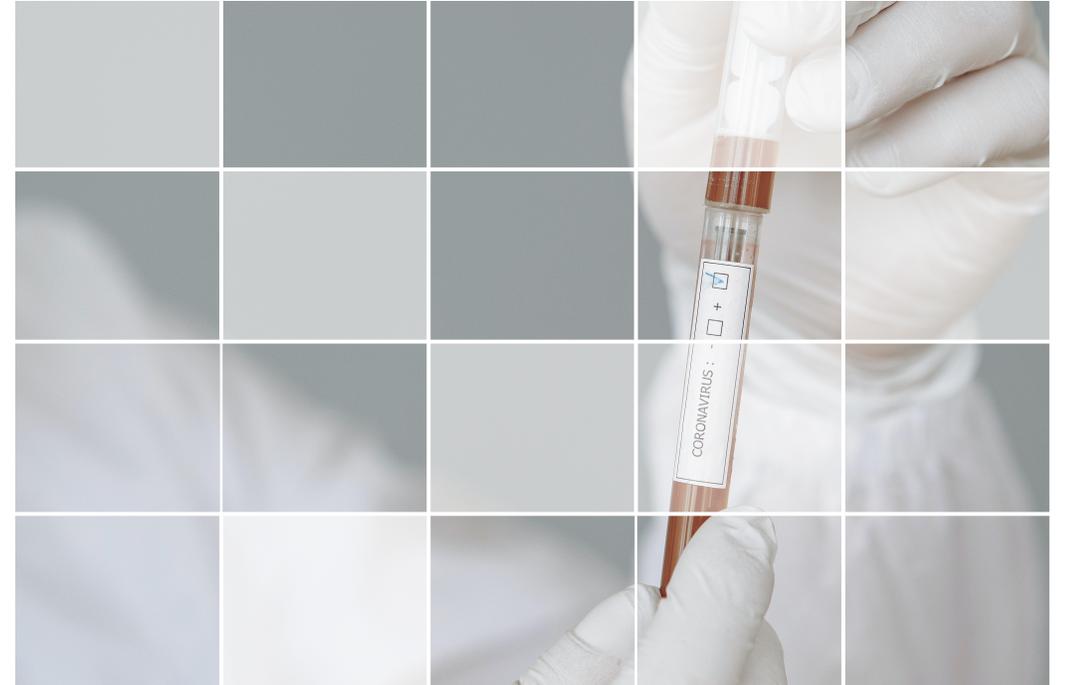




# COVID-19 Vaccines Overview



2021.04

Dragon Gate Investment Partners LLC

Stella Dai



# Types of Vaccines



# mRNA Vaccine

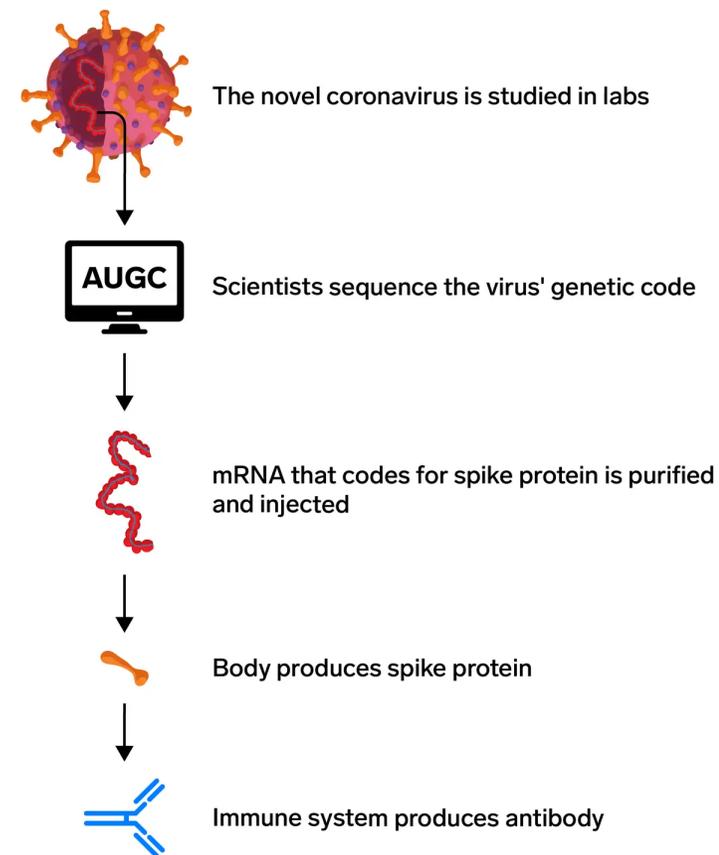
COVID-19 mRNA vaccines give instructions for our cells to make a **harmless piece** of what is called the “spike protein.” The spike protein is found on the surface of the virus that causes COVID-19.

COVID-19 mRNA vaccines are given in the upper arm muscle. Once the instructions (mRNA) are inside the immune cells, the cells use them to make the protein piece. After the protein piece is made, the cell breaks down the instructions and gets rid of them.

Next, the cell displays the protein piece on its surface. Our immune systems recognize that the protein doesn’t belong there and begin building an immune response and making antibodies, like what happens in natural infection against COVID-19.

At the end of the process, our bodies have learned how to protect against future infection. The benefit of mRNA vaccines, like all vaccines, is those vaccinated gain this protection without ever having to risk the serious consequences of getting sick with COVID-19.

## How mRNA vaccines work



Source: National Institutes of Health presentation at Senate hearing on September 9, 2020.

INSIDER

Sources: Centers for Disease Control and Prevention. “Understanding mRNA COVID-19 Vaccines”, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/mRNA.html>. Accessed Mar. 31, 2021; Insider. “Moderna's groundbreaking coronavirus vaccine was designed in just 2 days”, <https://www.businessinsider.com/moderna-designed-coronavirus-vaccine-in-2-days-2020-11>. Accessed Apr. 2, 2021

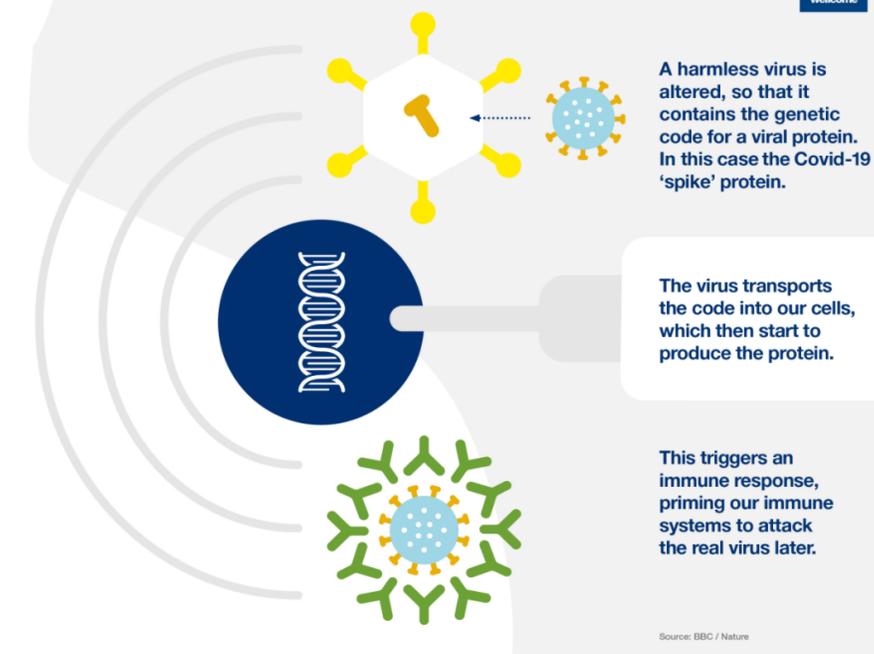
# Viral Vector COVID-19 Vaccines

Viral vector vaccines use a modified version of a different virus (the vector) to deliver important instructions to our cells. For COVID-19 viral vector vaccines, the vector (**not** the virus that causes COVID-19, but a different, harmless virus) will enter a cell in our body and then use the cell's machinery to produce **a harmless** piece of the virus that causes COVID-19. This piece is known as a spike protein and it is only found on the surface of the virus that causes COVID-19.

