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Editorial Letter

The sound of getting rid of coronavirus by RNA interference technology: RNAi against COVID-19

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Coronaviruses are a large family of *Coronaviridae* and a subfamily of *Coronavirinae* and the order *Nidovirales* that range from the common cold virus to the cause of more serious illnesses such as severe acute respiratory syndrome (SARS), middle east respiratory syndrome (MERS), and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Spherical or pleomorphic enveloped particles containing single-stranded RNA (ssRNA) are associated with a nucleoprotein within a capsid comprised of matrix protein. The envelope bears club-shaped glycoprotein projections [1]. Coronavirus disease 2019 (COVID-19), reported on December 31, 2019, in Wuhan, China, causes the acute respiratory syndrome. To date, thousands of people around the world are infected with the virus every day, while the number of people who die by COVID-19 is also significant. COVID-19 disease may manifest either as an asymptomatic infection or a mild to severe pneumonia [2]. Due to the epidemic of COVID-19 virus in the world, there is an urgent need for new antiviral [3]. To date, there is no known definitive cure for coronavirus, and no vaccine has been developed that is approved by the World Health Organization (WHO). Research to date has shown that the SARS-CoV-2 and SARS-CoV genes are up to 79% identical sequence and their receptor-binding domain structure are very similar [4]. Both viruses have an animal reservoir and have been transmitted from animal to human. SARS was first reported in the Guangdong province of southern China in 2002 [5].

As an effort to prevent and inhibit COVID-19 virus replication, RNA interference (RNAi) technology can be considered. This technology has been previously used to turn off the expression of the virus gene in SARS-CoV, HIV, HCV, and HBV [6]. RNA interference is a process in which double-stranded RNA causes a specific sequence in homologous genes to be silenced. This natural mechanism for silencing specific sequence genes has given biologists hope in the treatment of many diseases, including viral diseases and cancer, and may have important practical applications in agriculture, functional genomics, and therapeutic interventions. Historically, RNAi has been identified with terms such as repressing or silencing genes after transcription. The RNAi mechanism is evolutionarily conserved and was found in a wide range of eukaryotic organisms [7]. The mechanism of RNAi can be accomplished in three ways, including synthetic short-interference RNAs (siRNAs; 19-27 long double-stranded nucleotide RNAs) as well as in situ production of short hair RNAs (shRNAs) or pointed through plasmid DNA-based expression vectors (pDNA). The process of gene deactivation by

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RNAi mainly mediated through two small ribonucleic acid molecules called microRNA (miRNA) and small interfering RNA (siRNA). Specific inhibition of cellular mRNA in mammalian cells performed by the introduction of synthetic 21- to 23-nucleotide duplexes of RNA. Thus, RNAi specifically inhibits gene expression and viral genome replication in the host cell [8,9]. The RNAi mechanism inhibits gene expression in many eukaryotes, including animals. In this process, when a double-stranded RNA enters the cytoplasm, it is detected by the Dicer enzyme, and fragments of 21 to 25 nucleotides, known as siRNAs, are produced by the enzyme [10]. Then, these short two-string pieces will follow different destinies. They may be attached to the RNA-induced silencing complex (RISC) set and become single-stranded, with one strand separated from the whole set by one of the subunits and then attached to complementary versions and cut by the RISC set. Cleaves transcripts will be degraded by cytoplasmic RNases [11]. Good results have been obtained in the treatment of SARS virus using RNAi, which can be extended to other viruses of the coronavirus family. The RNAi strategy has been proven to work well in inhibiting different types of virus infections such as rotavirus [12], influenza virus [13], and HIV-1 [14-15]. In recent years, many studies and researches have been done in the treatment of SARS through siRNA. The results of most of these studies show that all siRNA duplexes specifically reduce the expression of the SARS-CoV gene to varying degrees compared to the control. Also, it was well demonstrated that DNA vector-based siRNA can effectively and specifically inhibit the expression of the spike protein gene in SARS-CoV cells and inhibit virus pathogenicity [6].

These results suggest that RNAi, as an effective antiviral strategy, may be used to inhibit COVID-19 infection, as previously demonstrated in similar viral infections such as SARS, MERS, etc. Since the coronavirus is very similar gnomically and structurally to the SARS virus, it is to be hoped that RNAi technology can be used to control the virus and prevent it from becoming pathogenic in humans, thus ending this bitter nightmare. Various cellular functions, including control of gene expression, chromatin status change, and gene silencing, are controlled by RNAi pathways. Speed, accuracy, economy, targeted transmission, and minimal toxicity are some of the factors affecting the therapeutic properties of RNAi. Access to methods to identify, design, and proprietary pharmaceuticals in the process of RNAi, can be considered for the next generation of drugs and can also be an effective treatment for emerging viral diseases such as COVID-19.

Author Contributions

All authors contributed equally to this manuscript, and approved the final version of manuscripts.

Conflict of Interests

The authors declare that they have no conflicts of interest.

Ethical declarations

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