Canaccord Genuity Capital Markets

US Equity Research
8 September 2025

Industry Update

Biotechnology

Company	Rating	Price	Target
Biotechnology			
ARCT-NASDAQ	Buy	US$17.85	US$66.00
RARE-NASDAQ	Buy	US$31.82	US$128.00
RCKT-NASDAQ	Buy	US$3.28	US$10.00
TNYA-NASDAQ	Buy	US$1.35	US$6.00
TSHA-NASDAQ	Buy	US$3.36	US$14.00
VRTX-NASDAQ	Hold	US$396.12	US$411.00
WVE-NASDAQ	Buy	US$8.29	US$19.00

Priced as of close of business 5 September 2025

Whitney Ijem | Analyst | Canaccord Genuity LLC (US) | wijem@cgf.com | 212.389.8094
Angela Qian, PharmD | Associate | Canaccord Genuity LLC (US) | aqian@cgf.com | 212.849.3927

Genetic medicine for generalists: Primer on the Priority Review Voucher Program

If you pay attention to the therapeutics space, you might have heard about PRVs, a way to accelerate FDA review timeline of a drug for any company that has one, and a lucrative source of non-dilutive capital for those who have one but don't need it. You may have also heard that recent legislative efforts to extend the PRV program were not successful and congress began phasing out the program at the end of 2024, putting a deadline on eligibility. In the current environment, this is particularly problematic for some companies who were/are planning on PRV-sale related cash to extend runway. As a result, many companies (including several in our coverage) are racing against the clock to secure FDA approval of their drugs by 2026.

So what is a PRV exactly? How does a company get one, and what exactly are the benefits of using one? If a company has one to sell, how much would it cost? If you're wondering about these same

questions, or if you kinda know but need a refresher, this is the primer for you. In the following slides we delve into PRVs: what are they, how do they work, how are they monetized, and what are the deadlines ahead.

For important information, please see the Important Disclosures beginning on page 21 of this document.

Genetic Medicine for Generalists: A Primer on the Priority Review Voucher Program

Whitney Ijem
Managing Director
Canaccord Genuity LLC (US)
e: wijem@cgf.com
o: 212.389.8094

Angela Qian
Associate
Canaccord Genuity LLC (US)
e: aqian@cgf.com
o: 212.849.3927

Table of contents

Background on the PRV program

Key terms defined

Sponsor
An individual or entity that is responsible for a clinical trial investigation.

Orphan drug
A drug for a rare disease or condition.

Rare Disease
The FDA defines rare disease as a condition that affects fewer than 200,000 people in the United States.

BLA
Biologics License Application; a request for permission from the FDA to introduce a biologic product into the market.

NDA
New Drug Application; submission to the FDA to introduce a small-molecule drug into the market.

Section 505(b)(1) of Federal Food, Drug, and Cosmetic Act (FD&C Act)
A specific pathway for a drug applicant to obtain FDA approval for a new drug application (NDA).

Section 351 of the Public Health Service (PHS) Act
Law that outlines the process for submitting a BLA.

PDUFA
Prescription Drug User Fee Act; law that authorizes the FDA to collect user fees from sponsors that submit human drug applications (NDAs or BLAs).

Sources: FDA.gov, Canaccord Genuity Research

A brief history lesson

Precedent for FDA Incentive Programs

- Since passing the Orphan Drug Act (ODA) in 1984, the U.S. has recognized that incentives can promote the development of new drugs for rare diseases.
- The number of designations and initial approvals has grown substantially since the ODA was enacted. Comparing the first decade (1983–1992) to the most recent (2013–2022), designations increased by nearly seven times and initial approvals by six times.

Priority Review Voucher Program

- The U.S. Congress created the priority review voucher (PRV) program in 2007 to encourage the development of drugs for neglected diseases that may lack market opportunities due to small patient populations and/or high development costs.
- The program was created first for neglected tropical diseases in 2007, then for rare pediatric diseases under the *Food and Drug Administration Safety and Innovation Act (FDASIA)* in 2014, and then finally in 2016 for material threat medical countermeasures under the 21st Century Cures Act.

Type	Definition	Examples
Tropical Disease	Infectious disease for which there is no significant market in developed nations and that disproportionately affects poor and marginalized populations	Tuberculosis , malaria , blinding trachoma, Buruli ulcer, cholera
Rare pediatric Disease (RPD)	Serious or life-threatening rare diseases affecting children 18 years and younger	Cystic fibrosis, Duchenne muscular dystrophy, spinal muscular atrophy
Medical countermeasures	FDA-regulated products that may be used in a public health emergency stemming from a terrorist attack with or accidental release of a biological, chemical, or radiological/nuclear agent, or a naturally occurring emerging infectious disease	Covid, smallpox

