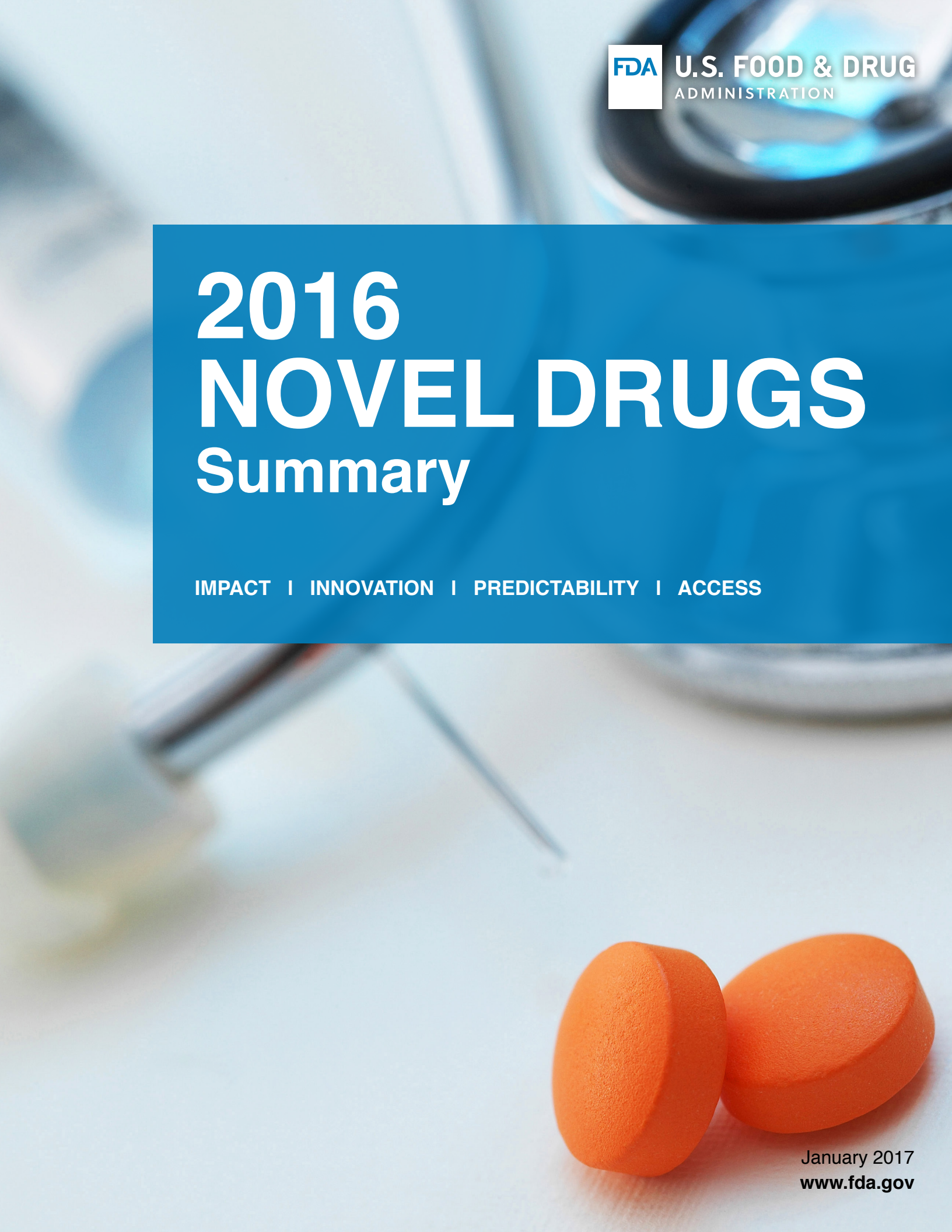

U.S. FOOD & DRUG ADMINISTRATION

2016 NOVEL DRUGS
Summary

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January 2017
www.fda.gov

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INTRODUCTION

Welcome to the FDA's Center for Drug Evaluation and Research's (CDER's) sixth annual Novel Drugs Summary.

Each year, CDER approves hundreds of new medications, most of which are variations of previously existing products, such as important new dosage forms of already-approved products, or cost-saving generic formulations. These new products contribute to quality of care, greater access to medication, more consumer choice, and a competitive marketplace that enhances affordability and public health. However, a small subset of these new approvals, referred to as **novel drugs**, are among the more innovative products that often help advance clinical care to another level. At the end of each calendar year, CDER summarizes these new products.

Our annual summary reports the number of novel drugs approved. However, we also focus on the medical value of many of these new drugs, their contributions to enhanced patient care, and the various regulatory tools CDER used to help ensure their safe and efficient development and approval. In 2016, novel approvals include the first treatment for patients with spinal muscular atrophy, the first drug approved to treat Duchenne muscular dystrophy, a new drug to treat hallucinations and delusions in some people with Parkinson's disease, a new drug to treat patients with a rare chronic liver disease known as primary biliary cirrhosis, and two new treatments for patients with hepatitis C. The field also includes new treatments for patients with ovarian cancer, bladder cancer, soft tissue sarcoma, and chronic lymphocytic leukemia --- as well as two new diagnostic agents for detecting certain forms of cancer.

