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## **PRESS RELEASE**

### **A clearer cancer test by measuring immune response: Jérôme Galon named European Inventor Award 2019 finalist**

- **French immunologist Jérôme Galon nominated for European Patent Office's (EPO) annual innovation prize**
- **Galon's invention – an immune diagnostic test that predicts the risk of relapse for cancer patients – works by counting immune cells near tumour sites**
- **Technology provides a clearer, more complete analysis of a person's cancer, enabling doctors to provide the most effective treatment**

**Munich, 7 May 2019** – The European Patent Office (EPO) today announced that French immunologist Jérôme Galon has been nominated for the European Inventor Award 2019 for his diagnostic cancer test based on a patient's immune response. His invention, which has improved the accuracy of cancer prognosis, uses clues found in the immune system of cancer patients to help doctors assess their risk of relapsing. Galon, who is Director of Research at the French National Institute of Health and Medical Research (INSERM) in Paris and head of its Laboratory on Integrative Cancer Immunology at the Cordeliers Research Center, is one of three finalists nominated in the "Research" category.

Galon's invention, licensed by INSERM and brought to market under the name Immunoscore® by the company he co-founded, counts the number of positive immune cells of a patient at the site of their tumour. It provides doctors with a full picture of patients' immune responses, enabling them to classify cancers more precisely and provide the most effective therapies. Clinics around the world use Immunoscore to predict the risk of relapse in patients with colorectal cancer.

"Jérôme Galon's invention has brought about a paradigm shift in the field of oncology," said EPO President António Campinos announcing the European Inventor Award 2019 finalists. "It has already prompted the re-examination of cancer classification schemes and could

ultimately give rise to new treatments. By launching a start-up and successfully using patents, Galon is bringing the technology to market so that his research efforts can make an impact where it counts most – in helping people."

The winners of the 2019 edition of the EPO's annual innovation prize will be announced at a ceremony in Vienna on 20 June.

### **Shedding light on the immune system's role in fighting cancer**

Cancer is the world's second most deadly disease and responsible for 9.6 million deaths globally every year, according to the World Health Organization. But despite this toll, the behaviour of the tumours themselves, and indeed the body's response to these tumours, remains poorly understood. If two patients are diagnosed at the same time with the same type of cancer, the tumours can develop and spread through the body at different rates. One patient could die after several months, while the other could live with the cancer for several years.

Established medical science held that differences in the tumours alone were responsible for differing patient outcomes. Oncologists thus focused their efforts on the cancer cells, and on the genetic mutations of these cells. But immunologist and cancer specialist Jérôme Galon took a different approach: he believed that the patient's immune system was also a key factor. Galon, who trained as an immunologist at the Pasteur Institute and the Curie Institute in Paris, received his PhD in immunology from Jussieu University in Paris in 1996. After working as a postdoctoral researcher at the National Institute of Health in the US, Galon returned to Paris in 2001 to run a research group funded by INSERM.

After several years of intense research, he and his team found that the ferocity of the tumour was not the sole factor in determining the lethality of the cancer, but instead that the strength of the patient's immune system also had a major impact. Their data was clear: the higher the number of immune cells in the tumour tissue, the greater the life expectancy of a cancer patient – a correlation which Galon named its "Immunoscore". This revelation changed the oncological landscape, particularly as far as cancer relapses were concerned.

Galon's invention also changed the way cancers are classified. For decades, the risk of recurrence in cancers has been assessed using a classification scheme that neglects intricacies in the body's immune response, leading to incomplete prognostic information. His diagnostic test fills in the gaps left by the original scheme.

Independent researchers have found that Immunoscore provides the most reliable prognostic to date for the risk of recurrence in solid cancers. It has been approved for use in colorectal cancer, where it has shown a 95% likelihood of predicting the overall survival of cancer patients. The international validation of Immunoscore has already been performed on over 5 000 patients in three separate studies.

"As doctors, we can now understand patients and their tumours far better," says Galon. "It's opened up a whole new era, the era of anti-cancer immunity, which is unfolding with immunotherapy."

### **Counting immune cells**

Immunoscore works by analysing a small tissue sample surgically removed from the primary tumour of a patient. It monitors the cancer site, counting immune 'cytotoxic T' cells, which destroy cancerous or virally-infected cells. The more of these immune cells are found in tumours, the better the patient's chances of survival. To conduct the test, a specialised scanner takes digital images of tumour samples on which Immunoscore's software counts the number of positive immune cells. An algorithm then calculates the Immunoscore for each patient based on T cell concentrations.

