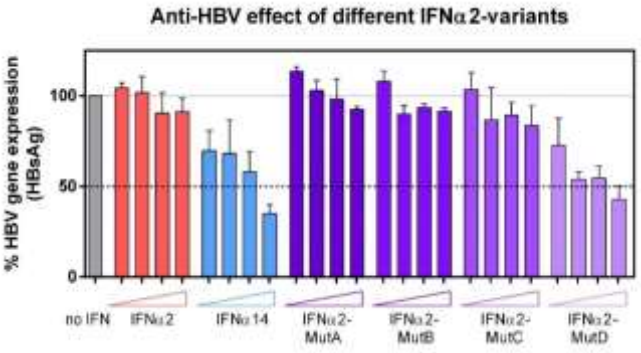
Artificial Interferons

Chimeric mutants of interferon alpha 2 and other interferon alpha subtypes with improved antiviral activity

Invention

Interferons are a family of proteins that were originally named for their ability to interfere with viral replication and propagation. To date, it is known that interferons are also involved in combating bacterial and parasitic infections, inhibit cell division, and promote or impede the differentiation of cells. Of the known IFN alpha (IFNα) subtypes, only IFNα2 has been extensively studied for its pharmaceutical potential. IFNα2 is therapeutically used for treatment of chronic infection with Hepatitis B Virus (HBV), but leads to a sustained virus control in less than 20% of the treated patients. In chronic Human Immunodeficiency Virus (HIV) infection its efficacy is even lower, with the results that it has been clinically used in only very few studies. Researchers of the University of Duisburg and Essen have discovered that IFNα14 is more efficient for the treatment of HBV and HIV infections. Whereas the most potent IFNα subtype against Influenza Virus is IFNα16. These findings were not only generated *in vitro*, but also in humanized mouse models and human organoid cultures. Based on these and earlier findings regarding the different antiviral activities of IFNα subtypes, the researchers designed chimeric mutants of the known IFNα2 and IFNα6/IFNα14/IFNα16 proteins that use the IFNα2 backbone, which is clinically well-established, with a variety of point mutations derived from the IFNα6/IFNα14/IFNα16 amino acid sequences that show significantly higher antiviral activity than IFNα2 (see Figure).



Effect of IFNα2-variants on HBV gene expression *in vitro*. The levels of extracellular HBsAg of HBV-infected primary human hepatocytes treated with increasing concentrations of IFNα2 mutants were examined by ELISA and normalized to the untreated control (no IFN, grey bar)

Commercial Opportunities

The invention is available for licensing and further development together with the researchers of the University of Duisburg-Essen. Several mutants have been generated for the treatment of chronic (e.g. HBV, HDV, HIV) or acute (e.g. Influenza, Zika, Corona) viral infections, bacterial or parasitic infections or for adjunct tumor therapy (e.g. renal-cell carcinomas, cutaneous melanoma, hairy-cell leukemia, leukemia, melanomas).

Current Status

A European priority application has been filed on April 4, 2020.

Relevant Publications

Chen J., et al. (2020) Functional comparison of IFN-α subtypes reveals potent HBV suppression by a concerted action of IFN-α and -γ signaling. Hepatology doi: 10.1002/hep.31282.

An invention of the University of Duisburg-Essen.

Competitive Advantages

- Higher antiviral efficacy than conventional IFNα2 therapy
- High biocompatibility
- IFNα2 as drug backbone is clinically well-established
- Applies to a broad range of viruses

Technology Readiness Level

1 2 3 4 5 6 7 8

Experimental proof of concept

Industries

- Pharmaceutical Industry

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