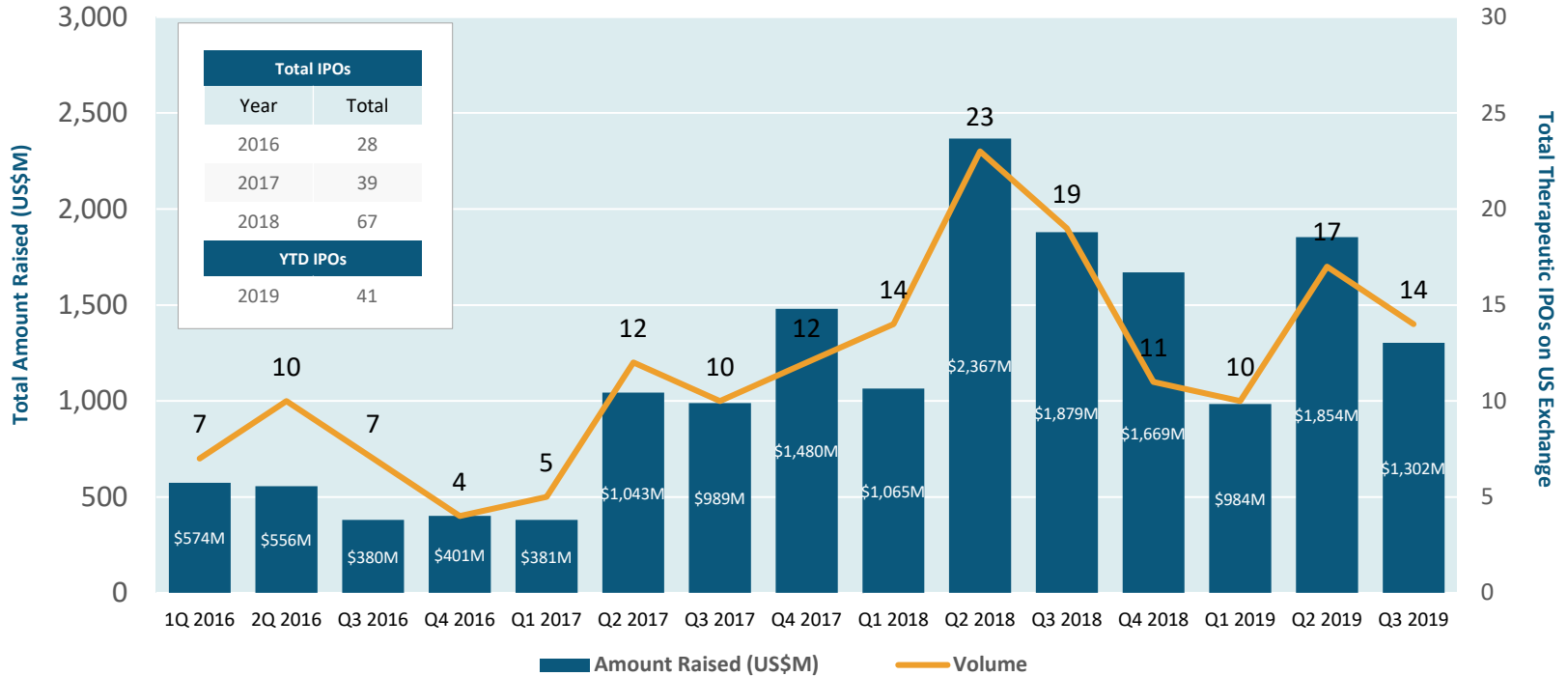
— S&P 500 — NYSE Biotech — NASDAQ Biotechnology

Events	
A	FDA Commissioner Scott Gottlieb announces resignation, creating biotech regulatory uncertainty
B	Biogen halts late-stage Alzheimer's drug and stock falls 25% amid President Trump comments regarding China tariffs
C	Healthcare stocks plummet as investors worry that left-leaning policy ideas are gaining support and could hinder corporate profits
D	Stocks under pressure as Chinese yuan drops to weakest level in 10 years resulting from additional US tariffs
E	Large biopharma stocks are up after Senate Majority Leader Mitch McConnell warned House Speaker Nancy Pelosi that her plan to allow Medicare to negotiate drug prices for at least 25 of the most expensive drugs will be dead on arrival

SOURCE: Locust Walk Analytics, Yahoo Finance

US Biopharma IPOs had a quieter Q3 with 14 total IPOs, signaling a slowing market

Number of Biopharma IPOs and Aggregate Total Raised By Quarter



SOURCE: Locust Walk Analytics, Yahoo Finance

In Q3 2019, 14 biopharma companies filed for IPO across a variety of development stages (1/2)

Q3 2019 US IPOs									
Biopharma Issuer	Ticker	Therapeutic Area	Lead Phase	Deal Date	Price Range	Offering Price	Total Raise (\$M)	Price Change to 9/30	Market Cap (\$M)*
Fulcrum Therapeutics Cambridge, Massachusetts	FULC NASDAQ	Rare genetic neuromuscular, CNS, and hematologic disorders	Phase 2 Ongoing	07/18/2019	\$16-\$18	\$16.00 Low	\$72	6.64	\$159
IGM Biosciences Mountain View, California	IGMS NASDAQ	Cancer therapies	Phase 1 Ready	09/18/2019	\$15-\$17	\$16.00 Middle	\$175	17.75	\$536
Mirum Pharmaceuticals Foster City, California	MIRM NASDAQ	Cholestatic liver diseases	Phase 3 Ongoing	07/18/2019	\$14-\$16	\$15.00 Middle	\$75	10.06	\$218
Satsuma Pharmaceuticals South San Francisco, California	STSA NASDAQ	Acute treatment of migraine	Phase 3 Ongoing	09/13/2019	\$14-\$16	\$15.00 Middle	\$82.5	15.01	\$251
SpringWorks Therapeutics Stamford, Connecticut	SWTX NASDAQ	Solid tumors	Phase 3 Ongoing	09/13/2019	\$16-\$18	\$18.00 High	\$162	21.68	\$909
ADC Therapeutics** Lausanne, Switzerland	ADCT NYSE	Solid and hematological cancers	Phase 2 Ready	09/06/2019	\$23-\$26	N/A	\$150*	N/A	N/A
Annovis Bio** Berwyn, Pennsylvania	ANVS NYSE	Alzheimer's, Parkinson's and other neurodegenerative disorders	Phase 2 Ongoing	07/03/2019	\$6-\$8	N/A	\$11.5*	N/A	N/A

SOURCE: Locust Walk Analytics, Yahoo Finance

* As of 9/30/2019 **Announced but not completed as of 9/30/2019



In Q3 2019, 14 biopharma companies filed for IPO across a variety of development stages (2/2)

Q3 2019 US IPOs									
Biopharma Issuer	Ticker	Therapeutic Area	Lead Phase	Deal Date	Price Range	Offering Price	Total Raise (\$M)*	Price Change to 9/30	Market Cap (\$M)
Aprea Therapeutics Boston, Massachusetts	APRE NASDAQ	Cancer therapeutics targeting mutant p53 tumor suppressor protein	Phase 3 Ongoing	09/06/2019	\$14-\$16	N/A	\$86.25	N/A	N/A
Frequency Therapeutics Woburn, Massachusetts	FREQ NASDAQ	Degenerative diseases with a focus on progenitor cells	Phase 2 Ready	09/06/2019	\$14-\$16	N/A	\$101	N/A	N/A
Monopar Therapeutics Wilmette, Illinois	CRTX NASDAQ	Various cancers	Phase 3 Ready	08/15/2019	\$8-\$10	N/A	\$40	N/A	N/A
RAPT Therapeutics South San Francisco, California	RAPT NASDAQ	Cancer and other immune-related diseases	Phase 1/2 Ongoing	08/01/2019	\$14-\$16	N/A	\$75	N/A	N/A
TFF Pharmaceuticals Austin, Texas	TFFP NASDAQ	Pulmonary diseases and conditions	Preclinical Ongoing	08/20/2019	\$5	N/A	\$22	N/A	N/A
Viela Bio Gaithersburg, Maryland	VIE NASDAQ	Inflammation and autoimmune diseases	Phase 3 Complete	08/29/2019	\$19-\$21	N/A	\$150	N/A	N/A
Vir (Biotechnology) San Francisco, California	VIR NASDAQ	Infectious diseases	Phase 2 Ready	09/03/2019	\$20-22	N/A	\$150	N/A	N/A