All of these newly approved products were required to meet our rigorous premarket safety standards --- and they will all be part of a strong postmarket safety surveillance system watching how they perform after they are more widely used by larger patient populations. Complementing this year's summary of novel approvals is CDER's recent report titled, Drug Safety Priorities 2015-2016, which details the Center's key safety priorities as well as the depth and versatility of drug safety initiatives across CDER and the FDA. The report includes program updates and milestones achieved since the start of 2015, describing a variety of the FDA's most important efforts in drug safety science, surveillance, and oversight.

We hope our Novel Drugs summary provides an appreciation of the expected impact that many of the novel drug approvals of 2016 will have on patient care, as well as the valuable role CDER played in helping to bring these drugs to market.

Janet Woodcock, M.D.

Director, Center for Drug Evaluation and Research

CDER'S 2016 NOVEL DRUG APPROVALS

22 novel drugs

In calendar year 2016, FDA's Center for Drug Evaluation and Research (CDER) approved 22 novel drugs, approved either as new molecular entities (NMEs) under New Drug Applications (NDAs), or as new therapeutic biologics under Biologics License Applications (BLAs). Below lists CDER's novel drug approvals of 2016.*

In 2016 CDER approved 22 novel drugs

Novel drugs are often innovative products that serve previously unmet medical needs or otherwise significantly help to advance patient care and public health. NMEs have chemical structures that have never been approved before. However, in some cases an NME may have actions similar to earlier drugs and may not necessarily offer unique clinical advantages over existing therapies. This report summarizes all of the 2016 NME and novel BLA approvals, emphasizing those that offer new and innovative treatments to patients in need.

The vertical bars in the graph to the right indicate the number of novel drugs approved by CDER in each year of the past decade. CDER approved 22 novel drugs in 2016. From 2007 through 2015, CDER has averaged about 30 novel drug approvals per year.

Applications for new approvals remain steady

CDER approved a lower than average number of novel drugs in 2016, but the number of applications for these drugs that sponsors have submitted over time has remained relatively stable.

The shaded portion of the graph to the right indicates the number of new NDA and BLA applications for NMEs and new therapeutic biologics CDER has received and filed for approval during the last 10 years. From 2007 through 2015, CDER filed an average of about 36 applications for novel drugs per year. CDER estimates 41 filings for 2016, which is consistent with previous years in this decade.

Novel Drugs Approved by CDER in Calendar Year 2016 (see pages 14-15 for their non-proprietary names, approval dates, and what they are used for.)

Adlyxin	Epclusa	Ocaliva	Xiidra
Anthim	Eucrisa	Rubraca	Zepatier
Axumin	Exondys 51	Spinraza	Zinbryta
Briviact	Lartruvo	Taltz	Zinplava
Cinqair	Netspot	Tecentriq	
Defitelio	Nuplazid	Venclexta	

* This information is accurate as of December 31, 2016. In rare instances, it may be necessary for FDA to change a drug's NME designation or the status of its application as a novel BLA. For instance, new information may become available which could lead to a reconsideration of the original designation or status. If changes must be made to a drug's designation or the status of an application as a novel BLA, the Agency intends to communicate the nature of, and the reason for, any revisions as appropriate.

For more details about the individual novel drugs, see pages 14-15.