The cell displays the spike protein on its surface, and our immune system recognizes it doesn't belong there. This triggers our immune system to begin producing antibodies and activating other immune cells to fight off what it thinks is an infection.

At the end of the process, our bodies have learned how to protect us against future infection with the virus that causes COVID-19. The benefit is that we get this protection from a vaccine, without ever having to risk the serious consequences of getting sick with COVID-19. Any temporary discomfort experienced after getting the vaccine is a natural part of the process and an indication that the vaccine is working.

## How do viral vector vaccines work?



## Inactivated Vaccines

Inactivated vaccines contain whole bacteria or viruses which have been killed or have been altered, so that they cannot replicate. Because inactivated vaccines do not contain any live bacteria or viruses, they cannot cause the diseases against which they protect, even in people with severely weakened immune systems. However, inactivated vaccines do not always create such a strong or long-lasting immune response as live attenuated vaccines.





DRAGON GATE  
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# Vaccine Manufacturers





## Pfizer Inc. (NYSE: PFE)



Pfizer Inc. is a research-based, global biopharmaceutical company. We apply science and our global resources to bring therapies to people that extend and significantly improve their lives through the discovery, development, manufacture, marketing, sales and distribution of biopharmaceutical products worldwide. We work across developed and emerging markets to advance wellness, prevention, treatments and cures that challenge the most feared diseases of our time. We collaborate with healthcare providers, governments and local communities to support and expand access to reliable, affordable healthcare around the world. The Company was incorporated under the laws of the State of Delaware on June 2, 1942.

# Pfizer Inc. (NYSE: PFE)



**36.28** -0.02 (-0.06%) **36.24** -0.03 (-0.10%)

At close: 4:02PM EDT

After hours: 4:34PM EDT

[Summary](#)
[Company Outlook](#)
[Chart](#)
[Conversations](#)
[Statistics](#)
[Historical Data](#)
[Profile](#)
[Financials](#)
[Analysis](#)
[Options](#)

Previous Close	<b>36.30</b>	Market Cap	<b>202.376B</b>
Open	<b>36.44</b>	Beta (5Y Monthly)	<b>0.65</b>
Bid	<b>36.25 x 4000</b>	PE Ratio (TTM)	<b>21.25</b>
Ask	<b>36.29 x 1800</b>	EPS (TTM)	<b>1.71</b>
Day's Range	<b>36.10 - 36.57</b>	Earnings Date	<b>May 04, 2021</b>
52 Week Range	<b>29.99 - 43.08</b>	Forward Dividend & Yield	<b>1.56 (4.30%)</b>
Volume	<b>21,284,007</b>	Ex-Dividend Date	<b>Jan 28, 2021</b>
Avg. Volume	<b>33,051,891</b>	1y Target Est	<b>40.54</b>

Fair Value 🔒

XX.XX

-22% Est. Return

[View details](#)

**Overvalued**



Related Research 🔒

Analyst Report: Pfizer Inc.

Technical Assessment: Bullish in ...

[View more](#)

1D 5D 1M 6M YTD **1Y** 5Y Max  [Full screen](#)



Trade prices are not sourced from all markets

Chart Events 🔒

**Bearish** pattern detected

 **Fast Stochastic**

[View all chart patterns](#)

Performance Outlook

Short Term 2W - 6W	Mid Term 6W - 9M	Long Term 9M+
↓	↓	↑



## BioNTech SE (NasdaqGS: BNTX)

**BIONTECH**

BioNTech was founded in 2008 on the understanding that every cancer patient's tumor is unique and that in order to effectively address this challenge, we must create individualized treatments for each patient. To realize this vision, we combine decades of groundbreaking research in immunology, cutting-edge therapeutic platforms and a suite of patient profiling and bioinformatic tools to develop immunotherapies for cancer and other diseases. We leverage powerful new therapeutic mechanisms and exploit a diverse array of biological targets to harness the power of each patient's immune system to address the unique molecular signature of each patient's underlying disease. The breadth of our immunotherapy technologies and expertise enables us to develop potential therapies to address a range of rare and infectious diseases, and we rapidly mobilized these to address the COVID-19 pandemic with our COVID-19 vaccine, referred to as COMIRNATY® in the European Union and other locations where we have received marketing approval.

# BioNTech SE (NasdaqGS: BNTX)

BIONTECH

**115.37** +1.50 (+1.32%) **114.99** -0.38 (-0.33%)  
 At close: 4:00PM EDT After hours: 4:22PM EDT

Summary Company Outlook Chart Conversations Statistics Historical Data Profile Financials Analysis Options

Previous Close	<b>113.87</b>	Market Cap	<b>27.864B</b>
Open	<b>114.01</b>	Beta (5Y Monthly)	<b>N/A</b>
Bid	<b>115.32 x 800</b>	PE Ratio (TTM)	<b>N/A</b>
Ask	<b>115.30 x 1300</b>	EPS (TTM)	<b>N/A</b>
Day's Range	<b>110.00 - 115.87</b>	Earnings Date	<b>May 10, 2021</b>
52 Week Range	<b>37.00 - 131.00</b>	Forward Dividend & Yield	<b>N/A (N/A)</b>
Volume	<b>1,374,586</b>	Ex-Dividend Date	<b>N/A</b>
Avg. Volume	<b>1,913,195</b>	1y Target Est	<b>124.37</b>

Fair Value

**XX.XX**

-57% Est. Return

[View details](#)

**Overvalued**



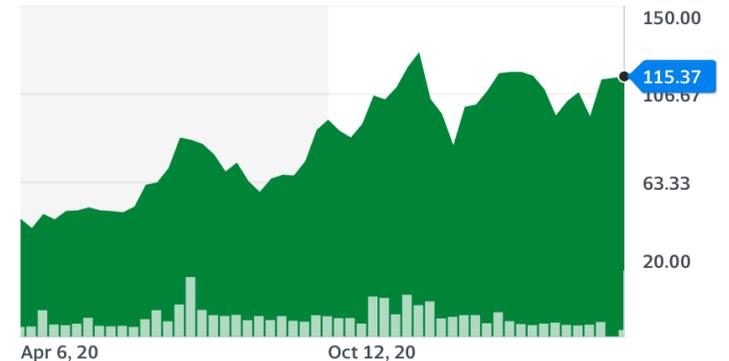
Related Research

Analyst Report: BioNTech SE

Analyst Report: BioNTech SE

[View more](#)