SOURCE: Locust Walk Analytics, Yahoo Finance

*Announced but not completed as of 9/30/2019

Two mega-biopharma IPOs led to valuations over \$500M this quarter

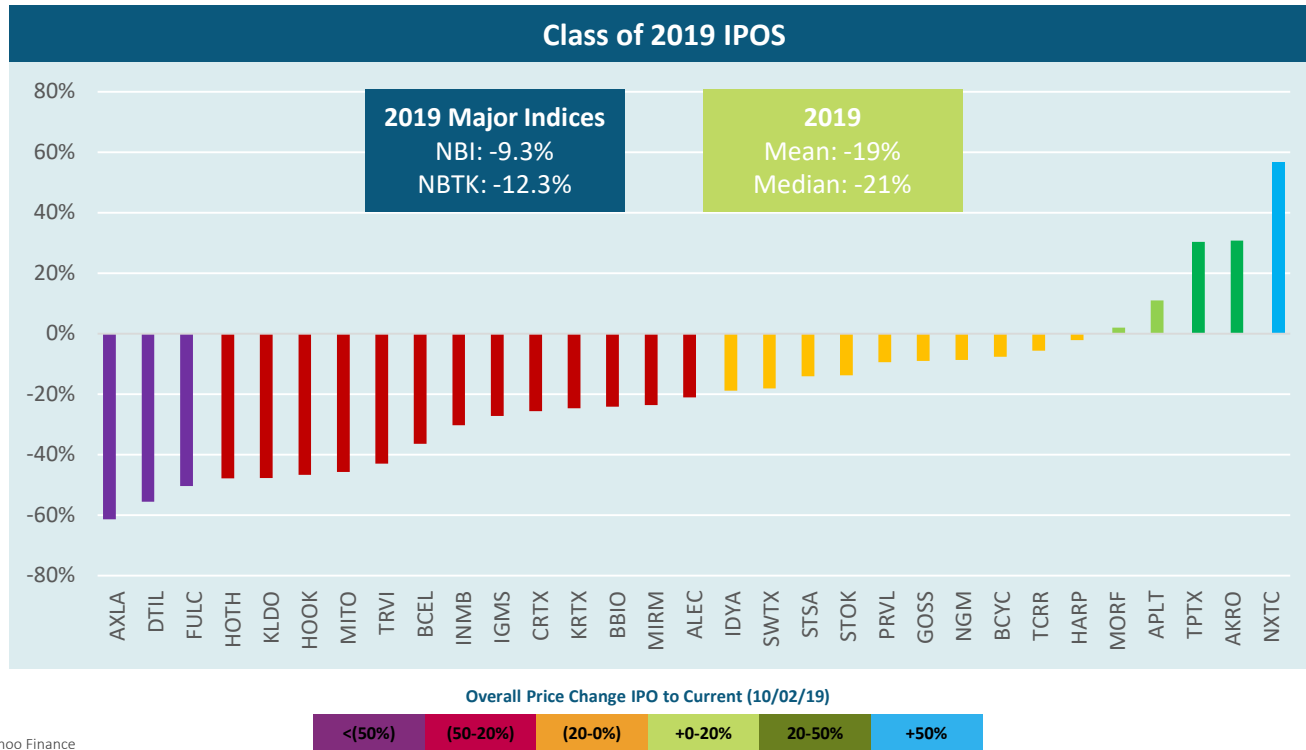
		
Summary	Developing therapeutic antibodies to treat cancer	Developing therapeutic medicines for severe rare diseases and cancer
Pipeline	<ul style="list-style-type: none"> Phase 1 ready -IGM-2323 (CD20xCD3), a T-cell engager for Non-Hodgkin's Lymphoma and Chronic Lymphocytic Leukemia Preclinical IGM Antibody (DR5), a receptor Cross-linking Agonist for solid and Hematologic Malignancies 	<ul style="list-style-type: none"> Nirogacestat, a Phase 3 Gamma Secretase Inhibitor (GSI) for Desmoid Tumors Nirogacestat+ Belantamab Mafodtin, a Phase 1b GI + BCMA-Targeted ADC for relapsed/refractory Multiple Melanoma Mirdametinib, a phase 2B MEK 1/2 Inhibitor for NF1-Associated PN Mirdametinib + Lifirafenib, a Phase 1b MEK1 + RAF dimer inhibitor for RAS/RAF Mutant solid tumors, with BeiGene Preclinical BGB-3245 collaboration with BeiGene that is a RAF dimer inhibitor targeting RAF Mutant Solid Tumors
Amount Raised	\$175M	\$162M
Market Cap*	\$536M	\$908.8M

SOURCE: Locust Walk Analytics, Yahoo Finance

*As of 10/2/2019

Q3 2019 IPOs performed below biotech indices

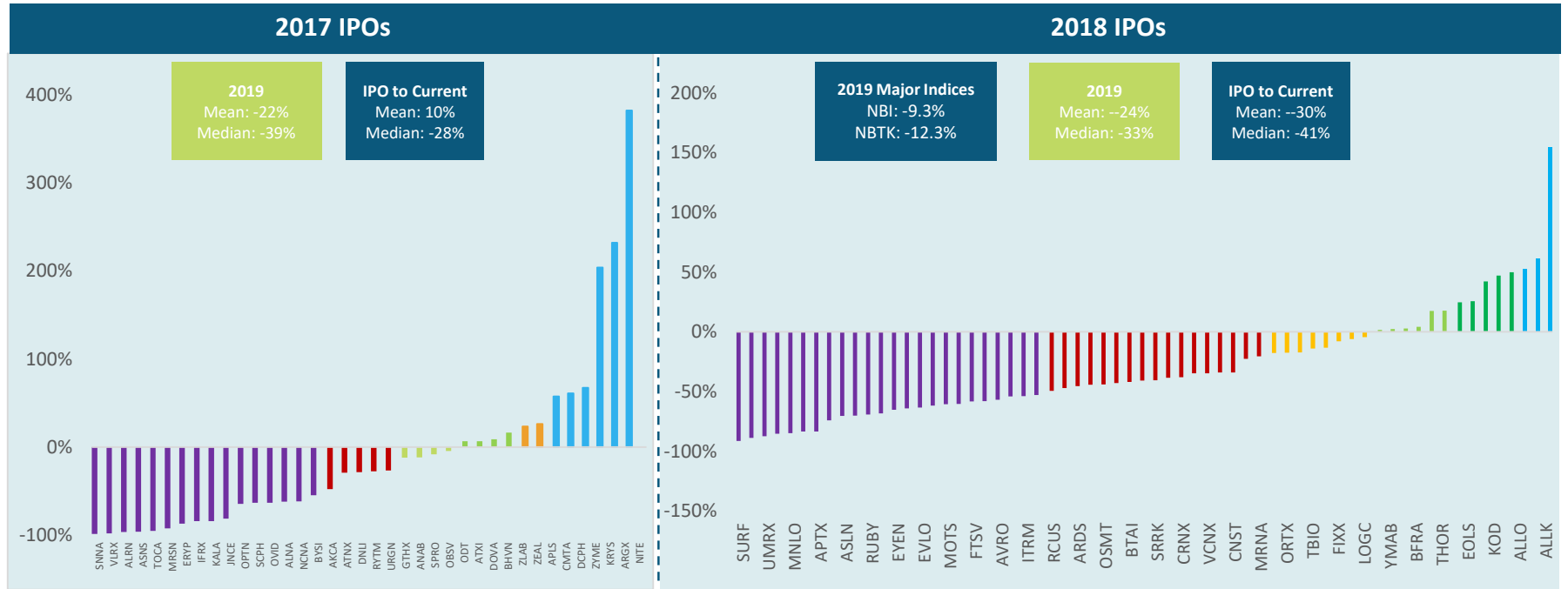
Current Performance of 2019 Biopharma IPOs



SOURCE: Locust Walk Analytics, Yahoo Finance
Price as of 10/2/2019

Class of 2017 IPOs have outperformed market trends, while 2018 IPOs have underperformed

2019 Performance of 2017 and 2018 Biopharma IPOs



Overall Price Change IPO to Current (10/02/19)



SOURCE: Locust Walk Analytics, Yahoo Finance
 *As of 10/02/2019

Biopharma United States financing

Q3 2019 saw declines from Q2 2019 in both number of financings and total amount raised

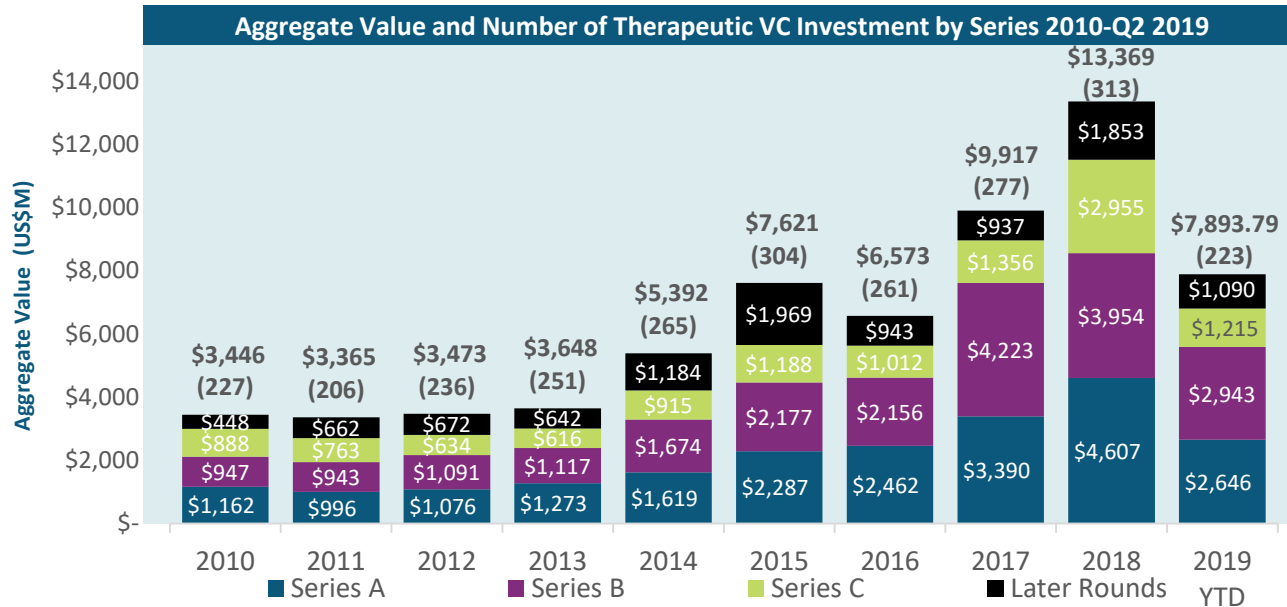
- This marked the second consecutive quarter of declines in financings, though a troubling trend, 2019 is still on pace to be one of the best in the last ten years for biopharma financings
- Anecdotally, private companies continue to have access to significant capital, but “lead” investors are taking longer to identify

Cell therapy and oncology companies, regardless of stage, are attracting the largest amounts of capital

- 5 of the top 6 largest capital raises of the quarter were for cell therapy and oncology companies
- Century Therapeutics, a developer of allogeneic immune cell therapies, raised the largest amount of capital with a \$250M Series A raise led by Bayer LEAPS

Multiple investor types remain active in private financings, including venture capital, institutional investors, family offices and Strategics

Q3 2019 aggregate value and volume of biopharma private capital raises slowed down from Q2



Deals (#)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 YTD
A	112	92	116	120	117	152	134	144	138	87
B	58	58	65	77	88	79	73	85	95	73
C	35	29	28	29	34	44	33	32	57	33
D & Later	22	27	27	25	26	29	21	16	23	30
Total	227	206	236	251	265	304	261	277	313	223

SOURCE: Locust Walk Analytics, Pitchbook; Methodology: All US series A, B, C, D, and later investments; therapeutics include drug delivery, drug discovery, pharmaceuticals, and select biotechnology companies; tools, devices, and diagnostics excluded

Q3 2019 private financings heavily concentrated in oncology space

High-Value Investment Rounds						
Company	Series	Raised (\$M)	Lead Investor	Therapeutic Area	Background	
 CENTURY THERAPEUTICS	A	\$250	 leaps 	Cell Therapy/Oncology	Century Therapeutics is developing iPSC-derived, off-the-shelf, allogeneic immune cell therapy products for cancer	
 nkarta THERAPEUTICS	B	\$114	 SAMSARA BIOCAPITAL	Cell Therapy/Oncology	Nkarta Therapeutics is developing differentiated cell therapies designed to boost and enhance the inherent power of natural killer cells to target and destroy tumor cells	
 Passage Bio	B	\$110	 ACCESS INDUSTRIES	CNS	Passage Bio is a genetic medicines company developing therapies for the treatment of rare monogenic central nervous system diseases	
 KRONOS-BIO	A	\$105	 OMEGA FUNDS  VIDA VENTURES	Oncology	Kronos Bio develops therapies that modulate historically undruggable oncology targets	
 Rakuten Medical	C	\$100	 Rakuten	Oncology	Rakuten Medical develops precision-targeted cancer therapies designed to treat various types of solid tumors	
 REVOLUTION MEDICINES	C	\$100	 BOXER CAPITAL	Oncology	Revolution Medicines develops novel targeted therapies to inhibit elusive frontier targets and proteins that drive the growth of notorious cancers and cancer pathways	

SOURCE: Locust Walk Analytics, Pitchbook

Biopharma US Q3 licensing transactions and M&A continue to decline in volume

Q3 2019 licensing deal volume trailed Q2 2019, but overall value of the licenses increased