22

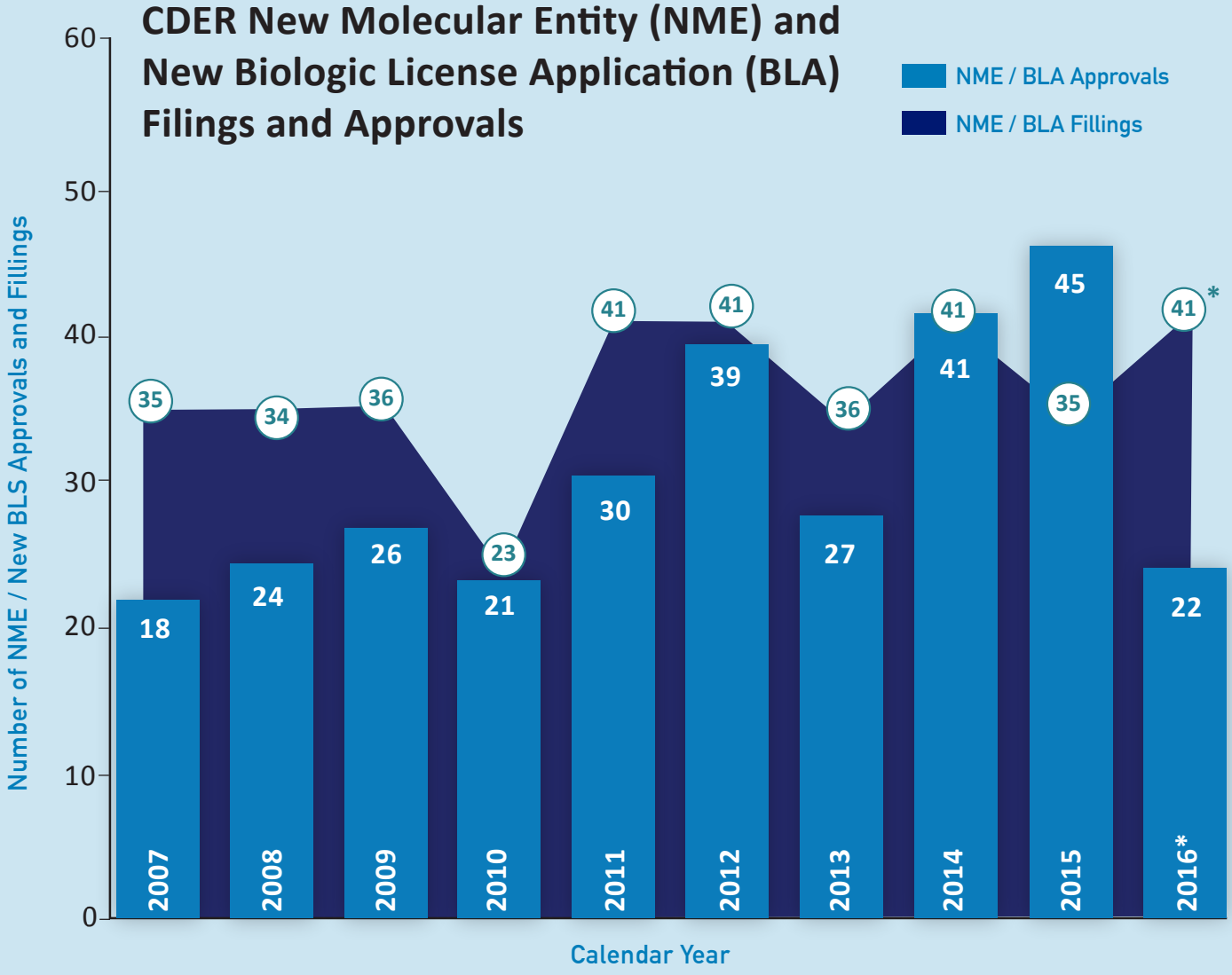
novel drug approvals in CY 2016 is less than the average number approved annually during the past decade

From 2007 through 2015 CDER averaged about

30

novel drug approvals per year

CDER New Molecular Entity (NME) and New Biologic License Application (BLA) Filings and Approvals



*The 2016 filed numbers include those filed in CY 2016 plus those currently pending filing (i.e., within their 60 day filing period) in CY 2016.

- Receipts that received a "Refuse to File" (RTF) or "Withdrawn before filing" (WF) identifier are excluded.
- Multiple submissions (multiple or split originals) pertaining to a single new molecular/biologic entity are only counted once.
- The filed number is not indicative of workload in the PDUFA V Program.

For more details about the individual novel drugs, see pages 14-15.

IMPACT

Impact on Public Health

Many of the 22 novel drugs CDER approved in 2016 are notable for their potential positive impact and unique contributions to quality medical care and public health.

First-in-Class

CDER identified eight of the 22 novel drugs approved in 2016 (36%) as First-in-Class, which is one indicator of the innovative nature of a drug. These drugs often have mechanisms of action different from those of existing therapies.

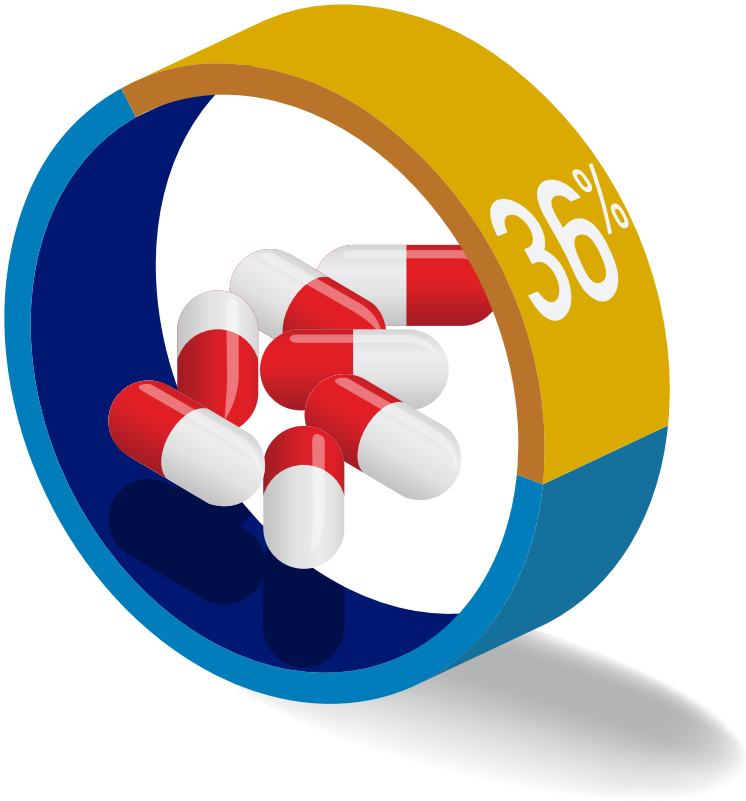
Defitelio Exondys 51 Ocaliva Spinraza Venclexta Xiidra Zinbryta Zinplava

