

## GOAT (Ghrelin-O-aciltransferase), a new biomarker for prostate cancer screening

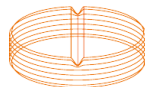
**IMIBIC**



MAIMONIDES BIOMEDICAL  
RESEARCH INSTITUTE OF  
CORDOBA



**Madrid, 14th November, 2017**



MEDICAMENTOS INNOVADORES  
Plataforma Tecnológica Española

## Content

### 1. The Institution

### 2. The Product

- a) Target Indications
- b) Innovative mechanisms of action
- c) Differential features facing the market
- d) Current status of development
- e) IPR protection
- f) Pitfalls & Risks to be considered

### 3. Partnering Opportunities

## Content

### 1. The Institution

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### 3. Partnering Opportunities

# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### University of Cordoba

- Established in **1972**
- **11 Faculties**
- **Students:**
  - 16,694 undergraduate students
  - 1,245 in Master's Programmes
  - 1,384 in Doctoral Programmes
- **PhD**
  - 1,384 PhD candidates
  - 228 International PhD candidates
  - 125 PhD dissertations/year
  - 21% of them with International PhD award
- **U-Ranking** (from Ivie/BBVA fundation): top 6 in Spain  
(top 1 in Andalusia; Total of 61 public and private Universities)





# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

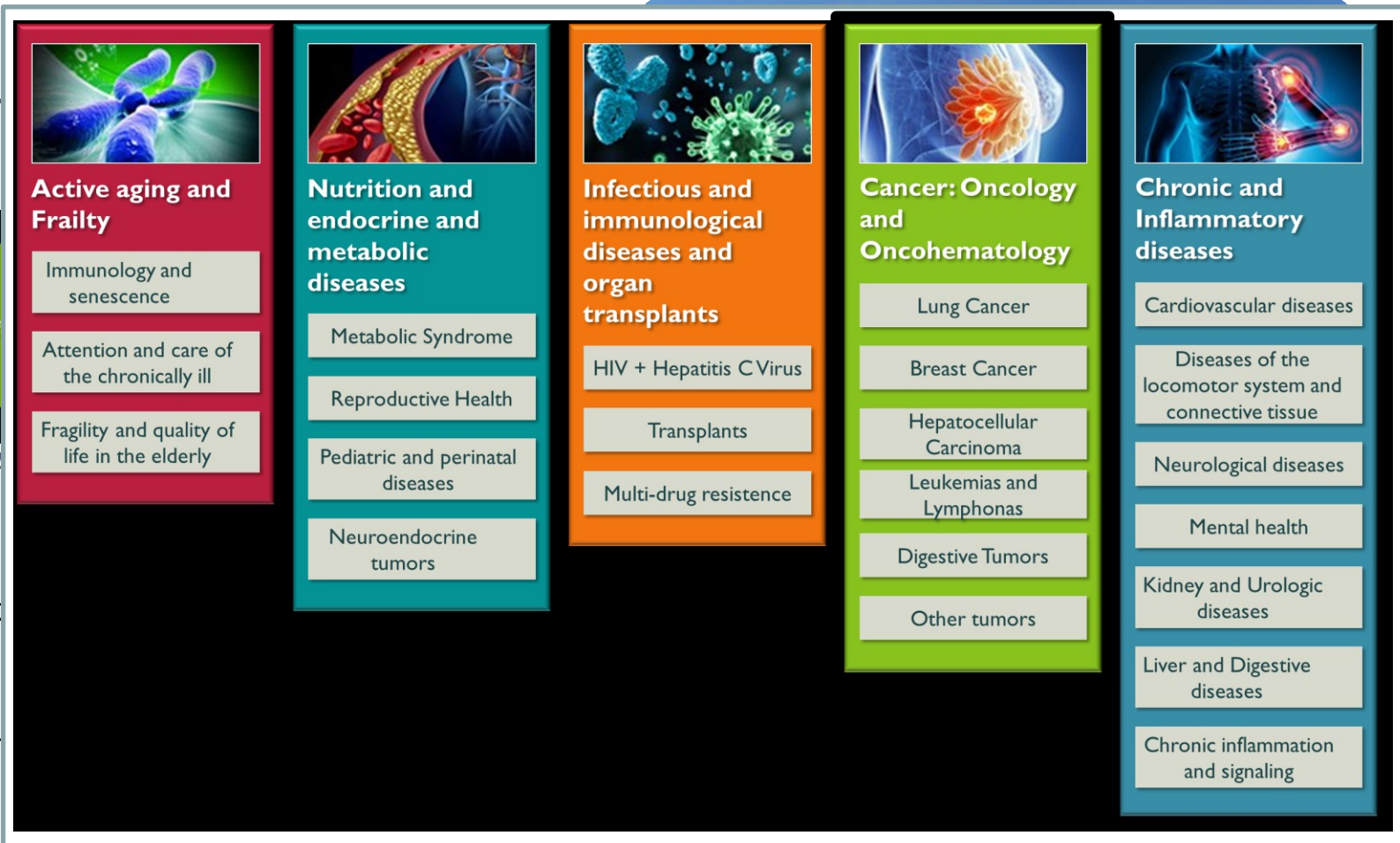
Maimón  
Biomed  
(IMIBIC)



Health of JA

- Accredited
- Building
- 10,000 r

- 5 scientific programmes



# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### Department of Cell Biology, Physiology and Immunology (UCO) GC08: Hormones and Cancer Group (IMIBIC)



Prize of the Spanish Society of Endocrinology  
and Nutrition for the research career of  
*Hormones and Cancer group*



#### Research topics:

- Neuro-endocrine-metabolic (dys)regulation in tumoral pathologies, including:
  - **Prostate cancer**
  - Breast cancer
  - Pituitary adenomas
  - Neuroendocrine tumors
    - Gastro-entero-pancreatic
    - Lung NETs
    - Thyroid
    - Adrenal
  - Brain tumors
  - Hepatocarcinoma
- Study of neuroendocrine systems in metabolic diseases/pathologies:
  - Obesity
  - Diabetes
  - Etc.

# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### Department of Cell Biology, Physiology and Immunology (UCO) GC08: Hormones and Cancer Group (IMIBIC)

#### Project leader: **Raúl M. Luque, PhD**

Associate Professor, University of Córdoba. Co-head, Hormones & Cancer Group at IMIBIC



- 124 peer-reviewed publications on top journals of Endocrinology and Oncology categories (h-index: 32; total number of cites: 2793)
- >35 book chapters
- >300 congress communications
- **Prizes and awards**
  - 2014: Biomedical Innovation IMIBIC-ROCHE, to the project *Mamkit OBD*
  - **2015: First Prize IMIBIC-ROCHE to the patent *Use of the GOAT levels as prostate cancer biomarker***
  - **2016:** Prize of the Spanish Society of Endocrinology and Nutrition for the research career of *Hormones and Cancer* group.
  - **2016 and 2017** Galileo Award (Innovation and Science; University of Cordoba)
- **Research projects** (most relevant as PI in competitive calls and private companies)
  - **Carlos III Institute of Health (FIS). 212.052€. 2017-2019: on Prostate cancer, as IP**
  - **Carlos III Institute of Health (FIS). 192.692€. 2014-2016: on Prostate cancer, as IP**
  - Excellence project of the Government of Andalusia. 284.894€. 2014-2019
  - IPSEN-SCRAS. 120.000€. 2011-2017
  - IPSEN-SCRAS. 165.000€. 2011-2017
  - Ministry of Education and Science of Spain. 60.500€. 2008- 2010
- **Patents:**
  - **Ghrelin variants and their use. P201030905. 2010**
  - **Ghrelin-O-acil transferase (GOAT) and its uses. P201531731. 2015**
  - **Non-invasive diagnostic method of cancer. P201631606 (under evaluation). 2016.**

# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

Department of Cell Biology, Physiology and Immunology (UCO)  
GC08: Hormones and Cancer Group (IMIBIC)

**Research Team:** Senior, Postdoctoral, Predoctoral, Thecnitians, Bioinfomatic, Clinitians



### Manuel D. Gahete, PhD

Senior Researcher (“*Miguel Server*” Program) and Co-leader of the project

- 71 peer-reviewed publications; >25 book chapters; >150 congress communications
- 2010: “Andalusian Promising Researcher Award” (Joly Group and Caja Madrid Foundation)
- 2013: “Young Investigator Award” European Society of Endocrinology
- PI of research projects funded by Carlos III Institute of Health and Andalusian Government



### Justo P. Castaño, PhD

Full Professor at the University of Córdoba & Co-head of Hormones & Cancer Group at IMIBIC

- 151 peer-reviewed publications; >40 book chapters; >350 congress communications
- 2009: First Prize “*Business Ideas 2009*”. Project: “DIMADEM: Molecular diagnosis of pituitary adenomas.” University of Cordoba.
- PI of research projects funded by Government of Spain, Andalusian Government , IPSEN, etc.



