



Aspen Institute Italia Award 2019

In olfactory neurons the key to diagnosing neurodegenerative diseases

A Test for Creutzfeldt-Jakob Disease Using Nasal Brushings¹ - This is the title of the study that won the fourth edition of the [Aspen Institute Italia Award](#) for collaboration and scientific research between Italy and the United States.

Eleven scientists belonging to four different scientific organizations worked together toward this result. Their research represents a significant step forward in diagnosing prion diseases; above all, however, it opens a new and broad perspective of diagnosis in the field of those neurodegenerative diseases that are more common and that have a significant social and economic impact.

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- **Matilde Bongianni, Ph.D.** ²
- **Giovanni Tonoli, M.D.** ⁴
- **Sergio Ferrari, M.D.** ²
- **Andrew G. Hughson, M.S.** ¹
- **Michele Fiorini, Ph.D.** ²
- **Bradley R. Groveman, Ph.D.** ¹
- **Maurizio Pocchiari, M.D.** ³
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The originality of the research lies in having devised a simple and non-invasive procedure for the reliable diagnosis of prion diseases. The neurons of the olfactory mucosa are taken with nasal brushing and then analyzed with a new technique that amplifies prions in vitro, called "real-time quaking-induced conversion (RT-QuIC)". This test is highly innovative because it combines the high sensitivity of the RT-QuIC technique (used to identify the pathogenetic marker of prion diseases) with the non-invasive collection of olfactory epithelium.

International criteria require that the definitive diagnosis of prion disease be obtained exclusively by a biochemical or histological exam. Indeed, before the research being recognized here was undertaken and proved successful, a certain diagnosis of prion disease could only be obtained after death, with a brain autopsy. A biopsy of a living brain is never recommended because of the high risk of contamination and the high costs of sterilizing healthcare facilities. Having a test capable of making a definite diagnosis of prion disease while a patient is still alive, therefore, is an extremely important step forward in our understanding of these diseases. It informs family members, avoids further tests, reduces costs and allows timely treatment.

In the near future, the diagnostic use of nasal brushing coupled with the RT-QuIC technique could be extended to other neurodegenerative diseases (such as Parkinson's, Alzheimer's and Lewy Body Dementia). RT-QuIC performed on samples of olfactory epithelium could identify the marker proteins of these diseases, thereby allowing diagnoses even in very early stages of the disease. In most neurodegenerative diseases – in particular Parkinson's – the first neuropathological lesions are observed in the olfactory system; indeed, olfactory disorders represent a very early non-motor symptom of the disease.

THE AWARD

The *Aspen Institute Italia Award* for scientific research and collaboration between Italy and the United States was launched in December 2015 in keeping with the Institute's commitment to encouraging and developing international leadership and transatlantic relations. Every year, the prize will be awarded to a research project studying applied or theoretical natural sciences, in which scientists and/or organizations from Italy and the US collaborate.

The Prize consolidates the Institute's commitment towards initiatives and meetings on important topics in the fields of science and technological innovation, with particular reference to their relevance to Italy.

The members of the Award committee for the 2019 Award are:

- Professor Giulio Tremonti, Chairman of the Award committee; Chairman, *Aspen Institute Italia*, Rome
- Professor Domenico Giardini, Chair of Seismology and Geodynamics, ETH, Zurich
- Professor Luciano Maiani, Professor Emeritus of Theoretical Physics, "La Sapienza" University, Rome
- Professor Gaetano Manfredi, Chairman, CRUI – The Conference of Italian University Rectors; Rector, University of Naples Federico II; Full Professor of Construction Design and Head of Department of Structural Analysis and Design, University of Naples Federico II
- Professor Giovanni Rezza, Director, Department of Infectious Diseases, Istituto Superiore di Sanità, Rome
- Mr. Lucio Stanca, Vice Chairman, *Aspen Institute Italia*, Rome

The winning researches of the 2016-2018 editions of the *Aspen Institute Italia Award* were:

2016: *Spatiotemporal spread of the 2014 outbreak of Ebola virus disease in Liberia* which created a mathematical model to interpret the spread of Ebola.

2017: *Wind from the black hole accretion disk driving a molecular outflow in an active galaxy* that demonstrates that wind coming from black holes contributes to the formation of new stars inside different galaxies.

2018: *The quest for forbidden crystals* that demonstrates the ample scope for discovering new quasicrystals in nature (with chemical compositions as-yet unexplored in the laboratory) and for extending the results of this new field of research to other scientific spheres and to groundbreaking industrial applications.