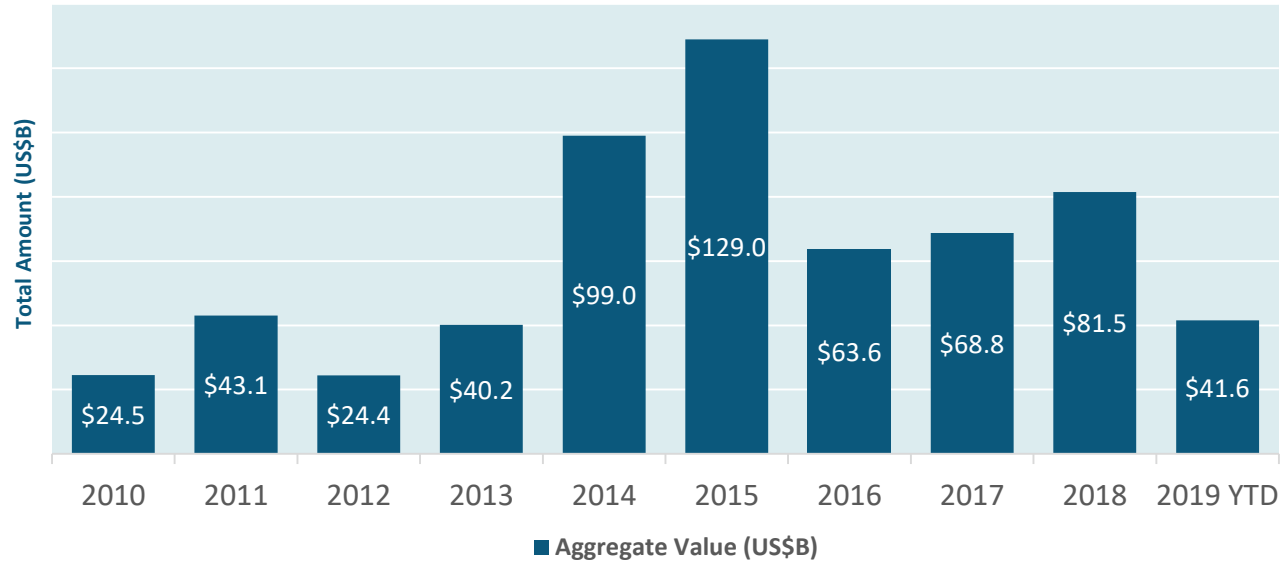
- M&A remained a driver of most BD transactions as licensing deal volume is at a six-year low
- The highest-value licensing deals were concentrated in discovery and preclinical spaces, indicating a continuation of the trend of Strategics focusing on licensing earlier stage assets and acquiring later stage assets

Q3 2019 M&A deal volume and value slowed significantly, but 2019 remains on pace to be a record year for biopharma M&A

- Several “mega” deals are driving overall 2019 deal value, but M&A remained a prime activity for strategics through Q3
- While a smaller number of deals was completed overall, the value of each continues to increase

Biopharma licensing deal activity slowed down in Q3 2019

US and WW Biopharma Licensing Deals (>\$50M Total Deal Size)

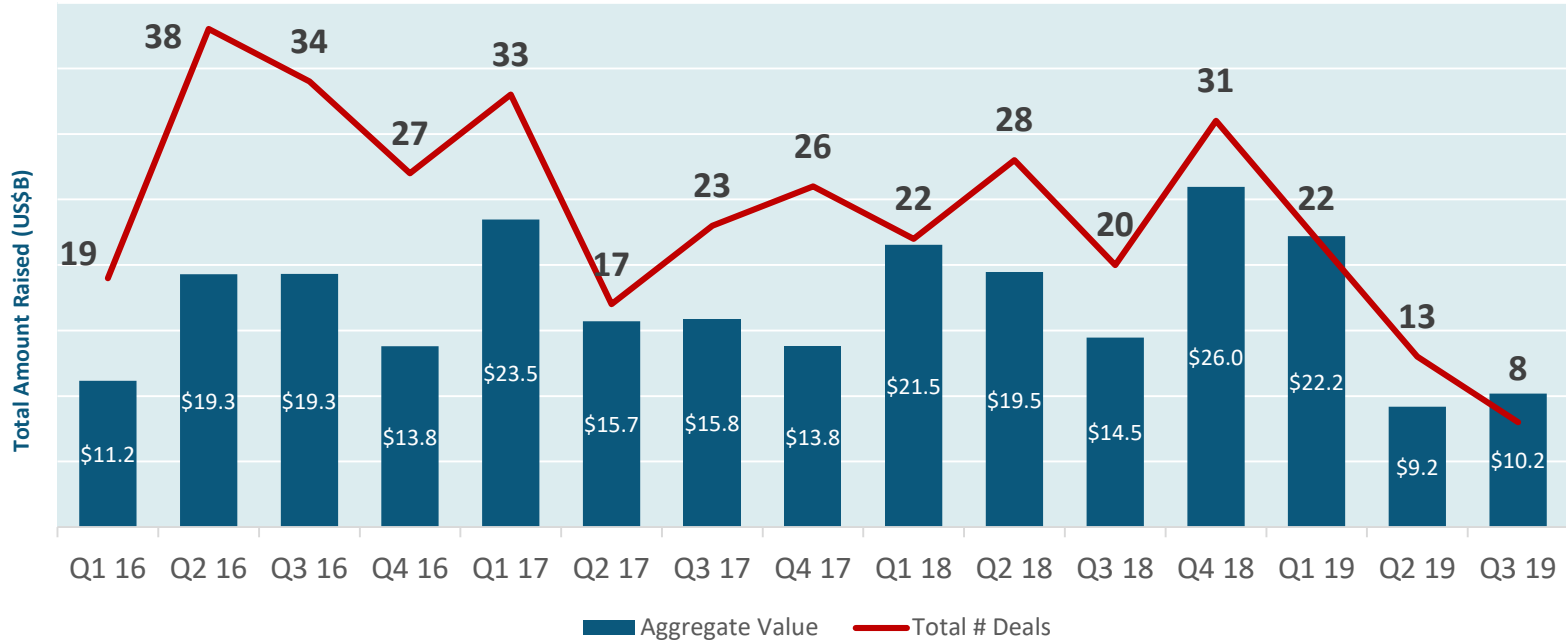


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 YTD
Deal Volume	61	70	62	99	127	163	118	99	101	43
Avg Deal Size	\$402M	\$615M	\$394M	\$456M	\$779M	\$791M	\$539M	\$695M	\$760M	\$967M

SOURCE: Locust Walk Analytics, BioScIDB; *Locust Walk has altered methodology beginning Q3 2017; includes WW and US licensing deals; ex-US regional deals are excluded

Q3 2019 US and WW licensing deal volume dropped from Q2, while aggregate value increased slightly

US and WW Biopharma Licensing Deals (>\$50M Total Deal Size)



SOURCE: Locust Walk Analytics, BioSciDB; *Locust Walk has altered methodology beginning Q3 2017; includes WW and US licensing deals; ex-US regional deals are excluded

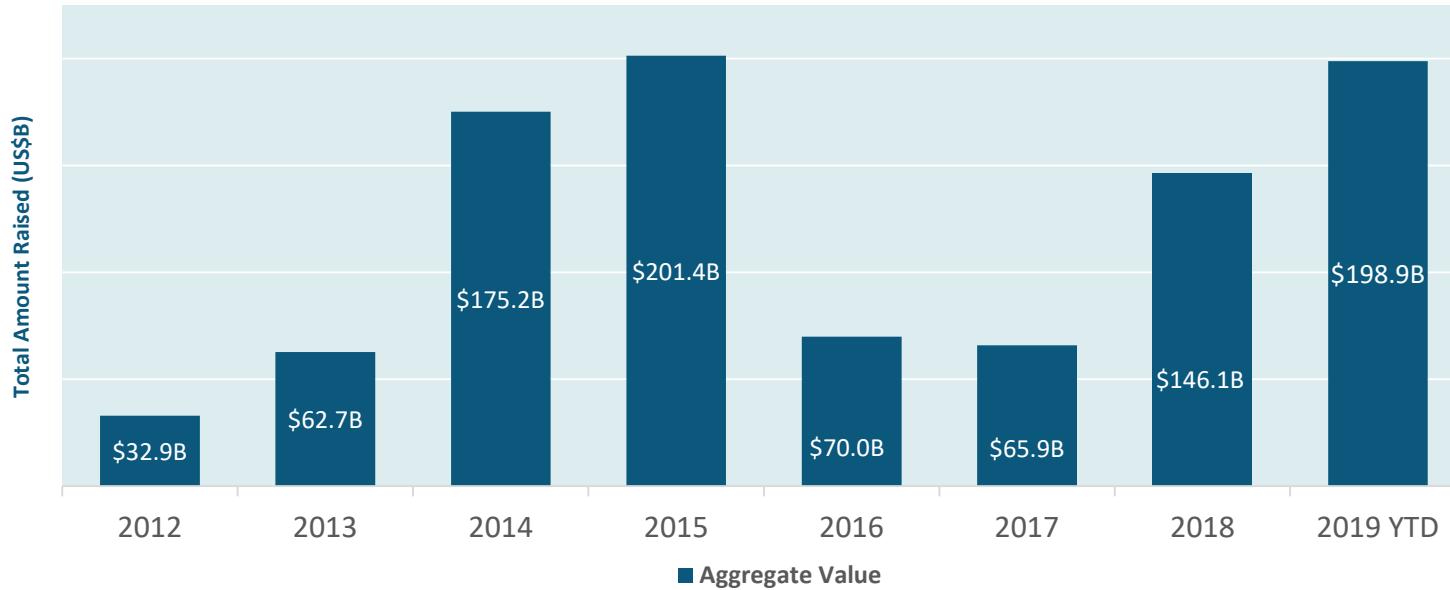
Q3 2019 highest-value licensing deals concentrated in discovery and preclinical therapies

Q3 2019 Licensing Deals								
Licensee	Licensor	Date	Stage	Total Deal Size (\$M)	Upfront (\$M)	Milestones (\$M)	Therapeutic Area	Deal Subject
Boehringer Ingelheim	Inflammasome Therapeutics	09/2019	Discovery	160	Undisclosed	Undisclosed	Ophthalmology	Intravitreal drug delivery technology to develop novel therapies for retinal diseases
Gurnet Point	KemPharm	09/2019	Phase 3, Preclinical	493	10	483	Diversified	KP415, KP484 SDX, and d-MPH products for ADHD, with option for other prodrugs
Adaptimmune	Noile-Immune Biotech	08/2019	Preclinical	312	Undisclosed	Undisclosed	Oncology	IL-7 and CCL19 co-expressing SPEAR T-cell products incorporating PRIME technology for cancer
Jazz Pharmaceuticals	Redx Pharma	07/2019	Preclinical	207	4	203	Oncology	Inhibitors aimed at cancerous tumor mutations that lead to uncontrolled RAS-RAF-MAPK signalling
Boehringer Ingelheim	Yuhan	07/2019	Preclinical	870	40	830	Hepatology	First-in-class dual GLP1R/FGF21R agonist for NASH
Gilead	Galapagos NV	07/2019	Phase 3, Phase 2	6,525	5,050	1,475	Diversified	Filgotinib and other current and future Galapago's assets
Gilead	Durect	07/2019	Discovery	320	25	295	Immune	SABER technology to develop long-acting injectable HIV and HBV therapy
Boehringer Ingelheim	Bridge Biotherapeutics	07/2019	Phase 1	1,300	50	1,250	Respiratory	BBT-877 autotaxin inhibitor for fibrosing interstitial lung diseases

SOURCE: Locust Walk Analytics, BioSciDB, Global Data

Megadeals have put 2019 biopharma M&A value on pace to be the largest year since 2015

WW Biopharma Therapeutic M&A Deals (>\$100M)



	2012	2013	2014	2015	2016	2017	2018	2019 YTD
Deal Volume	29	49	48	57	39	33	83	23

SOURCE: Locust Walk Analytics, Yahoo Finance

August 2019 saw a wave of high-value biopharma M&A activity despite overall lower Q3 volume

September 3, 2019



Vertex Acquires Semma Therapeutics for \$950M

Vertex acquired Semma Therapeutics, a privately held biotechnology company pioneering the use of stem cell-derived human islets as a potentially curative treatment for type 1 diabetes, for \$950 million in cash.