### Alejandro Ibáñez-Costa, PhD

Post-doctoral Researcher

- 22 peer-reviewed publications; >10 book chapters; >70 congress communications
- 2014: “Young Investigator Award” European Society of Endocrinology
- 2015: “ESE International Endocrine Scholars Programme” European Society of Endocrinology



# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### Department of Innovation Management (IMIBIC)



#### David Calvo Mallón: Manager of the Department

- >9 years in financial area and business management in technology-based companies
- Investment analyst in Uninvest
- Management experience in telecommunication and consultancy companies



#### Rosa Natera:

- Scientific and business background
- Holding a MBA applied to biotech and biomedical companies
- Experience in business development in a drug discovery spin-off and in tech transfer.



Over **425.000** euros generated by public/private collaboration agreements since 2012

**4** spin-off companies established since 2011

Over **120** meetings with researchers

Over **40** portfolios filed in Industrial and Intellectual Patents since 2010

**8** active license agreements  
4 signed in 2013

Over **40** contacts with companies and institutions

# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

Other associated research groups at the HURS, UCO and IMIBIC

### Urology Service



- Fresh samples
- Blood/Urine samples
- Collaborative projects
- Río Hortega PhD student

### Internal Medicine Service



- Blood/Urine samples
- Collaborative projects

### Pathology Service

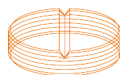


- Pathological analysis
- Collaborative projects
- PhD students



Servicio Andaluz de Salud  
CONSEJERÍA DE SALUD

Hospital Universitario Reina Sofía



MEDICAMENTOS INNOVADORES  
Plataforma Tecnológica Española

IMIBIC



farmaindustria

# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### External collaborators



REMAH Nacional

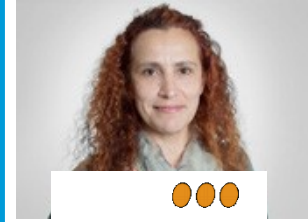


**Gemma  
Moreno  
-Bueno**  
**MD Anderson  
Cancer Center**  
Madrid • España



**Arkaitz  
Carracedo**

**ikerbasque**  
Basque Foundation for Science



**cnio**  
**Mercedes  
Robledo**



**Juan  
Valcarcel**



**Manel  
Puig-  
Domingo**



**Alfonso  
Soto**

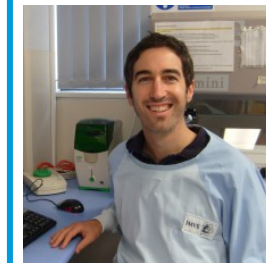


**Michael Culler**



**Steve  
Swanson**

**UIC COLLEGE OF  
PHARMACY**  
Chicago • Rockford



**Luke  
Selth**





# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### Background in the identification of novel tumoral biomarkers

Hormaechea-Agulla et al. *Molecular Cancer* (2017) 16:146  
DOI 10.1186/s12943-017-0713-9

Molecular Cancer

RESEARCH

Open Access



#### The oncogenic role of the In1-ghrelin splicing variant in prostate cancer aggressiveness

Daniel Hormaechea-Agulla<sup>1,2,3,4,5</sup>, Manuel D. Gahete<sup>1,2,3,4,5</sup>, Juan M. Jiménez-Vacas<sup>1,2,3,4,5</sup>, Enrique Gómez-Gómez<sup>1,3,6</sup>, Alejandro Ibáñez-Costa<sup>1,2,3,4,5</sup>, Fernando L-López<sup>1,2,3,4,5</sup>, Esther Rivero-Cortés<sup>1,2,3,4,5</sup>, André Sarmiento-Cabral<sup>1,2,3,4,5</sup>, José Valero-Rosa<sup>1,3,6</sup>, Julia Carrasco-Valiente<sup>1,3,6</sup>, Rafael Sánchez-Sánchez<sup>1,3,7</sup>, Rosa Ortega-Salas<sup>1,3,7</sup>, María M. Moreno<sup>1,3,7</sup>, Natia Tsomaia<sup>9</sup>, Steve M. Swanson<sup>8</sup>, Michael D. Culler<sup>9</sup>, María J. Requena<sup>1,3,6</sup>, Justo P. Castaño<sup>1,2,3,4,5\*</sup> and Raúl M. Luque<sup>1,2,3,4,5\*</sup>

## 1. Novel biomarkers in prostate cancer

Received: 20 July 2017 | Accepted: 23 August 2017  
DOI: 10.1002/pros.23426

ORIGINAL ARTICLE

WILEY **The Prostate**

#### Somatostatin receptor subtype 1 as a potential diagnostic marker and therapeutic target in prostate cancer

Sergio Pedraza-Arévalo<sup>1,2,3,4</sup> | Daniel Hormaechea-Agulla<sup>1,2,3,4</sup> | Enrique Gómez-Gómez<sup>1,2,3,5</sup> | María J. Requena<sup>1,2,3,5</sup> | Luke A. Selth<sup>6</sup> | Manuel D. Gahete<sup>1,2,3,4</sup> | Justo P. Castaño<sup>1,2,3,4</sup> | Raúl M. Luque<sup>1,2,3,4</sup>

Cancer Letters 383 (2016) 125–134

Contents lists available at ScienceDirect

Cancer Letters

journal homepage: [www.elsevier.com/locate/canlet](http://www.elsevier.com/locate/canlet)



Original Article

Ghrelin O-acyltransferase (GOAT) enzyme is overexpressed in prostate cancer, and its levels are associated with patient's metabolic status: Potential value as a non-invasive biomarker



Daniel Hormaechea-Agulla<sup>a, b, c, d, e</sup>, Enrique Gómez-Gómez<sup>a, c, f</sup>, Alejandro Ibáñez-Costa<sup>a, b, c, d, e</sup>, Julia Carrasco-Valiente<sup>a, c, f</sup>, Esther Rivero-Cortés<sup>a, b, c, d, e</sup>, Fernando L-López<sup>a, b, c, d, e</sup>, Sergio Pedraza-Arevalo<sup>a, b, c, d, e</sup>, José Valero-Rosa<sup>a, c, f</sup>, Rafael Sánchez-Sánchez<sup>a, c, g</sup>, Rosa Ortega-Salas<sup>a, c, g</sup>, María M. Moreno<sup>a, c, g</sup>, Manuel D. Gahete<sup>a, b, c, d, e</sup>, José López-Miranda<sup>a, c, d, h</sup>, María J. Requena<sup>a, c, f</sup>, Justo P. Castaño<sup>a, b, c, d, e, \*</sup>, Raúl M. Luque<sup>a, b, c, d, e, \*</sup>

THE FASEB JOURNAL • RESEARCH • [www.fasebj.org](http://www.fasebj.org)