Noteworthy First-in-Class products include:

Defitelio - To treat adults and children who develop hepatic veno-occlusive disease with additional kidney or lung abnormalities after they receive a stem cell transplant from blood or bone marrow called hematopoietic stem cell transplantation

Zinbryta - To treat multiple sclerosis

36%
First-in-Class Drugs



For more details about the individual novel drugs, see pages 14-15.

Drugs for Rare Diseases

Nine of the 22 novel drugs approved in 2016 (41%) were approved to treat rare or "orphan" diseases that affect 200,000 or fewer Americans. This is significant because patients with rare diseases often have few or no drugs available to treat their conditions.

Anthim Defitelio Exondys 51 Lartruvo Netspot Ocaliva Rubraca Spinraza Venclexta

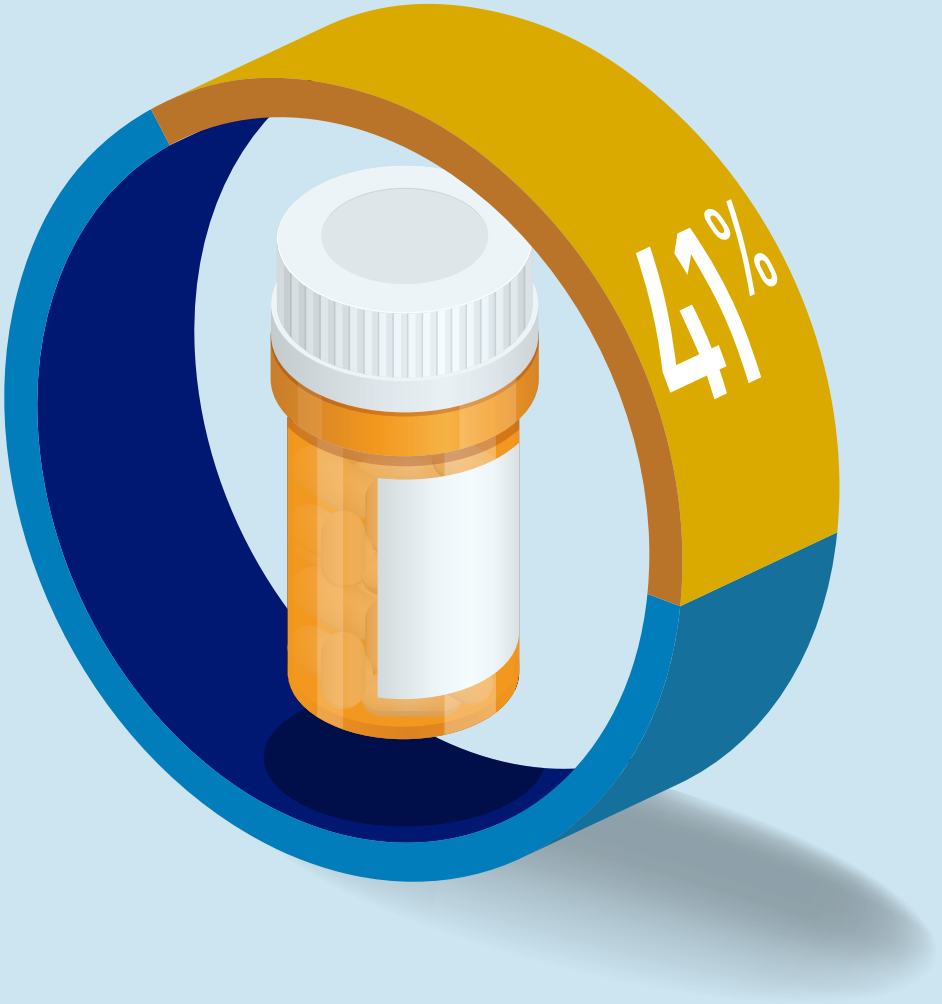
Noteworthy examples of drugs to treat rare diseases among the 2016 novel drugs include:

Exondys 51 - To treat patients with Duchenne muscular dystrophy

Spinraza - For treatment of patients with spinal muscular atrophy

41%

Rare or "Orphan" Diseases



For more details about the individual novel drugs, see pages 14-15.