August 8, 2019



Bayer Acquires BlueRock Therapeutics for \$600M

Bayer fully acquired BlueRock Therapeutics, a privately held US biotechnology company focused on developing engineered cell therapies, using a proprietary induced pluripotent stem cell (iPSC) platform. Terms of the deal include \$240 in cash upfront and an additional \$360 in milestones.

August 26, 2019



Zogenix Acquires Modis Therapeutics for \$400M

Zogenix, Inc. acquired Modis Therapeutics, Inc., a privately held company focused on developing novel therapies for rare genetic diseases. Modis's lead product candidate, MT1621, is in late-stage development for the treatment of Thymidine Kinase 2 deficiency (TK2d).

August 12, 2019



Jazz Pharmaceuticals Acquires Cavion for \$312.5M

Jazz Pharmaceuticals acquired Cavion, a clinical-stage biotechnology company creating therapies for chronic and rare neurological diseases. Jazz will acquire Cavion's lead Phase 2 molecule, CX-8998 for essential tremor, and pay an upfront of \$52.5M and up to \$260 in milestones.

SOURCE: Locust Walk Analytics, Yahoo Finance

Q3 2019 saw 14 new drug approvals, an increase over Q2

Approvals

Xpovio To treat adults with relapsed or refractory Multiple Melanoma Karyopharm Therapeutics 07/19	Accrufer To treat iron deficiency anemia Shield Therapeutics 07/19	Wakix To treat excessive daytime sleepiness Harmony Bioscience 08/19	Xenlata To treat community-acquired bacterial pneumonia NABRIVA Therapeutics 08/19
Recarbrio To treat complicated urinary tract and intra-abdominal infections Merck 07/19	Nubeqa To treat adults with non-metastatic castration-resistant prostate cancer Bayer 07/19	Rozlytrek To treat metastatic NSCLC and solid tumors Genentech 08/19	Ga-68-DOTATOC To treat neuroendocrine tumors UHC-PET Imagine Center 08/19
	Turalio To treat adults with symptomatic tenosynovial giant cell tumor Daiichi Sankyo 08/19	Inrebic To treat intermediate-2 or high-risk myelofibrosis Celgene 08/19	Nourianz To treat adults with Parkinson's disease Kyowa Kirin 08/19
	Pretomanid To treat treatment-resistant forms of tuberculosis Mylan Laboratories LTD 08/19	Rinvoq To treat moderate to severe rheumatoid arthritis AbbVie 06/19	Ibsrela To treat irritable bowel syndrome Ardelyx 09/19

SOURCE: Locust Walk Analytics, FDA Website

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BIOPHARMA EUROPE

Biopharma Europe financing – private

Q3 2019 saw a healthy increase in the deal volume and size of private financings in the EU biopharma market

- More and larger Series B financings were completed: \$494M in Q3 alone compared to \$212M for Q1 and Q2 together. Noteworthy: Achilles Therapeutics raised \$130M led by Syncona and RA Capital Management; Juvenescence raised \$100M from Explorer Equity Group, IPGL and Longevity Vision Fund; Pharvaris raised \$66M led by Foresite Capital
- There were 20 late stage (Stage D or beyond) private financings demonstrating the maturity of the EU biopharma pipeline. As public markets improve there may be an immediate surplus in capital raises as advanced biotechs may look to go public. In the meantime, the strongest EU biotech companies will try to access US investors and the US public market (e.g. BioNTech)

Overall, the \$2.2B in aggregated EU biopharma private financings YTD 2019 has already exceeded all of 2018 (\$1.9B)

- The UK biotech remains a strong performer, with three of the top 10 transactions in Q3, but the majority of the transactions occurred in other EU countries, e.g. Switzerland (10). In Q3 of 2018, six of the 10 largest transactions (including three of the top five) involved U.K. biotech firms
- In Q3, larger financings were led by strong contribution from US investors. For example, Dutch company Pharvaris raised \$66M from Foresite Capital, Bain Capital Life Sciences, venBio Partners and Venrock, with existing backers LSP and Kurma Partners also participating. They have an experienced management team and an oral Phase 1 NCE for a clinically validated target (B2-receptor antagonist) which could be a game changer in the IV only standard of care for the treatment and prevention of Hereditary Angioedema.
- A majority of capital raises in the EU market were focused on oncology, immunology, or combination assets showing continued strong VC interest in those therapeutic areas

Biopharma Europe financing – public

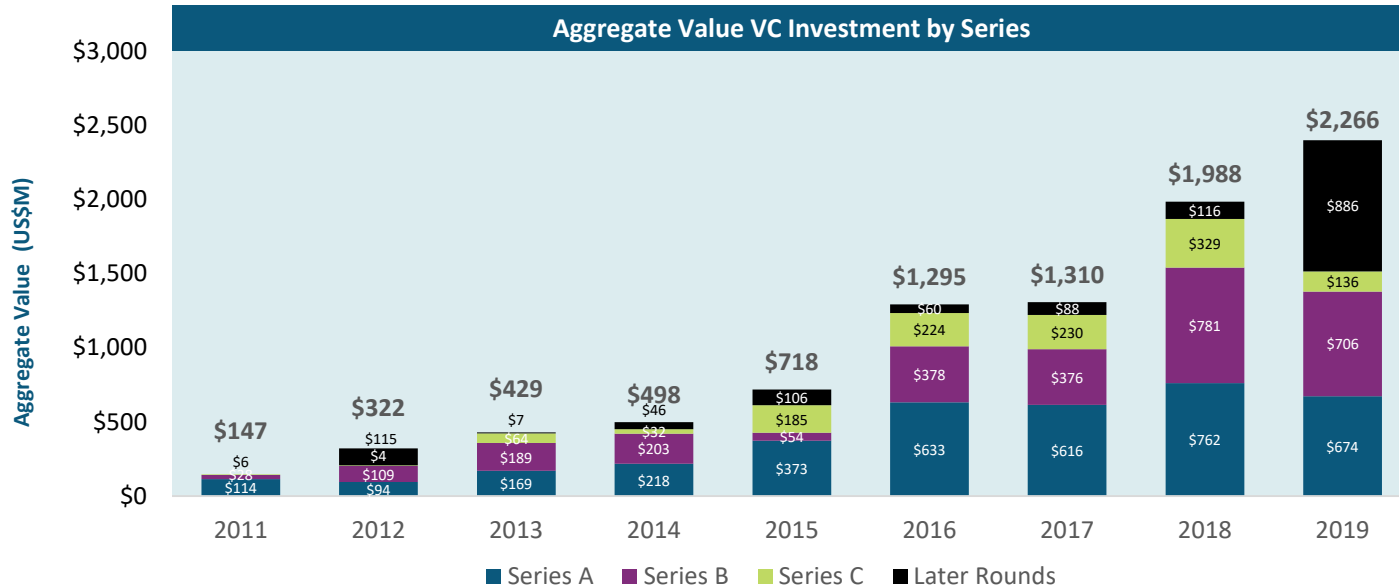
The public EU markets remained calm in Q3—consistent with recent years

- There were no EU biopharma IPOs or secondary offerings this quarter
- Overall low appetite in the public financing market, which may explain the high volume of private financings this quarter
- Two companies, Vir Biotechnology and BioNTech, have announced IPOs that are slated to be completed in Q4 2019. The expected value for BioNTech’s IPO on Nasdaq is around \$250M which would be higher than all IPOs in Q2 (\$110M) and Q1 (\$50M) of 2019. Similarly, Vir Biotechnology expects to raise \$150M in an IPO on Nasdaq

Predictions and Insights for EU public and private financings

- Financing activities in Q4 2019 is predicted to be higher than Q3 2019 with many companies pursuing investment opportunities before 2020 including Vir Biotechnology’s and BioNTech’s planned IPOs on Nasdaq
- In line with our prediction in Q2, EU-based companies pursuing an IPO will try to explore options in the US prior to going public in Europe unless there is strong regional angle
- Any company that wants to IPO in Q4 will need to have a strong pipeline and multiple assets that enable a high valuation pre-IPO
- In Q3, we observed strong interest in private VC investments into EU biotech by US investors that is likely to grow in Q4 and beyond

Q3 sees a continuation of the robust EU private financing market



Deals (#)	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	19	19	21	26	33	37	38	32	52
B	4	11	14	10	5	14	15	25	14
C	1	1	3	1	7	7	6	5	2
D & Later	0	3	1	1	1	1	2	2	21
Total	24	34	39	38	46	59	61	62	89