Low Immunoscores indicate a smaller number of immune cells tackling the tumour. They alert doctors to urgent cases that may previously have been overlooked, indicating vulnerable patients who may benefit from a higher dose of cancer treatments. High Immunoscores (showing a greater number of positive immune cells) indicate a higher survival chance for patients, suggesting that burdensome treatments, such as intense chemo- or radiotherapy, could be avoided. Thanks to Galon's invention, doctors can now apply a greater level of accuracy when selecting, dosing, and otherwise tailoring treatments to individual patients. Galon believes that test readings could eventually be used to supplement vulnerable patients with personalised medicine, including immunotherapy, to compensate for natural deficiencies in their immune system.

### **Unlocking wider use through co-operation**

Galon filed his initial patent application for Immunoscore in 2005, before publishing his results on the importance of immunology on cancer in the journal *Science* in 2006. More patent applications followed for many other aspects of the invention, and Galon is now named as inventor on 15 European patents.

To bring his invention to the market, Galon co-founded the Marseille-based company HaliuDx in 2014 and today serves as chairman of its scientific advisory board. The inventor, who has always had a spirit of entrepreneurship and wanted to play a role in building the company, believes that patents proved vital in commercialising his technology and enabled him to launch his business as a spin-off. "It is very rewarding to transform basic research into real life," he says. "The company was supported by venture capital from the start and investors looked hard at how deep and broad our patents were. Without them I would not have been able to raise the capital needed."

Immunoscore is already being used routinely at major cancer centres around the world to predict the risk of relapse in early to mid-stage colon cancer. The company has also launched a lung cancer test, and the inventor hopes that it can be used on many types of cancer in future.

Today HaliuDx has some 160 employees and licenses Galon's Immunoscore patents from INSERM. The company has obtained certification to sell products including the Immunoscore Colon Kit for use in clinical diagnostics since January 2017. The Immunoscore-related market has been estimated at EUR 1 billion per year; and today, the method is already in use in 19 countries. Over the past five years, HaliuDx has raised EUR 26.5 million in financing that will be used to further validate its test for other cancers and set up a US lab and production facility. These plans are in-line with the market trend; molecular diagnostics was worth EUR 5.4 billion in 2016 and is estimated to grow at a compound annual growth rate of 12.5% between 2017 and 2021.

The company has also joined forces with medical technology providers to reach a larger audience. In 2018 it announced a partnership with Philips to make Immunoscore available on its digital pathology platform, and with US-based Nanostring to offer immuno-oncology tests that are still in the research phase. It continues to validate the technology for other types of cancer and approve its general use through clinical studies.

### **About the European Inventor Award**

The European Inventor Award is one of Europe's most prestigious innovation prizes. Launched by the EPO in 2006, it honours individual inventors and teams of inventors whose pioneering inventions provide answers to some of the biggest challenges of our times. The finalists and winners are selected by an independent jury consisting of international authorities from the fields of business, politics, science, academia and research who examine the proposals for their contribution towards technical progress, social development, economic prosperity and job creation in Europe. The Award is conferred in five categories at a ceremony that will this year take place in Vienna on 20 June. The public selects the winner of the Popular Prize from among

the 15 finalists by online voting on the [EPO website](#) in the run-up to the ceremony. Voting is open until 16 June 2019.

### **About the EPO**

With nearly 7 000 staff, the [European Patent Office \(EPO\)](#) is one of the largest public service institutions in Europe. Headquartered in Munich with offices in Berlin, Brussels, The Hague and Vienna, the EPO was founded with the aim of strengthening co-operation on patents in Europe. Through the EPO's centralised patent granting procedure, inventors are able to obtain high-quality patent protection in up to 44 countries, covering a market of some 700 million people. The EPO is also the world's leading authority in patent information and patent searching.

### **Additional resources**

View the patent(s): [EP1943520](#), [EP2241891](#), [EP2420836](#)

[Video and photo material](#)

[Read more about the inventor](#)

Additional information, photos and videos about the European Inventor Award 2019 can be found in the EPO Media Centre. Smart TV users can download our app "[Innovation TV](#)" and watch videos about all finalists on their TV screen. The award ceremony on 20 June 2019 will be broadcast live on "Innovation TV", the [EPO website](#) and the EPO's [Facebook page](#).

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