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Nanoscale Horizons Emerging Investigator Series: Dr Verónica Mora Sanz, Basque Research and Technology Alliance (BRTA), Spain

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Our Emerging Investigator Series features exceptional work by early-career nanoscience and nanotechnology researchers. Read Verónica Mora Sanz's Emerging Investigator Series article 'Dot-blot immunoassay based on antibody-nanocluster biohybrids as tags for naked-eye detection' (**https://doi.org/10.1039/D5NH00045A**) and read more about her in the interview below.

Dr Verónica Mora Sanz holds a bachelor's degree in chemistry from the University of Zaragoza (2015) and a master's degree in nanostructured materials for nanotechnological applications from the same university (2016). Between 2016 and 2017, she worked as a junior researcher at the Institute of Nanoscience of Aragon (INA).

In 2017, she began her PhD in applied chemistry and polymeric materials at the University of the Basque Country (UPV/EHU), under the supervision of Dr Valery Pavlov (CIC biomaGUNE) and Dr Nerea Briz (Tecnalia), obtaining the highest distinction, "*summa cum laude*". Her doctoral research focused on the preparation of antibody atomic cluster conjugates and their application in bioanalytical assays. From this work, she obtained a patent, titled "Nanoclusters-antibodies conjugates and uses thereof", as well as two first-author scientific publications.

In 2020, she joined the Biomaterials Area of the Health Division at Tecnalia (San Sebastián), where she focused her research on the development of bioanalytical assays, including enzymatic reactions and immunoassays, and on the design of novel nanomaterials to enhance assay sensitivity. She also contributed to the development of lab-on-a-chip devices for *in vitro* diagnostics.

In September 2025, she joined CIRCE (Research Centre for Energy Resources and Consumption) in Zaragoza, a technology centre dedicated to energy, sustainability, and digitalization, to begin a new stage in her professional career within the Funding and Technology Transfer Unit, supporting the development of European project proposals.

Read Verónica's Emerging Investigator Series article 'Dot-blot immunoassay based on antibody-nanocluster biohybrids as tags for naked-eye detection' (https://doi.org/10.1039/D5NH00045A) and read more about her in the interview below.

NH: Your recent Nanoscale Horizons *communication describes a dot-blot immunoassay based on antibody-nanocluster biohybrids for naked-eye detection. How has your research evolved from your first article to this most recent article and where do you see your research going in the future?*

VMS: My research in this field began during my PhD, carried out jointly between CIC biomaGUNE and Tecnalia. The results obtained at that stage led to my first article, where I reported for the first time the embedding of nanoclusters within an antibody. The focus was mainly on the fundamental science behind their synthesis, and it was the first time that a nanobiohybrid was developed using an antibody as a scaffold. After the synthesis, not only were the nanoclusters successfully formed, but the antibody also retained its biological activity – specifically its ability to recognize its target analyte. In those early studies, my main goal was to demonstrate that the nanoclusters were indeed embedded within the antibody and to identify their exact location in the hinge region between the heavy chains, showing that this did not affect the antibody's recognition ability.

When this had been well established and demonstrated, I continued this line of research at Tecnalia, further advancing the concept toward more applied objectives, such as the use of these antibody–nanocluster hybrids as probes in immunoassays. In my most recent article, we exploited their peroxidase-like

properties for naked-eye detection in a dot-blot format. Looking ahead, I believe there is great potential to further explore naked-eye detection by developing lateral flow assays (LFAs), as well as to investigate other transduction mechanisms, such as electrochemical detection. In both cases, the ultimate goal is to develop biosensors for rapid, on-site analysis that can be integrated into lab-on-a-chip devices.

NH: How do you feel about Nanoscale Horizons *as a place to publish research on this topic?*

VMS: I feel that *Nanoscale Horizons* is the most appropriate and inspiring venue for publishing this work. The journal's commitment to conceptual innovation and transformative advances in nanoscience and nanotechnology perfectly aligns with the core idea of our study. We introduce a new paradigm in biosensing, in which catalytic bimetallic nanoclusters are integrated within antibody structures to merge biorecognition and signal transduction in a single probe.

This approach goes beyond incremental technological improvement; it represents a fundamentally different way of designing paper-based bioassays, eliminating the need for natural enzymes while enhancing sensitivity, robustness, and long-term stability. These advances highlight the potential of nanomaterials to redefine conventional analytical strategies, offering a broader impact that aligns with *Nanoscale Horizons*' interdisciplinary readership.

NH: What aspect of your work are you most excited about at the moment?

VMS: At the moment, I am particularly excited about a new stage in my career, having recently joined the Funding and Technology Transfer Unit in CIRCE (Zaragoza), where I focus on the preparation of European project proposals. This position gives me the opportunity to work at the interface between fundamental science and industry, helping to bridge the gap between academic research and market needs. Through European projects, we build solid partnerships, strengthen our technological capabilities, and develop solutions that can be effectively transferred to industry, ultimately contributing to innovation and societal impact.

NH: In your opinion, what are the most important questions to be asked/answered in this field of research?

VMS: In my view, the key questions in this field are about how to precisely control the interaction between nanomaterials and biological molecules to achieve reliable, reproducible, and tunable biosensing performance, such as enzyme-like activity, fluorescent signals or other molecule-like properties.

NH: What do you find most challenging about your research?

VMS: Translating the synthesis of nanomaterials at the laboratory scale, employing antibodies or other proteins as scaffolds, into robust and reproducible formats remains a demanding step. Another essential question is how to bridge the gap between the design of nanomaterials and their integration into functional bioanalytical devices which can serve as tools for real-world and point-of-care applications.

NH: In which upcoming conferences or events may our readers meet you?

VMS: As part of my ongoing involvement in European research initiatives, I will soon attend the BIC Matchmaking Event 2025.

NH: How do you spend your spare time?

VMS: In my spare time, I like to spend time with my family and friends, travel to discover new places, and stay active by doing sport.

NH: Can you share one piece of career-related advice or wisdom with other early-career scientists?

VMS: My advice would be to stay passionate and enthusiastic. In science, there are good days and bad years, which means that achieving valuable results often requires many unsuccessful attempts. Keeping this perspective is essential in order not to get discouraged, particularly in experimental work.