SOURCE: Locust Walk Analytics, Yahoo Finance

Q3 M&A or Licensing transactions follow trends similar to Q3 2018

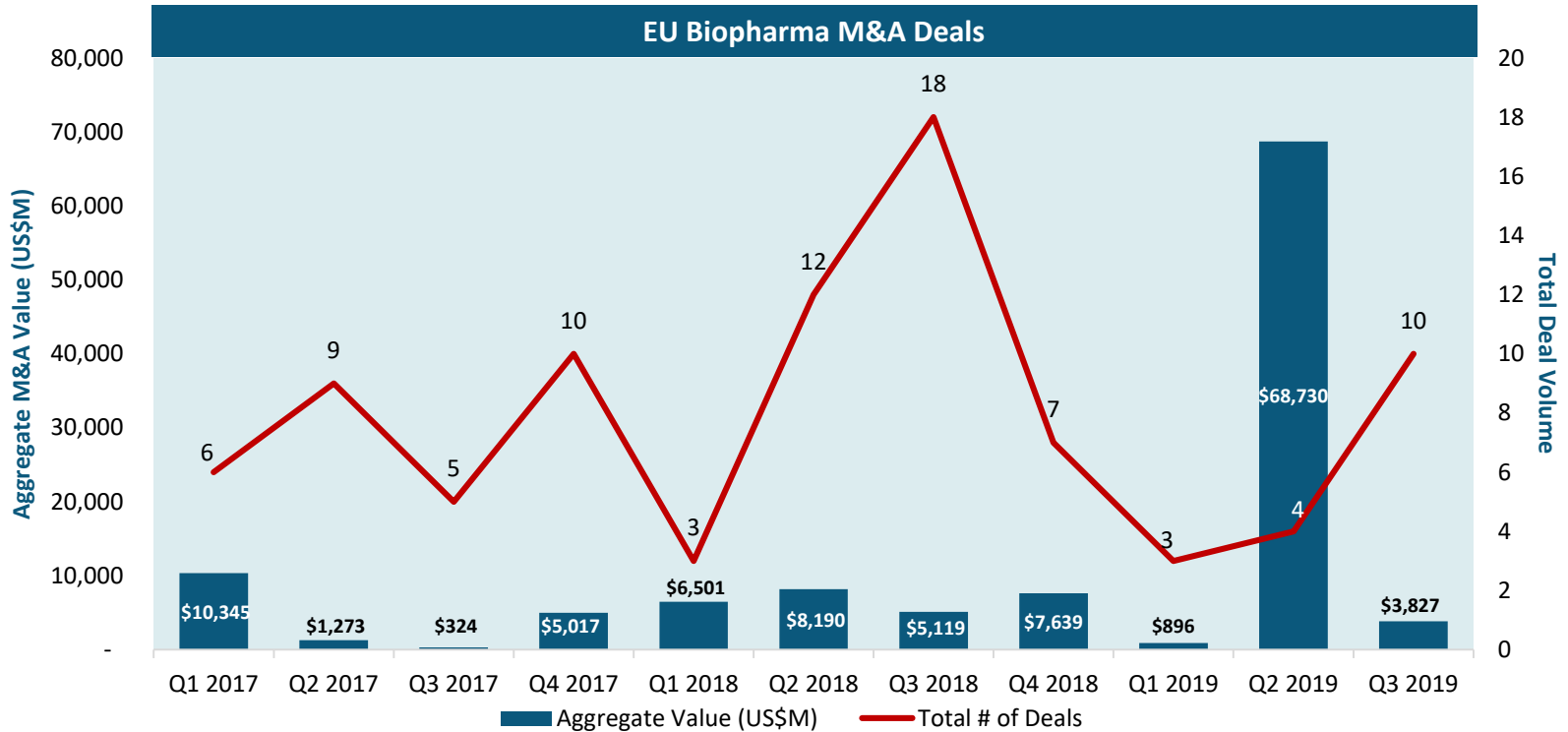
Q3 saw the highest number of M&A transaction in 2019 (7 in Q3 vs 4 in Q2 and 3 in Q1)

- The high Q2 aggregate value was driven almost entirely by the Allergan/Abbvie megamerger (\$63B). When taken out, the Q3 value is in between the two previous quarters: Q2 (\$5.7B) and Q1 (\$896M) and significantly lower than same quarter last year (Q3 2018)
- The most notable Q3 M&A transaction was Pfizer's \$810M acquisition of Therachon, a company with a Phase 3 asset for achondroplasia, based in Basel, Switzerland
- Boehringer Ingelheim was very active with two completed licensing deals, one in oncology with Lupin and one in ophthalmology with Inflammasome, with a total deal value of \$860M. They also acquired Amal Therapeutics in a \$367M deal for their therapeutic vaccine pipeline

Predictions and Insights

- Large EU biotech (Genmab) and regional specialty pharma like (Pharming or Mundipharma) have become active licensees with the latter paying healthy upfronts to strengthen their pipelines with innovative assets
- Oncology accounts for a greater majority of the licensing deals in the EU biopharma market, continuing the trend in 2019
- We expect the number of licensing deals to decrease as companies can leverage the favorable private financing landscape to raise funds and further develop assets in-house
- Pharma companies will benefit as more mature programs with stronger data becomes available; investors will benefit as strong programs from innovative biotech companies will be able to demand higher deal terms

The number of M&A deals went up in Q3



SOURCE: Locust Walk Analytics, Yahoo Finance

The four largest M&A transactions represent 78% of the total announced deals



SOURCE: Locust Walk Analytics, PitchBook

Q3 saw 7 biopharma licensing deals, in line with M&A activity in Q3 2018

Boehringer Ingelheim, a German biotech, is actively pursuing multiple licensing opportunities

Licensee	Licensor	Completion Date	Indication	Total Deal Size (\$M)	Upfront (\$M)	Comments
Boehringer Ingelheim	Lupin	9/4/2019	Oncology	\$700	\$20	Boehringer Ingelheim will develop and commercialize Lupin's MEK Inhibitor compound for patients with difficult to treat cancers
Mundipharma	Cidara Therapeutics	9/3/2019	Infectious Disease	\$649	\$30	Strategic collaboration to develop and commercialize rezafungin in an intravenous formulation to treat invasive fungal infections
Genmab A/S	BliNK Biomedical	7/12/2019	Oncology	\$202	\$2	Genmab licensed certain antibodies targeting CD47 for cancer indications
Merck	Themis Bioscience	8/22/2019	Infectious Disease	\$200	NA	Exclusive license agreement for the discovery and development of undisclosed vaccine candidates using Themis's measles virus platform
Boehringer Ingelheim	Inflammasome Therapeutics	9/20/2019	Ophthalmology	\$160	NA	Boehringer Ingelheim will develop up to three therapies for patients with retinal disease
Sanofi	Verastem	7/25/2019	Oncology	\$47	\$5	Sanofi will develop and commercialize Verastem Oncology's COPIKTRA an oral inhibitor of PI3K for the treatment of all oncology indications
Pharming Group	Novartis AG	8/13/2019	Immune Disorders	\$20	\$20	Development collaboration and license agreement to develop and commercialize CDZ173, a PI3K inhibitor, to treat patients with APDS

SOURCE: Locust Walk Analytics, Yahoo Finance

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BIOPHARMA ASIA

Japan overview—modest in biopharma market performance but strong in deal making

For Japanese biotechs, Q3 was a solid strong quarter with significant out-licensing deals

- Two research collaborations announced by Sosei with \$26M upfront payments each and 1 co-development deal by Noile-Immune

However, the sector has faced various setbacks resulting in a flat performance in share price

- Reimbursement price for Angen's gene therapy (first in Japan), Collategene, listed below market expectations
- Failure in drug development (e.g. RaQualia/Meiji's ziprasidone in Phase 3) and filing withdrawn (Takara Bio/Otsuka's oncolytic virus)
- StemRIM was the first biotech IPO in 2019, but market performance off to a slow start

For the overall biopharma space 2019 is already proving to be an active year

- Total deal value in 9 months of 2019 surpassing total 2018 values, with matching number of deals >\$10M
- Deals in Q3 highlighted by \$80M upfront deal for Frequency by Astellas

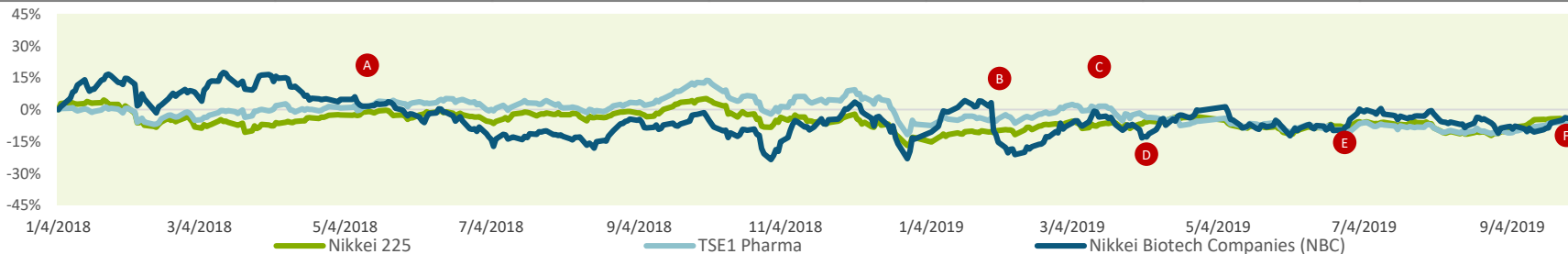
In terms of M&A, Sumitomo Dainippon (DSP) was the most active in Q3

- In September, DSP announced a \$3B strategic alliance with Roivant Sciences, which includes acquiring 5 of Roivant's subsidiaries, >10% of Roivant shares, Roivant's technology platform and data technology, and option to acquire 6 other subsidiaries
- DSP acquisition of Cynata in July to strengthen regenerative medicine franchise

Japanese biotech sector was flat in Q3 2019 while overall market and pharma is showing improvement

Q3 2019 and Historical Performance of key Market Indices

	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019
ΔNikkei 225(%)	(7.0%)	(3.3%)	4.6%	(13.2%)	(8.1%)	(7.8%)	(5.7%)
ΔTSE1P (%)	0.1%	3.4%	12.9%	(6.8%)	(2.5%)	(10.3%)	(7.7%)
ΔNBC (%)	16.3%	(8.1%)	(2.2%)	(13.9%)	(6.9%)	(4.5%)	(4.7%)



Key Event

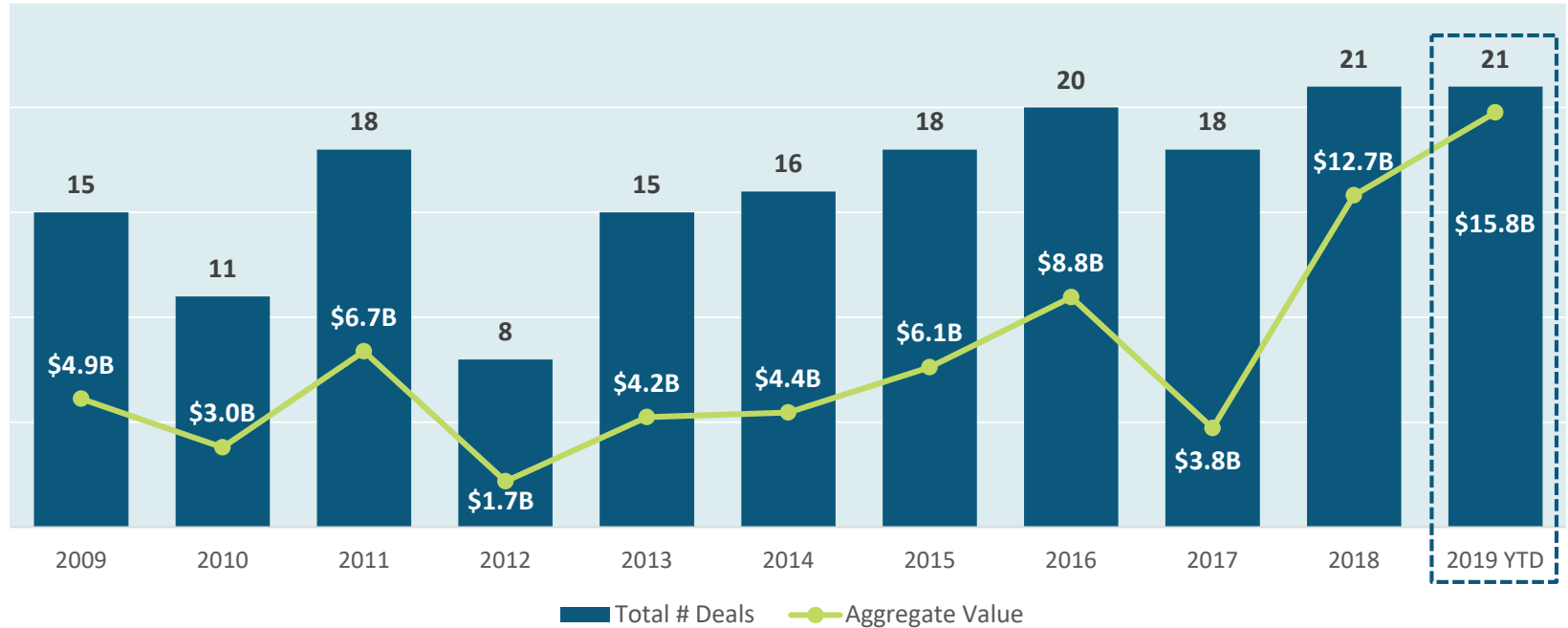
- A** May 8, 2018: Takeda Pharmaceutical agreed to buy Shire for \$62 billion, which brings Takeda into the top 10 pharma rank by worldwide revenue
- B** Sharp market drop attributed to “SanBio Shock”: Announcement of SanBio’s failure in Ph2b trial of SB623 for chronic ischemic stroke led to a -8.1% drop in the MOTHERS Index
- C** AnGes saw an 87% increase in stock price after receiving conditional approval for its HGF gene therapy drug, and was expected to re-ignite interest in NBC stocks
- D** Oncolys – Chugai deal for OBP-301, oncolytic virus telomelysin, resulted in its’ stock hitting its daily trading limit and seeing an ~65% increase in three days after its Apr 8 announcement
- E** Carna Biosciences announced deal with Gilead for development collaboration on June 25, and its share price rose >400% towards the end of this quarter
- F** Sep 30, 2019: TSE1P and NBC close 0.0% and 6.4%, respectively, since the beginning of 2019

