

Científico Titular

Instituto de Investigaciones Biomédicas "Alberto Sols" CSIC-UAM

Department of Cancer Biology, Cancer Stem Cells and Tumor Microenvironment Group

Instituto Ramón y Cajal de Investigación Sanitaria

Enfermedades Crónicas y Cáncer Área, Cancer Stem Cells and Inflammatory Microenvironment Group

Calle del Arzobispo Morcillo 4 (B-17 Laboratory)

28029 Madrid (Spain)

Email: bsainz@iib.uam.es

Website: https://www.iib.uam.es/grupo?id=bsainz_lab

Office: +34 91 497 3385 | Lab: +34 91 497 5420 | Fax: +34 91 597 5000 | Mobile: +34 689 302 317

ACADEMIC BACKGROUND

B.S. in Biology, American University, Washington, DC, USA

May 1997

PhD in Microbiology and Immunology, Tulane University, New Orleans, LA, USA

May 2005

SUMMARY OF CV

My early scientific career focused on understanding the role the innate immune system in viral infections, and was funded by a National Institutes of Health (NIH, USA) NRSA research award. As a postdoctoral fellow at the Scripps Research Institute (2005-2006), I developed a more physiologically relevant hepatocyte culture system to study Hepatitis C Virus (HCV) infection *in vitro*. The more differentiated hepatocyte system also permitted me to independently discover that the Niemann-Pick C1-Like 1 (NPC1L1) cholesterol absorption receptor is an HCV entry factor and the clinically-available and FDA-approved NPC1L1 antagonist ezetimibe (Zetia) can potently block HCV uptake *in vitro* and in mice with human liver grafts. These findings translated into a 2012 Nature Medicine publication, a US patent application, invited talks and presentations at international conferences and institutes and several follow-up publications. As a semi-independent investigator at the CNIO in Spain from 2011-2014, I changed my research focus and began to study cancer stem cell (CSC) biology in pancreatic cancer. I identified several immune proteins that have powerful pro-CSC properties, including the human cationic antimicrobial protein 18 (hCAP-18)/LL-37 peptide and the interferon-stimulated gene 15 protein. The sum of these studies has advanced our understanding of CSC pathobiology. In addition to the contributions described above, my contributions to science and specifically to the CSC field are best exemplified by my publications aimed at dissecting the biological and molecular signatures of CSCs. From 2014-2020, as an independent Ramón y Cajal investigator at the UAM, my laboratory has discovered a new inherent biomarker present in CSCs, known autofluorescence, which is the result of riboflavin accumulation in ABCG2-coated intracellular vesicles exclusively found in CSCs. Using this marker, we have learned that CSCs are distinct from non-CSCs at the epigenetic level (e.g. genome methylation and miRNA profiles) and these differences in methylation and miRNA expression are necessary for the maintenance of these cells. In addition, we have also learned that CSCs are metabolically different than non-CSCs. While non-CSCs meet their energy requirements via glycolysis, CSCs depend on mitochondrial respiration (i.e. oxidative phosphorylation) to survive. Since July 2020, I am Científico Titular in the Department of Cancer Biology as the Instituto de Investigaciones Biomédicas "Alberto Sols" CSIC-UAM. In summary, my accomplishments and research have resulted in more than 70 publications, several awarded US (Cancer Research Institute, Concern Foundation), Spanish (Ramón y Cajal Merit Award, ISCIII, AECC, ACANPAN, Beca FERO) and European (EURO-NanoMed) grants, 3 patent applications, numerous invited talks and presentations, editorial affiliations and international recognition. I have a broad background in immunology, microbiology and oncology, with specific expertise in pancreatic cancer, small animal models of cancer and drug discovery.

RESEARCH INTERESTS

Cancer, cancer stem cells (CSC), CSC-mediated tumorigenesis and metastasis, pancreatic cancer, fibroinflammatory tumor microenvironment, tumor-associated macrophages, pre-metastatic tumor niche, immune-based anti-cancer therapies, anti-CSC drug screening, small animal models of cancer and infectious disease (chimeric mice and transgenic mice), viral-mediated cancer, hepatitis B and C viruses

