

# Does IHU-Méditerranée Infection influence Gilead Sciences' stock price?

E. Chabrière

Aix-Marseille Université, IRD, APHM, MEPHI, IHU-Méditerranée Infection, Marseille, France

## Abstract

During COVID-19 pandemic the Gilead Sciences stock prices rose sharply with large variations. These fluctuations have been tentatively related to communications, publications or leaks about remdesivir or hydroxychloroquine/azithromycin treatment.

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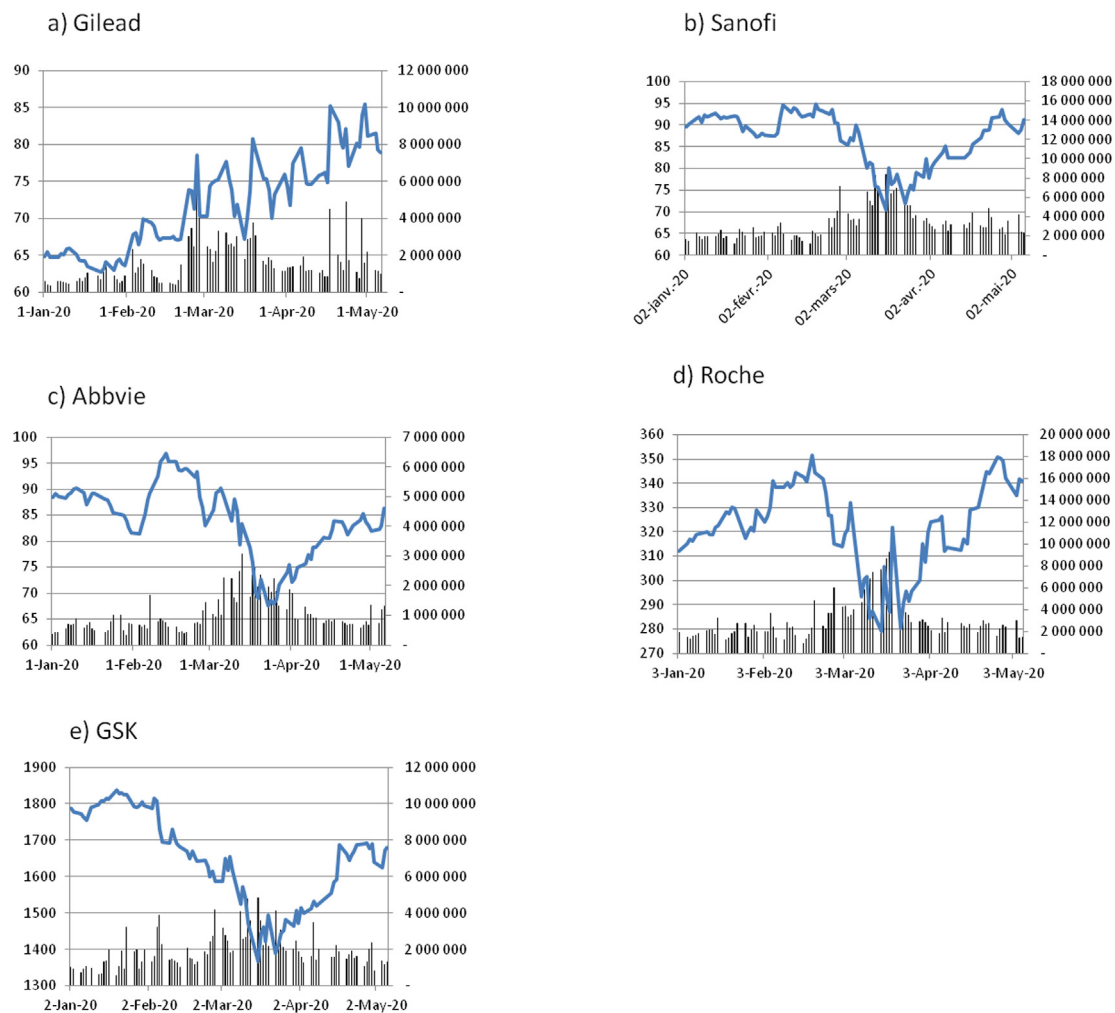
**Corresponding author:** E. Chabrière, Aix-Marseille Université, IRD, APHM, MEPHI, IHU-Méditerranée Infection, Marseille, France.  
**E-mail:** [eric.chabriere@univ-amu.fr](mailto:eric.chabriere@univ-amu.fr)