1D 5D 1M 6M YTD **1Y** 5Y Max Full screen



Trade prices are not sourced from all markets

Chart Events

**Bullish** pattern detected

Price Crosses Moving Average

[View all chart patterns](#)

Performance Outlook

Short Term	Mid Term	Long Term
2W - 6W	6W - 9M	9M+



## Moderna, Inc. (NasdaqGS: MRNA)



Moderna is advancing messenger RNA (mRNA) science to create a new class of transformative medicines for patients. mRNA medicines are designed to direct the body's cells to produce intracellular, membrane or secreted proteins that can have a therapeutic or preventive benefit and have the potential to address a broad spectrum of diseases. Moderna's platform builds on continuous advances in basic and applied mRNA science, delivery technology and manufacturing, providing the Company the capability to pursue in parallel a robust pipeline of new development candidates. Moderna is developing therapeutics and vaccines for infectious diseases, immuno-oncology, rare diseases, cardiovascular diseases, and autoimmune and inflammatory diseases, independently and with strategic collaborators.

# Moderna, Inc. (NasdaqGS: MRNA)

moderna®

**129.91** -2.64 (-1.99%) **129.50** -0.41 (-0.32%)  
 At close: 4:00PM EDT After hours: 4:39PM EDT

Summary Company Outlook + Chart Conversations Statistics Historical Data Profile Financials Analysis Options

Previous Close	132.55	Market Cap	52.032B
Open	132.60	Beta (5Y Monthly)	1.38
Bid	129.82 x 900	PE Ratio (TTM)	N/A
Ask	129.84 x 1100	EPS (TTM)	-1.96
Day's Range	127.04 - 133.19	Earnings Date	May 05, 2021 - May 10, 2021
52 Week Range	30.98 - 189.26	Forward Dividend & Yield	N/A (N/A)
Volume	5,053,621	Ex-Dividend Date	N/A
Avg. Volume	11,989,381	1y Target Est	174.25

Fair Value ? +  
 XX.XX **Overvalued**

View details

Related Research ? +  
 Technical Assessment: Bullish in ...  
 Analyst Report: Moderna Inc  
 View more

1D 5D 1M 6M YTD 1Y 5Y Max Full screen



Chart Events ? +  
 Bullish pattern detected  
 Fast Stochastic  
 View all chart patterns

Performance Outlook

Short Term 2W - 6W	Mid Term 6W - 9M	Long Term 9M+
↓	↓	→



## Johnson & Johnson (NYSE: JNJ)



Johnson & Johnson and its subsidiaries (the Company) have approximately 134,500 employees worldwide engaged in the research and development, manufacture and sale of a broad range of products in the health care field. Johnson & Johnson is a holding company, with operating companies conducting business in virtually all countries of the world. The Company's primary focus is products related to human health and well-being. Johnson & Johnson was incorporated in the State of New Jersey in 1887.

The Company is organized into three business segments: Consumer Health, Pharmaceutical and Medical Devices.

# Johnson & Johnson (NYSE: JNJ)



**163.43** +0.60 (+0.37%) **163.32** -0.10 (-0.06%)  
 At close: 4:00PM EDT After hours: 4:52PM EDT

Summary Company Outlook Chart Conversations Statistics Historical Data Profile Financials Analysis Options

Previous Close	<b>162.83</b>	Market Cap	<b>430.264B</b>
Open	<b>163.64</b>	Beta (5Y Monthly)	<b>0.71</b>
Bid	<b>163.00 x 800</b>	PE Ratio (TTM)	<b>29.66</b>
Ask	<b>163.43 x 800</b>	EPS (TTM)	<b>5.51</b>
Day's Range	<b>162.66 - 164.74</b>	Earnings Date	<b>Apr 20, 2021</b>
52 Week Range	<b>133.65 - 173.65</b>	Forward Dividend & Yield	<b>4.04 (2.48%)</b>
Volume	<b>7,010,367</b>	Ex-Dividend Date	<b>Feb 22, 2021</b>
Avg. Volume	<b>8,236,622</b>	1y Target Est	<b>185.44</b>

**Fair Value**   
**XX.XX**  
 -25% Est. Return  
[View details](#)

**Overvalued**

**Related Research**   
 Analyst Report: Johnson & John...  
 The Argus Innovation Model Por...  
[View more](#)

1D 5D 1M 6M YTD **1Y** 5Y Max Full screen



**Chart Events**   
**Bearish** pattern detected  
**Momentum**  
[View all chart patterns](#)

Performance Outlook

Short Term 2W - 6W		Mid Term 6W - 9M		Long Term 9M+	
-----------------------	--	---------------------	--	------------------	--

## Pfizer-BioNTech Received Authorizations from...

- Argentina
- Australia
- Bahrain
- Brazil
- Canada
- Chile
- Costa Rica
- Ecuador
- The European Union
- Hong Kong
- Iraq
- Israel
- Jordan
- Kuwait
- Malaysia
- Mexico



Sources: <https://riotimesonline.com/brazil-news/mercosur/argentine-extends-emergency-approval-to-the-pfizer-vaccine/>, <https://www.tga.gov.au/media-release/tga-provisionally-approves-pfizer-covid-19-vaccine>, <https://www.aljazeera.com/news/2020/12/4/bahrain-becomes-second-country-to-approve-pfizer-covid-19-vaccine>, <https://www.reuters.com/article/us-health-coronavirus-brazil/brazil-approves-pfizers-covid-19-shot-but-has-none-to-use-idUSKBN2AN19Q>, <https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/authorization/applications.html#wb-auto-4>, <https://www.reuters.com/article/health-coronavirus-chile-vaccine/chilean-health-regulator-approves-pfizer-biontech-vaccine-for-emergency-use-idUSKBN28Q2EZ>, <https://ticotimes.net/2020/12/16/costa-rica-authorizes-pfizer-biontech-coronavirus-vaccine>, <http://www.uniindia.com/news/world/health-ecuador-vaccine/2266006.html>, <https://www.pfizer.com/news/press-release/press-release-detail/pfizer-and-biontech-receive-authorization-european-union>, <https://www.info.gov.hk/gia/general/202101/25/P2021012500829.htm>, <https://www.arabnews.com/node/1781171/middle-east>, <https://www.pfizer.com/news/press-release/press-release-detail/real-world-evidence-confirms-high-effectiveness-Pfizer>, <https://medicalxpress.com/news/2020-12-jordan-pfizer-biontech-covid-vaccine.html>, <https://www.arabnews.com/node/1776666/middle-east>, <https://codeblue.galencentre.org/2021/01/08/malysias-npra-approves-pfizer-covid-19-vaccine/>, <https://www.bloomberg.com/news/articles/2020-12-12/mexico-approves-pfizer-vaccine-for-emergency-use-as-covid-surges>. Accessed Apr. 2, 2021

## Pfizer-BioNTech Received Authorizations from...

- Oman
- Panama
- the Philippines
- Qatar
- Saint Vincent and the Grenadines
- Saudi Arabia
- Singapore
- South African
- South Korea
- Switzerland
- The United Arab Emirates
- The United Kingdom
- The United States
- WHO