PROFESSIONAL BACKGROUND

Position	Institute/Centre	Dates
<i>Científico Titular</i>	Instituto de Investigaciones Biomédicas "Alberto Sols" CSIC-UAM, Madrid, Spain https://www.iib.uam.es/grupo?id=bsainz_lab	14/07/2020 - present
<i>Group Leader</i>	<i>Instituto Ramón y Cajal de Investigación Sanitaria</i> https://www.iryccis.org	01/05/2015 - present
<i>Ramón y Cajal Investigator</i>	<i>Universidad Autónoma de Madrid, Madrid, Spain</i> Instituto de Investigaciones Biomédicas "Alberto Sols" CSIC-UAM, Madrid, Spain	01/05/2014 – 13/07/2020
<i>Staff Scientist</i>	<i>Centro Nacional de Investigaciones Oncológicas, (CNIO) Madrid, Spain</i>	02/11/2011 – 30/04/2014
<i>Senior Postdoctoral Fellow/Lead Scientist</i>	<i>University of Illinois at Chicago, IL USA</i> <i>Department of Medicine, Section of Hepatology</i>	11/06/2006 – 31/10/2011
<i>Scientific Consultant/Writer</i>	<i>Global Viral Forecast Initiative; SF, CA USA</i>	01/05/2009 – 30/04/2010
<i>Postdoctoral Fellow</i>	<i>Scripps Research Institute, La Jolla, CA USA</i>	04/01/2005 – 05/06/2006
<i>PhD Student</i>	<i>Tulane University, New Orleans, LA USA</i> <i>PhD Mentor: Dr. Robert F Garry</i>	01/08/2000 – 20/12/2004
<i>Research Assistant</i>	<i>LSU Health Sciences Center, New Orleans, LA USA</i>	04/1998 – 07/2000
<i>Research Assistant</i>	<i>US Dept of Agriculture, New Orleans, LA USA</i>	05/1996 – 08/1996
<i>Research Assistant</i>	<i>National Institutes of Health, Bethesda, MD USA</i>	01/1995 – 01/1998

CURRENT RESEARCH FUNDING

Project Title: Utility of new pancreatic ductal adenocarcinoma subtype profiles for the discovery of druggable targets or pathways: new tools for personalized medicine

Principal Investigator: Bruno Sainz

Funding Source: Spanish Ministry Science, Innovation & Universities, ISCIII (PI21/01110)

Start: 01/2022 End: 12/20214 Total Funding: €208.000 (3yrs)

Project Title: AptaBreast: Desarrollo Preclínico de un Aptámero para el Tratamiento del Cáncer

Empresa: APTUS BIOTECH S.L.

Role: Partner PI - Bruno Sainz

Funding Source: Convocatoria Retos-Colaboración 2019 (RTC2019-007227-1), Spanish Ministry Science, Innovation & Universities

Start: 04/2020 End: 03/2022 Total Funding: €81,204.75 (3yrs)

Project Title: RuCSC - targeting cancer stem cells using ruthenium compounds

Coordinator: José Luis Mascareñas (Universidad de Santiago de Compostela)

Role: Partner PI - Bruno Sainz

Funding Source: Program IGNICIA proof of concept, an initiative of the Agencia Gallega de Innovación (GAIN) to facilitate the access of I+D+i projects to the market.

Start: 01/2019 End: 12/2022 Total Funding: €386,603 (2yrs + 1)

Project Title: Combating Pancreatic Cancer by Identifying Those Genes Essential for Cancer Stem Cell-Mediated Tumorigenicity

Principal Investigator: Bruno Sainz

Funding Source: Fundación Fero

Start: 02/2019 End: 02/2022 Total Funding: €80,000 (2yrs + 1)

Project Title: Photoactivable nanoparticles to immunostimulate the tumour microenvironment in pancreatic cancer (PANIPAC)
 EURONANOMED III - JOINT TRANSNATIONAL CALL FOR PROPOSALS (2018) / CONVOCATORIA PROGRAMACIÓN CONJUNTA INTERNACIONAL 2019 /PCI 2019-1
 Coordinator: Rafael López, MD, PhD
 Role: Partner PI - Bruno Sainz
 Funding Source: Spanish Ministry Science, Innovation & Universities (PCI2019-103725)
 Start: 04/2019 End: 03/2022 Total Funding: €150,000 (3yrs)

Project Title: The basal subtype of pancreatic cancer as a new tool towards personalized medicine: cellular and molecular characterization for the development of new therapies
 Principal Investigator: Bruno Sainz
 Funding Source: Spanish Ministry Science, Innovation & Universities, ISCIII (PI18/00757)
 Start: 01/2019 End: 12/2022 Total Funding: €135,520 (3yrs + 1)

