

Influenza

Vironova Medical's anti-influenza compounds

Although vaccination remains the primary method for the prevention of influenza, efficacy may be limited by a poor match between the vaccine and circulating strains. Furthermore, vaccination confers little or no protection in a pandemic outbreak. Hence, antiviral therapy plays an important role in combating both seasonal and pandemic influenza.

Available anti-influenza drugs

Currently, Neuraminidase inhibitors such as Tamiflu, are the golden standard treatment of influenza infection. M2 proton channel inhibitors represent another class that is used to a lesser extent. New drugs, including Xofluza and Pimodivir, targeting the Polymerase complex, show promising results and it remains to be seen how these compounds stand against the challenge of viral mutations and resistance. The constant evolution of influenza will always call for novel and more effective antiviral therapies to combat reoccurring infections.

Vironova Medical's anti-influenza candidates

In the development of antivirals against influenza, the thionation process with our thionation reagent JBR was used to chemically modify Nucleozin derivatives – leading up to our lead candidate VNFC045. VNFC045 targets the relatively conserved internal Nucleoprotein NP, thereby expected to be less sensitive to viral mutations. It has been evaluated for its antiviral properties in various strains of influenza and *in vivo* efficacy studies are currently ongoing.

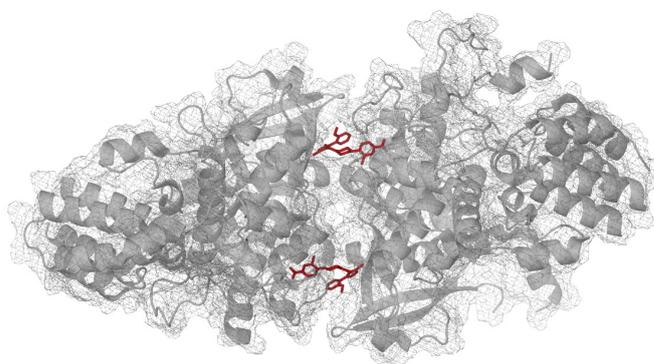
THE EPIDEMICS CAUSED BY THE INFLUENZA VIRUS ARE ESTIMATED TO RESULT IN ABOUT 3 TO 5 MILLION CASES OF SEVERE ILLNESS, AND UP TO 500,000 DEATHS WORLDWIDE EACH YEAR

Intellectual property

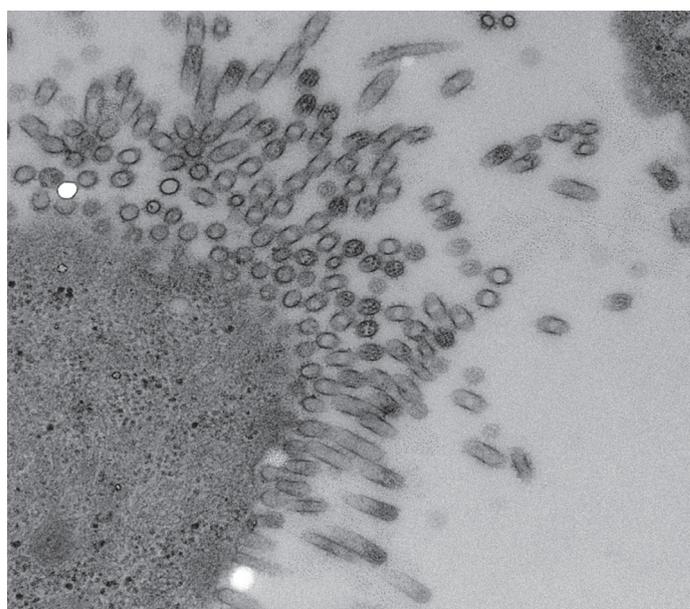
Vironova Medical works actively to achieve a strong intellectual property status globally by developing a comprehensive patent portfolio protecting the treatment of influenza virus infection with thionated Nucleozin derivatives.

Market

The influenza drug market is expected to grow to \$8.5 billion by the end of 2019 and \$11.8 billion by 2024 (*Research and Markets: Global Antiviral Therapeutics 2015-2024 - Technologies, Markets and Companies*).



The nucleoprotein (NP) is a good target for antiviral treatment. Nucleozin (red sticks) was the first molecule identified to bind to NP and cause an anti-influenza effect (*Kao RY et al. Nat Biotechnol. 2010 Jun;28(6):600-5, Gerritz SW et al. Proc Natl Acad Sci USA. 2011 Sep 13;108(37):15366-71*). Vironova Medical's anti-influenza compound VNFC045 is a thionated derivative of Nucleozin.



Influenza particles acquired with a transmission electron microscope. Image property of Vironova.