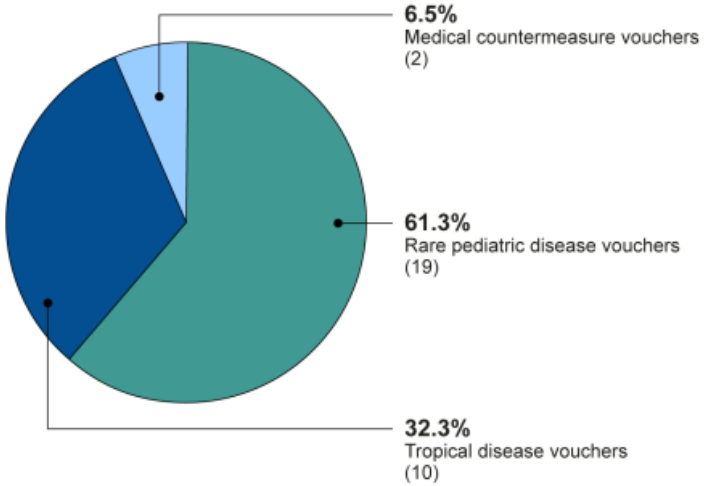
Sources: FDA.gov, Canaccord Genuity Research, Fermaglich LJ, Miller KL. A comprehensive study of the rare diseases and conditions targeted by orphan drug designations and approvals over the forty years of the Orphan Drug Act. Orphanet J Rare Dis. 2023 Jun 23;18(1):163. doi: 10.1186/s13023-023-02790-7. PMID: 37353796; PMCID: PMC10290406.; Berman J, Radhakrishna T. The Tropical Disease Priority Review Voucher: A Game-Changer for Tropical Disease Products. Am J Trop Med Hyg. 2017 Jan 11;96(1):11-13. doi: 10.4269/ajtmh.16-0099. Epub 2016 Aug 29. PMID: 27573627; PMCID: PMC5239674.

Historically rare pediatric disease PRVs have accounted for for most PRVs

RPD PRVs vs. Other PRVS

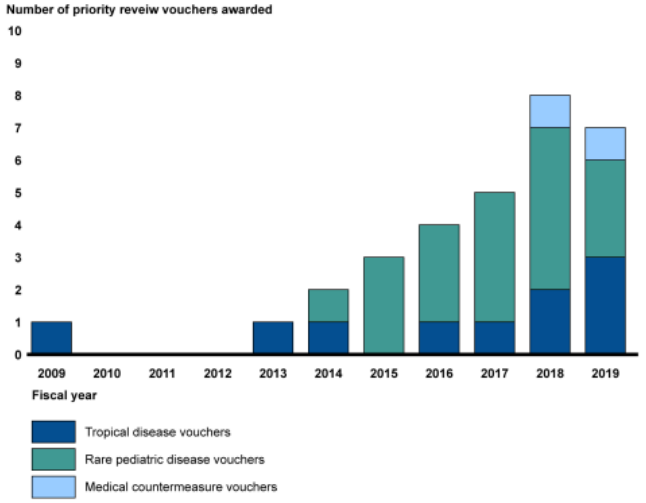
- A study conducted by the United States Government Accountability Office (GAO) showed that as of September 30, 2019 the FDA awarded 31 PRVS across the 3 PRV programs.
- According to the FDA, all PRVs were awarded for drugs that met unmet medical needs.
- Of the 31 PRVs, the majority were awarded through the rare pediatric disease PRV program.

Figure 2: Priority Review Vouchers (PRV) Awarded by FDA by Program Type, as of September 30, 2019



Source: GAO analysis of Food and Drug Administration (FDA) data. | GAO-20-251

Figure 3: Number of Priority Review Vouchers (PRV) Awarded by FDA, by Program Type, Fiscal Years 2009-2019



Source: GAO analysis of Food and Drug Administration (FDA) data. | GAO-20-251

Sources: GAO.gov, Canaccord Genuity Research

For the rest of this primer, we will focus on RPD PRVs

Priority Review Designation

A refresher on FDA's priority review process

- FDA's method of focusing resources towards a particular therapeutic that has fulfilled the criteria of showing significant improvements upon efficacy, prevention, diagnosis, or safety profiles compared to standard of care medications.
- Significant improvement may be demonstrated by the following:
  - Evidence of increased effectiveness in treatment, prevention, or diagnosis of condition.
  - Elimination or substantial reduction of a treatment-limiting drug reaction.
  - Documented enhancement of patient compliance that is expected to lead to an improvement in serious outcomes.
  - Evidence of safety and effectiveness in a new subpopulation.
- The standard review time of a drug from initial NDA/BLA application to drug approval is ~10 months.
- Sponsors can apply for Priority Review Designation to shorten the review time from 10 months of review to within 6 months.
- The status of an application for a Priority Review is communicated to a sponsor within 60 days of receipt of the original NDA/BLA submission.
- Refer to our previous primer for an overview of the FDA development process.

