

# Ceria nanoparticles for use in the treatment of hepatocellular carcinoma

- The present invention relates to the use of a particular cerium oxide single crystal nanoparticles (CeO<sub>2</sub>NPs) in the treatment of Hepatocellular Carcinoma (HCC)
- These CeO<sub>2</sub>NPs allowed increasing the survival of treated animals and reduced the proliferation of cancer cells
- A patent application has been filed protecting the formulation and its use in HCC

## Opportunity

Hepatocellular carcinoma (HCC) is a primary malignancy of the liver and occurs predominantly as metastasis from the colon or in patients with underlying chronic liver disease and cirrhosis. HCC is now the third leading cause of cancer deaths worldwide, with over 500,000 people affected. The threat of HCC is expected to continue to grow in the coming years. The peak incidence of HCC associated with hepatitis C virus infection has not yet occurred. There is also a growing problem with cirrhosis, which develops in the setting of nonalcoholic fatty liver disease, or nonalcoholic steatohepatitis (NASH). NASH typically develops in the setting of obesity, type 2 diabetes, dyslipidemia, and hypertension, and it will undoubtedly remain a significant problem, given the modern obesity epidemics.

## Unmet need

Unfortunately, HCC is still orphan in terms of treatment. The unmet need are:

- To get a better drug to the current *gold standard* treatment (sorafenib) which still has not proved to be effective enough
- To find a second line treatment for patients who are refractory to sorafenib
- To improve the overall survival of patient undergoing advanced HCC

We have synthesized conjugated CeO<sub>2</sub>NPs and have tested them in rats undergoing induced HCC. Results show a remarkable effect of these CeO<sub>2</sub>NPs in cell proliferation reduction and rat survival with HCC.

## Inventors

This project has been developed combining the experience of clinical (Hospital Clínic de Barcelona, UB and CIBER) and basic (ICN2 and ICREA) research. Dr Wladimiro Jiménez is the principal investigator leading the clinical research. Dr. Víctor F. Puntès and Dr. Guillermo Fernández-Varo are the principal investigators leading the basic and technical research.

## Key Publications

Oró D, Yudina T, Fernández-Varo G, Casals E, Reichenbach V, Casals G, González de la Presa B, Sandalinas S, Carvajal S, Puntès V, Jiménez W, *Cerium oxide nanoparticles reduce steatosis, portal hypertension and display anti-inflammatory properties in rats with liver fibrosis*+J Hepatol. 2016 Mar;64 (3):691-8.

## Intellectual Property

A European Patent application was filed on April 2016 at the European Patent Office. This patent claims both the new CeO<sub>2</sub>NPs formulation and its use in HCC treatment. Applicants are Hospital Clínic de Barcelona, Universitat de Barcelona (UB), Centro de Investigación Biomédica en Red (CIBER), Institut Català de Nanociència i Nanotecnologia (ICN2) and Institució Catalana de Recerca i Estudis Avançats (ICREA).

## Commercial Opportunity

Fundació Clínic per la Recerca Biomèdica is seeking an industrial partner interested in the co-development of the technology and/or acquisition of the license. Experience and know-how related to HCC treatment is advisable.

## FCRB and Hospital Clínic

FCRB works in partnership with Hospital Clínic de Barcelona, one of the most productive scientific and medical communities in Spain.

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