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### **Development of composite polymeric matrices, containing metal nanoparticles and / or essential oils, with antiviral properties against VIRUS SARS-CoV-2 Sars-Cov-2 (STOP-VIRUS)**

IFC-CNR: Principal Investigator Dr. Giorgio Soldani

Partner: Centro Retrovirus, AOUP: Dr. Mazzetti/Prof. Mauro Pistello

IBF-CNR: Dr. Mario D'Acunto

Altri ricercatori IFC -CNR coinvolti: Dr. Paola Losi, Dr. Ilenia Foffa, Dr. Lorena Tedeschi

Coronavirus disease 2019 (COVID-19) due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is the second pandemic of the 21st century. In this scenario of non-univocal medical treatments and vaccine unavailability and for its easily propagate, it is imperative to ensure the protection. Therefore, increasing the effectiveness of personal protective equipment (PPE) and at the same time developing composite polymer matrices such as antiviral “coatings” could represent an effective tool to prevent the spread of the virus. Several studies showed that different metallic nanoparticles (NPs) can inactivate bacterial cells and some viruses, as well as substances of natural origin such as essential oils have antiviral properties against many RNA or DNA viruses.

The aim of the project will be to develop polymeric matrices, using spray-technology, based on metallic NPs, in particular copper nanoparticles (CuNP), and/or essential oils that can help in countering the spread of the virus, showing antiviral properties. In particular, these polymeric matrices could be used for the treatment, “coating”, of filters for masks to increase the effectiveness of PPE, developing safer devices and therefore with better shielding properties. Furthermore, these “coating” could have applications in different field not only in the biomedical area.

The activities will be divided into 3 operational objectives:

- Development and characterization of copper nanoparticles with antiviral properties.
- Development of biocompatible polymeric matrices, using phase inversion spray technology, based on metallic NP and based on essential oils and their characterization. The retention capacity of small-caliber aerosols and the differential pressure through the filtering layer will be evaluated according to EN 14683.
- Evaluation of the antiviral activity of the composite polymer matrix.

Preliminary results

The viral suspension, placed in contact with samples of facemask treated with CuNP 25nm and polyurethane using phase inversion spray technology showed reduced infectivity of the Virus on Vero E6 cells at several timepoint.

Antiviral activity was evaluated at Retrovirus Center with over thirty years of experience in manipulation with virus, has specific instrumentation with biosafety level 2 and 3.

Expected results

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The development of a composite polymer matrix with antiviral properties, specifically for SARS-CoV-2, used for coating could lead to the manufacture of safer and more effective PPE.

Furthermore, the development of a polymeric-based coating treatment with antiviral activity could also be applied to other types of materials with possible application in manufacturing medical devices, the textile industry, food packaging and water decontamination.

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**Contacts:** Giorgio Soldani, giorgio.soldani@ifc.cnr.it; Paola Losi, losi@ifc.cnr.it; Ilenia Foffa, ilenia.foffa@ifc.cnr.it; Lorena Tedeschi, tedeschi@ifc.cnr.it

**Website(s):**

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Collaboration with AOUP Retrovirus center (Prof. Mauro Pistello, Dr. Paola Mazzetti, Dr. Paola Quaranta) e IBF-CNR (Dr. Mario D'Acunto)

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