Project Title: A multi-faceted approach to treating pancreatic cancer (Grupos Coordinados Estables 2016)
 Principal Investigators: Mariano Barbacid (CNIO), *Bruno Sainz (UAM) and Alfredo Carrato (IRYCIS)*
 Funding Source: *Asociación Española Contra el Cáncer (AECC)*, GC16173694BARB
 Start: 10/2016 End: 03/2022 Total Funding: €280,000 (5yrs + 0.5)

PUBLICATIONS

Nº of total publications	86 (+ 2 pending)			
Nº of publications (Top 10%)	29			
Nº of publications (Top 25%)	57			
Nº of 1 st author publications	18 (1 co-1st author)			
Nº of corresponding authorships	27 (+ 1 pending)			
SUM of IF = 698.265	h-index* = 37	i10-index* = 65	Citations* = 5573	*Source Google Scholar

TOP 25 Peer-reviewed Publications (* = co-1st author, † = corresponding author)

- Alonso-Nocelo M., Ruiz-Cañas L.*, Sancho P., Görgülü K., Alcalá S., Perdero C., Vallespinos M., López-Gil J.C., Ochando M., García-García E., Trabulo S., Martinelli P., Sánchez-Tomero P., Sánchez Palomo C., Santamaría P.G., Yuste L., Wörmann S.M., Kabacaoglu D., Earl J., Martin A., Salvador F., Valle S., Martin-Hijano L., Carrato A., Erkan M., Garcia-Bermejo L., Hermann P.C., Algül H., Moreno-Bueno G., Heeschen C., Portillo F., Cano A., and **Sainz B. Jr.**†
 Macrophages direct cancer cells through a LOXL2-mediated metastatic cascade in pancreatic ductal adenocarcinoma.
Gut, 2022, *in press*, Apr 15: [gutjnl-2021-325564](https://doi.org/10.1136/gutjnl-2021-325564). doi: 10.1136/gutjnl-2021-325564
 2021 IF: 31.840 Q1 D1 PMID: [35428659](https://pubmed.ncbi.nlm.nih.gov/35428659/)
- Aguayo V., Jiménez-Vacas J.M., Mafficini A., Sánchez-Frías M.E., Cano M.Y., Abollo-Jiménez F., Marín-Sanz J.A., Cabezas-Sainz P., Lawlor R.T., Luchini C., Sánchez L., Sánchez-Hidalgo J.M., Ventura S., Martin-Hijano L., Gahete M.D., Scarpa A., Arjona-Sanchez A., Ibáñez-Costa A., **Sainz B. Jr.**†, Luque R.M.†, Castano J.P.†
 Dysregulated splicing factor SF3B1 unveils a dual therapeutic vulnerability to target pancreatic cancer cells and cancer stem cells with an anti-splicing drug.
Journal of Exp & Clin Cancer Research, 2021, 40(1):382.
 IF: 12.658 Q1 D1 PMID: [34857016](https://pubmed.ncbi.nlm.nih.gov/34857016/)
- Ai J., Wörmann S.M., Görgülü K., Vallespinos M., Zagorac S., Alcala S., Wu N., Kabacaoglu D., Berninger A., Navarro D., Kaya-Aksoy E., Ruess D.A., Ciecieski K.J., Kowalska M., Demir E.I., G.O. Ceyhan, Heid I., Braren R., Riemann M., Schreiner S., Hofmann S., Kutschke M., Jastroch M, Slotta-Huspenina J., Muckenhuber A., Schlitter A.M., Schmid R.M., Steiger K., Diakopoulos K.N., Lesina M., **Sainz B. Jr.** †, Algül H. †.
 BCL3 deficiency couples cancer stem cell enrichment with pancreatic cancer molecular subtypes.
Gastroenterology, 2021, 161(1):318-332.e9.
 IF: 33.88 Q1 D1 PMID: [33819482](https://pubmed.ncbi.nlm.nih.gov/33819482/)