#### The oncogenic role of the spliced somatostatin receptor sst5TMD4 variant in prostate cancer

Daniel Hormaechea-Agulla<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Juan M. Jiménez-Vacas<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Enrique Gómez-Gómez<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Fernando L. López<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Julia Carrasco-Valiente<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, José Valero-Rosa<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, María M. Moreno<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Rafael Sánchez-Sánchez<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Rosa Ortega-Salas<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Francisco Gracia-Navarro<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Michael D. Culler<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Alejandro Ibáñez-Costa<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Manuel D. Gahete<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, María J. Requena<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>, Justo P. Castaño<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup> and Raúl M. Luque<sup>a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52</sup>

<sup>a</sup>Maimonides Institute of Biomedical Research of Córdoba (IMIBIC), <sup>b</sup>Department of Cell Biology, Physiology and Immunology, University of Córdoba, <sup>c</sup>Centro de Investigación Biomédica en Red de Fisiopatología de la Obesidad y Nutrición, (CIBEROBN), <sup>d</sup>Campus de Excelencia Internacional Agroalimentario (ceiA3), Córdoba, Spain; <sup>e</sup>Urology Service, HURS/IMIBIC, Córdoba, Spain; <sup>f</sup>Anatomical Pathology Service, <sup>g</sup>Hospital Universitario Reina Sofía (HURS), Córdoba, Spain; and <sup>h</sup>Ipsen Bioscience, Cambridge, Massachusetts, USA

# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

### Background in the identification of novel tumoral biomarkers



## 2. Novel biomarkers in other tumoral pathologies



# XVI Encuentro de Cooperación Farma-Biotech

## 1. The Institution

Collaborative initiatives in research transfer



**Novel non-invasive  
biomarker for prostate  
cancer**

**Caixa** *impulse*  
innovation for society



Girelin O-acyltransferase: a new  
biomarker for prostate cancer  
screening

Team leader: **Raúl M. Luque**,  
from Instituto Maimónides de  
Investigación Biomédica de  
Córdoba / Universidad de  
Córdoba (IMIBIC / UCO)

2017

### *Proyectos de desarrollo tecnológico en salud (DTS)*



Instituto de Salud Carlos III - Acuse de recibo

#### DATOS GENERALES

Asunto:	Solicitud del expediente: DTS17/00061
Procedimiento:	Acción Estratégica de Salud. Ayudas y Subvenciones
Órgano destinatario:	SG de Evaluación y Fomento de la Investigación
Número de expediente:	ISCIII-AES-2017/001207
Número de asiento registral:	2017999E001282
Fecha:	25/05/2017 11:19:29

## Content

### 1. The Institution

### 2. The Product

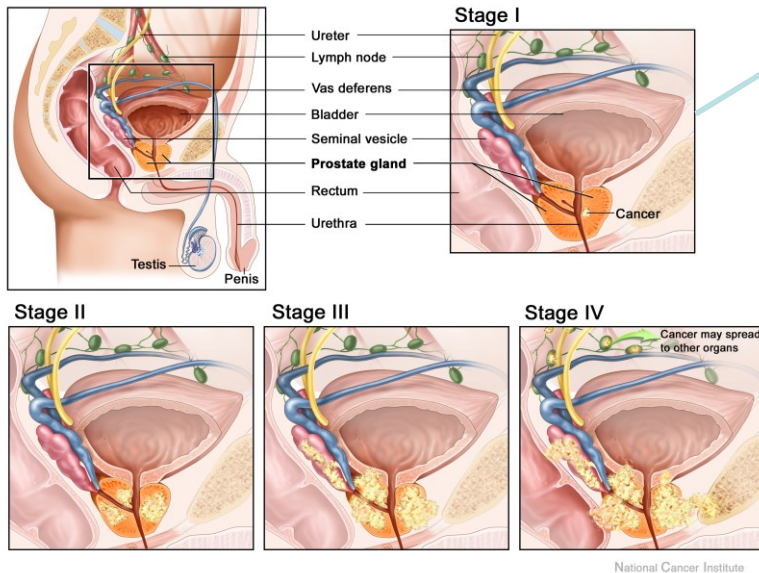
- a) Target Indications
- b) Innovative mechanisms of action
- c) Differential features facing the market
- d) Current status of development
- e) IPR protection
- f) Pitfalls & Risks to be considered

### 3. Partnering Opportunities

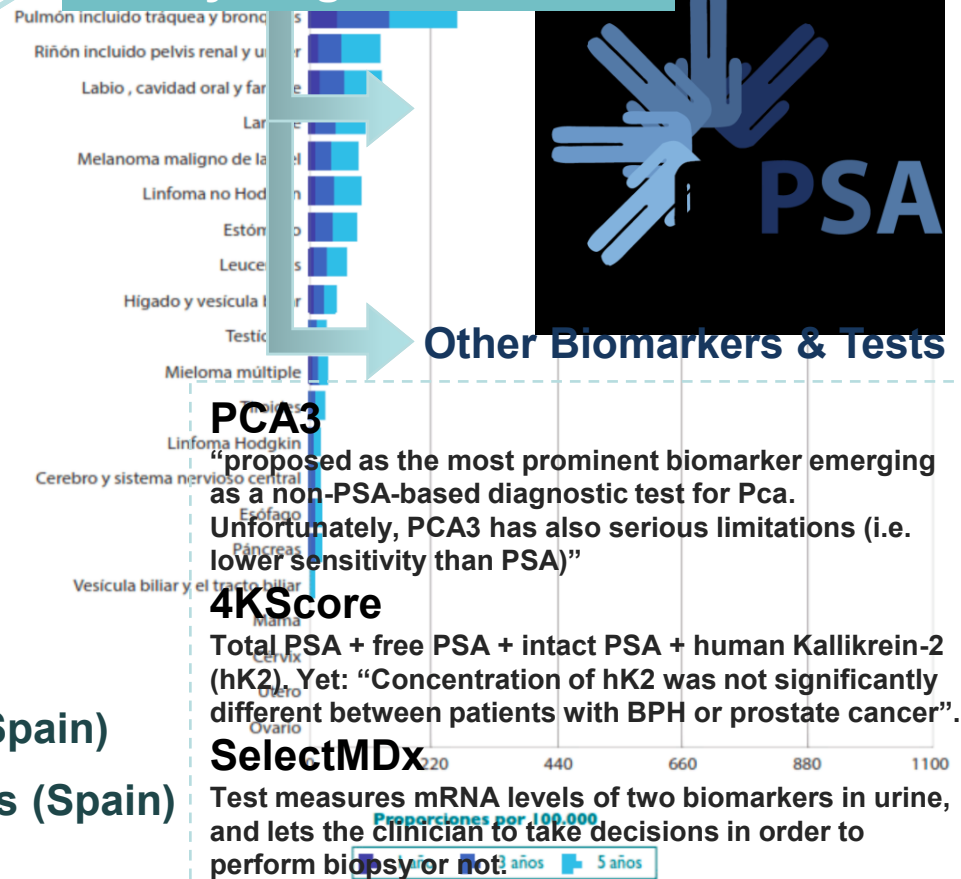
**GOAT (Ghrelin-O-aciltransferase),  
a new biomarker for prostate cancer screening**

## 2. The Product: a) Target Indications

### Prostate cancer



Appropriate diagnosis  
Early stage detection



3 millions of new cases in 2016

> 330.000 cases/year (higher incidence in Spain)

> Higher prevalence >900.000 cases/5-years (Spain)