Note: Index growth based on change from Jan 4, 2018 price. MOTHERS (Market of the high-growth and emerging stocks) = the stock market at the Tokyo Stock Exchange for emerging businesses, including Sosei Group, Brightpath Bio, and Solasia.

SOURCE: Locust Walk Analytics, Yahoo Finance Japan

Total deal size in 2019 amounted to \$16B, already surpassing the value in 2018

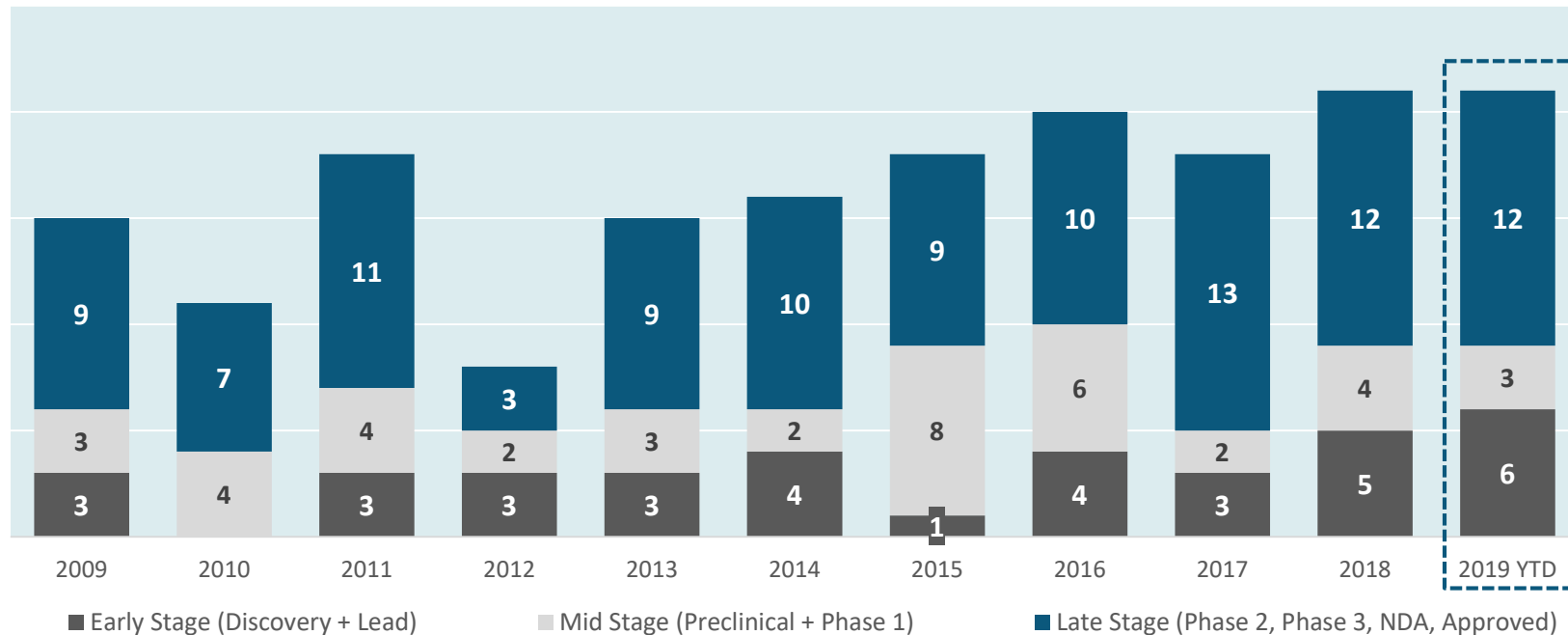
Biopharma licensing deals >\$10M (announced deal size basis)



SOURCE: Locust Walk Analytics, BioSciDB, Globaldata

Late stage assets still cover the majority of deals over \$10M

Biopharma deals >\$10M (announced deal size basis)



SOURCE: Locust Walk Analytics, BioSciDB, Globaldata

Key licensing deals involving Japanese companies or Japan-only regional rights in Q3 2019

2019 Licensing Deals							
Licensor	Licensee	Date	Therapeutic Area	Stage	Upfront (\$M)	Deal Size (\$M)	Deal Background
Chimerix	SymBio	2019/09	Infectious disease	Phase 3	5.0	180	<ul style="list-style-type: none"> License global rights to brincidofovir, an anti-multiviral agent to prevent serious infections in transplant recipients and treat infections in immunocompromised patients
Evotec	Takeda	2019/09	Multiple areas	Discovery	NA	850	<ul style="list-style-type: none"> Strategic drug discovery collaboration for at least 5 programs in Takeda's core TAs Each program is worth in excess of \$170M in development and commercial milestones
Eidos Therapeutics	Alexion	2019/09	CV	Phase 3	25.0	50	<ul style="list-style-type: none"> Alexion to in-license Japan rights to AG10 for transthyretin amyloidosis cardiomyopathy
Noile-Immune	Adaptimmune Therapeutics	2019/08	Oncology	Pre-clinical	2.5	312	<ul style="list-style-type: none"> Co-development of Adaptimmune's SPEAR T-cell cells incorporating Noile-Immune's PRIME technology to treat solid tumors
Sosei Heptares	Takeda	2019/08	GI and option for other TAs	Discovery	26.0	1226	<ul style="list-style-type: none"> Multi-target partnership to discovery, develop and commercialize new molecules targeting GPCRs selected by Takeda, first focus on GI with potential to expand to other areas
AVEO	Kyowa Kirin	2019/08	Unknown	Approved (for oncology)	25.0	416	<ul style="list-style-type: none"> Kyowa Kirin re-obtains non-oncology rights to tivozanib in AVEO territories excluding rights sublicensed EUSA Pharma
Frequency Therapeutics	Astellas	2019/07	ENT	Phase 1/2	80.0	625	<ul style="list-style-type: none"> Ex-US rights to FX-322 for sensorineural hearing loss treatment via activation inner ear progenitor cells to induce hair cell regeneration
Sosei Heptares	Genentech	2019/07	Multiple areas	Discovery	26.0	1026	<ul style="list-style-type: none"> Multi-target research collaboration and licensing of new molecules targeting GPCRs selected by Genentech
Forty Seven	Ono	2019/07	Oncology	Phase 2	15.8	119.8	<ul style="list-style-type: none"> Development, manufacturing and commercialization rights to 5F9 (anti-CD47 antibody) in Japan, South Korea, Taiwan and ASEAN countries

SOURCE: Locust Walk Analytics, Globaldata, BioScidb

China overview—relatively stable markets with regulatory changes further stimulating change

China healthcare sector stock market remains relatively stable in Q3

- SSE Composite Index (-2.4%) while selected top 20 mainland listed companies (+2.8%) vs. Q2 2019
- However in late September 2019, the expansion of the drug procurement policy resulted in price reduction of generic drugs which negatively impacted many Global and Chinese pharma. For example, Lipitor prices went down 74%, while Salubris, one of the leading Chinese pharma focused in CV space, has seen its stock price drop 10% in a day

2 biopharma companies went public in Q3, raising \$558M in total

- Shenzhen Chipscreen is the first China innovative biopharma to list on the Shanghai STAR Board, raising \$148M at a \$1.2B valuation and gained a stunning 367% in the first trading session following its IPO
- Henlius, a subsidiary of Fosun Pharma which focuses on developing biosimilars, raised \$410M in its Hong Kong IPO
- Other companies, such as Nanjing Frontier Biotech, China Immunotech, and HitGen are poised to IPO shortly

In-license deal volume slumped, 13 in-license deals have been announced in Q3

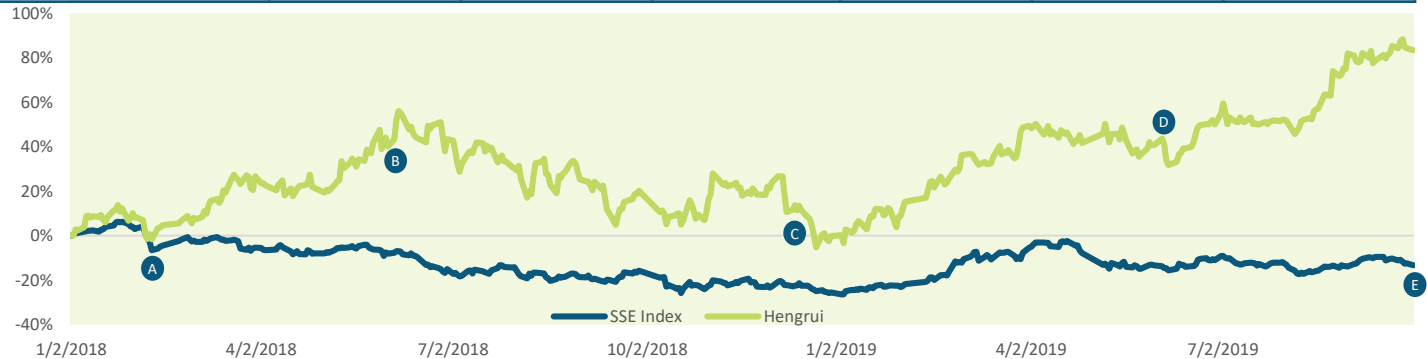
China passed a comprehensive “New Drug Administrative Law” on Aug 26, 2019

- Chinese government reiterated calls on the NMPA to prioritize pediatric drug reviews, along with drugs for rare diseases and major infectious diseases
- Drug registration: the NMPA can now provide conditional approval to foreign approved drugs that have the potential to treat unmet, life-threatening diseases where there are no effective therapies in China. This is conditional upon the NMPA’s decision to extrapolate foreign data to Chinese subjects and if similar efficacy can be achieved, then conditional approval is granted

