

**Frontiers of Knowledge Award in Development Cooperation**

## **The BBVA Foundation recognizes Nubia Muñoz for enabling the achievement of an effective vaccine against cervical cancer, one of the main causes of death among women in developing countries**

- Muñoz proved epidemiologically that human papillomavirus was the main agent causing cancer of the uterine cervix in a series of studies run in 30 countries over the space of 25 years
- The jury remarked that the work of the Colombian scientist has served to successfully combat a disease which, in 80% of cases, affects women in developing countries
- Her work played a key role in the development and implementation of “the first vaccine specifically targeting the prevention of cancer”
- The scientist has also participated in other research projects that have identified links between viruses and cancerous conditions especially prevalent in developing countries
- Muñoz, the jury notes, “is an example of a woman scientist working on diseases that affect women, particularly in the developing world.”

**Madrid, February 27, 2018.-** The BBVA Foundation Frontiers of Knowledge Award in the Development Cooperation category goes, in this tenth edition, to the Colombian epidemiologist Nubia Muñoz, whose work was instrumental in establishing that infection with human papillomavirus (HPV) is the principal and necessary cause of cervical cancer. Her studies played a catalytic role in the development of anti-virus vaccines capable of preventing 70% of all cervical cancers, a disease where 80% of cases involve women in developing countries.

Dr. Muñoz (Cali, Colombia, 1940), says the jury, “established the epidemiological relationship between papillomavirus and cervical cancer,” and her work “has been a true catalyst for vaccine development and subsequent application throughout the world, including the most affected countries.” “This was the first vaccine,” the citation points out, “specifically targeting the prevention of cancer.”

The new laureate has also participated in other research projects dealing with viruses and other cancer-causing agents that are rife in developing countries. In this respect, Muñoz, the jury notes, "is an example of a woman scientist working on diseases that affect women, particularly in the developing world."

The existence of the HPV vaccine "is like a dream come true," she commented by phone this morning at the awards press event. "I am keenly aware that I am a privileged researcher. Very few epidemiologists have seen their work become the definitive proof that resolves a major public health problem."

The Colombian scientist has spent her professional life at the International Agency for Research on Cancer (IARC) in Lyon, France. She is currently Emeritus Professor of the National Cancer Institute of Colombia and a visiting scientist at the Catalan Institute of Oncology (ICO). Part of her research on the epidemiology of HPV was carried out with Xavier Bosch, Chief of International Affairs at ICO and one of her nominators, with whom she continues to enjoy a working relationship. Muñoz was also put forward for the award by Josep María Antó, Scientific Director of the Barcelona Global Health Institute.

At the age of six, Nubia Muñoz experienced first-hand the devastating impact of infectious diseases when her father, a farmer worker in Cali, died of diphtheria, leaving her mother alone to raise five children (four boys and Nubia, the baby of the family). It was this early loss that inspired her to devote her life to medicine. In an interview published in *The Lancet*, Muñoz remarks that her father's death was particularly terrible, since it could have been prevented if he had received the right treatment with penicillin, which at the time was hard to come by in Colombia.

Despite growing up in such modest surroundings, Muñoz was an exceptional student. Not only did she win a place at the Medicine School of the Universidad del Valle, but by consistently achieving the top marks in her class she was able to complete most of her degree without paying tuition fees. As a recent graduate, she began working with her mentor, Pelayo Correa, head of the pathology department at the Universidad del Valle, who advised her to move into cancer epidemiology if what she wanted was, as she said, "to be somewhere with the most potential to benefit the community."

Muñoz would subsequently obtain an IARC grant to study public health at Johns Hopkins University, in the United States, and in 1970 was hired to work at the IARC headquarters in Lyon. Her first projects there involved research into infectious agents suspected of being linked to some kinds of cancer; among them the herpes simplex 2 virus, then under investigation as a possible cause of cervical cancer. This hypothesis, proposed by German scientist Harald zur Hausen, turned out to be untrue. But not long after, zur Hausen himself proposed another candidate: human papillomavirus. This time his intuition was correct, and his discovery, made at the start of the 1980s, won him the Nobel Prize in Medicine in 2008.