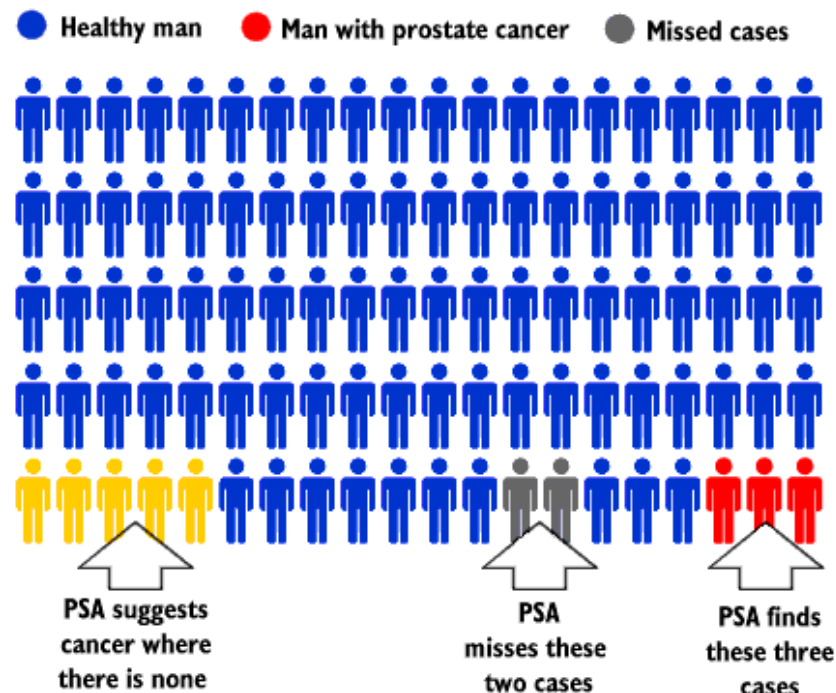
## 2. The Product: a) Target Indications

### PSA test

- Non-invasive (plasma levels)
- Specific and sensible
- Relevant to the decision
- Prognostic biomarker



Test characteristic	PSA (normal <4 NG/ML)	PSA (normal <3 NG/ML)
Test positivity (%)	12	18
Cancer detection rate (%)	3	4
<b>Sensitivity (%)</b>	<b>21</b>	<b>32</b>
Sensitivity (%) for high grade cancer, i.e., gleason score $\geq 8$	51	68



“Elevated PSA levels may be driven by benign conditions (i.e. prostatic hyperplasia or prostatitis)”

19 millions  
PCa  
screenings

4.7 millions  
abnormal PSA  
results

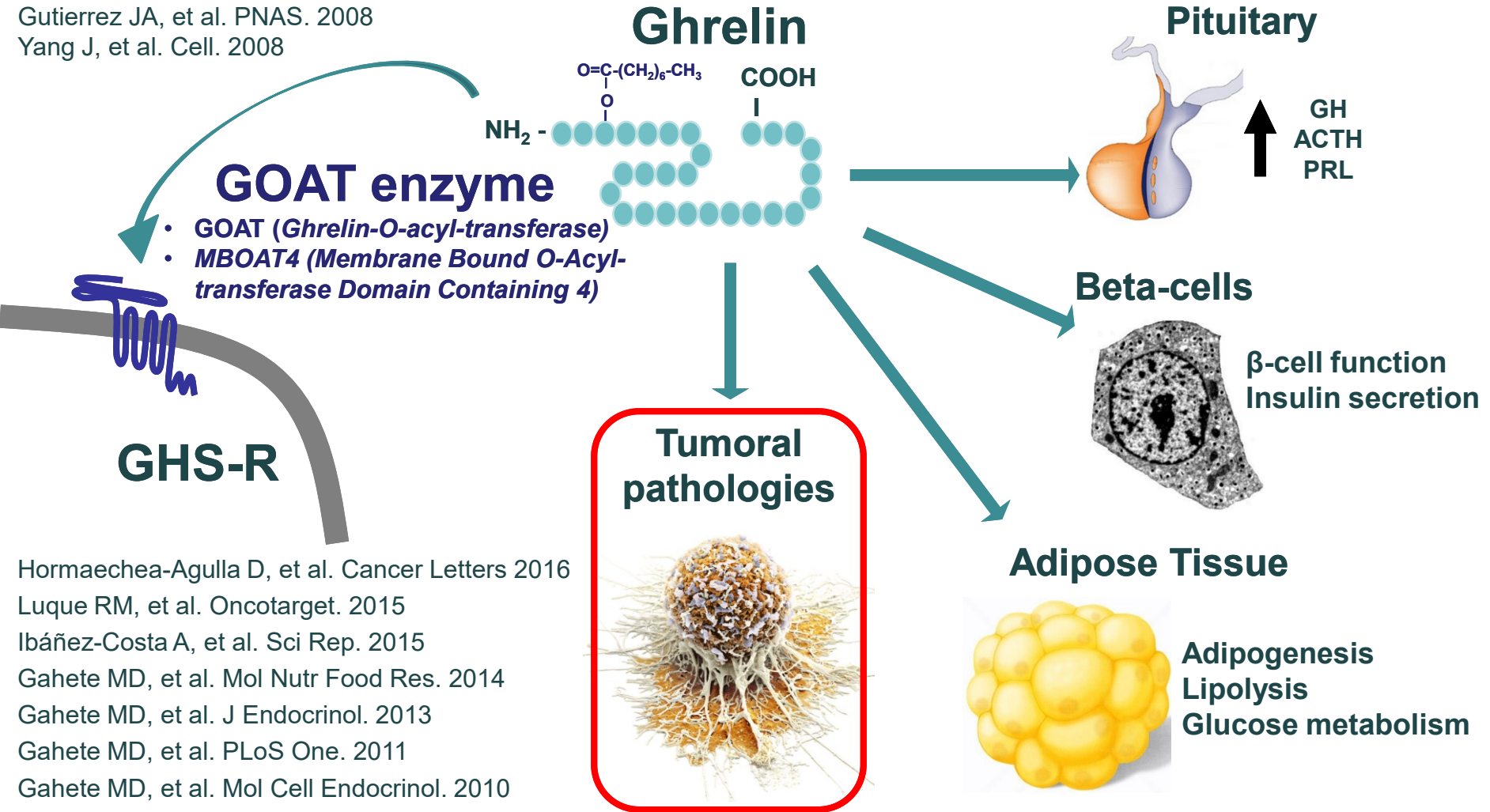
1.3 millions biopsies  
procedures (many  
unnecessary)



- Unnecessary biopsies
- Risks and Reduced QoL
- Associated cost

# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: b) Innovative mechanisms of action





# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: b) Innovative mechanisms of action

Journal of Alzheimer's Disease 22 (2010) 819–828  
DOI 10.3233/JAD-2010-100873  
IOS Press

Expression of the Ghrelin Systems is Altered in Alzheimer's Disease

[www.impactjournals.com/oncotarget/](http://www.impactjournals.com/oncotarget/)

Review

M. D. GAHETE and others

Pathophysiological insight of the ghrelin system

220:1

R1–R24

ence.2009.12.023.

**Ghrelin gene products, receptors, and GOAT enzyme: biological and pathophysiological insight**

ansferase (GOAT)

pituitary, and stomach

ratori<sup>2</sup>, Justo P. Castaño<sup>1</sup>, Rhonda

PLoS one

In1-ghrelin, a s  
the evolution  
tumors: Evid  
parameters

Raul M. Luque<sup>1,\*</sup>, M  
Alejandro Ibáñez  
Magdalena Adrado

Cancer Letters 383 (2016) 125–134

Contents lists available at ScienceDirect

Cancer Letters

journal homepage: [www.elsevier.com/locate/canlet](http://www.elsevier.com/locate/canlet)



ELSEVIER



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sed in Breast  
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onio J. Martínez-Fuentes<sup>1</sup>,  
staño<sup>1,\*</sup>

Original Article

**Ghrelin O-acyltransferase (GOAT) enzyme is overexpressed in prostate cancer, and its levels are associated with patient's metabolic status: Potential value as a non-invasive biomarker**