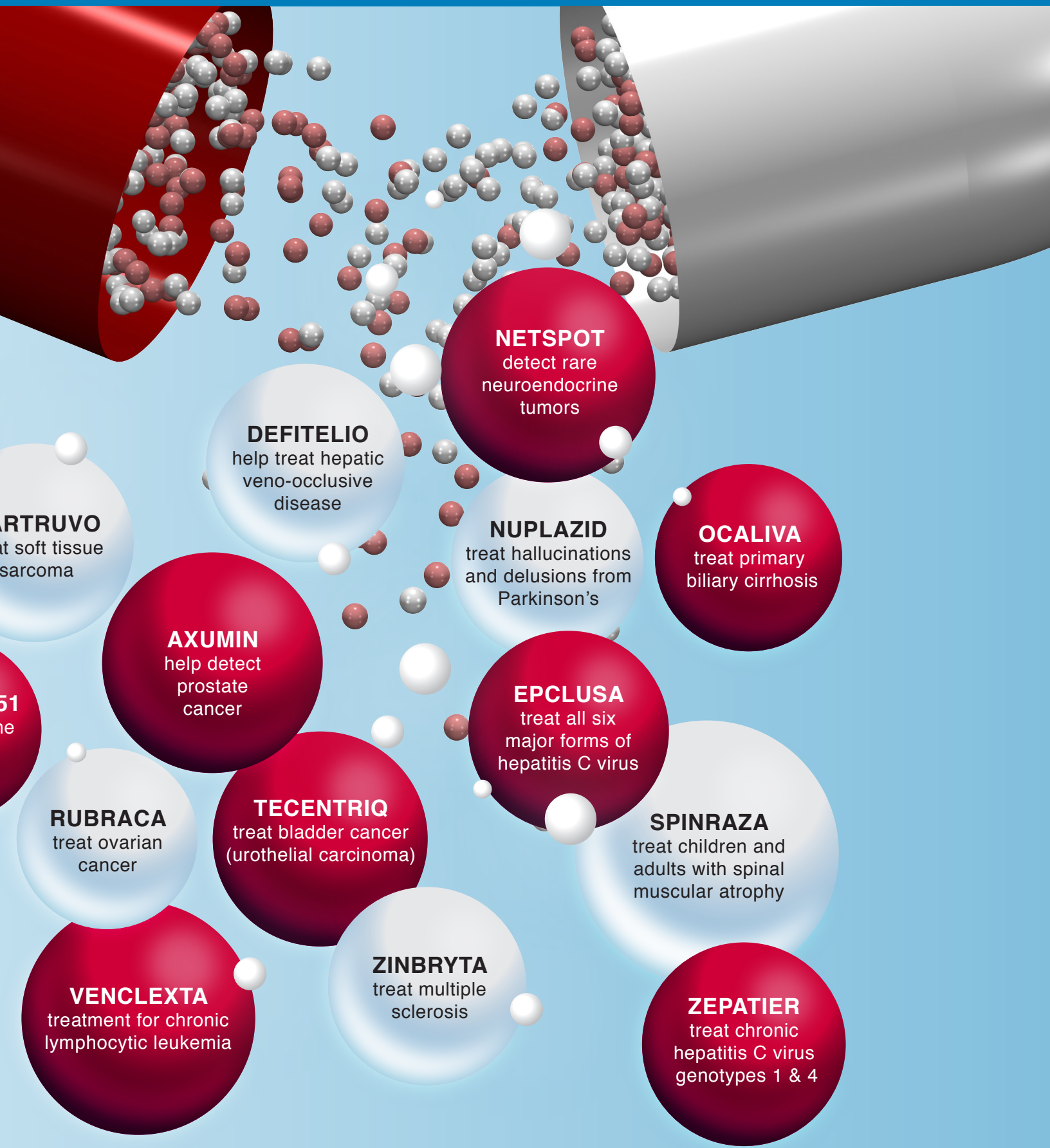
OTHER NOTEWORTHY NOVEL DRUGS OF 2016:

In addition to the noteworthy examples of innovative First-in-Class and "orphan" new products mentioned on pages 4 and 5, the 2016 novel drug field also includes a variety of other notable drugs. These include cancer therapies: **Lartruvo** to treat patients with a form of cancer called soft tissue sarcoma; **Rubraca**, to treat women with ovarian cancer; **Tecentriq**, to treat patients with the most common type of bladder cancer (urothelial carcinoma), and **Venclexta**, for certain patients with chronic lymphocytic leukemia. Also notable are two diagnostic agents, **Axumin**, which is an imaging agent used to help detect prostate cancer, and **Netspot**, another imaging agent used to detect rare neuroendocrine tumors.

This year's novel approvals also include two new treatments for hepatitis C --- **Epclusa**, to treat all six major forms of hepatitis C virus; and **Zepatier**, to treat adult patients infected with chronic hepatitis C virus genotypes 1 and 4.