In the mid-1980s, as head of her own team at IARC, Muñoz launched a major international effort to confirm the link between papillomavirus and cancer of the uterine cervix. At the end of the decade, she and Bosch were able to confirm the presence of papillomavirus in patients in Colombia and Spain. The search was extended in the 1990s to another thirty countries, with the same result.

These studies not only proved that HPV infection is the principal and necessary cause of cervical cancer. They were also able to show that in all countries it was the same HPV strains that were doing the damage, genotypes 16 and 18.

"Nubia Muñoz's work," said Bosch yesterday after hearing of the award, "provided the breakthrough information enabling the development of a universal vaccine against cervical cancer."

As Muñoz explained this morning, "Harald zur Hausen's group molecularly identified the first types of human papillomavirus and developed laboratory tests to detect patients' exposure. I continued the studies, which concluded that the virus was the main cause of cervical cancer (...) There are around 100 types of human papillomavirus, and just over twenty are linked to the disease. Knowing this was vital so pharmaceutical companies could start working on a vaccine."

But Muñoz did not stop at providing the basic input for the vaccine's development. In 1993, she organized the first international meeting on HPV vaccines. She also convinced the IARC to convene a group of experts to agree on the HPV strains to be classified as carcinogens, leading in 1995 to HPVs 16 and 18 being classed as group 1 human carcinogens.

Since 1999, HPV infection has been accepted as a necessary cause of cancer of the uterine cervix, for as Nubia Muñoz baldly explains it: "Without the virus, there is no cancer." She has carried on researching into the possible co-factors that increase cancer risk, because the immense majority of women infected with what is a fairly widespread virus are entirely asymptomatic, and only a small proportion go on to develop cancer.

The HPV vaccine has been available since 2006. All versions on the market confer protection against HPVs 16 and 18, with some also effective against other strains. And it is commonly estimated that they can now prevent up to 90% of cases of cervical cancer, as well as other cancers where HPV is implicated. These include 80% of cases of anal cancer, 60% of vaginal cancer, 40% of vulvar cancer and also some cases of mouth and throat cancer.

The vaccine is considered of paramount importance in developing countries, where few women have access to techniques to detect pre-cancerous lesions – through regular smear tests – meaning the disease only shows up in its later stages. As we write, over 80% of cervical cancer cases are in developing countries. And the disease is among the three top causes of cancer deaths among women living there.

Muñoz is at pains to stress the vaccine's safety and effectiveness: "We know that the biggest causes of cancer are smoking and infectious agents. Among this last group are papilloma, *Helicobacter pylori* and hepatitis B and C. We have had hepatitis vaccines for over thirty years and now have a comparable arm against papilloma. We know how to prevent 40% of cancer cases, and the tragedy is that we are not using that knowledge."

The vaccine, she adds, is fully available in 84 countries, most of them in the developed world. So "the important thing now is to continue rolling it out in the developing countries, where it is most needed." A major step to achieving this would be if the studies now under way confirm that just one dose will suffice, instead of the current three: "That would mean the price could come down, which is an obstacle to the vaccine's implementation, and one of the reasons why few African countries have taken it up. We hope this will now change, with the help of GAVI, the Global Alliance for Vaccines and Immunization."

Talking about her devotion to science, the laureate explains "for me, it has never been a burden, but always a pleasure, because I am doing what I love. I went into research in order to help people."