In December 2019, an outbreak of an emerging disease, coronavirus disease 2019 (COVID-19), caused by a novel coronavirus, later named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), started in Wuhan, China, and rapidly spread both within and outside China [1,2]. The World Health Organization declared the COVID-19 epidemic to be a pandemic on 12 March 2020 [3]. Two promising drugs against COVID-19 rapidly emerged: remdesivir and chloroquine [4]. Remdesivir, a new antiviral drug developed by Gilead Sciences (Foster City, CA, USA) in 2017, is currently under clinical investigation as a treatment against Ebola virus infection [5]. Chloroquine is a very old, widely used and safe generic anti-malarial drugs [6].

Some early clinical Chinese studies suggested efficacy of chloroquine [7]. From this hint, Institut Hospitalo-Universitaire Méditerranée Infection (IHU-MI) chose to evaluate the association of hydroxychloroquine, a closely related molecule to chloroquine which is better tolerated, and azithromycin drugs. Azithromycin is a generic classical antibiotic, chosen for prevention of bacterial complications and also for its antiviral properties [8]. Despite some promising results, with a first clinical trial including 24 patients [9] and another including 80

patients [10], the treatment associating hydroxychloroquine and azithromycin was strongly attacked. The first argument was that clinical trials were not performed using a conventional randomized controlled trial design. The second argument noted the toxicity and adverse effects of these two molecules [11]. Such debate was surprising, considering that these two generic drugs have been widely prescribed for a long time, are very safe and have well-documented and limited adverse effects [12]. Conversely, investors seemed more optimistic regarding remdesivir, although there is still no publication demonstrating the efficiency of remdesivir treatment, and remdesivir may result in toxicity adverse effects. Meanwhile, the stock price of Gilead Sciences, the biopharmaceutical company developing the remdesivir molecule, increased significantly during a period in which numerous stock prices fell, including the stock of pharmaceutical companies. Consequently, we decided to analyse the reasons and consequences of these harbingers of availability of a possible treatment.

We compared the market trading prices from 1 January to 6 May 2020 of the stock of several pharmaceutical companies: Gilead, Sanofi, Roche, GlaxoSmithKline and AbbVie (Fig. 1). With the exception of Gilead, all companies suffered from the COVID-19 crisis, with a drastic decrease at the end of March 2020 followed by a steady increase thereafter. The absolute cumulative



**FIG. 1.** Cotation of some pharmaceutical companies (opening price). Curves indicate stock price (left axis). Histogram indicates volume of shares exchanged (right axis). (a) Gilead, (b) Sanofi, (c) AbbVie, (d) Roche, (e) GlaxoSmithKline.

