Nanopills release drugs directly from the inside of cells

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Universitat Autonoma de Barcelona researchers developed a new vehicle to release proteins with therapeutic effects. The vehicles are known as "bacteria inclusion bodies", stable insoluble nanoparticles which are found normally in recombinant bacteria. Even though these inclusion bodies traditionally have been an obstacle in the industrial production of soluble enzymes and biodrugs, they were recently recognised to have large amounts of functional proteins with direct values in industrial and biomedical applications.

The research team led by Antoni Villaverde from the Institute of Biotechnology and Biomedicine (IBB) at UAB worked in collaboration with the spanish Centro de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (CIBER-BBN) to verify the value of these nanoparticles as natural "nanopills" with a strong capacity to penetrate cells and carry out biological activities. The nanopill concept represents a new and promising platform for drug administration and illustrates the yet to be explored power of microbial materials in medicine.

The researchers, in a multidisciplinary study at UAB led by Dr Esther Vàzquez, packaged four proteins containing different therapeutic effects into experimental nanopills, the inclusion bodies of the bacteria *Escherichia coli*. They put the bacteria in contact with cell cultures of mammals under similar conditions to those found in real clinical pathologies, "sick" cells with low viability, and achieved to recover their activity.

Once the technology was licensed to Janus Developments, the tolerance of its administration in vivo was confirmed through experiments conducted by UAB researcher Ester Fernández. The results and detailed description of the "nanopill" were published in the last issue of the journal *Advanced Materials*.

The multidisciplinary study included researchers from IBB, the UAB Departments of Genetics and Microbiology and of Cell Biology, Physiology and Immunology, the CIBER-BBN, the CIBER-EHD (Centro de Investigación Biomédica en Red en el Área temática de Enfermedades hepáticas y Digestivas), the firm Janus Developments, the Leibniz University of Hannover and the Helmholtz Centre for Infection Research in Germany.

The use of inclusion bodies as therapeutic agents was patented by UAB and CIBER-BBN (patent code: WO2010131117A1), and licensed to the biotechnology firm Janus Developments, which currently invests in the development of the product.

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