Dramatic price cut in generic products led innovation-derived company Hengrui to perform strong

2019 and Historical Performance of SSE Composite Index and Hengrui

	1Q 2018	2Q 2018	3Q 2018	4Q 2018	1Q 2019	2Q 2019	3Q 2019
ΔSSE Composite Index %	(5.4%)	(15.0%)	(15.7%)	(25.5%)	(7.7%)	(11.0%)	(13.2%)
ΔHengrui %	26.7%	43.4%	20.2%	(0.1%)	48.6%	49.9%	83.3%

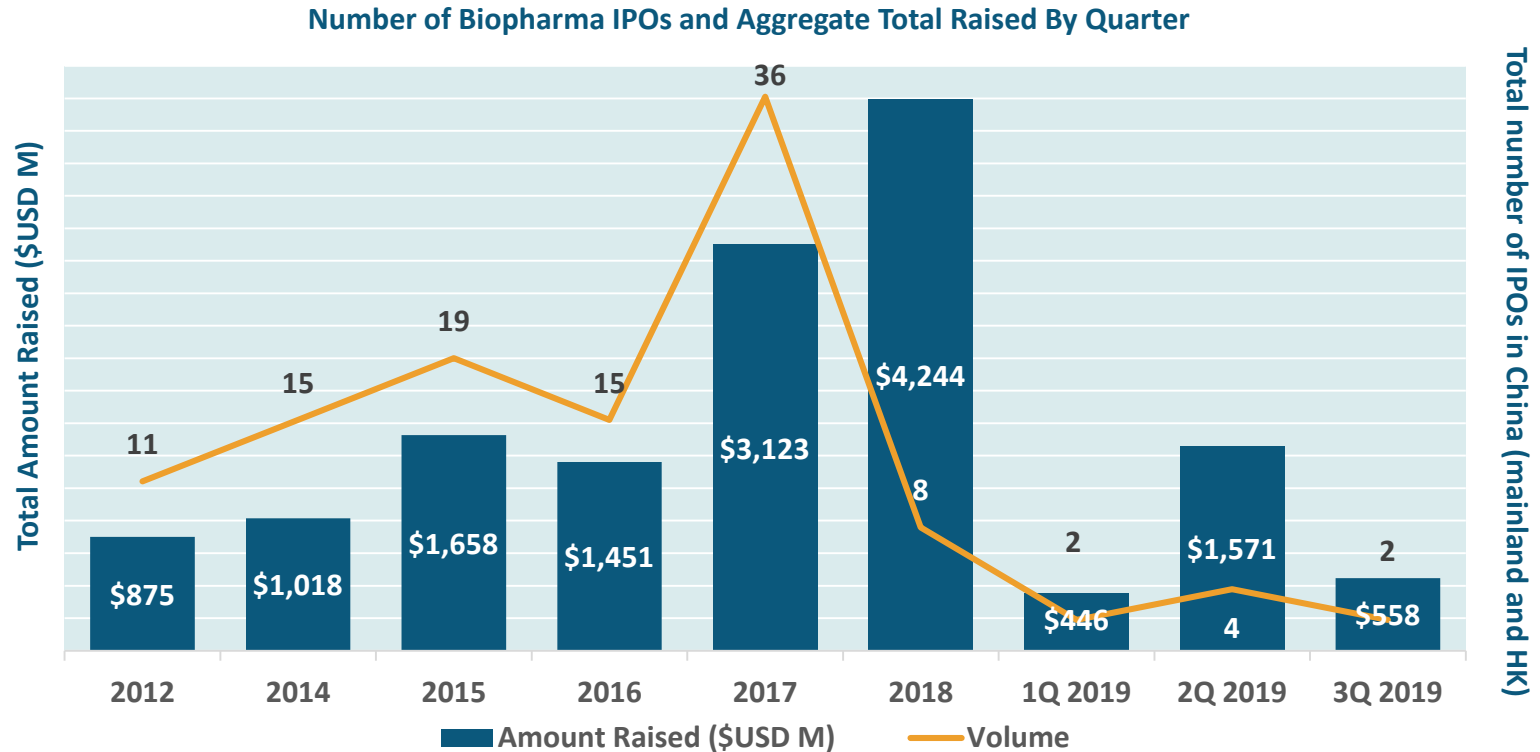


Key Event

- A** SSE composite index has seen its price drop due to the poor performance of US stock market
- B** Hengrui announce approval of its long-acting G-CSF product
- C** Significant drug price cut in “4+7 Centralized Purchasing of Drug for Public Hospitals” hurt investors confidence in pharmaceutical sector
- D** Chinese government to audit 77 companies (including Hengrui) after Kangmei reports a \$4.4B fraud
- E** SSE composite index closed at 2,905.19 (17.8% vs Jan 2nd, 2019)

SOURCE: Locust Walk Analytics, Yahoo Finance (stock price growth rate is calculated by compare to Jan 2, 2018)

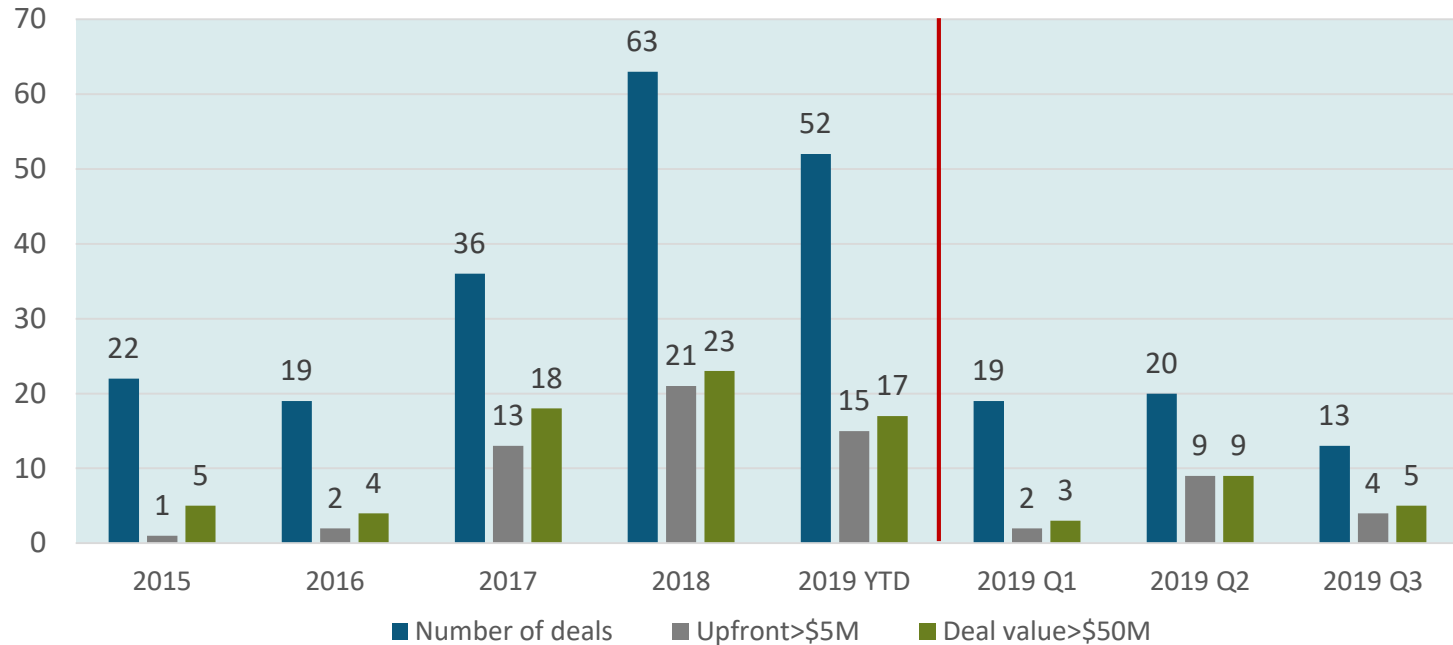
2 IPOs were seen in Q3, with Chipscreen becoming the first pharma to list on the STAR board



SOURCE: Locust Walk Analytics, ChinaBio Today

In-licensing deal activity slowed down in Q3, however total deal volume is on pace to surpass 2018

Trend of in-licensing deals in China (number of deals)



SOURCE: Locust Walk Analytics, ChinaBio Today, BioSciDB, Globaldata

Licensing activity cooled down compared to 1H 2019 with a focus on later stage clinical assets

In addition to oncology, Chinese companies are now investing in aesthetics, metabolic, ophthalmology and female diseases

- Newsoara to pay \$15M upfront for the China rights of ZEN-3694 (BET inhibitor), a Phase 2 asset targeting metastatic castration-resistant prostate cancer and triple negative breast cancer
- China National Biotec Group (CNBG), market leader of botulinum toxin in China, acquired Algeness® (gel implant dermal fillers) to expand its footprint in aesthetics
- Ocumension Therapeutics, an ophthalmology specialty company, in-licensed NCX4251 for acute blepharitis from Nicox

Financing activity stays active in healthcare sectors and AI-based companies successfully attracted investors

- PingAn Insurance Company led a \$15M round in Riverain, a US AI based imaging software company
- Huimei closed \$30M round for AI-based hospital clinical decision support
- Yaoyanshe, a Shanghai on-line AI-based CRO/CMO, raised \$42M in a Series C funding round led by Eastern Bell Capital and Sequoia China
- Lepu Biotech, a one-year old biopharma company focused on immunotherapy, raised \$131M in a Series A financing led by Shiyu Capital

CFIUS continues to be a concern with the Trump administration increasing scrutiny and government approval of foreign investment in a broad swath of private biotechs

SOURCE: Locust Walk Analytics, ChinaBio Today, BioSciDB, Globaldata

China in-licensing deals in Q3 2019

Licensor	Licensee	Area/Indication	Date	Stage	Upfront (\$M)	Total deal (\$M)
Ocugen	CanSino Biologics	Ophthalmology (Inherited eye diseases)	2019/09	Pre-clinical	NA	NA
JW Pharma	Simcere	Metabolic (Gout)	2019/09	Phase 2b	NA	NA
Advanced Aesthetic Technologies	China National Biotech Group	Aesthetics	2019/09	Approved	NA	NA
iBio	CC-Pharming	Oncology	2019/08	Non-disclosed	NA	NA
Alligator Bioscience	Biotheus	Oncology	2019/08	Discovery	\$1	\$52
Eli Lilly	Innovent	Metabolic (Diabetes)	2019/08	Non-disclosed	NA	NA
Zenith Epigenetics	Newsoara Biopharma	Oncology (Prostate cancer and breast cancer)	2019/08	Phase 2	\$15	\$78
Aucta	Wanbang	CNS (Infant seizure)	2019/07	Approved	NA	NA
X4 Pharma	Abbisko Therapeutics	Oncology (Pancreatic cancer, ovarian cancer, etc.)	2019/07	Phase 3	NA	NA
MacroGenics	I-Mab	Oncology	2019/07	Phase 2 ready	\$15	\$150
Nicox	Ocumension Therapeutics	Ophthalmology (Acute blepharitis)	2019/07	Phase 2	\$2.2	\$13.5
Incyte	Zai Lab	Oncology	2019/07	Phase 2	\$17.5	\$77.5
Photocure	Asieris MediTech	Female disease (Cervical dysplasia)	2019/07	Phase 3	\$5	\$73