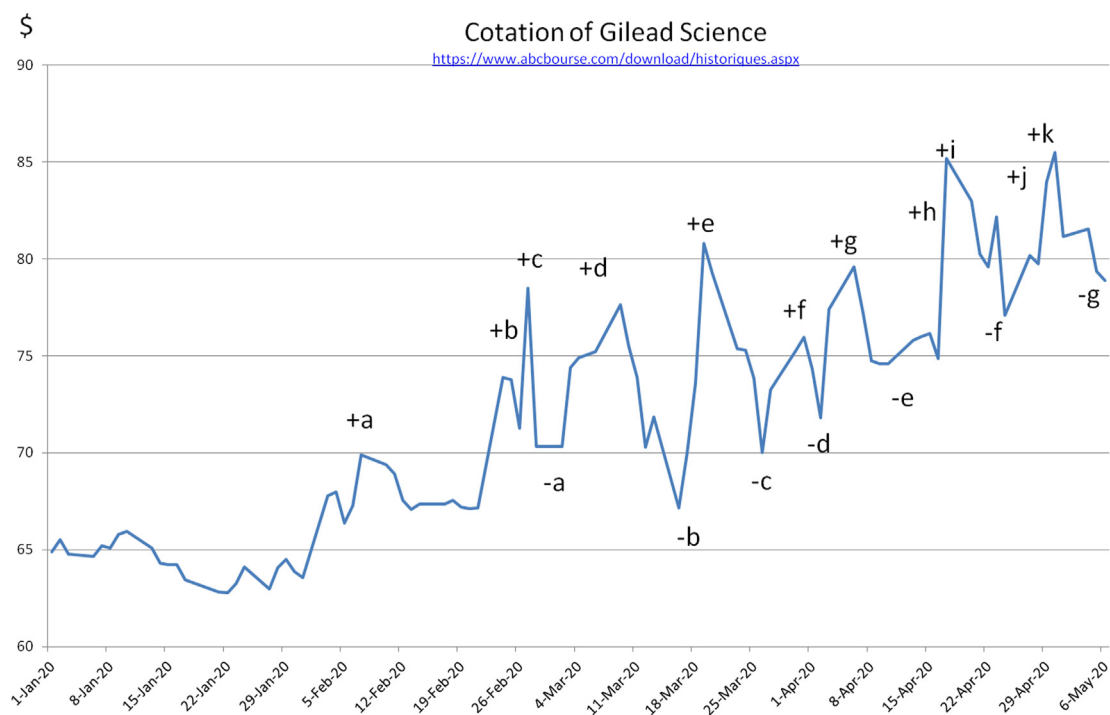
fluctuations day by day of the stock price for these companies represent 2.4, 1.71, 1.65, 1.57 and 1.29 times its value for Gilead, AbbVie, Sanofi, Roche and GlaxoSmithKline respectively. The Gilead stock price clearly presented the most variations. Its stock was also an exception in that it did not experience this drastic drop and instead was catching up with other companies.

The market capitalization of Gilead is about \$100G. The share market trading price of Gilead from 1 January 2020 forwards is represented in Fig. 1 [13]. It increased regularly from the end of January. The minimum share price was \$62.83 on 21 January and reached \$85.19 on 17 April. This corresponds to a capitalization increase of about €35.6G in 3 months. The curve shows also large fluctuations, revealing a quasi-perfect synchronization with declarations regarding or publications about remdesivir, including those of IHU-MI (Fig. 1). We found that forces that increase the market price of Gilead are journal publications or leaks related to the performance of remdesivir

and information about the start of clinical trials (Fig. 2). We found that the main elements decreasing the market price are weekly communication of the IHU-MI about a drug competing with remdesivir (hydroxychloroquine/azithromycin), political support or journal publications about remdesivir's inefficiency.

The main fluctuation we observed occurred on 16 March 2020, with a market price increase of \$13.70 in 3 days, corresponding to an increase of Gilead's value of \$21.8G. This huge increase followed Dr Anthony Fauci's lecture announcing, without any supporting documentation, that remdesivir was only effective for the duration of hospitalization but not for mortality or clinical improvement.

Publications about the efficiency of remdesivir as a treatment for COVID-19 are not convincing from either a methodological or medical point of view [14,15]. Furthermore, a Chinese team recently reported a lack of benefit of remdesivir treatment compared to placebo [16]. Consequently, the value of Gilead



**FIG. 2.** Cotation of Gilead Science (opening price). Plus sign indicates elements likely to explain increase in Gilead's market price; minus sign, elements likely to explain decrease in Gilead's market price. Increases are as follows: +a, COVID-19 reaches Europe [19]; +b, 13 February 2020, first publication of 'Prophylactic and therapeutic remdesivir (GS-5734) treatment in the rhesus macaque model of MERS-CoV infection' [20]; +c, clinical trial of remdesivir to treat COVID-19 begins [21]; +d, publication of first patient healed with remdesivir [22]; +e, start of European trial discovery [23]; +f, fake news about chloroquine toxicity [11]; +g, Gilead initiates two studies of remdesivir for COVID-19 in United Kingdom [24]; +h, publication of first clinical trial about remdesivir [16]; +i, leak from Chicago hospital suggests disease responds to remdesivir [25]; +j, health ministry moves to approve remdesivir to treat domestic coronavirus patients [26]; +k, NIH claims remdesivir accelerates recovery from advanced COVID-19 [27]. Decreases are as follows: -a, IHU-MI suggest that hydroxychloroquine is treatment for COVID-19 [28]; -b, IHU-MI announce beginning of clinical trial with hydroxychloroquine [29]; -c, IHU-MI announce that it will treat COVID-19 patients with hydroxychloroquine and azithromycin, invoking the Hippocratic Oath [30]; -d, Publication of first IHU-MI clinical trial [9]; -e, French president E. Macron visits IHU-MI on 9 April 2020; -f, WHO leak, 'First trial for potential COVID-19 drug shows it has no effect' [31]; -g, clinical trial published in *Lancet* shows no benefit of remdesivir treatment [15]. COVID-19, coronavirus disease 2019; IHU-MI, Institut Hospitalo-Universitaire Méditerranée Infection; MERS-CoV, Middle East respiratory syndrome coronavirus; WHO, World Health Organization.