Sources: FDA.gov, Canaccord Genuity Research

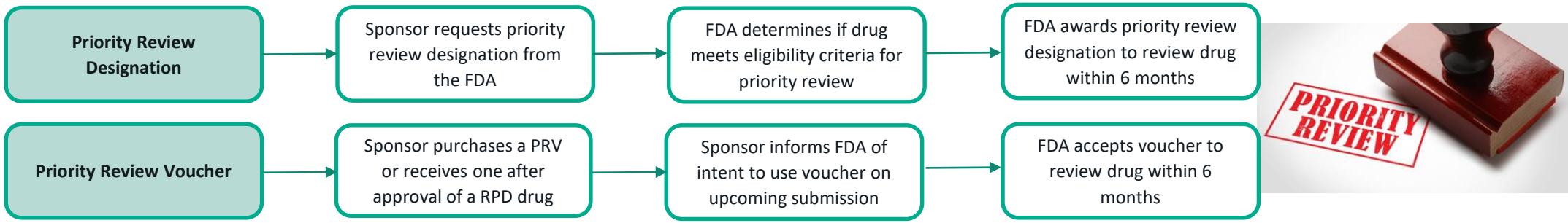
Priority Review Voucher Program

General Priority Review Voucher Program

- Under the priority review voucher program, a sponsor that receives FDA approval for a drug treating a rare or neglected disease can earn a voucher to speed up review of another drug.
- A company can choose to redeem the voucher to receive priority review for a different drug candidate in their pipeline OR they can sell the voucher to another company.

Rare Pediatric Designation Priority Review Voucher (RPD PRV)

- RPD is granted by the FDA to drugs and biologics targeting serious or life-threatening rare diseases affecting children 18 years and younger.
- Upon FDA approval of a RPD drug, the FDA can grant a sponsor a priority review voucher (PRV) allowing for a reduction in review time from 10 months to 6 months for a subsequent application for a different drug.
- Importantly, the PRV does not accelerate approval of the RPD drug itself and serves to incentivize the development of additional treatments for rare pediatric diseases, which might otherwise be under-researched.



Sources: FDA.gov, Canaccord Genuity Research

PRV Program Details

Obtaining a PRV

Purchasing or requesting a PRV

- There are two ways a company can receive a priority review voucher:
    1. they can submit a voucher request to the FDA;
    2. they can purchase a voucher from another company.
- According to FDA's Draft Guidance on RPD PRVs, prior to September 30, 2020, a "rare pediatric disease designation" was not required to get a priority review voucher.
- For any voucher awarded after September 30, 2020, the drug must have been designated as a rare pediatric disease drug by that date.
- Sponsors seeking a RPD PRV submit voucher requests in the original submission of the potential rare pediatric disease product application – either in the initial package sent or up until the point of NDA/BLA filing.
- Sponsors who have already received rare pediatric disease designation can include their designation letter with the voucher request.

Sources: FDA.gov, Canaccord Genuity Research

Cashing in a PRV

Redeeming a PRV for a different drug

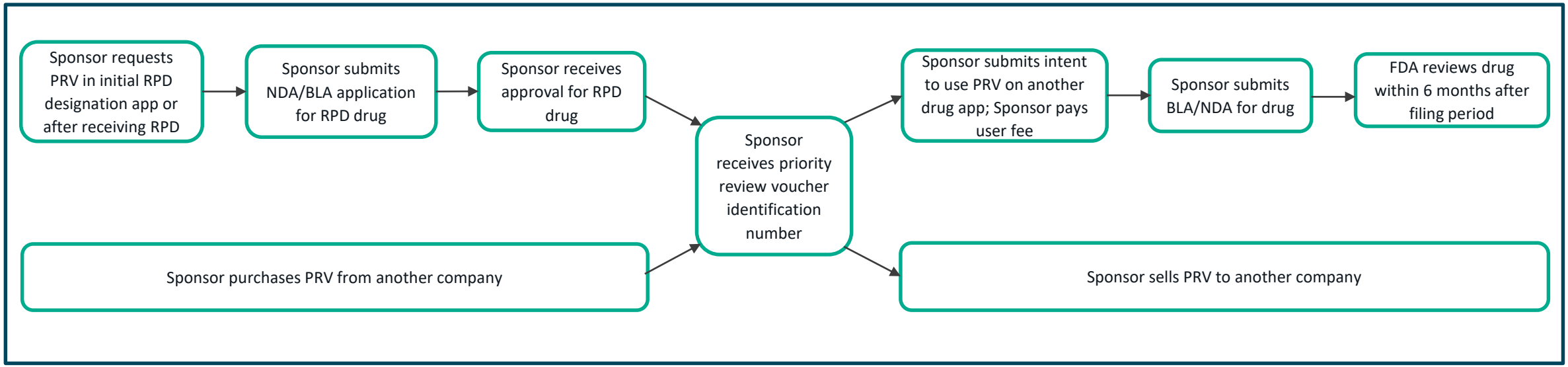
- A sponsor can use a priority review voucher for any eligible drug application submitted to the FDA under either section 505(b)(1) of the FD&C Act (small molecule) or section 351 of the PHS Act (biologics).
- The voucher is not restricted to rare pediatric diseases and can even be used for a new indication of the same drug that earned the voucher.
- Before submitting the application, the sponsor must inform the FDA of their intent to use the voucher at least 90 days beforehand, including the planned submission date.
- Upon submitting this notification to FDA, the sponsor is obligated to pay a priority review user fee (in addition to the standard Prescription Drug User Fee Act (PDUFA) application fee.
- The user fee for priority reviews is set annually to cover the extra cost the FDA incurs to perform a faster-than-standard review of a new drug or biologic; the FY 2025 user fee rate is about $2.5 million.
- It is important to note that the FDA is not obligated to approve a product using a voucher and their guidance states that while the goal is to act within 6 months after the 60-day filing period, the timeframe is not guaranteed.
- Priority review can get a “good” drug to the finish line sooner, but it can't revive a drug that is already failing.