Sources: <https://www.bloomberg.com/news/articles/2020-12-15/oman-approves-pfizer-biontech-vaccine-for-covid-19>, [https://www.business-standard.com/article/current-affairs/panama-govt-approves-emergency-use-of-pfizer-biontech-coronavirus-vaccine-120121600370\\_1.html](https://www.business-standard.com/article/current-affairs/panama-govt-approves-emergency-use-of-pfizer-biontech-coronavirus-vaccine-120121600370_1.html), <https://www.bloomberg.com/news/articles/2021-01-14/philippines-fda-approves-pfizer-vaccine-for-emergency-use>, <https://www.reuters.com/article/healthcoronavirus-vaccine-qatar/qatar-approves-pfizer-and-biontech-covid-19-vaccine-emergency-use-qna-news-agency-idUSL8N2J00OD>, [https://www.gov.vc/images/pdf\\_documents/SRO-Public\\_Health\\_Emergency\\_Authorisation\\_of\\_Covid-19\\_Vaccine.pdf](https://www.gov.vc/images/pdf_documents/SRO-Public_Health_Emergency_Authorisation_of_Covid-19_Vaccine.pdf), <https://www.fdanews.com/articles/200476-saudi-arabia-approves-pfizerbiontech-covid-19-vaccine>, <https://www.cnbc.com/2020/12/14/singapore-approves-pfizers-covid-vaccine.html>, <https://www.bloomberg.com/news/articles/2021-03-16/south-africa-approves-pfizer-biontech-vaccine-for-local-use>, <https://www.reuters.com/article/us-health-coronavirus-southkorea/south-korea-approves-pfizer-covid-19-vaccine-drug-safety-ministry-idUSKBN2AX0DC>, <https://www.bloomberg.com/news/articles/2020-12-19/switzerland-grants-authorization-for-pfizer-biontech-vaccine>, <https://www.bloomberg.com/news/articles/2020-12-22/dubai-to-offer-free-pfizer-biontech-virus-shots-from-Wednesday>, <https://www.nbcnews.com/news/world/u-k-becomes-first-country-approve-pfizer-biontech-covid-19-n1249651>, <https://www.fda.gov/news-events/press-announcements/fda-takes-key-action-fight-against-covid-19-issuing-emergency-use-authorization-first-covid-19>, <https://www.who.int/news/item/31-12-2020-who-issues-its-first-emergency-use-validation-for-a-covid-19-vaccine-and-emphasizes-need-for-equitable-global-access>. Accessed Apr. 2, 2021

## Moderna Received Authorizations from...

- Canada
- Saint Vincent and the Grenadines
- The United States



- The European Union
- Israel
- Qatar
- Switzerland
- Singapore
- The United Kingdom

Moderna will work with regulators to pursue necessary approvals prior to distribution in the Philippines, Taiwan, Colombia, South Korea. Also, Takeda Pharmaceutical Co., Ltd (NYSE: TAK) submitted a New Drug Application to the Government of Japan's Ministry of Health, Labour and Welfare (MHLW) to import and distribute Moderna's vaccine candidate against COVID-19 (mRNA-1273 or TAK-919) in Japan.

Sources: <https://investors.modernatx.com/news-releases/news-release-details/qatar-ministry-public-health-issues-emergency-use-authorization>, [https://www.gov.vc/images/pdf\\_documents/SRO-Public\\_Health\\_Emergency\\_Authorisation\\_of\\_Covid-19\\_Vaccine.pdf](https://www.gov.vc/images/pdf_documents/SRO-Public_Health_Emergency_Authorisation_of_Covid-19_Vaccine.pdf), <https://investors.modernatx.com/news-releases/news-release-details/moderna-announces-new-supply-agreement-philippines-7-million>, <https://investors.modernatx.com/news-releases/news-release-details/moderna-announces-covid-19-vaccine-supply-agreements-government>, <https://investors.modernatx.com/news-releases/news-release-details/moderna-confirms-40-million-covid-19-vaccine-dose-supply>, <https://investors.modernatx.com/news-releases/news-release-details/moderna-announces-new-drug-application-submitted-import-and>. Accessed Apr. 1, 2021



## Johnson & Johnson's Janssen Received Authorizations from...



- Bahrain
- Canada
- Colombia
- The European Union
- Iceland
- Liechtenstein
- Norway
- Saint Vincent and the Grenadines
- South Africa
- The United States
- WHO

Sources: <https://abcnews.go.com/International/wireStory/bahrain-1st-nation-grant-jj-shot-emergency-76112143>, <https://www.cbc.ca/news/politics/johnson-johnson-covid19-vaccine-approved-1.5937900>, <https://www.reuters.com/article/health-coronavirus-colombia/colombia-grants-emergency-use-for-jj-coronavirus-vaccine-idUSL1N2LO01O>, <https://johnsonandjohnson.gcs-web.com/static-files/8864bf6f-9911-4b5d-8b2f-cae21dee4e5c>, [https://www.gov.vc/images/pdf\\_documents/SRO-Public\\_Health\\_Emergency\\_Authorisation\\_of\\_Covid-19\\_Vaccine.pdf](https://www.gov.vc/images/pdf_documents/SRO-Public_Health_Emergency_Authorisation_of_Covid-19_Vaccine.pdf), <https://www.reuters.com/article/us-health-coronavirus-safrica-johnson-jo/jj-says-south-african-health-regulator-registers-its-covid-19-vaccine-idUSKBN2BO5FM>, <https://johnsonandjohnson.gcs-web.com/static-files/52d81400-e4be-45cd-9491-7b46403d46fe>, <https://johnsonandjohnson.gcs-web.com/static-files/5e2aeeb2-38a9-4b2b-b7b1-782f8f5933ca>. Accessed Apr. 2, 2021



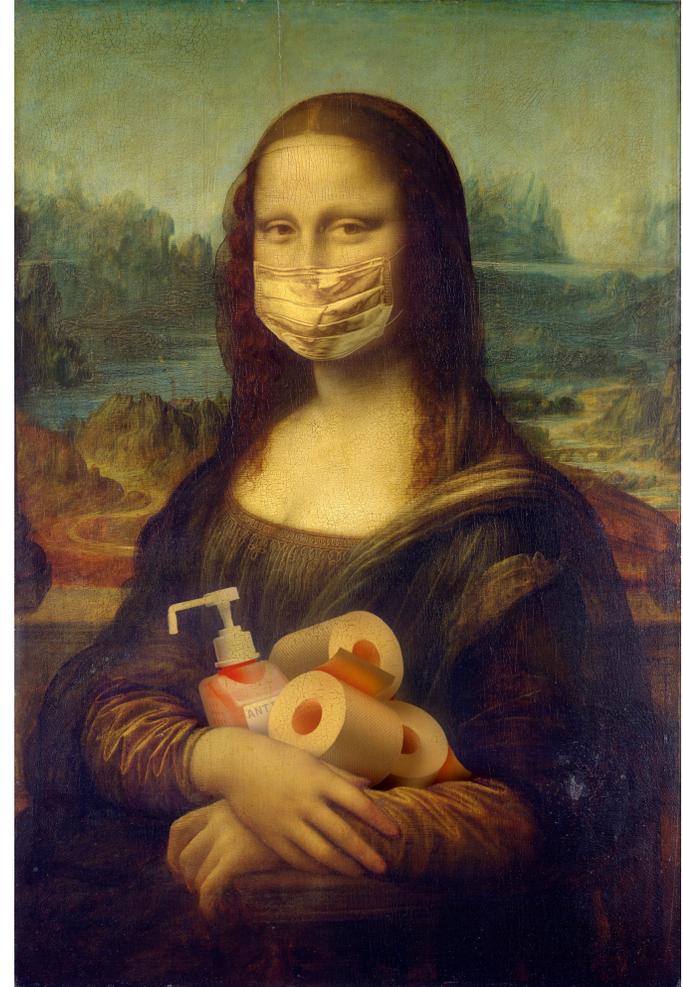
## How to Calculate Vaccine Efficacy ?