4. Valle S., Alcalá S., Martin-Hijano L., Cabezas-Sainz P., Navarro D., Ramos Muñoz E., Yuste L., Tiwary K., Walter K., Alonso-Nocelo M., Rubiolo J.A., González-Arnay E., Garcia-Bermejo L., Hermann P.C., Sánchez L., Sancho P., Fernández-Moreno M.A. †, **Sainz B. Jr.** †
Exploiting Oxidative Phosphorylation to Promote the Stem and Immuno-evasive Properties of Pancreatic Cancer Stem Cells.
Nature Communications, 2020, Oct 16; 11(1):5265. PMID: [33067432](#)
IF: 14.919 Q1 D1
5. Gout J., Perkhofer L., Morawe M., Arnold F., Ihle M., Biber S., Lange S., Roger E., Krau J.M., Stifter K., Hahn S., Zamperone A., Engleitner T., Müller M., Rodriguez-Aznar E., **Sainz B. Jr.**, Hermann P.C., Hessmann E., Müller S., Azoitei N., Schirmbeck R., Lechel A., Liebau S., Wagner M., Simeone D., Kestler H.A., Seufferlein T., Wiesmüller L., Rad R., Frappart P.O., Kleger A.
Synergistic targeting and resistance to PARP inhibition in DNA damage repair-deficient pancreatic cancer.
Gut, 2020, 70(4):743-760. PMID: [32873698](#)
IF: 23.059 Q1 D1
6. Pajuelo-Lozano N., Alcalá S., **Sainz B. Jr.** †, Perona R. †, Sanchez-Perez I. †
Targeting MAD2 modulates stemness and tumorigenesis in human gastric cancer cell lines
Theranostics, 2020, 10(21): 9601- 9618.
IF: 11.556 Q1 D1 PMID: [32863948](#)
7. Alcalá S., Sancho P., Martinelli P., Navarro D., Perdero C., Valle S., Martin-Hijano L., Earl J., Rodriguez-Serrano M., Rojas K., Carrato A., Garcia-Bermejo L., Fernández-Moreno M.A., Hermann P.C., **Sainz B. Jr.** †
Loss of ISG15 expression and ISGylation Reduces Mitophagy and the Functionality and Metabolic Plasticity of Pancreatic Cancer Stem Cells.
Nature Communications, 2020, May 29;11(1):2682. PMID: [32472071](#)
IF: 14.919 Q1 D1
8. D'Errico G., Alonso-Nocelo M., Vallespinos M., Hermann P.C., Alcalá S., Pedrero García C., Martin-Hijano L., Valle S., Earl J., Cassiano, C., Lombardia L., Feliu J., Chiara-Monti M., Seufferlein T., García-Bermejo L., Martinelli P., Carrato A., **Sainz B. Jr.** †.
Tumor-associated macrophage-secreted 14-3-3ζ signals via AXL to promote pancreatic cancer chemoresistance.
Oncogene, 2019, 38(27):5469-5485 PMID: [30936462](#)
IF: 7.971 Q1 D1
9. Teresa Blasco M., Navas C., Martín-Serrano G., Graña-Castro O., Lechuga C.G., Martín-Díaz L., Djurec M., Li J., Morales-Cacho L., Esteban-Burgos L., Perales-Patón J., Bousquet-Mur E., Castellano E., Jacob H.K.C., Cabras L., Musteanu M., Drosten M., Ortegam S., Mulero F., **Sainz B. Jr.**, Dusetti N., Iovanna J., Sánchez-Bueno F., Hidalgo M., Khiabani H., Rabadán R., Al-Shahrour F., Guerra C. and Barbacid M.
Complete regression of advanced pancreatic ductal adenocarcinoma upon combined inhibition of EGFR and C-Raf.
Cancer Cell, 2019; 35(4):573-587 PMID: [30975481](#)
IF: 26.602 Q1 D1
10. Görgülü K., Diakopoulos K.N., Ai J., Schoeps B., Kabacaoglu D., Karpathaki A.F., Ciecieski K.J., Kaya-Aksoy E., Ruess D.A., Berninger A., Kowalska M., Stevanovic M., Wörmann S.M., Wartmann T., Zhao Y., Halangk W., Voronina S., Tepikin A., Schlitter A.M., Steiger K., Artati A., Adamski J., Aichler A.M., Walch A., Jastroch M., Hartleben G., Mantzoros C.S., Weichert W., Schmid R.M., Herzig S., Krueger A., **Sainz B. Jr.**, Lesina M. and Algül H.
Levels of Atg5 determine pancreatic tumor progression and metastasis in mice.
Gastroenterology, 2019 Jan;156(1):203-217.e20. PMID: [30296435](#)
IF: 17.373 Q1 D1
11. Friederich M., Timal S., Powell C., Dallabona C., Kurolap A., Palacios-Zambrano S., Bratkovic D., Derks T., Bick D., Bouman K., Chatfield K., Damouny-Naoum N., Dishop M., Falik-Zaccai T., Fares F., Fedida A., Ferrero I., Gallagher R., Garesse R., Gilberti M., González C., Gowan K., Habib C., Halligan R., Kalfon L., Knight K., Lefeber D.J., Mamlona L., Mandel H., Mory A., Ottoson J., Paperna T., Pruijn G., Rebelo-Guiomar P., Saada A., **Sainz B. Jr.**, Salvemini H., Schoots M., Smeitink J., Szukszto M., ter Horst H., van den Brandt F., van Spronsen F., Veltman J., Wartchow E., Wintjes L., Zohar Y., Fernandez-Moreno M., Baris H., Donnini C., Minczuk M., Rodenburg R.