Transferring/Selling a PRV

- The sponsor of a drug for a RPD can sell or transfer their PRV to another sponsor.
- The voucher can be transferred an unlimited number of times before it is used, as long as the current holder has not applied to redeem the voucher.

Sources: FDA.gov, Canaccord Genuity Research

Schematic of the RPD PRV process



Sources: FDA.gov, Canaccord Genuity Research

Monetizing PRVs

Understanding the Value of PRVs

The market price of PRVs are influenced by several factors

- To date, the value of PRVs has ranged from as low as $21.2M (paid by Novartis in 2023 to Pharming Technologies) to $350M (paid by Abbvie for United Therapeutics' voucher in 2015).
- Variation in price suggest considerable uncertainty about the market price.
- When the PRV system was first introduced in a March 2006 *Health Affairs* paper, the authors estimated that a PRV could be worth approximately $300 million if used for a "blockbuster" product generating at least $1 billion in annual global revenue.
- Company Surveys have been conducted to investigate how much companies are willing to spend to obtain a PRV and how much companies would expect to receive for the sale of a PRV to another organization; estimates ranged from less than $50 million to more than $400 million.
- A model by David Ridley (Co-Author of the Original PRV Proposal) and Stephane A. Régnier (global director of health economics outcomes research for Novartis) estimates the value of a PRV based on three key effects:
    1. Capturing market share from competitors (a third of commercial value);
    2. Earlier sales of a new drug due to expedited review (half of commercial value);
    3. Extended time on the market before generic entry (less than a quarter of commercial value).
- Notably, the value of a PRV is sensitive to supply; if only one priority review voucher is available in a year, they are estimated to be worth more than $200 million, but if four vouchers are available, the value could fall below $100 million.

Sources: Canaccord Genuity Research, Ridley DB, Grabowski HG, Moe JL. Developing drugs for developing countries. Health Aff (Millwood). 2006 Mar-Apr;25(2):313-24. doi: 10.1377/hlthaff.25.2.313. PMID: 16522573.; Robertson AS, Stefanakis R, Joseph D, Moree M. The impact of the US priority review voucher on private-sector investment in global health research and development. PLoS Negl Trop Dis. 2012;6(8):e1750. doi: 10.1371/journal.pntd.0001750. Epub 2012 Aug 28. PMID: 22953004; PMCID: PMC3429395.; Ridley DB, Régnier SA. The Commercial Market For Priority Review Vouchers. Health Aff (Millwood). 2016 May 1;35(5):776-83. doi: 10.1377/hlthaff.2015.1314. PMID: 27140982.

Compilation of known RPD PRVs illustrates a range of prices

While there is no official FDA public record of all PRVs, the following table contains a representative sample of RPD PRVs