### Bio notes

**Nubia Muñoz** (Cali, Colombia, 1940) earned a medical degree from the Universidad del Valle in Cali, Colombia, going on to specialize in pathology. She completed a fellowship in pathology and virology at the National Cancer Institute (Bethesda, United States) and earned a Master's Degree in Public Health (Cancer Epidemiology) from the Johns Hopkins University in Baltimore (United States). In 1969 she joined the International Agency for Research on Cancer (Lyon, France), where she rose to the rank of Chief of the Unit of Field and Intervention Studies. She is currently Emeritus Professor of the National Cancer Institute of Colombia and a consultant to the Epidemiology Research Program at the Catalan Institute of Oncology (Barcelona, Spain), the Ministry of Health and Social Protection in Colombia and the Instituto Nacional de Salud Pública (Cuernavaca, Mexico).

### Development Cooperation jury and technical committee

The jury in this category was chaired by **Pedro L. Alonso**, Director of the World Health Organization's Global Malaria Program in Geneva (Switzerland). The secretary was **José García Montalvo**, Professor of Economics and ICREA-Academia Fellow at Pompeu Fabra University (Spain). Remaining members were **Antonio Ciccone**, Chair for Macroeconomics and Financial Markets in the Department of Economics at the University of Mannheim (Germany) and Professor of Economics and Business at Pompeu Fabra University (Spain), **Isabel Noguera**, Director of the National Center for Epidemiology at the Instituto de Salud Carlos III (Spain); **Vicente Larraga**, Research Professor in the Vaccine and Gene Expression Unit at the Center for Biological Research of the Spanish National Research Council (CSIC), **Norman Loayza**, Lead Economist in the Development

Research Group of the World Bank (United States), **Francisco Pérez**, Professor of Economic Analysis at the University of Valencia (Spain), and Research Director of the Valencian Institute of Economic Research (Ivie), and **Joachim von Braun**, Director of the Center for Development Research (ZEF) at the University of Bonn (Germany).

The **Technical Committee of the Spanish National Research Council (CSIC)** was coordinated by **María Victoria Moreno**, Deputy Vice President for Scientific and Technical Areas, and formed by: **Enrique Playán**, Research Professor at Aula Dei Experimental Station (EEAD); **Helena Gómez**, Tenured Researcher at the Institute of Sustainable Agriculture (IASD); **Francisco Tomás**, Research Professor in the Segura Edaphology and Applied Biology Center (CEBAS);, **Ramón González**, Research Professor at the Institute of Grapevine and Wine Sciences (ICVV), and **Ángel Ruiz**, Coordinator of the Area of Agricultural Sciences and Research Professor at the Mountain Stockbreeding Institute (IGM).

### **About the BBVA Foundation Frontiers of Knowledge Awards**

The promotion of knowledge based on research and artistic and cultural creation, and the interaction of these domains, forms a core strand of the **BBVA Foundation's** action program, along with the recognition of talent and excellence across a broad spectrum of disciplines, from science to the arts and humanities.

In line with these objectives, the **BBVA Foundation Frontiers of Knowledge Awards** were established in 2008 to recognize outstanding contributions in a range of scientific, technological and artistic areas, together with knowledge-based responses to the central challenges of our times. The areas covered by the Frontiers Awards are congruent with the knowledge map of the 21st century, in terms of the disciplines they address and their assertion of the value of cross-disciplinary interaction.

The BBVA Foundation is aided in the evaluation process by the **Spanish National Research Council (CSIC)**, the country's premier public research organization. As well as designating each jury chair, the CSIC is responsible for appointing the technical evaluation committees that undertake an initial assessment of candidates put forward by numerous institutions across the world and draw up a reasoned shortlist for the consideration of the juries.

#### LAUREATE'S FIRST DECLARATIONS AND IMAGES

A video recording of the new laureate's first interview on receiving news of the award is available from the Atlas FTP with the following coordinates:

Server: **5.40.40.61**

Username: **AgenciaAtlas4**

Password: **mediaset17**

The name of the video is:

**"PREMIO COOPERACIÓN"**

In the event of connection difficulties, please contact **Miguel Gil** at production company Atlas:

**Mobile:** +34 619 30 87 74

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## Fundación **BBVA**

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