$$VE = (ARU - ARV) / ARU * 100\%$$

VE = Vaccine efficacy

ARU = Attack rate of unvaccinated people

ARV = Attack rate of vaccinated people





## COVID-19 Vaccines Overview

Types of Vaccines	Vaccine Name	Vaccine Efficacy
mRNA Vaccines	Pfizer-BioNTech	95%
	Moderna	94.1%
Viral Vector Vaccines	Johnson & Johnson's Janssen	66.3%
	AstraZeneca/Oxford	
	Russian Sputnik-V	
Inactivated Vaccines	CanSinoBIO	
	Wuhan Institute of Biological Products	
	Beijing Institute of Biological Products	
	Sinovac Biotech	



# Israel MoH Vaccination Program and Analysis

In January, **Pfizer and the Israel MoH** entered into a collaboration agreement to monitor the real-world impact of the Pfizer-BioNTech COVID-19 Vaccine.

Findings from the analysis were derived from de-identified aggregate Israel MoH surveillance data collected between January 17 and March 6, 2021, when the Pfizer-BioNTech COVID-19 Vaccine was the **only vaccine available in the country** and when the more transmissible B.1.1.7 variant of SARS-CoV-2 (formerly referred to as the U.K. variant) was the dominant strain. Vaccine effectiveness was **at least 97% against symptomatic COVID-19 cases, hospitalizations, severe and critical hospitalizations, and deaths**. Furthermore, the analysis found a vaccine effectiveness of **94% against asymptomatic SARS-CoV-2 infections**. For all outcomes, vaccine effectiveness was measured from two weeks after the second dose.



## Things to know before vaccination

	<b>Pfizer-BioNTech</b>	<b>Moderna</b>	<b>Johnson &amp; Johnson's Janssen</b>
Recommended Group	16 years and older	18 years and older	18 years and older
Fully Vaccinated Time	Two weeks after the second shot	Two weeks after the second shot	Two weeks after the shot
Number of shots	2 shots, 21 days apart	2 shots, one month (28 days) apart	1 shot

Sources: Centers for Disease Control and Prevention. “Information about the Pfizer-BioNTech COVID-19 Vaccine”, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/Pfizer-BioNTech.html>; “Moderna COVID-19 Vaccine Overview and Safety”, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/Moderna.html>; “Information About Johnson & Johnson’s Janssen COVID-19 Vaccine”, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/janssen.html>; “Possible Side Effects After Getting a COVID-19 Vaccine”, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/expect/after.html#:~:text=It%20takes%20time%20for%20your,COVID%2D19%20vaccine>. Accessed Apr. 1, 2021



## Local Adverse Reactions (Within 7 Days After Each Dose)

	P-B D1	P-B D2	M D1	M D2	J
	N=2291	N=2098	N=11406	N=10985	N=2036
Pain	83.1%	77.8%	86.9%	89.9%	58.6%
Pain <sup>b</sup>	1%	1.2%	3.2%	4.6%	0.4%

P-B=Pfizer-BioNTech (Participants 18-55 Years of Age) M=Moderna (Participants 18-64 Years) J=Johnson & Johnson's Janssen (Individuals 18 to 59 Years of Age) D1=Dose 1 D2=Dose 2

Pain<sup>b</sup>: P-B: Prevents daily activity. M: Defined as any use of prescription pain reliever; prevents daily activity. J: Defined as incapacitating symptoms; inability to do work, school, or usual activities; use of narcotic pain reliever.

Sources: Food and Drug Administration. <https://www.fda.gov/media/144637/download>;  
<https://www.fda.gov/media/144413/download>; <https://www.fda.gov/media/146304/download>. Accessed Mar. 31, 2021



## Local Adverse Reactions (Within 7 Days After Each Dose)

	P-B D1	P-B D2	M D1	M D2	J
	N=2291	N=2098	N=11406	N=10985	N=2036
Erythema / Redness <sup>a</sup>	4.5%	5.9%	3.0%	8.9%	9%
Erythema /Redness <sup>b</sup>	0.3%	0.5%	0.3%	1.9%	0.3%
Swelling <sup>a</sup>	5.8%	6.3%	6.7%	12.6%	7%
Swelling <sup>b</sup>	0.2%	0.3%	0.5%	1.7%	0.2%

P-B=Pfizer-BioNTech (Participants 18-55 Years of Age) M=Moderna (Participants 18-64 Years) J=Johnson & Johnson's Janssen (Individuals 18 to 59 Years of Age) D1=Dose 1 D2=Dose 2

Erythema/ Redness<sup>a</sup> & Swelling<sup>a</sup> : P-B: Defined as >2cm M: Defined as  $\geq 25$ mm J: Defined as  $\geq 25$ mm

Erythema /Redness<sup>b</sup> & Swelling<sup>b</sup> : Defined as >100 mm

Sources: Food and Drug Administration. <https://www.fda.gov/media/144637/download>;

<https://www.fda.gov/media/144413/download>; <https://www.fda.gov/media/146304/download>. Accessed Mar. 31, 2021



## Systemic Adverse Reactions (Within 7 Days After Each Dose)

	P-B D1	P-B D2	M D1	M D2	J
	N=2291	N=2098	N=11406	N=10985	N=2036
Headache	41.9%	51.7%	35.3%	62.8%	44.4%
Headache <sup>b</sup>	1.0%	3.2%	1.9%	5.0%	0.9%
Fever	3.7%	15.8%	0.9%	17.4%	12.8%
Fever <sup>b</sup>	0.3%	1.2%	<0.1%	1.7%	0.3%

P-B=Pfizer-BioNTech (Participants 18-55 Years of Age) M=Moderna (Participants 18-64 Years) J=Johnson & Johnson's Janssen (Individuals 18 to 59 Years of Age) D1=Dose 1 D2=Dose 2

Headache<sup>b</sup>: P-B: Prevents daily activity. M: Defined as significant; any use of prescription pain reliever or prevents daily activity. J: Defined as incapacitating symptoms; requires bed rest and/or results in loss of work, school, or cancellation of social activities; use of narcotic pain reliever.