Company Selling PRV	RPD Indication for which PRV was granted	Drug	Price (million USD)	Buyer	Used For
Pharming Technologies	Activated PI3Kδ syndrome	Joenja	$21.20	Novartis	
BioMarin	Morquio A	Vimizim	$67.50	Regeneron/Sanofi	Praluent
Ultragenyx Pharma/Kyowa Kirin	X-linked hypophosphatemia	Crysvita	$80	Gilead	
Ultragenyx Pharma	X-linked hypophosphatemia	Crysvita	$81	Gilead	
Novimmune	hemophagocytic lymphohistiocytosis	Gamifant	$95	AstraZeneca	
Eiger BioPharmaceuticals	Progeria	Zokinvy	$95	AbbVie	Qulipta
Bluebird bio	Cerebral adrenoleukodystrophy	Skysona	$95	Bristol Myers Squibb	
Rhythm Pharmaceuticals	Genetic obesity	Imcivree	$100	Alexion	
Mallinckrodt	Deep Partial Thickness Thermal Burns	Stratagraft	$100	Novartis	
Krystal Biotech	Dystrophic epidermolysis bullosa	Vyjuvek	$100	Unknown	
Sarepta Therapeutics	Duchenne muscular dystrophy	Amondys 45	$102	Unknown	
Bluebird bio	Beta-thalassemia	Zynteglo	$102	Argenx	
Sarepta Therapeutics	Duchenne muscular dystrophy	Elevidys	$102	Unknown	
Biogen	Spinal muscular atrophy	Spinraza	$103	Unknown	
GW Research	Seizures associated with Lennox Gastaut-Syndrome and Dravet syndrome	Epidiolex	$105	Biohaven Pharma	Nurtec
Y-mAbs Therapeutics	Neuroblastoma	Danyelza	$105	United Therapeutics	Tyvaso
Prometic Bioproduction	Plasminogen deficiency type 1	Ryplazim	$105		
Albireo	Progressive familial intrahepatic cholestasis	Bylvay	$105	Ares Trading	
X4 Pharma	WHIM	Xolremdi	$105	Unknown	
Sarepta Therapeutics	Duchenne muscular dystrophy	Vyondys 53	$108	Vifor	Vafseo
Day One Biopharma	Glioma	Ojemda	$108	Incyte?	
Spark Therapeutics	Biallelic RPE65 mutation-associated retinal dystrophy	Luxturna	$110	Jazz Pharma	Xywav
BridgeBio Pharma/Origin Biosciences	Molybdenum cofactor deficiency	Nulibry	$110		
Mirum Pharma	Cholestatic pruritus	Livmarli	$110	Johnson & Johnson	
BioMarin	Achondroplasia	Voxzogo	$110	Eli Lilly	
Marinus Pharma	CDKL5 deficiency disorder	Ztalmy	$110	Novo Nordisk	
Sarepta Therapeutics	Duchenne muscular dystrophy	Exondys 51	$125	Gilead Science	Descovy
BioMarin	Batten disease	Brineura	$125	Novartis	Mayzent
Marathon Pharma	Duchenne muscular dystrophy	Emflaza	$130	GSK/ViiV	Juluca
Ultragenyx Pharma	Mucopolysaccharidosis type VII	Mepsevii	$130	Novartis	Beovu
Wellstat Therapeutics	Hereditary orotic aciduria	Xuriden	$150	Teva	Ajovy
Acadia Pharma	Rett Syndrome	Daybue	$150	Unknown	
Zevra Therapeutics	Niemann-Pick disease type C	Miplyffa	$150	Unknown	
PTC Therapeutics	Aromatic L-amino acid decarboxylase deficiency	Kebilidi	$150	Unknown	
Ipsen Biopharmaceuticals	Fibrodysplasia ossificans progressiva	Sohonos	$158	Unknown	
Asklepion Pharma/Retrophin	Bile acid synthesis disorders and peroxisomal disorders	Cholbam	$245	Sanofi	Soliqua
United Therapeutics	Neuroblastoma	Unituxin	$350	AbbVie	Rinvoq

Sources: Federal Register, GAO, Company Reports, Canaccord Genuity Research

The story behind the $350M PRV purchased by AbbVie

AbbVie's $350M investment on PRV Used for Rinvoq pays off

- In 2015 AbbVie acquired a PRV for $350 million from United Therapeutics, who received the PRV for Unituxin, a drug for neuroblastoma, a rare pediatric disease.
- At the time, there was only one voucher available and the company was heavily dependent on Humira for most of its income.
- Based on models described earlier, a $320 million voucher price is associated with fifth-year US drug sales of $1.25 billion, so it was clear that AbbVie expected to use the voucher for a "blockbuster" drug.
- The company reportedly used the United PRV for Rinvoq, which was approved for moderate to severe rheumatoid arthritis in 2019 (3 years after they bought the PRV).
- Since then, Rinvoq has also been approved for several other indications and as of 2Q25, Global Rinvoq Net Revenues Were $2.028 billion.

Sources: Canaccord Genuity Research, Morrison C. AbbVie buys last available priority voucher for $350 million. Nat Biotechnol. 2015 Nov;33(11):1120. doi: 10.1038/nbt1115-1120. PMID: 26544127.; Ridley DB, Régnier SA. The Commercial Market For Priority Review Vouchers. Health Aff (Millwood). 2016 May 1;35(5):776-83. doi: 10.1377/hlthaff.2015.1314. PMID: 27140982.

Where PRVs stand today

Status of the PRV program today

To qualify for a PRV, FDA approval of RPD drugs must be obtained by September 30, 2026

- At the end of 2024, Congress did not reauthorize the rare pediatric disease priority review program.
- The FDA began sunsetting the program as of December 20, 2024, which means the agency cannot award any new PRVs to drugs that do not already have a rare pediatric disease designation.
- Companies with existing pediatric designations will have to get their drugs approved by **September 30, 2026** to earn their priority review voucher.

Give Kids a Chance Act may extend that deadline another 5 years

- Bipartisan legislation was introduced in 2024 Congress to accelerate the development and availability of treatments for pediatric cancers and rare pediatric diseases.
- Aims to allow the FDA to authorize trials for drug combinations, reauthorize the RPD PRV program, and improve pediatric study requirements for drugs.
- The 2024 bill passed the House of Representatives but failed to pass the Senate and as a result was not included in a government funding bill in December 2024, causing the PRV program to expire on December 20, 2024.
- In early 2025, the legislation was reintroduced in both the House and the Senate.
- If the 2025 version of the bill passes, the RPD PRV program will be reauthorized for another 5 years, renewing the FDA's authority to award RPD PRVs through September 30, 2029.