Additional noteworthy approvals include **Nuplazid**, to treat hallucinations and delusions associated with psychosis experienced by some people with Parkinson's disease, and **Ocaliva**, to treat patients with a rare chronic liver disease known as primary biliary cirrhosis.

For more details about the individual novel drugs, see pages 14-15.



For more details about the individual novel drugs, see pages 14-15.

INNOVATION

Methods for expediting innovative novel drugs to market

CDER used a number of regulatory methods to expedite the development and approval of novel drugs in 2016, including: Fast Track, Breakthrough, Priority Review, and Accelerated Approval.

Fast Track

Fast Track drugs have the potential to address unmet medical needs. Eight of the 2016 novel drugs (36%) were designated by CDER as Fast Track. Fast Track speeds new drug development and review, for instance, by increasing the level of communication FDA allocates to drug developers and by enabling CDER to review portions of a drug application ahead of the submission of the complete application.

Anthim Defitelio Epclusa Exondys 51 Lartruvo Ocaliva Spinraza Zinplava

Breakthrough

Breakthrough therapies are drugs with preliminary clinical evidence demonstrating that the drug may result in substantial improvement on at least one clinically significant endpoint (e.g., study result) over other available therapies. CDER designated seven of the 2016 novel drugs (32%) as Breakthrough therapies. A breakthrough therapy designation includes all of the Fast Track program features, as well as more intensive FDA guidance on an efficient drug development program. Breakthrough status is designed to help shorten the development time of a potential new therapy.

Epclusa Lartruvo Nuplazid Rubraca Tecentriq Venclexta Zepatier

Priority Review

A drug receives a Priority Review if CDER determines that the drug could potentially provide a significant advance in medical care. The drug is reviewed within six months instead of the standard 10 months. Fifteen of the 2016 novel drugs (68%) were designated Priority Review.

Axumin Defitelio Epclusa Exondys 51 Lartruvo Netspot Nuplazid Ocaliva
Rubraca Spinraza Tecentriq Venclexta Xiidra Zepatier Zinplava

Accelerated Approval

The Accelerated Approval program allows for early approval of a drug for serious or life threatening illness that offers a benefit over current treatments. CDER approved six of the 2016 novel drugs (27%) under the Accelerated Approval program. This approval is based on a "surrogate endpoint" (e.g., a laboratory measure) or other clinical measure that we consider reasonably likely to predict a clinical benefit of the drug. Once Accelerated Approval is granted, the drug must undergo additional testing to confirm that benefit. This speeds the availability of the drug to patients who need it.

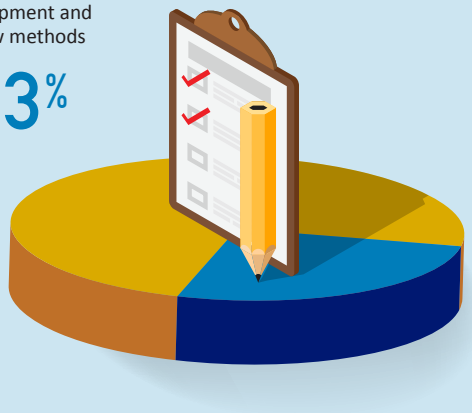
Exondys 51 Lartruvo Ocaliva Rubraca Tecentriq Venclexta

For more details about the individual novel drugs, see pages 14-15.

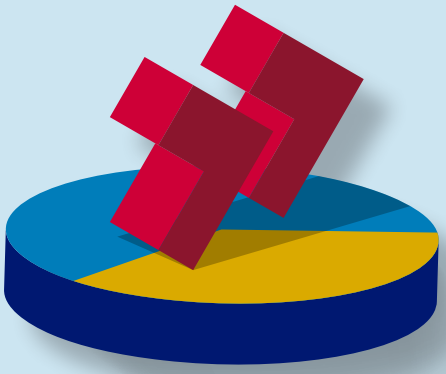
Overall use of expedited development and review methods

Sixteen of the 2016 novel drugs (73%) were designated in one or more expedited categories of Fast Track, Breakthrough, Priority Review, and/or Accelerated Approval. Each of these designations helps expedite the speed of the development and/or approval process and is designed to help bring important medications to the market as quickly as possible.

One or more expedited development and review methods **73%**



Anthim	Axumin	Defitelio	Epclusa	Exondys 51	Lartruvo
Netspot	Nuplazid	Ocaliva	Rubraca	Spinraza	Tecentriq
Venclexta	Xiidra	Zepatier	Zinplava		



Fast Track 36%

Priority Review 68%

Breakthrough 32%

Accelerated Approval 27%

For more details about the individual novel drugs, see pages 14-15.

