

# Periodic Graphics

A collaboration between C&EN and  
Andy Brunning, author of the popular  
graphics blog *Compound Interest*

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online

To see more of  
Brunning's work, go to  
[compoundchem.com](http://compoundchem.com).  
To see all of C&EN's  
Periodic Graphics,  
visit [cenm.ag/  
periodicgraphics](http://cenm.ag/periodicgraphics).

## A SHORT HISTORY OF ANTIVIRAL DRUGS

Approximately 90 antiviral drugs have been approved worldwide since the 1960s; medicines to treat COVID-19 are the most recent. Here we look at how antivirals work and some key drugs.



### HOW ANTIVIRALS WORK

Antiviral drugs can target features of viruses themselves or pathways inside host cells that viruses exploit.

#### Preventing infection of new cells

Some antivirals target viral proteins or host-cell mechanisms to stop viruses from entering our cells.

#### Blocking viral genome copying

Some antivirals mimic the bases that make up viral genomes and cause viruses to introduce errors when copying their genetic material.

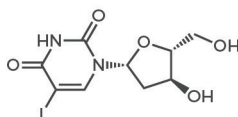
#### Stopping viral protein activation

Protease inhibitors stop the production of new virus particles by interfering with enzymes that make functional viral proteins.

Note: All dates are for US Food and Drug Administration approvals.

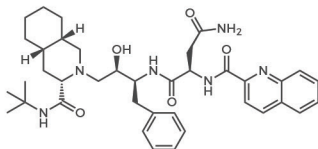
#### 1963 First approved antiviral

**Idoxuridine** is approved as a topical treatment for keratitis caused by the herpes simplex virus.



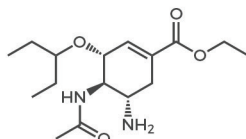
#### 1995 First protease inhibitor

**Saquinavir** treats HIV and is the first approved protease inhibitor antiviral.



#### 1999 Antivirals for influenza

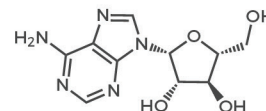
**Oseltamivir** (Tamiflu) and zanamivir are approved to treat influenza.



1960

#### 1977 First systemic antiviral

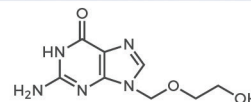
**Vidarabine** is approved for the systemic treatment of herpes virus infections.



1970

#### 1981 First highly selective antiviral

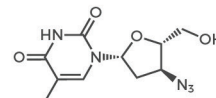
**Acyclovir** treats herpes virus infections and has few side effects.



1980

#### 1987 First antiviral for HIV

**Azidothymidine** is approved as the first antiviral targeting HIV.



1990

2000

2010

2020

#### 2020 First antiviral for COVID-19

**Remdesivir** is approved to treat COVID-19 in hospitalized patients.