Sources: FDA.gov, congress.gov, Canaccord Genuity Research

Companies under our coverage with pipeline candidates eligible for RPD PRVs

The following is a list of pipeline candidates from the companies we cover that have reportedly received RPD designations and are eligible for a PRV, but have not yet received FDA approval

Ticker	Indication with RPD Designations	Drug Candidate	Current Stage of Development	Anticipated future catalysts
ARCT	Orinithine Transcarbamylase Deficiency	ARCT-810	Phase 2	Phase 3 initiation 2026
	Cystic Fibrosis	ARCT-032	Phase 2	Phase 3 design 1H26
TSHA	Rett Syndrome	TSHA-102*	Pivotal	Part B patient enrollment 4Q25
VRTX	APOL1-mediated kidney disease (AMKD)	Inaxaplin (VX-147)*	Phase 3	Enrollment completion in by YE25
WVE	Duchenne Muscular Dystrophy	WVE-N531	Phase 2	NDA/CTA submission 2026
RARE	Sanfilippo syndrome type A	UX111*	Phase 3	Resubmit BLA upon resolving CRL (approval expected in 2026)
	Osteogenesis imperfecta	Setrusamab (UX143)*	Phase 3	Phase 3 final analysis by YE25
	Glycogen Storage Disease type Ia	DTX401*	Phase 3	BLA submission in 4Q25
RCKT	Dannon Disease	RP-A501	Phase 2 Pivotal	Hold recently lifted; completion TBD
	Leukocyte Adhesion Deficiency Type I	RP-L201 (Kresladi)*	Registrational	Submission of complete BLA to resolve CRL YE25
	Fanconi Anemia	RP-L102	On Pause	Paused due to corporate restructuring and pipeline prioritization
TNYA	MYBPC3 associated hypertrophic cardiomyopathy	TN-201	Phase 1	Data update in 4Q25

* Should the 2025 version of the Give Kids a Chance Act fail to pass and the deadline remain September 30, 2026, the starred candidates may still have a chance of obtaining a PRV.

Sources: Company press releases, SEC Filings, Canaccord Genuity Research

Appendix: Important Disclosures

Analyst Certification

Each authoring analyst of Canaccord Genuity whose name appears on the front page of this research hereby certifies that (i) the recommendations and opinions expressed in this research accurately reflect the authoring analyst's personal, independent and objective views about any and all of the designated investments or relevant issuers discussed herein that are within such authoring analyst's coverage universe and (ii) no part of the authoring analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by the authoring analyst in the research, and (iii) to the best of the authoring analyst's knowledge, she/he is not in receipt of material non-public information about the issuer.

Analysts employed outside the US are not registered as research analysts with FINRA. These analysts may not be associated persons of Canaccord Genuity LLC and therefore may not be subject to the FINRA Rule 2241 and NYSE Rule 472 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.

Sector Coverage

Individuals identified as "Sector Coverage" cover a subject company's industry in the identified jurisdiction, but are not authoring analysts of the report.

Investment Recommendation

Date and time of first dissemination: September 08, 2025, 14:20 ET

Date and time of production: September 08, 2025, 14:20 ET

Compendium Report

This report covers six or more subject companies and therefore is a compendium report and Canaccord Genuity and its affiliated companies hereby direct the reader to the specific disclosures related to the subject companies discussed in this report, which may be obtained at the following website (provided as a hyperlink if this report is being read electronically) http://disclosures.canaccordgenuity.com/EN/Pages/default.aspx; or by sending a request to Canaccord Genuity Corp. Research, Attn: Disclosures, P.O. Box 10337 Pacific Centre, 2200-609 Granville Street, Vancouver, BC, Canada V7Y 1H2; or by sending a request by email to disclosures@cgf.com. The reader may also obtain a copy of Canaccord Genuity's policies and procedures regarding the dissemination of research by following the steps outlined above.

Past performance

In line with Article 44(4)(b), MiFID II Delegated Regulation, we disclose price performance for the preceding five years or the whole period for which the financial instrument has been offered or investment service provided where less than five years. Please note price history refers to actual past performance, and that past performance is not a reliable indicator of future price and/or performance.

Distribution of Ratings:

Global Stock Ratings (as of 09/08/25)

Rating	Coverage Universe		IB Clients
	#	%	%
Buy	640	69.87%	26.56%
Hold	132	14.41%	6.82%
Sell	6	0.66%	0.00%
Speculative Buy	133	14.52%	60.15%
	916*	100.0%	

*Total includes stocks that are Under Review

Canaccord Genuity Ratings System

BUY: The stock is expected to generate returns greater than 10% during the next 12 months.

HOLD: The stock is expected to generate returns from -10% to 10% during the next 12 months.

SELL: The stock is expected to generate returns less than -10% during the next 12 months.

NOT RATED: Canaccord Genuity does not provide research coverage of the relevant issuer.

Given the inherent volatility of some stocks under coverage, price targets for some stocks may imply target returns that vary temporarily from the ratings criteria above.