PREDICTABILITY

- Adlyxin
- Anthim
- Axumin
- Briviact
- Cinqair
- Defitelio
- Epclusa
- Eucrisa
- Lartruvo
- Netspot
- Nuplazid
- Ocaliva
- Rubraca
- Spinraza
- Taltz
- Tecentriq
- Venclexta
- Xiidra
- Zepatier
- Zinbryta
- Zinplava

PDUFA Goal Dates Met

Under the Prescription Drug User Fee Act (PDUFA), sponsors are assessed user fees that provide FDA with the additional resources needed to meet performance goals. Throughout the year, CDER was able to meet or exceed most PDUFA goal dates for application review, agreed to with the pharmaceutical industry and approved by Congress. In 2016, CDER met its PDUFA goal dates for 95% of the novel drugs approved (21 of 22).

In
2016
CDER met its PDUFA goal
for
95%
of the novel drugs
approved in
2016

For more details about
novel drugs,
see pages 14-15.

ACCESS

First Cycle Approval

CDER approved 21 of the novel drugs of 2016 (95%) on the "first cycle" of review, meaning without requests for additional information that would delay approval and lead to another cycle of review.

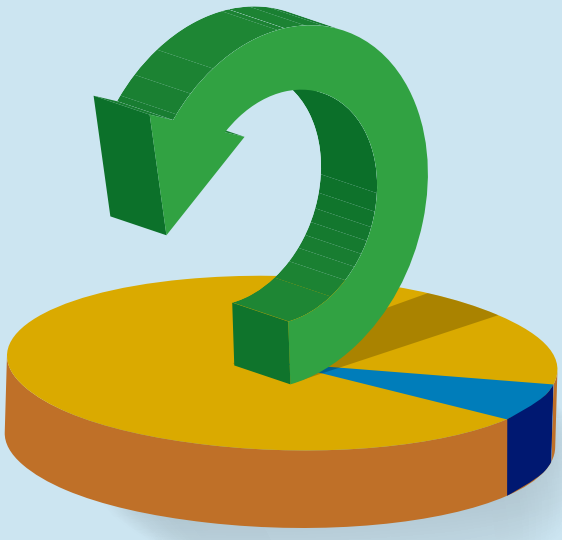
Adlyxin	Anthim	Axumin	Briviact	Cinqair	Defitelio	Epclusa
Eucrisa	Exondys 51	Lartruvo	Netspot	Nuplazid	Ocaliva	Rubraca
Spinraza	Taltz	Tecentriq	Venclexta	Zepatier	Zinbryta	Zinplava

Approval in the U.S. Before Other Countries

Comparing approval to other countries offers another measure of approval efficiency. Although regulatory processes differ widely between FDA and those of regulatory agencies in other countries, 19 of the 22 novel drugs approved in 2016 (86%) were approved in the United States before receiving approval in any other country.

Anthim	Axumin	Cinqair	Epclusa	Eucrisa	Exondys 51	Lartruvo	Netspot	Nuplazid	Ocaliva
Rubraca	Spinraza	Taltz	Tecentriq	Venclexta	Xiidra	Zepatier	Zinbryta	Zinplava	

95%
First Cycle Approval



86%
Approved First in U.S.

For more details about the individual novel drugs, see pages 14-15.

CONCLUSION

This document represents a broad overview of CDER approvals of novel drugs for calendar year 2016.

A continuing upward trend for the annual number of CDER's novel drug approvals relies on a corresponding increase in the number of drug applications submitted for approval. During the past decade, submissions of applications for NMEs and novel BLAs by the pharmaceutical and biotechnology industry have remained relatively stable.

More important than the quantity of novel drugs approved in 2016 are the qualities of the new drugs the pharmaceutical industry has developed and the important new roles these drugs are serving to advance medical care.

Also noteworthy is the efficiency with which most of these drugs were reviewed and approved. CDER used a variety of expedited development and review regulatory tools in an effort to help speed these drugs to market.

In all cases, while striving for efficiency of review and approval of applications for new drugs, CDER maintains its rigorous standards for demonstration of effectiveness and safety in the process.

More important than the quantity of novel drugs approved by CDER in 2016 is their medical value and the important new roles they are serving to advance patient care.

For more details about the individual novel drugs, see pages 14-15.

Drug Designation Summary

Approval Date	Trade Name	First-in-Class	Orphan	Fast Track	Breakthrough	Priority Review	Accelerated Approval	Met PDUFA Goal Dates	First Cycle	First Approved in U.S.	Dosage Form
07/27/16	Adlyxin										Injection
03/18/16	Anthim										Injection
05/27/16	Axumin										Injection
02/18/16	Briviact										Tablet; Injection
03/23/16	Cinqair										Injection
03/30/16	Defitelio										Injection
06/28/16	Epclusa										Tablet
12/14/16	Eucrisa										Ointment
09/19/16	Exondys 51										Injection
10/19/16	Lartruvo										Injection
06/01/16	Netspot										Injection
04/29/16	Nuplazid										Tablet
05/27/16	Ocaliva										Tablet
12/16/16	Rubraca										Tablet
12/23/16	Spinraza										Injection
03/22/16	Taltz										Injection
05/18/16	Tecentriq										Injection
04/11/16	Venclexta										Tablet
07/11/16	Xiidra										Ophthalmic Solution
01/28/16	Zepatier										Tablet
05/27/16	Zinbryta										Injection
10/21/16	Zinplava										Injection

For more details about the individual novel drugs, see pages 14-15.