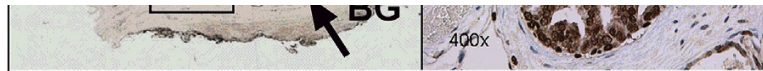
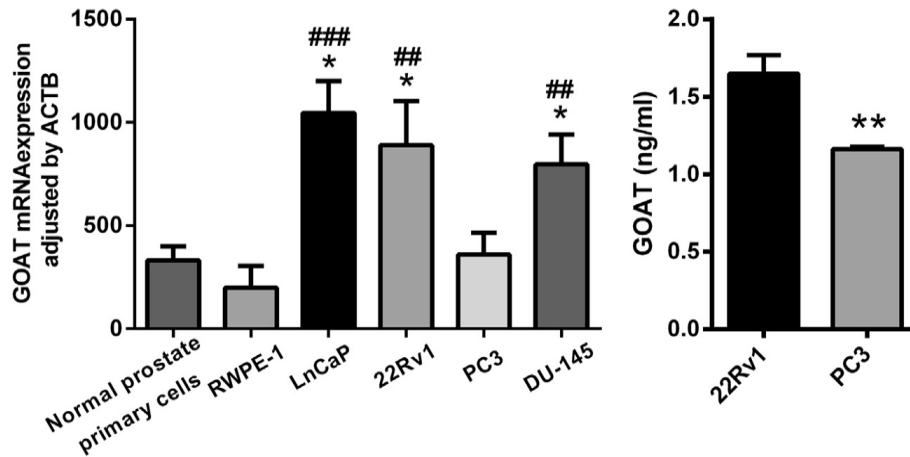
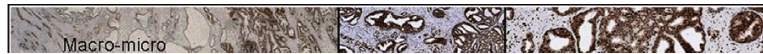
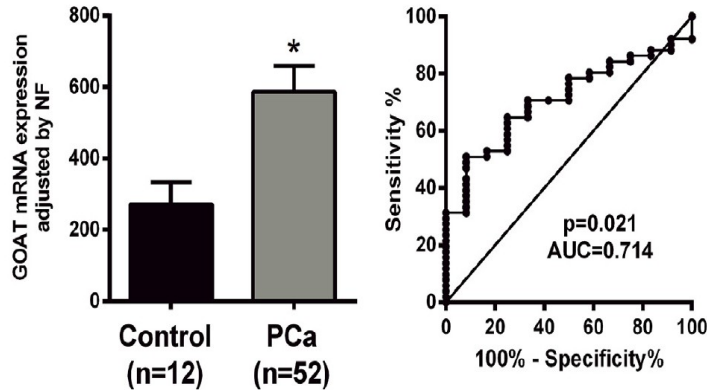


Daniel Hormaechea-Agulla<sup>a, b, c, d, e</sup>, Enrique Gómez-Gómez<sup>a, c, f</sup>,  
Alejandro Ibáñez-Costa<sup>a, b, c, d, e</sup>, Julia Carrasco-Valiente<sup>a, c, f</sup>, Esther Rivero-Cortés<sup>a, b, c, d, e</sup>,  
Fernando L-López<sup>a, b, c, d, e</sup>, Sergio Pedraza-Arevalo<sup>a, b, c, d, e</sup>, José Valero-Rosa<sup>a, c, f</sup>,  
Rafael Sánchez-Sánchez<sup>a, c, g</sup>, Rosa Ortega-Salas<sup>a, c, g</sup>, María M. Moreno<sup>a, c, g</sup>,  
Manuel D. Gahete<sup>a, b, c, d, e</sup>, José López-Miranda<sup>a, c, d, h</sup>, María J. Requena<sup>a, c, f</sup>,  
Justo P. Castaño<sup>a, b, c, d, e, \*\*</sup>, Raúl M. Luque<sup>a, b, c, d, e, \*</sup>

## 2. The Product: b) Innovative mechanisms of action

### GOAT in prostate cancer

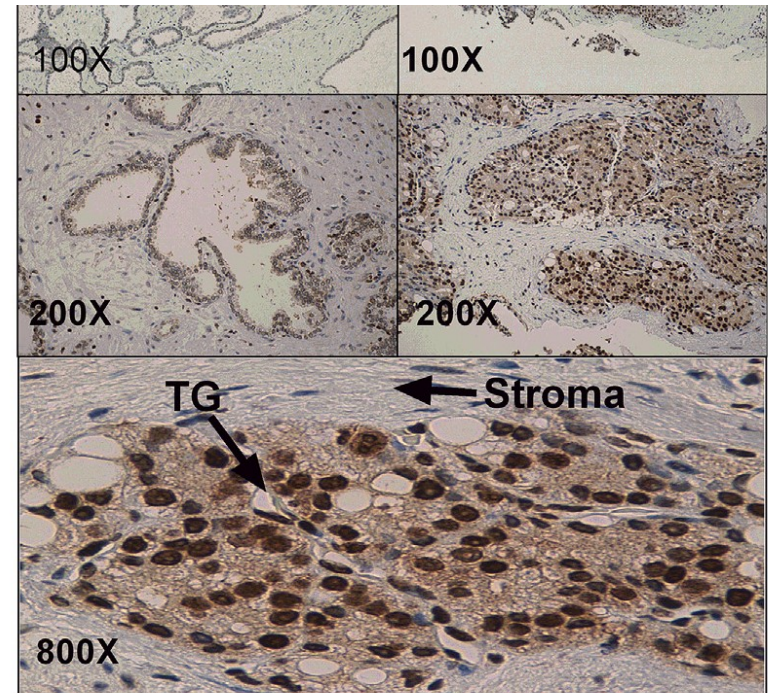
Tissue



Hormaechea-Agulla et al. / Cancer Letters 383 (2016)

Benign glands (BG) Tumoral glands (TG)

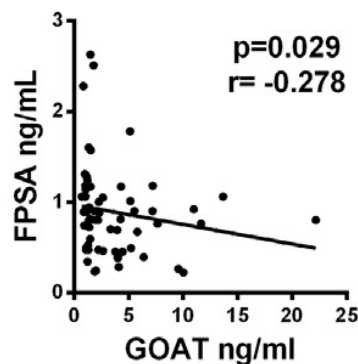
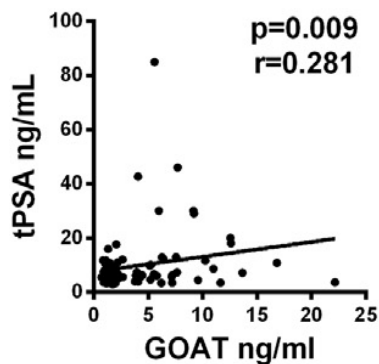
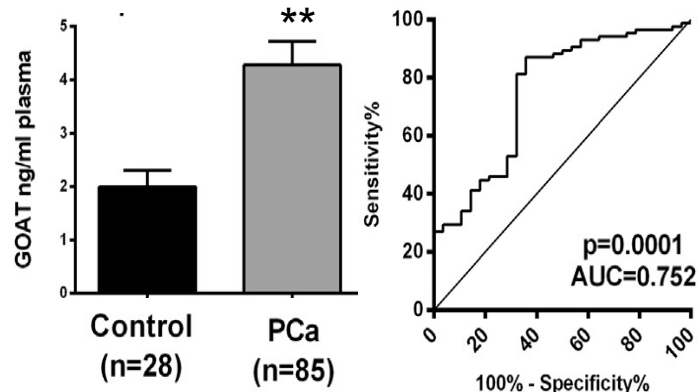
**GOAT** is overexpressed in prostate cancer (tissues and cell lines) and can be secreted by prostate cancer cells.