*As of January 1, 2024, the Ratings History Chart will reflect the new Canaccord Genuity Ratings System as defined above.

Risk Qualifier

SPECULATIVE: The stock bears significantly above-average risk and volatility. Investments in the stock may result in material loss.

12-Month Recommendation History (as of date same as the **Global Stock Ratings** table)

A list of all the recommendations on any issuer under coverage that was disseminated during the preceding 12-month period may be obtained at the following website (provided as a hyperlink if this report is being read electronically) http://disclosures-mar.canaccordgenuity.com/EN/Pages/default.aspx

General Disclaimers

See "Required Company-Specific Disclosures" above for any of the following disclosures required as to companies referred to in this report: manager or co-manager roles; 1% or other ownership; compensation for certain services; types of client relationships; research analyst conflicts; managed/co-managed public offerings in prior periods; directorships; market making in equity securities and related derivatives. For reports identified above as compendium reports, the foregoing required company-specific disclosures can be found in a hyperlink located in the section labeled, "Compendium Reports." "Canaccord Genuity" is the business name used by certain wholly owned subsidiaries of Canaccord Genuity Group Inc., including Canaccord Genuity LLC, Canaccord Genuity Limited, Canaccord Genuity Corp., and Canaccord Genuity (Australia) Limited, an affiliated company that is 80%-owned by Canaccord Genuity Group Inc.

The authoring analysts who are responsible for the preparation of this research are employed by Canaccord Genuity Corp. a Canadian broker-dealer with principal offices located in Vancouver, Calgary, Toronto, Montreal, or Canaccord Genuity LLC, a US broker-dealer with principal offices located in New York, Boston, San Francisco and Houston, or Canaccord Genuity Limited., a UK broker-dealer with principal offices located in London (UK) and Dublin (Ireland), or Canaccord Genuity (Australia) Limited, an Australian broker-dealer with principal offices located in Sydney and Melbourne.

The authoring analysts who are responsible for the preparation of this research have received (or will receive) compensation based upon (among other factors) the Investment Banking revenues and general profits of Canaccord Genuity. However, such authoring analysts have not received, and will not receive, compensation that is directly based upon or linked to one or more specific Investment Banking activities, or to recommendations contained in the research.

Some regulators require that a firm must establish, implement and make available a policy for managing conflicts of interest arising as a result of publication or distribution of research. This research has been prepared in accordance with Canaccord Genuity's policy on managing conflicts of interest, and information barriers or firewalls have been used where appropriate. Canaccord Genuity's policy is available upon request.

The information contained in this research has been compiled by Canaccord Genuity from sources believed to be reliable, but (with the exception of the information about Canaccord Genuity) no representation or warranty, express or implied, is made by Canaccord Genuity, its affiliated companies or any other person as to its fairness, accuracy, completeness or correctness. Canaccord Genuity has not independently verified the facts, assumptions, and estimates contained herein. All estimates, opinions and other information contained in this research constitute Canaccord Genuity's judgement as of the date of this research, are subject to change without notice and are provided in good faith but without legal responsibility or liability.

From time to time, Canaccord Genuity salespeople, traders, and other professionals provide oral or written market commentary or trading strategies to our clients and our principal trading desk that reflect opinions that are contrary to the opinions expressed in this research. Canaccord Genuity's affiliates, principal trading desk, and investing businesses also from time to time make investment decisions that are inconsistent with the recommendations or views expressed in this research.

This research is provided for information purposes only and does not constitute an offer or solicitation to buy or sell any designated investments discussed herein in any jurisdiction where such offer or solicitation would be prohibited. As a result, the designated investments discussed in this research may not be eligible for sale in some jurisdictions. This research is not, and under no circumstances should be construed as, a solicitation to act as a securities broker or dealer in any jurisdiction by any person or company that is not legally permitted to carry on the business of a securities broker or dealer in that jurisdiction. This material is prepared for general circulation to clients and does not have regard to the investment objectives, financial situation or particular needs of any particular person. Investors should obtain advice based on their own individual circumstances before making an investment decision. To the fullest extent permitted by law, none of Canaccord Genuity, its affiliated companies or any other person accepts any liability whatsoever for any direct or consequential loss arising from or relating to any use of the information contained in this research.

Research Distribution Policy

Canaccord Genuity research is posted on the Canaccord Genuity Research Portal and will be available simultaneously for access by all of Canaccord Genuity's customers who are entitled to receive the firm's research. In addition research may be distributed by the firm's sales and trading personnel via email, instant message or other electronic means. Customers entitled to receive research may also receive it via third party vendors. Until such time as research is made available to Canaccord Genuity's customers as described above, Authoring Analysts will not discuss the contents of their research with Sales and Trading or Investment Banking employees without prior compliance consent.

For further information about the proprietary model(s) associated with the covered issuer(s) in this research report, clients should contact their local sales representative.