based on the potential of remdesivir as a COVID-19 treatment is overestimated, as was indeed pointed out by a Gilead analyst [17]. Furthermore, we estimated from the ABC Bourse [13] that the total exchange of shares from 1 January to 6 May represents \$10.7G, a very high level. Communication about remdesivir considerably influences changes in Gilead's stock price. Given that, we raise the issue of insider trading [14]. Prior knowledge by certain Gilead shareholders regarding the publication of articles written by Gilead's scientists as well as statements and leaks from various institutions would allow the shareholders to obtain enormous benefits.

Cotation of pharmaceutical companies and volume shares exchanged from 1 January to 6 May 2020 have been uploaded to the ABC Bourse website [13]. The total sum exchanged of shares was calculated by multiplying the opening price of the share by the number of shares exchanged and summed over the period. The

accumulated fluctuations were the absolute difference between the price ( $D_i - D_{i-1}$ ) and summed over the period. This sum was divided by the average price of the share over the period to compare the accumulated fluctuations with the share value.

### Conflict of interest

None declared.

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## References

- [1] Lai CC, Shih PS, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. *Int J Antimicrob Agents* 2020;55:105924.
- [2] Wang LS, Wang YR, Ye DW, Liu A QQ. Review of the 2019 novel coronavirus (COVID-19) based on current evidence. *Int J Antimicrob Agents* 2020.
- [3] World Health Organization (WHO). WHO Director-General's opening remarks at the media briefing on COVID-19. 11 March 2020. Available at: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>.
- [4] Wang M, Cao R, Zhang L, et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) *in vitro*. *Cell Res* 2020;30:269–71.
- [5] Mulangu S, Dodd LE, Davey RT, et al. A randomized, controlled trial of Ebola virus disease therapeutics. *N Engl J Med* 2019;381:2293–303.
- [6] Solomon VR, Lee H. Chloroquine and its analogs: a new promise of an old drug for effective and safe cancer therapies. *Eur J Pharmacol* 2009;625:220–33.
- [7] Gao J, Tian Z, Yang X. Breakthrough: chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. *Biosci Trend* 2020;14:72–3.
- [8] Min JY, Jang YJ. Macrolide therapy in respiratory viral infections. *Mediat Inflamm* 2012;2012:649570.
- [9] Gautret P, Lagier JC, Parola P, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. *Int J Antimicrob Agents* 2020.
- [10] Gautret P, Lagier JC, Parola P, Hoang VT, Meddeb L, Sevestre J, et al. Clinical and microbiological effect of a combination of hydroxychloroquine and azithromycin in 80 COVID-19 patients with at least a six-day follow up: a pilot observational study. *Travel Med Infect Dis* 2020;34:101663.
- [11] Edwards E, Hillyard V. Man dies after taking chloroquine in an attempt to prevent coronavirus. Available at: NBC News; 24 March 2020. <https://www.nbcnews.com/health/health-news/man-dies-after-ingesting-chloroquine-attempt-prevent-coronavirus-n1167166>.
- [12] Hache G, Rolain JM, Gautret P, Deharo JC, Brouqui P, Raoult D, et al. Combination of hydroxychloroquine plus azithromycin as potential treatment for COVID-19 patients: pharmacology, safety profile, drug interactions and management of toxicity. Preprint available at: IHU-Méditerranée Infection; 2020. [https://www.mediterranee-infection.com/wp-content/uploads/2020/04/azithroquine\\_manuscript-soumis.pdf](https://www.mediterranee-infection.com/wp-content/uploads/2020/04/azithroquine_manuscript-soumis.pdf). Preprint.