Fever<sup>b</sup>: P-B: Defined as >38.9°C to 40.0°C M: Defined as ≥39.0–≤40.0°C/≥102.1–≤104.0°F J: Defined as 39.0°C - 40.0°C

Sources: Food and Drug Administration. <https://www.fda.gov/media/144637/download>;

<https://www.fda.gov/media/144413/download>; <https://www.fda.gov/media/146304/download>. Accessed Mar. 31, 2021



## Systemic Adverse Reactions (Within 7 Days After Each Dose)

	P-B D1	P-B D2	M D1	M D2	J
	N=2291	N=2098	N=11406	N=10985	N=2036
Fatigue <sup>a</sup>	47.4%	59.4%	38.4%	67.6%	43.8%
Fatigue <sup>b</sup>	1.4%	4.6%	1.1%	10.7%	1.2%
Myalgia <sup>a</sup>	21.3%	37.3%	23.7%	61.6%	39.1%
Myalgia <sup>b</sup>	0.6%	2.2%	0.6%	10.1%	1.4%

P-B=Pfizer-BioNTech (Participants 18-55 Years of Age) M=Moderna (Participants 18-64 Years) J=Johnson & Johnson's Janssen (Individuals 18 to 59 Years of Age) D1=Dose 1 D2=Dose 2 Myalgia: Muscle Pain

Fatigue<sup>b</sup> & Myalgia<sup>b</sup>: P-B: Prevents daily activity. M: Defined as significant; prevents daily activity. J: Defined as incapacitating symptoms; requires bed rest and/or results in loss of work, school, or cancellation of social activities; use of narcotic pain reliever.

Sources: Food and Drug Administration. <https://www.fda.gov/media/144637/download>;

<https://www.fda.gov/media/144413/download>; <https://www.fda.gov/media/146304/download>. Accessed Mar. 31, 2021



## Systemic Adverse Reactions (Within 7 Days After Each Dose)

	P-B D1	P-B D2	M D1	M D2	J
	N=2291	N=2098	N=11406	N=10985	N=2036
Nausea/ Vomiting <sup>a</sup>	1.2%	1.9%	9.4%	21.4%	15.5%
Nausea/ Vomiting <sup>b</sup>	0	0.2%	<0.1%	<0.1%	0.1%

P-B=Pfizer-BioNTech (Participants 18-55 Years of Age) M=Moderna (Participants 18-64 Years) J=Johnson & Johnson's Janssen (Individuals 18 to 59 Years of Age) D1=Dose 1 D2=Dose 2

Nausea/Vomiting<sup>b</sup>: P-B: Vomiting: Requires intravenous hydration. M: Nausea/Vomiting: Defined as prevents daily activity, requires outpatient intravenous hydration. J: Nausea: Defined as incapacitating symptoms; requires bed rest and/or results in loss of work, school, or cancellation of social activities; use of narcotic pain reliever.

Sources: Food and Drug Administration. <https://www.fda.gov/media/144637/download>;  
<https://www.fda.gov/media/144413/download>; <https://www.fda.gov/media/146304/download>. Accessed Mar. 31, 2021



## Systemic Adverse Reactions (Within 7 Days After Each Dose)

	P-B D1	P-B D2	M D1	M D2	J
	N=2291	N=2098	N=11406	N=10985	N=2036
Use of antipyretic or pain medication	27.8%	45.0%	23.3%	57.3%	26.4%

P-B=Pfizer-BioNTech (Participants 18-55 Years of Age) M=Moderna (Participants 18-64 Years) J=Johnson & Johnson's Janssen (Individuals 18 to 59 Years of Age) D1=Dose 1 D2=Dose 2

Sources: Food and Drug Administration. <https://www.fda.gov/media/144637/download>;  
<https://www.fda.gov/media/144413/download>; <https://www.fda.gov/media/146304/download>. Accessed Mar. 31, 2021



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# Related Companies





## Catalent, Inc. (NYSE: CTLT)

# Catalent®

Catalent is the leading global provider of advanced delivery technologies, development, and manufacturing solutions for drugs, biologics, cell and gene therapies, and consumer health products. With over 85 years serving the industry, Catalent has proven expertise in bringing more customer products to market faster, enhancing product performance and ensuring reliable global clinical and commercial product supply.

A collaboration with the Janssen Pharmaceutical Companies of Johnson & Johnson, whereby Catalent's Biologics business unit will accelerate availability of manufacturing capacity and prepare for large-scale commercial manufacturing at its facility in Bloomington, Indiana of Johnson & Johnson's lead vaccine candidate for COVID-19.

A collaboration for large-scale, commercial fill-finish manufacturing of Moderna's mRNA-based COVID-19 vaccine candidate (mRNA-1273) at Catalent's biologics facility in Bloomington, Indiana.

# Catalent, Inc. (NYSE: CTLT)

# Catalent®

**105.75** -0.79 (-0.74%) **105.75** +0.08 (0.08%)  
 At close: 4:03PM EDT After hours: 4:03PM EDT

[Summary](#) [Company Outlook](#) [Chart](#) [Conversations](#) [Statistics](#) [Historical Data](#) [Profile](#) [Financials](#) [Analysis](#) [Options](#)

Previous Close	<b>106.54</b>	Market Cap	<b>18.002B</b>
Open	<b>107.14</b>	Beta (5Y Monthly)	<b>1.44</b>
Bid	<b>105.61 x 800</b>	PE Ratio (TTM)	<b>58.59</b>
Ask	<b>105.60 x 800</b>	EPS (TTM)	<b>1.80</b>
Day's Range	<b>105.47 - 107.61</b>	Earnings Date	<b>May 03, 2021 - May 07, 2021</b>
52 Week Range	<b>50.55 - 127.68</b>	Forward Dividend & Yield	<b>N/A (N/A)</b>
Volume	<b>428,122</b>	Ex-Dividend Date	<b>N/A</b>
Avg. Volume	<b>1,098,013</b>	1y Target Est	<b>133.90</b>

**Fair Value** ? +  
**XX.XX** Overvalued  
 -27% Est. Return ▬  
[View details](#)

**Related Research** ? +  
 The Argus Innovation Model Por...  
 Analyst Report: Catalent Inc.  
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1D 5D 1M 6M YTD **1Y** 5Y Max ▬ Full screen



**Chart Events** ? +  
Bearish pattern detected  
Triple Moving Average Crossover  
[View all chart patterns](#)

Performance Outlook

Short Term 2W - 6W	Mid Term 6W - 9M	Long Term 9M+
<span style="color: green;">↑</span>	<span style="color: red;">↓</span>	<span style="color: green;">↑</span>

## Croda International Plc (OTC: COIHF; LSE: CRDA)

### CRODA

We (Croda International Plc) create, make and sell speciality chemicals that deliver real benefits to a range of diverse products including health and beauty, engine lubricants, plastics and many more.

Croda International Plc, the speciality chemical company that uses smart science to create high performance ingredients and technologies that improve lives, announces that it has recently entered into an agreement with Pfizer Inc. to supply novel excipients used in the manufacture of a COVID-19 vaccine candidate. The contract with Pfizer runs for five years and awards Croda an initial supply contract for four component excipients used in the production of the vaccine candidate for the first three years of the contract. Demand remains subject to relevant approvals.