Short-Term Trade Ideas

Research Analysts may, from time to time, discuss "short-term trade ideas" in research reports. A short-term trade idea offers a near-term view on how a security may trade, based on market and trading events or catalysts, and the resulting trading opportunity that may be available. Any such trading strategies are distinct from and do not affect the analysts' fundamental equity rating for such stocks. A short-term trade idea may differ from the price targets and recommendations in our published research reports that

reflect the research analyst's views of the longer-term (i.e. one-year or greater) prospects of the subject company, as a result of the differing time horizons, methodologies and/or other factors. It is possible, for example, that a subject company's common equity that is considered a long-term 'Hold' or 'Sell' might present a short-term buying opportunity as a result of temporary selling pressure in the market or for other reasons described in the research report; conversely, a subject company's stock rated a long-term 'Buy' or "Speculative Buy' could be considered susceptible to a downward price correction, or other factors may exist that lead the research analyst to suggest a sale over the short-term. Short-term trade ideas are not ratings, nor are they part of any ratings system, and the firm does not intend, and does not undertake any obligation, to maintain or update short-term trade ideas. Short-term trade ideas are not suitable for all investors and are not tailored to individual investor circumstances and objectives, and investors should make their own independent decisions regarding any securities or strategies discussed herein. Please contact your salesperson for more information regarding Canaccord Genuity's research.

For Canadian Residents:

This research has been approved by Canaccord Genuity Corp., which accepts sole responsibility for this research and its dissemination in Canada. Canaccord Genuity Corp. is registered and regulated by the Canadian Investment Regulatory Organization (CIRO) and is a Member of the Canadian Investor Protection Fund. Canadian clients wishing to effect transactions in any designated investment discussed should do so through a qualified salesperson of Canaccord Genuity Corp. in their particular province or territory.

For United States Persons:

Canaccord Genuity LLC, a US registered broker-dealer, accepts responsibility for this research and its dissemination in the United States. This research is intended for distribution in the United States only to certain US institutional investors. US clients wishing to effect transactions in any designated investment discussed should do so through a qualified salesperson of Canaccord Genuity LLC. Analysts employed outside the US, as specifically indicated elsewhere in this report, are not registered as research analysts with FINRA. These analysts may not be associated persons of Canaccord Genuity LLC and therefore may not be subject to the FINRA Rule 2241 and NYSE Rule 472 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.

For United Kingdom and European Residents:

This research is distributed in the United Kingdom and elsewhere Europe, as third party research by Canaccord Genuity Limited, which is authorized and regulated by the Financial Conduct Authority. This research is for distribution only to persons who are Eligible Counterparties or Professional Clients only and is exempt from the general restrictions in section 21 of the Financial Services and Markets Act 2000 on the communication of invitations or inducements to engage in investment activity on the grounds that it is being distributed in the United Kingdom only to persons of a kind described in Article 19(5) (Investment Professionals) and 49(2) (High Net Worth companies, unincorporated associations etc) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (as amended). It is not intended to be distributed or passed on, directly or indirectly, to any other class of persons. This material is not for distribution in the United Kingdom or elsewhere in Europe to retail clients, as defined under the rules of the Financial Conduct Authority.

For Jersey, Guernsey and Isle of Man Residents:

This research is sent to you by Canaccord Genuity Wealth (International) Limited (CGWI) for information purposes and is not to be construed as a solicitation or an offer to purchase or sell investments or related financial instruments. This research has been produced by an affiliate of CGWI for circulation to its institutional clients and also CGWI. Its contents have been approved by CGWI and we are providing it to you on the basis that we believe it to be of interest to you. This statement should be read in conjunction with your client agreement, CGWI's current terms of business and the other disclosures and disclaimers contained within this research. If you are in any doubt, you should consult your financial adviser.

CGWI is licensed and regulated by the Guernsey Financial Services Commission, the Jersey Financial Services Commission and the Isle of Man Financial Supervision Commission. CGWI is registered in Guernsey and is a wholly owned subsidiary of Canaccord Genuity Group Inc.

For Australian Residents:

This research is distributed in Australia by Canaccord Genuity (Australia) Limited ABN 19 075 071 466 holder of AFS Licence No 234666. To the extent that this research contains any advice, this is limited to general advice only. Recipients should take into account their own personal circumstances before making an investment decision. Clients wishing to effect any transactions in any financial products discussed in the research should do so through a qualified representative of Canaccord Genuity (Australia) Limited or its Wealth Management affiliated company, Canaccord Genuity Financial Limited ABN 69 008 896 311 holder of AFS Licence No 239052. This report should be read in conjunction with the Financial Services Guide available here - Financial Services Guide.

For Hong Kong Residents:

This research is distributed in Hong Kong by Canaccord Genuity (Hong Kong) Limited which is licensed by the Securities and Futures Commission. This research is only intended for persons who fall within the definition of professional investor as defined in the Securities and Futures Ordinance. It is not intended to be distributed or passed on, directly or indirectly, to any other class of persons. Recipients of this report can contact Canaccord Genuity (Hong Kong) Limited. (Contact Tel: +852 3919 2561) in respect of any matters arising from, or in connection with, this research.

Additional information is available on request.