## 2. The Product: b) Innovative mechanisms of action

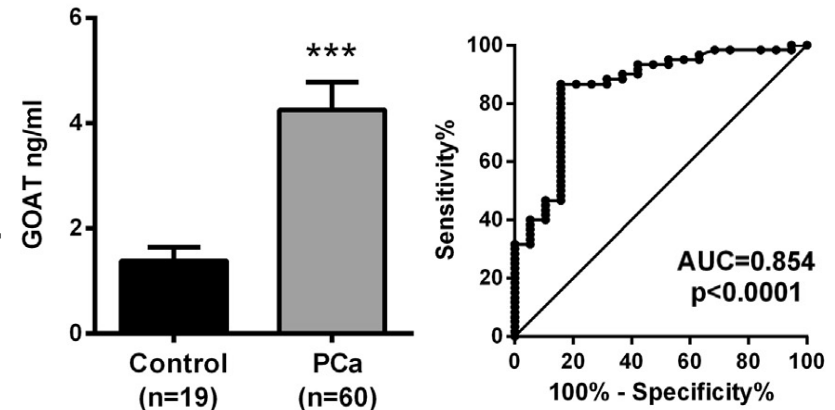
### GOAT in prostate cancer

Plasma



Non diabetic patients

Hormaechea-Agulla et al. / Cancer Letters 383 (2016)



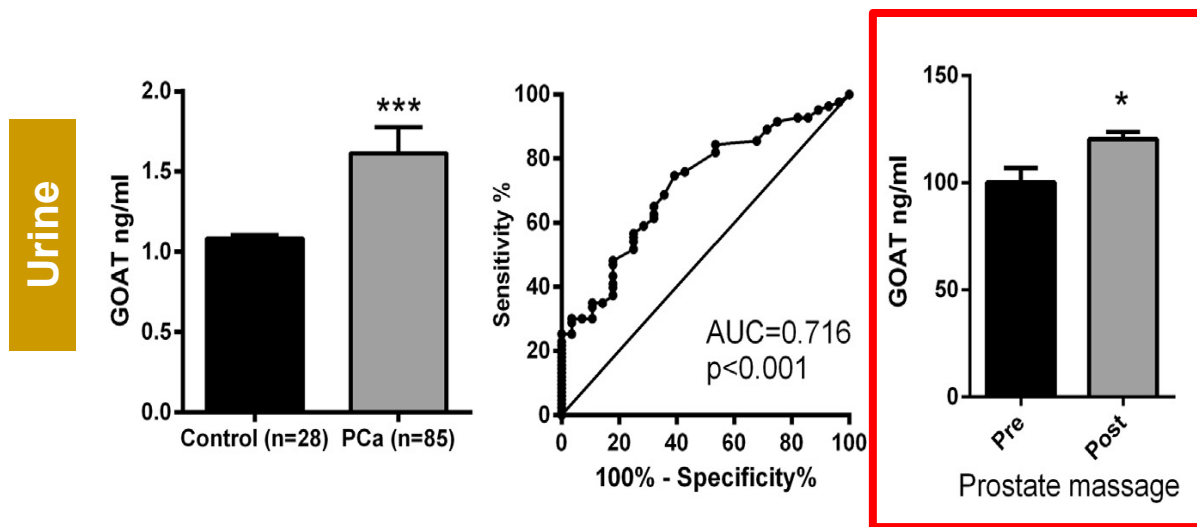
**GOAT** levels can be detected in **plasma**, where it discriminates between prostate cancer patients and controls.

The difference was even bigger in the **non-diabetic population**

## 2. The Product: b) Innovative mechanisms of action

### GOAT in prostate cancer

Hormaechea-Agulla et al. / Cancer Letters 383 (2016)



Most importantly, **GOAT** levels can be detected in **urine**, where it discriminates between prostate cancer patients and controls.

**Urine GOAT** levels are higher in prostate cancer patients after prostate massage






## 2. The Product: c) Differential features facing the market

### GOAT vs. PSA

- Higher sensitivity than previous methods
  - **GOAT** levels in **plasma**: (cut-off 1.22 ng/mL) **81.1% sensitivity**
  - **GOAT** levels in **urine**: (cut-off 1.061 ng/mL) 75% sensitivity
  - **PSA** levels in **plasma**:
    - cut-off 3 ng/mL: 32% sensitivity for any prostate cancer and **68%** for high-grade cancers (Gleason  $\geq 8$ )

TABLE 2. PSA Screening Test Characteristics as a Function of Threshold for a Positive Test Wolf *et al.*, CA Cancer J Clin 2010

TEST CHARACTERISTIC	PSA (NORMAL <4 NG/ML)	PSA (NORMAL < 3 NG/ML) 
Test Positivity (%)	12	18
Cancer Detection Rate (%)	3	4
Sensitivity (%)	21	32 
Sensitivity (%) for High Grade Cancer, i.e., Gleason Score $\geq 8$	51	68 
Specificity (%)	91	85
Positive Predictive Value (%)	30	28

— ACS Guideline for the Early Detection of Prostate Cancer —

- Easy to assess
  - GOAT levels can be measured using **simple, easy to use and rapid methods**: ELISA plate reader in contrast to other assays that require qPCR or automated systems

# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: c) Differential features facing the market

Improvement in terms of invasiveness, time of analysis, sensitivity and specificity

	GOAT	PSA	PCA3	4KScore	SelectMDx
Assay type	ELISA	ELISA	PCR	ELISA	PCR
Sample type	Plasma, urine	Plasma	Urine (post- massage)	Plasma	Urine
Time	Few hours	Few hours	14 Days	Few days	Days
Resources needed	Plate reader	Plate reader	External assay	External assay	External assay
Sensitivity	81%	32%	65%	89%	—
Specificity	68%	85%	73%	61%	—

↓  
Hormaechea-Agulla et al.,  
Cancer Lett 2016  
10.1016/j.canlet.2016.09.022

↓  
Wolf et al.,  
CA Cancer J Clin 2010  
10.3322/caac.20066

↓  
Cui et al.,  
SciRep 2017  
10.1038/srep25776

↓  
<http://4kscore.com>

↓  
<http://mdxhealth.com>

# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: d) Current status of development



Nº de Anuncio: 2017/00644  
Fecha de Publicación: 03/11/2017  
BOUCO

Resolución definitiva de la Convocatoria del segundo plazo de Ayudas de la Modalidad II:  
Protección de Resultados de la Investigación

III Plan Propio Galileo de Innovación y Transferencia de la Universidad de Córdoba

Tras la publicación en el Boletín Oficial de la UCO, con fecha 12/10/2017, de la relación provisional del segundo plazo de ayudas de la Modalidad II: Protección de resultados de la investigación concedidas de acuerdo con los criterios establecidos en las bases de la convocatoria del III Plan Propio Galileo de Innovación y Transferencia, y una vez finalizado el plazo de presentación de alegaciones, el Consejo de Gobierno aprueba la siguiente relación de ayudas concedidas por la Comisión de Innovación y Transferencia:

Solicitante	Importe solicitado	Importe concedido
Gil Ribes, Jesús Antonio	5.000,00 €	5.000,00 €
Guerrero Vaca, Guillermo	3.309,35 €	3.309,35 €
Luque Huertas, Raúl Miguel	5.000,00 €	5.000,00 €
Ramos Ruiz, José	5.000,00 €	5.000,00 €



**Novel non-invasive  
biomarker for prostate  
cancer**



Ghrelin O-acyltransferase: a new  
biomarker for prostate cancer  
screening

Team leader: **Raúl M. Luque**,  
from Instituto Maimónides de  
Investigación Biomédica de  
Córdoba / Universidad de  
Córdoba (IMIBIC / UCO)

2017



## Proyectos de desarrollo tecnológico en salud (DTS)



Instituto de Salud Carlos III - Acuse de recibo

### DATOS GENERALES

Asunto:	Solicitud del expediente: DTS17/00061
Procedimiento:	Acción Estratégica de Salud. Ayudas y Subvenciones
Órgano destinatario:	SG de Evaluación y Fomento de la Investigación
Número de expediente:	ISCIII-AES-2017/001207
Número de asiento registral:	2017999E001282
Fecha:	25/05/2017 11:19:29