# Croda International Plc (OTC: COIHF; LSE: CRDA)

# CRODA

**87.32** 0.00 (0.00%)

At close: March 30 1:16PM EDT

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[Analysis](#)
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Previous Close	<b>87.32</b>	Market Cap	<b>12.343B</b>
Open	<b>87.32</b>	Beta (5Y Monthly)	<b>0.49</b>
Bid	<b>0.00 x 0</b>	PE Ratio (TTM)	<b>40.96</b>
Ask	<b>0.00 x 0</b>	EPS (TTM)	<b>2.13</b>
Day's Range	<b>87.32 - 87.32</b>	Earnings Date	<b>N/A</b>
52 Week Range	<b>50.59 - 92.90</b>	Forward Dividend & Yield	<b>1.23 (1.41%)</b>
Volume	<b>453</b>	Ex-Dividend Date	<b>May 06, 2021</b>
Avg. Volume	<b>188</b>	1y Target Est	<b>N/A</b>

**Fair Value** ⓘ ⚙️

**XX.XX**

🔒 [View details](#)

**Related Research** ⓘ ⚙️

📄 Analyst Report: Lockheed Marti...

📄 CNSWF: Initiating coverage on C...

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1D 5D 1M 6M YTD **1Y** 5Y Max  [Full screen](#)



**Chart Events** ⓘ ⚙️

**Neutral** pattern detected

🔒 [View all chart patterns](#)

Performance Outlook

Short Term 2W - 6W	Mid Term 6W - 9M	Long Term 9M+
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## Lonza Group AG (OTC: LZAGY; SIX: LONN; SGX: O6Z)



Lonza is a leading global provider of integrated healthcare solutions. We focus on enabling treatments that prevent illness, support healthier lifestyles and create a healthy environment. We optimize scientific innovation and manufacturing technology to enable our customers to serve their patients and consumers.

A 10-year strategic collaboration agreement to enable larger scale manufacture of Moderna's mRNA vaccine (mRNA-1273) against the novel coronavirus (SARS-CoV-2) and additional Moderna products in the future.

# Lonza Group AG (OTC: LZAGY; SIX: LONN; SGX: O6Z)



**58.39** +1.41 (+2.47%)

At close: 3:59PM EDT

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Previous Close	<b>56.98</b>	Market Cap	<b>43.22B</b>
Open	<b>56.99</b>	Beta (5Y Monthly)	<b>0.43</b>
Bid	<b>0.00 x 0</b>	PE Ratio (TTM)	<b>47.15</b>
Ask	<b>0.00 x 0</b>	EPS (TTM)	<b>1.24</b>
Day's Range	<b>56.93 - 58.39</b>	Earnings Date	<b>N/A</b>
52 Week Range	<b>40.02 - 69.07</b>	Forward Dividend & Yield	<b>0.14 (0.25%)</b>
Volume	<b>105,469</b>	Ex-Dividend Date	<b>May 01, 2020</b>
Avg. Volume	<b>86,191</b>	1y Target Est	<b>N/A</b>

Fair Value ? +

XX.XX

N/A

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Related Research ? +

[The Argus Innovation Model Por...](#)

[Analyst Report: Catalent Inc.](#)

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1D 5D 1M 6M YTD **1Y** 5Y Max  [Full screen](#)

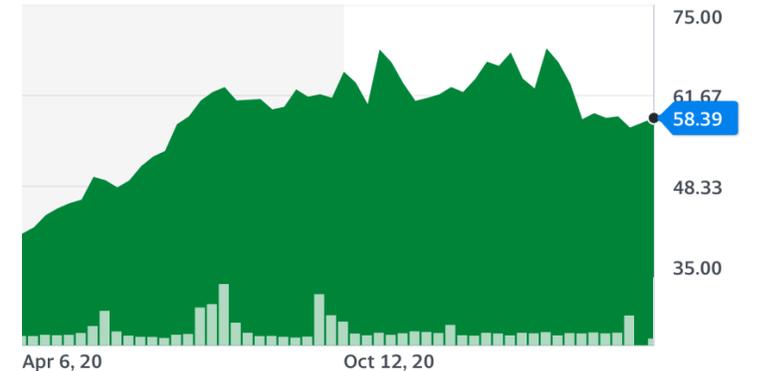


Chart Events ? +

Neutral pattern detected

[View all chart patterns](#)

Performance Outlook

Short Term 2W - 6W	Mid Term 6W - 9M	Long Term 9M+
-----------------------	---------------------	------------------

## Roche Holding AG (SIX: ROG; OTCQX: RHHBY)



Roche is a global pioneer in pharmaceuticals and diagnostics focused on advancing science to improve people's lives. The combined strengths of pharmaceuticals and diagnostics under one roof have made Roche the leader in personalised healthcare – a strategy that aims to fit the right treatment to each patient in the best way possible.

Roche announced a partnership with Moderna Inc. to utilise the Elecsys® Anti-SARS-CoV-2 S antibody test in Moderna's mRNA-1273 vaccine research trials. This will facilitate the quantitative measurement of SARS-CoV-2 antibodies and help to establish a correlation between vaccine-induced protection and levels of anti-receptor binding domain (RBD) antibodies.

This partnership with Moderna, started by using the Elecsys Anti-SARS-CoV-2 test for qualitative determination of anti-N SARS-CoV-2 antibodies. This has been part of Moderna's vaccine trials for baselining and assessing natural infection in trial participants.

# Roche Holding AG (SIX: ROG; OTCQX: RHHBY)



**41.45** +0.68 (+1.67%)

At close: 4:00PM EDT

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Previous Close	<b>40.77</b>	Market Cap	<b>283.453B</b>
Open	<b>41.17</b>	Beta (5Y Monthly)	<b>0.26</b>
Bid	<b>N/A x N/A</b>	PE Ratio (TTM)	<b>18.85</b>
Ask	<b>N/A x N/A</b>	EPS (TTM)	<b>2.20</b>
Day's Range	<b>40.92 - 41.56</b>	Earnings Date	<b>N/A</b>
52 Week Range	<b>39.16 - 47.15</b>	Forward Dividend & Yield	<b>1.22 (2.99%)</b>
Volume	<b>1,049,090</b>	Ex-Dividend Date	<b>Mar 18, 2021</b>
Avg. Volume	<b>2,072,601</b>	1y Target Est	<b>48.51</b>

Fair Value ? 🔒  
**XX.XX**

[View details](#)

Related Research ? 🔒  
[Analyst Report: Roche Holding AG](#)  
[Analyst Report: Roche Holding AG](#)  
[View more](#)

1D 5D 1M 6M YTD **1Y** 5Y Max 📈 🔗 Full screen

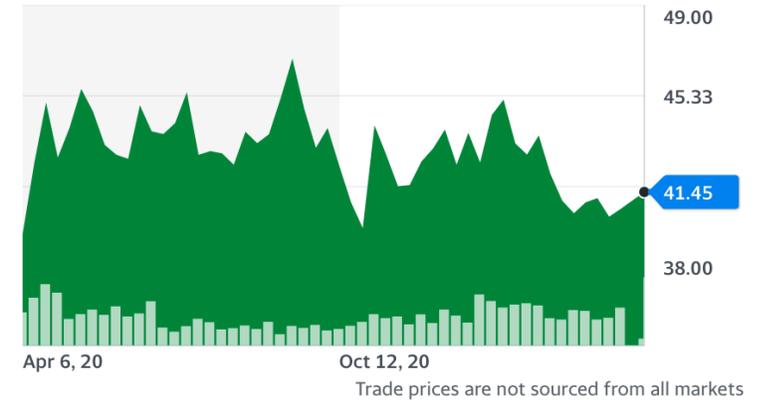


Chart Events ? 🔒  
**Neutral** pattern detected  
[View all chart patterns](#)

Performance Outlook		
Short Term	Mid Term	Long Term
2W - 6W	6W - 9M	9M+

## Sanofi (Euronext: SAN; NasdaqGS: SNY)



Sanofi is dedicated to supporting people through their health challenges. We are a global biopharmaceutical company focused on human health. We prevent illness with vaccines, provide innovative treatments to fight pain and ease suffering. We stand by the few who suffer from rare diseases and the millions with long-term chronic conditions.