THE NOVEL DRUGS OF 2016

CDER's Novel Drug Approvals of 2016 (Listed in order of approval date).

Drug Name	Active Ingredient	Approval Date	What it is used for
Zepatier	elbasvir; grazoprevir	01/28/2016	To treat patients with chronic hepatitis C virus (HCV) genotypes 1 and 4 infections in adult patients.
Briviact	brivaracetam	02/18/2016	To treat partial onset seizures in patients age 16 years and older with epilepsy.
Anthim	obiltoxaximab	03/18/2016	To treat inhalational anthrax in combination with appropriate antibacterial drugs.
Taltz	ixekizumab	03/22/2016	To treat adults with moderate-to-severe plaque psoriasis.
Cinqair	reslizumab	03/23/2016	To treat severe asthma
Defitelio	defibrotide sodium	03/30/2016	To treat adults and children who develop hepatic veno-occlusive disease with additional kidney or lung abnormalities after they receive a stem cell transplant from blood or bone marrow called hematopoietic stem cell transplantation
Venclexta	venetoclax	04/11/2016	For chronic lymphocytic leukemia in patients with a specific chromosomal abnormality
Nuplazid	pimavanserin	04/29/2016	To treat hallucinations and delusions associated with psychosis experienced by some people with Parkinson's disease
Tecentriq	atezolizumab	05/18/2016	To treat urothelial carcinoma, the most common type of bladder cancer
Axumin	fluciclovine F-18	05/27/2016	A new diagnostic imaging agent to detect recurrent prostate cancer
Ocaliva	obeticholic acid	05/27/2016	To treat rare, chronic liver disease known as primary biliary cirrhosis
Zinbryta	daclizumab	05/27/2016	To treat multiple sclerosis
Netspot	gallium Ga 68 dotatate	06/01/2016	A diagnostic imaging agent to detect rare neuroendocrine tumors

Drug Name	Active Ingredient	Approval Date	What it is used for
Epclusa	sofosbuvir; velpatasvir	06/28/2016	To treat all six major forms of hepatitis C virus
Xiidra	lifitegrast	07/11/2016	To treat the signs and symptoms of dry eye disease
Adlyxin	lixisenatide	07/27/2016	To improve glycemic control (blood sugar levels)
Exondys 51	eteplirsen	09/19/2016	To treat patients with Duchenne muscular dystrophy
Lartruvo	olaratumab	10/19/2016	To treat adults with certain types of soft tissue sarcoma
Zinplava	bezlotoxumab	10/21/2016	To reduce the recurrence of Clostridium difficile infection in patients aged 18 years or older
Eucrisa	crisaborole	12/14/2016	To treat mild to moderate eczema (atopic dermatitis) in patients two years of age and older
Rubraca	rucaparib	12/19/2016	To treat women with a certain type of ovarian cancer
Spinraza	nusinersen	12/23/2016	To treat children and adults with spinal muscular atrophy (SMA)

New Molecular Entity and New Therapeutic Biological Product Approvals for 2016
http://www.fda.gov/Drugs/DevelopmentApprovalProcess/DrugInnovation/ucm483775.htm

DRUG DESIGNATION REVIEW

First-in-Class

Drugs with a new and unique mechanism for treating a medical condition

Orphan Drugs

Drugs approved for small populations of patients with rare diseases

Breakthrough

A drug with preliminary clinical evidence demonstrating that it may result in substantial improvement on at least one clinically significant endpoint over available therapies.

Fast Track

Drugs that can treat unmet medical needs

Priority Review

A drug is given a priority review if there is potential to provide a significant advance in existing medical care. Drugs assigned priority review under CDER's Priority Review Voucher program are not included in this summary.

Accelerated Approval

Early approval based on markers that predict a reasonable benefit, with more testing to confirm clinical benefit after approval

PDUFA Goal Date

The goal date for application review determined by the Prescription Drug User Fee Act (PDUFA).

First Cycle

Drugs that were approved without request for additional information that could delay approval and lead to another cycle of review

First Approved in U.S.

Drugs that were approved in the United States before approval in other country

U.S. FOOD & DRUG ADMINISTRATION

NOVEL DRUGS 2016

Adlyxin
Anthim
Axumin
Briviact
Cinqair
Defitelio
Epclusa
Eucrisa
Exondys 51
Lartruvo
Netspot
Nuplazid
Ocaliva
Rubraca
Spinraza
Taltz
Tecentriq
Venclexta
Xiidra
Zepatier
Zinbryta
Zinplava

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