**FIPSE**

FUNDACIÓN PARA LA  
INNOVACIÓN Y LA PROSPECTIVA  
EN SALUD EN ESPAÑA

Estudios de  
Viabilidad de las  
innovaciones en  
Salud

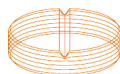
Pruebas de  
Concepto

Fondo de  
Transferencia

**Fostering innovation to improve people's health**

**Training in key areas to ensure quality improvement of your project**

**Networking and expert advice to generate business opportunities**



MEDICAMENTOS INNOVADORES  
Plataforma Tecnológica Española



MAIMONIDES BIOMEDICAL  
RESEARCH INSTITUTE OF  
CÓRDOBA



**farmaindustria**

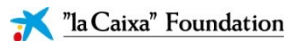


2. The Product: d) Current status of development

# GOAT (Ghrelin-O-aciltransferase): New Biomarker for PCa Screening (CI00015)

**CaixaImpulse**  
2017, CaixaForum Barcelona

**Raúl M. Luque, Manuel D. Gahete, Alejandro Ibáñez-Costa,**  
**David Calvo-Mallón, Justo P. Castaño**  
***IMIBIC / Universidad de Córdoba***



# Advantage of the asset

## GOAT behaves as a better diagnosis tool than PSA (or other methods)

- Higher sensitivity than previous methods
  - **GOAT** levels in **plasma**: (cut-off 1.22 ng/mL) **81.1% sensitivity**
  - **GOAT** levels in **urine**: (cut-off 1.061 ng/mL) 75% sensitivity
  - **PSA** levels in **plasma**:
    - cut-off 3 ng/mL: 32% sensitivity for any prostate cancer and **68%** for high-grade cancers (Gleason  $\geq 8$ )
- Easy to assess
  - GOAT levels can be measured **using a simple ELISA** plate reader in contrast to other assays that require qPCR or automated systems

Wolf *et al.*,  
CA Cancer J Clin 2010

## Valorization Strategy

### Current Status: promising results

- 113 plasma samples cohort
- 113 urine samples cohort
- 64 tissue samples cohort
- Good preliminary results

### Valorize this tool



### Expected Results

- 1) Expand to 1000-1300 plasma/urine samples cohort
- 2) Perform a regulatory and transfer plan and a budget Impact study

Generate a **STRONG PROOF OF CONCEPT** and a find a way for the **TRANSFERRING OF THE ASSET**

## Valorization Plan

### Main goal and different objectives

- 1. To obtain a strong proof-of-concept** (expanding this tool to a larger, more significant cohort of patients : >1,000-1,300 patients, MULTICENTER study;  
Explore the feasibility and validity of **GOAT as prognostic tool** compared with PSA).
- 2. To continue and implement the protection of the asset (patent).** Patent as PCT (November, 2016) and the International Search Report was encouraging. We plan to transfer the patent into national phases during the project period.
- 3. To perform a Market Research and Budget Impact study** comparing **GOAT** with the gold standard, **PSA**, and other available technologies and its impact in the healthcare system.
- 4. Delineate a Business Plan** to be presented to the investors.

Proof of Concept  
Budget Impact  
Regulatory Plan



Spin-off

**Licensing-out**

# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: d) Current status of development

### Conditions, assumptions and constrains

Conditions	Assumptions	Constrains
<ul style="list-style-type: none"><li>- To obtain the necessary samples to increase the cohort and purchase the kits and materials for experimentation</li><li>- To hire a trained person to perform the experiments and tests</li><li>- To preserve the intellectual protection of the asset</li><li>- To subcontract the Market Research and Budget Impact Study, as well as the Business Plan.</li></ul>	<ul style="list-style-type: none"><li>- To obtain a strong proof of concept with the bigger cohort in order to be interesting for the industry and to reach a license agreement.</li><li>- To maintain the protection of the asset and to start the protection through national phases</li><li>- To obtain a good Market Research and Budget Impact Study, as well as the Business Plan.</li></ul>	<ul style="list-style-type: none"><li>- There are no constrains identified, which could be directly affecting project development.</li><li>- Ethically the hospital committee has approved the project.</li></ul>

### Quality Plan

The host organization has been certified in the UNE 160022:2014 (ANECOR) quality management system in research, development and innovation.



Particularly, an **executive committee** will be designated, which will be responsible for:

- 1) the close **follow-up** of the project progress; 2) the organization of regular **scientific and executive meetings**; and 3) the **promotion of the asset**.



**Manuel Tena-Sempere**  
(Deputy Scientific Director of Basic Research at the IMIBIC)



**Laura Sampietro-Colom**  
(Deputy Director of Innovation and Head of the Health Technology Assessment (HTA) Unit at the Hospital Clinic of Barcelona)

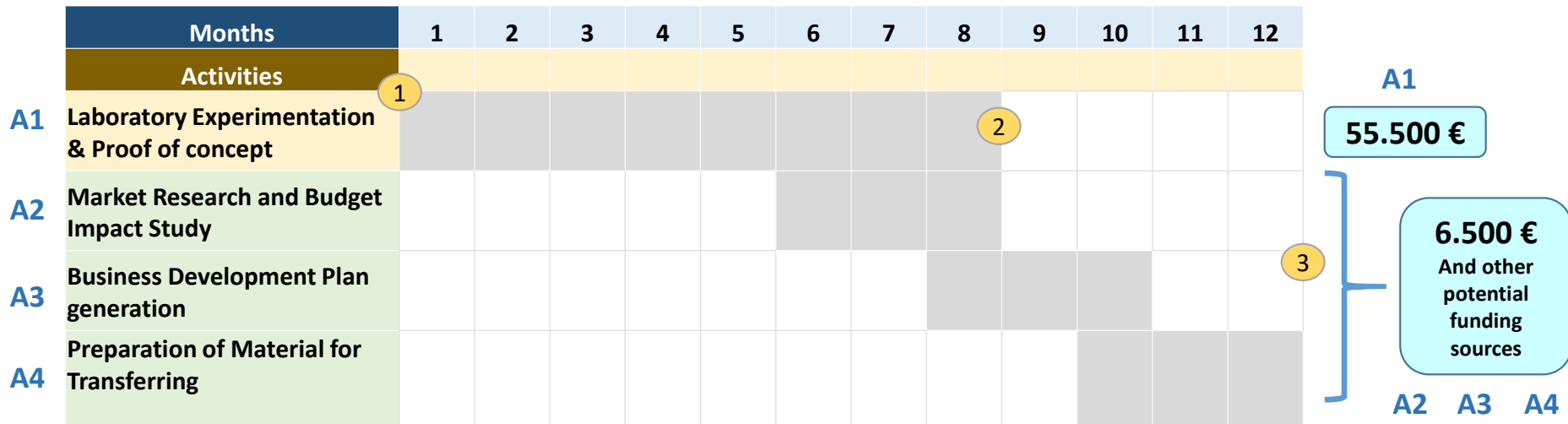


**Francisco Gracia-Navarro**  
(Director de Evaluación y Acreditación de la Agencia Andaluza del Conocimiento)



# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: d) Current status of development



- **A1. Laboratory Experimentation & Proof-of-concept:** GOAT levels will be assessed to better define the cut-off values and to compare with PSA behavior (1,000-1,300 patients, MULTICENTER study)
- **A2. Market Research and Budget Impact Study:** The goal of this activity is to have more reasons to engage companies to acquire the asset.
- **A3. Business Development Plan generation:** business development plan will more profoundly pursued at this point to increase the presence of **GOAT evaluation** in different forums and to present it to the different companies in order to advance in licensing relations.
- **A4. Preparation of materials for transferring:** i.e. "Pitch desck / thecnology offer" to present the technology to the industry and possible licensors.