Sanofi will provide BioNTech access to its established infrastructure and expertise to produce over 125 million doses of COVID-19 vaccine in Europe. Initial supplies will originate from Sanofi's production facilities in Frankfurt from summer of 2021.

Once authorized, Sanofi will provide Johnson & Johnson access to the established infrastructure and expertise of its vaccine manufacturing plant in Marcy l'Etoile, France, to formulate and fill vials of Janssen's COVID-19 vaccine candidate in 2021, at a rate of approximately 12 million doses per month.

# Sanofi (Euronext: SAN; NasdaqGS: SNY)



**50.18** +0.82 (+1.66%) **50.26** +0.08 (0.16%)

At close: 4:00PM EDT

After hours: 4:53PM EDT

[Summary](#) [Company Outlook](#) [Chart](#) [Conversations](#) [Statistics](#) [Historical Data](#) [Profile](#) [Financials](#) [Analysis](#) [Options](#)

Previous Close	<b>49.36</b>	Market Cap	<b>125.365B</b>
Open	<b>49.58</b>	Beta (5Y Monthly)	<b>0.39</b>
Bid	<b>50.12 x 800</b>	PE Ratio (TTM)	<b>8.73</b>
Ask	<b>50.15 x 800</b>	EPS (TTM)	<b>5.75</b>
Day's Range	<b>49.40 - 50.22</b>	Earnings Date	<b>N/A</b>
52 Week Range	<b>42.80 - 55.00</b>	Forward Dividend & Yield	<b>1.91 (3.86%)</b>
Volume	<b>792,075</b>	Ex-Dividend Date	<b>May 03, 2021</b>
Avg. Volume	<b>2,669,313</b>	1y Target Est	<b>64.67</b>

Fair Value [?](#) [+](#)

**XX.XX**

-14% Est. Return

[View details](#)

**Overvalued**



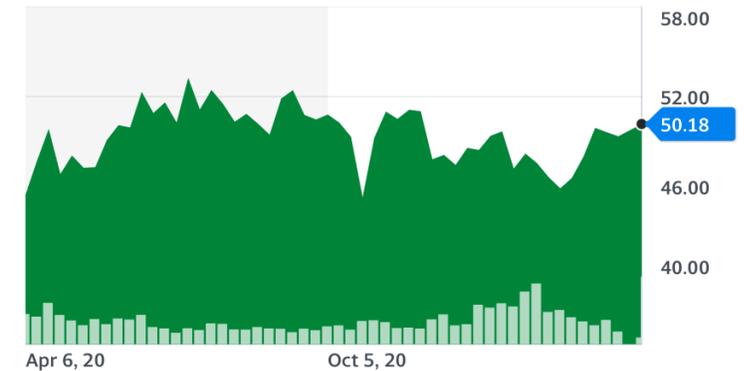
Related Research [?](#) [+](#)

[Analyst Report: Sanofi](#)

[Analyst Report: Sanofi SA](#)

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1D 5D 1M 6M YTD **1Y** 5Y Max [Full screen](#)



Trade prices are not sourced from all markets

Chart Events [?](#) [+](#)

**Bearish** pattern detected

**Price Crosses Moving Average**



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Performance Outlook

Short Term 2W - 6W	Mid Term 6W - 9M	Long Term 9M+
<b>↑</b>	<b>↑</b>	<b>↓</b>

## Takeda Pharmaceutical Company Limited (TSE: 4502; NYSE: TAK)



Takeda focuses its R&D efforts on four core therapeutic areas: Oncology, Rare Genetic and Hematology, Neuroscience and Gastroenterology, with targeted investments in Plasma-Derived Therapies and Vaccines. We are focusing on targeted patient populations in areas of high unmet need, where there is potential for greater therapeutic benefit.

Takeda previously announced its commitment to providing rapid and sustained access to COVID-19 vaccines in Japan through partnerships with Novavax and Moderna. Takeda will receive a manufacturing technology transfer from Novavax and will be responsible for the development and commercialization based on manufacturing capacity of over 250 million doses. The company will also import and distribute 50 million doses of Moderna's mRNA COVID-19 vaccine as part of a joint partnership with Moderna and the Government of Japan's Ministry of Health Labour and Welfare (MHLW).

# Takeda Pharmaceutical Company Limited (TSE: 4502; NYSE: TAK)



**18.20** -0.44 (-2.36%) **18.30** +0.10 (0.55%)

At close: 4:00PM EDT

After hours: 4:55PM EDT

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Previous Close	<b>18.64</b>	Market Cap	<b>56.763B</b>
Open	<b>18.24</b>	Beta (5Y Monthly)	<b>1.17</b>
Bid	<b>18.11 x 2900</b>	PE Ratio (TTM)	<b>34.83</b>
Ask	<b>18.23 x 2200</b>	EPS (TTM)	<b>0.52</b>
Day's Range	<b>18.11 - 18.28</b>	Earnings Date	<b>N/A</b>
52 Week Range	<b>15.21 - 20.00</b>	Forward Dividend & Yield	<b>0.85 (4.56%)</b>
Volume	<b>2,337,017</b>	Ex-Dividend Date	<b>Sep 29, 2020</b>
Avg. Volume	<b>4,021,544</b>	1y Target Est	<b>22.90</b>

Fair Value ? +

**XX.XX**

59% Est. Return

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**Undervalued**



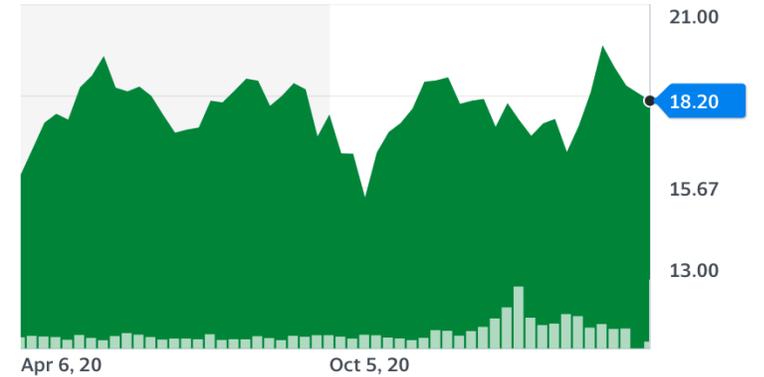
Related Research ? +

[Analyst Report: Roche Holding AG](#)

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1D 5D 1M 6M YTD **1Y** 5Y Max 📈 🔗 Full screen



Trade prices are not sourced from all markets

Chart Events ? +

**Neutral** pattern detected

**Commodity Channel Index**

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Performance Outlook

Short Term 2W - 6W	<span style="color: red;">↓</span>	Mid Term 6W - 9M	<span style="color: green;">↑</span>	Long Term 9M+	<span style="color: green;">↑</span>
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