Pathogenic variants in glutamyl-tRNA_{Gln} amidotransferase subunits cause a lethal mitochondrial cardiomyopathy disorder.

Nature Communications, 2018 Oct 3;9(1):4065.

PMID: [30283131](#)

IF: 11.878 Q1 D1

12. Ruess D.A., Heynen G.J., Ciecieski K.J., Ai J., Kabacaoglu D., Diakopoulos K.N., Wörmann S.M., Görgülü K., Dantes Z., Karpathaki A.F., Berninger A., Kowalska M., Kaya E., Song L., Zeeuw van der Laan E.A., López-Alberca M.P., Nazaré M., Reichert M., Saur D., Erkan M., Hopt U.T., **Sainz B. Jr.**, Birchmeier W., Schmid R.M., Lesina M., Algül H. Mutant KRAS-driven cancers depend on PTPN11/SHP2 phosphatase.

Nature Medicine, 2018, 24(7):954-960.

PMID: [29808009](#)

IF: 30.641 Q1 D1

13. Djurec M., Graña O., Lee A., Troule K., Espinet E., Cabras L., Navas C., Blasco M.T., Burdiel M., Martín-Díaz L., Li J., Liu Z., Vallespinós M., Sanchez-Bueno F., **Sainz B. Jr.**, Sprick M.R., Trumpp A., Al-Shahrour F., Rabadán R., Guerra C., and Barbacid M. Saa3 Is a Key Mediator of The Pro-Tumorigenic Properties of Cancer Associated Fibroblasts in Pancreatic Tumors.

PNAS, 2018 115(6):E1147-E1156.

PMID: [29351990](#)

IF: 9.580 Q1 D1

14. Martinelli P, Carrillo-de Santa Pau P., Cox T., **Sainz B. Jr.**, Dusetti N., Greenhalf W., Rinaldi L., Costello E., Gahneh P., Malats N., Buchler M., Iovanna J., Neoptolemos J., Real F.X. GATA6 regulates EMT and tumor dissemination, and is a marker of response to adjuvant chemotherapy in pancreatic cancer.

Gut, 2017, 66(9):1665-1676.

PMID: [27325420](#)

IF: 16.658 Q1 D1

15. Zagorac S., Alcalá S., Fernández Bayon G., Bou Kheir T., Schoenhals M., González-Neira A., Fernández Fraga M., Aicher A., Heeschen C., **Sainz B. Jr.** DNMT1 inhibition reprograms pancreatic cancer stem cells via upregulation of the miR-17-92 cluster.

Cancer Research, 2016, 76(15):4546-58.

PMID: [27261509](#)

IF: 9.122 Q1 D1

16. Sancho P., Burgos E., Tavera A., Campos-Olivas R., Grana O., Bou Kheir T., Viera C.R., **Sainz B. Jr.**, Heeschen C. MYC/PGC-1 α balance determines the metabolic phenotype and plasticity of pancreatic cancer stem cells.

Cell Metabolism, 2015, 22(4):590-605.