SOURCE: Locust Walk Analytics, Globaldata, Chinabio Today

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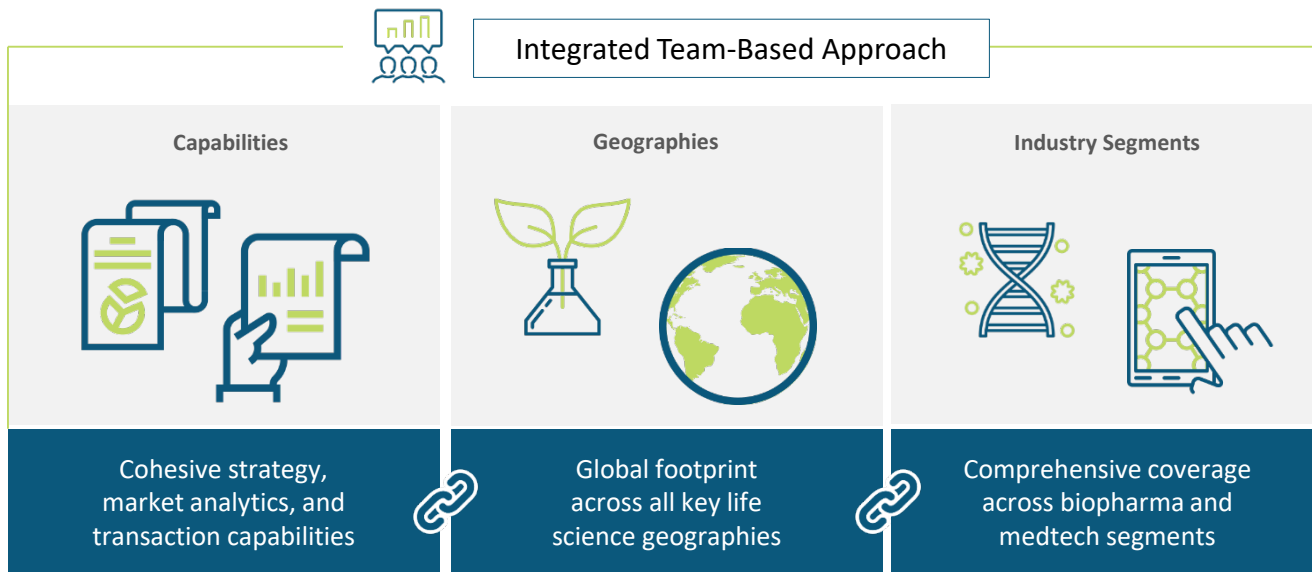
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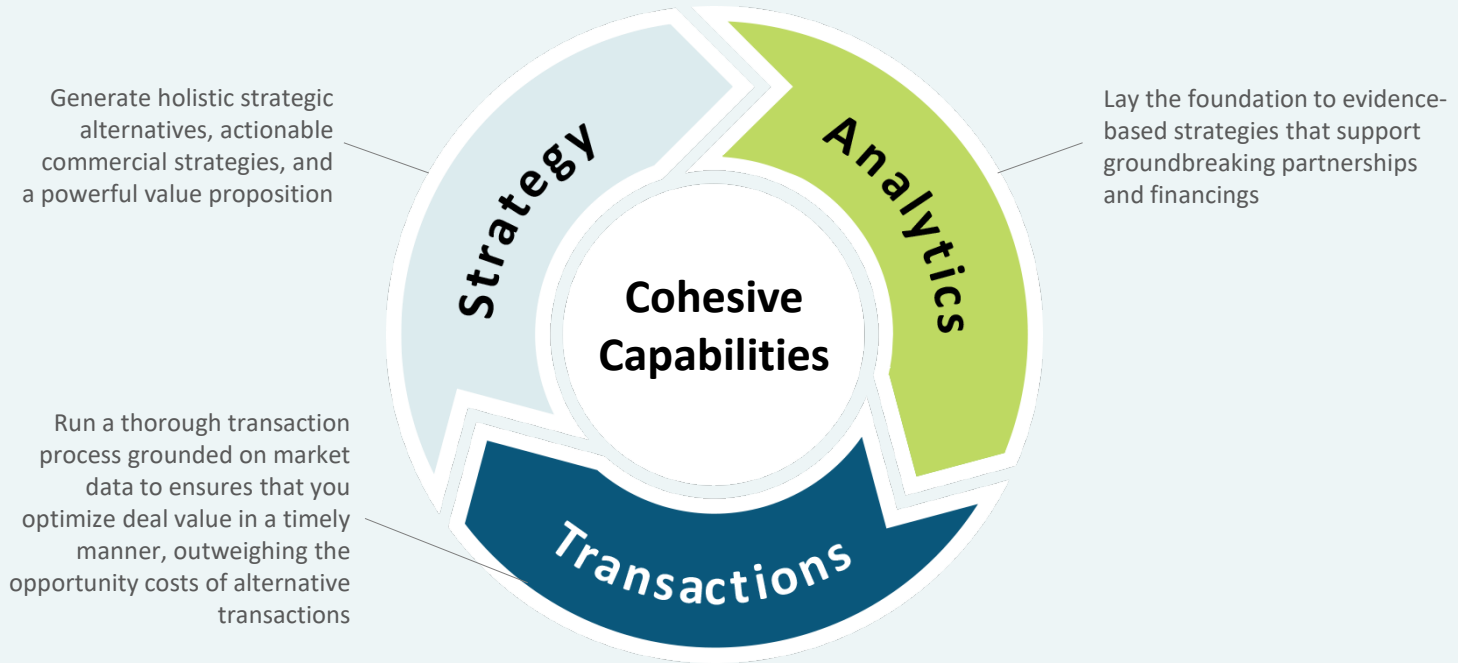
ABOUT LOCUST WALK

Locust Walk is a global life science transaction firm

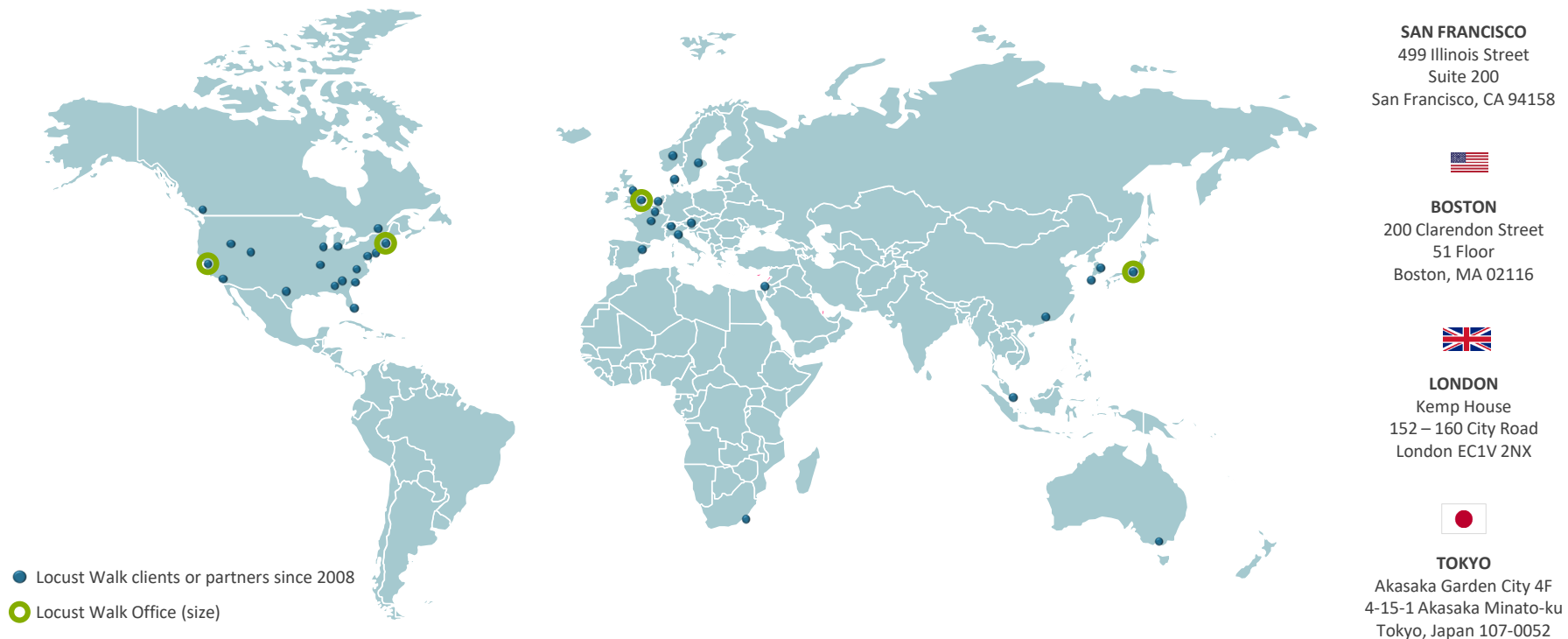
Our integrated team-based approach across capabilities, geographies, and industry segments delivers the right products, the right partners, and the most attractive sources of capital to get the right deals done for biopharma and medtech companies.



Locust Walk's cohesive combination of strategy, market analytics, and transaction capabilities means that you have one integrated team focused on your entire deal process



Locust Walk maintains a global footprint across all key life science geographies



Locust Walk is the only firm to integrate strategy, market analytics, and transaction capabilities on a global scale, from both biopharma and medtech perspectives

Capabilities

Cohesive strategy, market analytics, and transaction capabilities

- One integrated team focused on your company's entire transactional life-cycle.
- Track record of addressing key strategic questions for companies at the corporate, portfolio, and asset levels; we have the experience to execute all deal types, from licensing to M&A to IPO advisory to PIPEs to private raises.
- Foundational, evidence-based market analytics capabilities that support groundbreaking deals and partnerships.
- Focused strategic capabilities that generate novel alternatives, actionable strategies, and powerful value propositions.

Geographies

Global footprint across all key life sciences geographies

- On-the-ground presence in all major life sciences markets across the United States, Europe, and Asia.
- Offices are staffed with local teams, who also have experience working around the globe.
- Maintaining a global presence enables us to tap into a combination of deal sources regardless of where they reside, so that your deal isn't limited by geographical borders.

Industry Segments

Comprehensive coverage across biopharma and medtech segments

- Strong understanding of the nuanced differences (and similarities) between biopharma and medtech: value drivers, risk-profiles, time-horizons, transaction preferences and precedents, and deal structures

BioPharma



Our BioPharma team has completed over 40 transactions at Locust Walk across a range of therapeutic areas, modalities, and all stages of development and marketed products.

MedTech



Our Medtech team brings deep, segment-specific experience from over 25 transactions across various therapeutic areas and care settings for medical devices, diagnostics, tools, and digital health companies.

Convergence

Our strong understanding of both the biopharma and medtech segments enables our team to identify and maximize the convergence opportunities that many innovative life science companies have top-of-mind.

Locust Walk's leadership team includes successful life science operating, investing, and transaction executives



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