- [13] ABC Bourse. Élévation des cotations. n.d. Available at: <https://www.abcbourse.com/download/historiques>.
- [14] Ahmed SI, Johnson K. Gilead trades that made millions on COVID-19 drug news raise eyebrows. Available at: Reuters; 1 June 2020. <https://www.reuters.com/article/us-health-coronavirus-gilead-sciences-op-idUSKBN23828D>.
- [15] Grein J, Ohmagari N, Shin D, et al. Compassionate use of remdesivir for patients with severe COVID-19. *N Engl J Med* 2020.
- [16] IHU-Méditerranée Infection. Actualité du traitement. Available at: 14 April 2020. <https://www.mediterranee-infection.com/actualite-du-traitement/>.
- [17] Whang Y, Zhang D, Guanhua D, et al. Remdesivir in adults with severe COVID-19: a randomised, double-blind, placebo-controlled, multicentre trial. *Lancet* 2020.
- [19] Remuzzi. COVID-19 and Italy: what next? *Lancet* 2020;395:1225–8.
- [20] De Wit E, Feldmann F, Cronin J, et al. Prophylactic and therapeutic remdesivir (GS-5734) treatment in the rhesus macaque model of MERS-CoV infection. *Proc Natl Acad Sci U S A* 2020;117:6771–6.
- [21] US Department of Health and Human Services; National Institutes of Health. NIH clinical trial of remdesivir to treat COVID-19 begins. News release. Available at: 25 February 2020. <https://www.nih.gov/news-events/news-releases/nih-clinical-trial-remdesivir-treat-covid-19-begins>.
- [22] Holshue M, DeBolt C, Linsquist S, et al. First case of 2019 novel coronavirus in the United States. *N Engl J Med* 2020;382:929–36.
- [23] Wikipedia François. Discovery (essai clinique). n.d. Available at: [https://fr.wikipedia.org/wiki/Discovery\\_\(essai\\_clinique\)](https://fr.wikipedia.org/wiki/Discovery_(essai_clinique)).
- [24] Clinical Trials Arena. Gilead initiates two studies of remdesivir for Covid-19 in UK. Available at: 2 April 2020. <https://www.clinicaltrialsarena.com/news/gilead-remdesivir-covid-19-uk-trials/>.
- [25] Feuerstein A, Herper M. Early peek at data on Gilead coronavirus drug suggests patients are responding to treatment. Available at: Stat News; 16 April 2020. <https://www.statnews.com/2020/04/16/early-peek-at-data-on-gilead-coronavirus-drug-suggests-patients-are-responding-to-treatment/>.
- [26] Available at: Reuters. Japan health ministry expediting remdesivir for COVID-19 patients. Japan Times; 3 May 2020. <https://www.japantimes.co.jp/news/2020/05/03/national/science-health/japan-health-ministry-approve-remdesivir/#.XrLk10QzZOQ>.
- [27] National Institutes of Health; National Institute of Allergy and Infectious Diseases. NIH clinical trial shows remdesivir accelerates recovery from advanced COVID-19. Available at: News release; April 29, 2020. <https://www.niaid.nih.gov/news-events/nih-clinical-trial-shows-remdesivir-accelerates-recovery-advanced-covid-19>.
- [28] IHU-Méditerranée Infection. Coronavirus: Vers une sortie de crise? IHU-MI communication. Available at: 25 February 2020. <https://www.mediterranee-infection.com/coronavirus-vers-une-sortie-de-crise/>.
- [29] IHU-Méditerranée Infection. Coronavirus: Peur vs data/Chloroquine: Recherche clinique. IHU-MI communication. 9 March 2020. <https://www.mediterranee-infection.com/coronavirus-peur-vs-data-chloroquine-recherche-clinique/>.
- [30] IHU-Méditerranée Infection. Épidémie à coronavirus COVID-19. Available at: IHU-FMI press release; 22 March 2020. <https://www.mediterranee-infection.com/epidemie-a-coronavirus-covid-19/>.
- [31] Bosley S. First trial for potential Covid-19 drug shows it has no effect. Guardian; 23 April 2020. Available at: <https://www.theguardian.com/world/2020/apr/23/high-hopes-drug-for-covid-19-treatment-failed-in-full-trial>.