PMID: [26365176](#)

IF: 17.303 Q1 D1

17. **Sainz B. Jr.** †, Alcalá S., García E., Sanchez-Ripoll Y., Azevedo M.M., Cioffi M., Tatari M., Miranda-Lorenzo I., Hidalgo M., Gomez G., Erkan M., Kleef J., Garcia-Silva S., Sancho P., Hermann P and Heeschen C †. Microenvironmental hCAP-18/LL-37 promotes pancreatic ductal adenocarcinoma by activating its cancer stem cell compartment.

Gut, 2015, 64(12):1921-35.

PMID: [25841238](#)

IF: 14.921 Q1 D1

18. Cioffi M., Sanchez-Ripoll Y., Aicher A., Lonardo E., Miranda-Lorenzo I., Trabulo S.M., Dorado J., Reis C., Ramirez J.C., Hidalgo M., Hahn S., **Sainz B. Jr.** and Heeschen C. The miR-17-92 cluster counteracts quiescence and chemoresistance of pancreatic cancer stem cells.

Gut, 2015, 64(12):1936-48.

PMID: [25887381](#)

IF: 14.921 Q1 D1

19. Cioffi M., Trabulo S.M., Hidalgo M., **Sainz B. Jr.** and Heeschen C. Inhibition of CD47 effectively targets pancreatic cancer stem cells via dual mechanisms.

Clin Cancer Res, 2015, 21(10):2325-37.

PMID: [25717063](#)

IF: 8.738 Q1 D1

20. **Sainz B. Jr.** †, Martín B., Tatari M., Heeschen C and Guerra S †. ISG15 is a critical microenvironmental factor for pancreatic cancer stem cells.

Cancer Research, 2014, 74(24):7309-20.

PMID: [25368022](#)

IF: 9.329 Q1 D1

21. Miranda-Lorenzo I., Dorado J., Lonardo E., Alcalá S., Gonzalez A., Clausell-Tormos, J. Cioffi M., Megias D., Hidalgo M., **Sainz B. Jr.** †, and Heeschen C †. Intracellular autofluorescence: a biomarker for epithelial cancer stem cells

Nature Methods, 2014, Nov;11(11):1161-9.

PMID: [25262208](#)

IF: 32.072 Q1 D1

22. Hermann P., Sancho P., Cañamero M., Michl P., Gress T., de Pascual R., Gandia L., Guerra C., Barbacid M., Wagner M., Reis C., Aicher A., Martinelli P., Real F.X., **Sainz B. Jr.** †, Heeschen C †
Nicotine promotes initiation and progression of KRAS-induced pancreatic cancer via Gata6-dependent dedifferentiation of acinar cells in mice
Gastroenterology, 2014, 147(5):1119-1133.e4. PMID: [25127677](#)
IF: 16.716 Q1 D1
23. **Sainz B. Jr.** and Heeschen C. Standing out from the crowd: cancer stem cells in hepatocellular carcinoma.
Cancer Cell, 2013, 15;23(4):431-3. PMID: [23597561](#)
IF: 23.893 Q1 D1
24. **Sainz B. Jr.** †, Barretto N., Martin D.M., Hiraga N., Imamura M., Marsh K.A., Yu X., Chayama K., Alrefai W.A., and Uprichard S.L. † Identification of the Niemann-Pick C1-like 1 cholesterol absorption receptor as a new hepatitis C virus entry factor.
Nature Medicine, 2012, 18(2):281-5. PMID: [22231557](#)
**Highlighted in Nature Rev Gastro & Hepatology, Nature Chemical Biology, SciBx, J of Hepatology*
IF: 24.302 Q1 D1

PATENTS

1. S. L. Uprichard and **B. Sainz, Jr.** Composition and Method for Inhibiting Entry of a Hepatic Virus.
(US61/093,549 US61/169,899)
Priority Date: 02/09/2008 Holder entity: University of Illinois at Chicago (USA)
2. S. L. Uprichard, X. Yu, and B. Sainz, Jr. Non-dividing Cell-based Assay for High Throughput Antiviral Screening (US12/566,074)
Priority Date: 24/09/2009 Holder entity: University of Illinois at Chicago (USA)
3. J. Rodríguez Villar, J. L. Mascareñas Cid, J. Rodríguez Couceiro, J. Mosquera Mosquera, M.E. Vázquez Sentís, **B. Sainz Anding.** Complejos de Rutenio para el tratamiento del cancer
(ES 2 594 499 B2) Priority Date: 14/06/2017
Holder entity: Universidad de Santiago de Compostela and Universidad Autónoma de Madrid