Caixa **impulse**

**A2 A3 A4**

**Oriol Sola-Morales**

**HITT** Health Innovation  
Technology Transfer

# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: d) Current status of development

Months		1	2	3	4	5	6	7	8	9	10	11	12
Activities													
Activities:	A1	1							2				
	A2												
	A3												3
	A4												



Raúl M. Luque

A1, A2, A3, A4

Experts in scientific  
area and  
in business/tech  
transfer area

Scientific Area

Business Area

Manuel D. Gahete



A1, A2, A3, A4

Justo P. Castaño



A2, A3, A4

Alejandro Ibáñez



A1, A2, A3

David Calvo



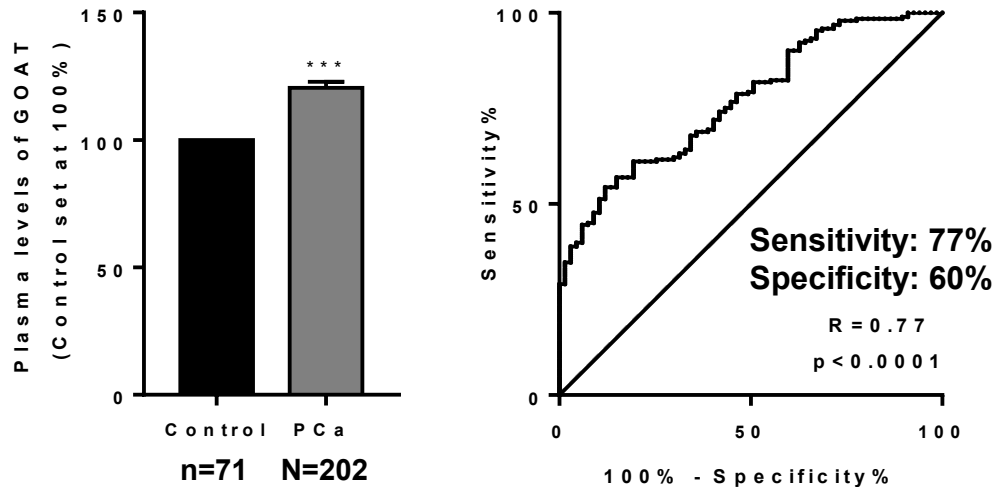
A2, A3, A4

Rosa Natera



## 2. The Product: d) Current status of development

**GOAT** levels are being assessed in a **bigger cohort** of patients to further support the proof-of-concept. The first preliminary result in a subpopulation of this cohort, further confirm the data obtained previously:



Contacts have been established in other hospitals to obtain samples from additional cohorts of samples in order to further validate the asset.

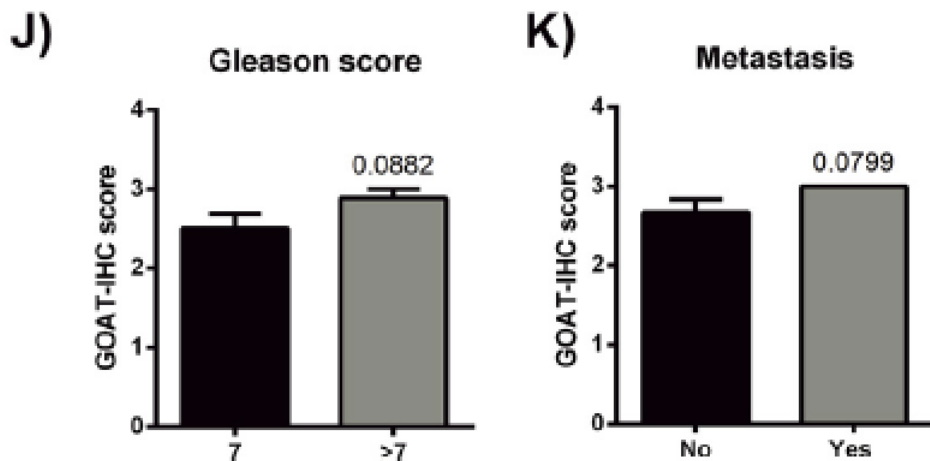
Initial cohort => N=113 samples  
Additional validation (shown above) => N=273 samples

**Full cohort > 1200 samples in total**



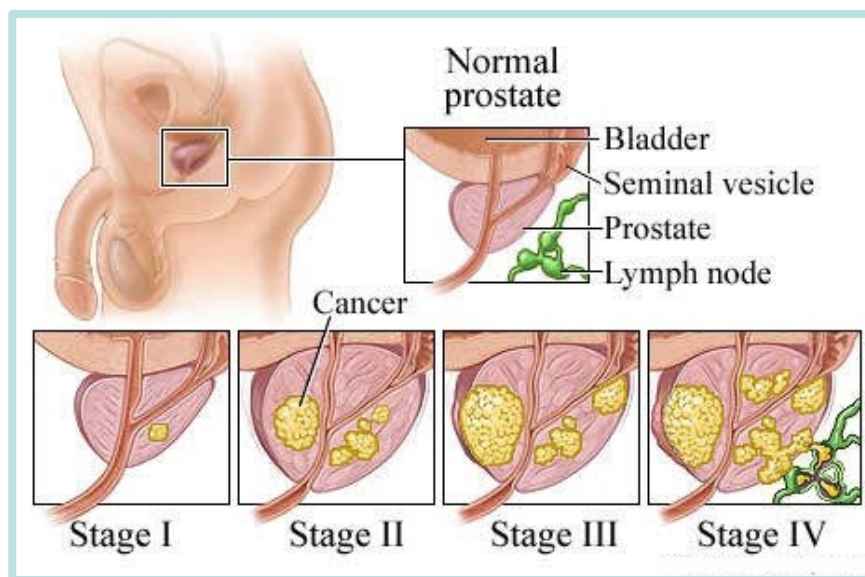
## 2. The Product: d) Current status of development

**GOAT is being explored as a putative biomarker of Prostate Cancer Progression**



**GOAT** levels seem to be associated to the aggressiveness of the Prostate Cancer

The full cohort (>1200 patients in total) is being followed to determine the capacity of GOAT to predict the development and aggressiveness of Prostate cancer



# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: d) Current status of development

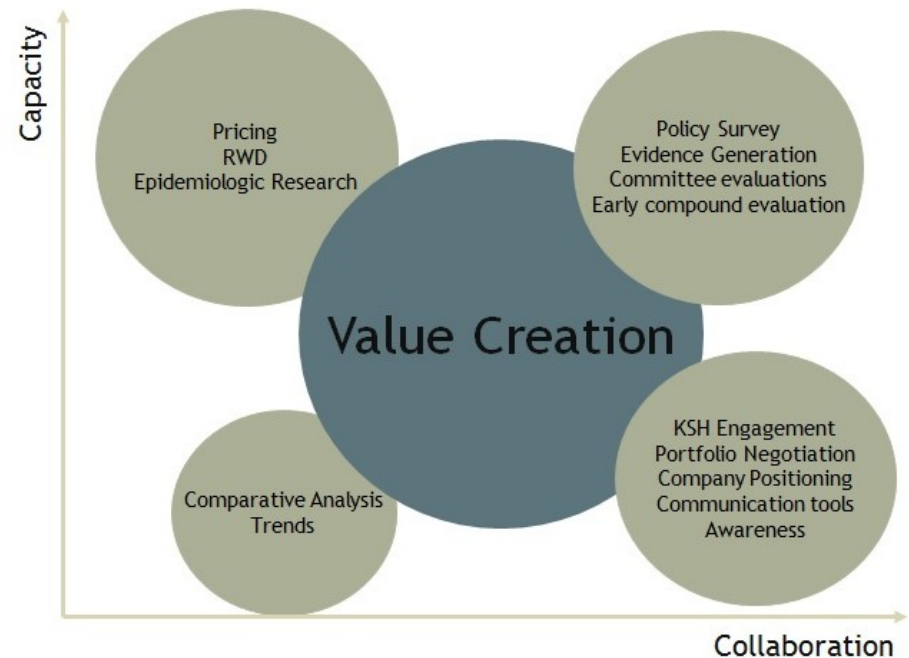


**HITT** Health Innovation  
Technology Transfer



**Oriol Sola-Morales**

- **A2. Market Research and Budget Impact Study**
- **A3. Business Development Plan generation**
- **A4. Preparation of materials for transferring**



# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: e) IPR protection

### Level of development and protection of the asset



### "GHRELINA-O-ACIL TRANSFERASA (GOAT) Y SUS USOS"

- Spanish Patent (P201531731) was requested on December 27<sup>th</sup>, 2015

Número de solicitud:	P201531731
Fecha de recepción:	27 noviembre 2015, 15:41 (CET)
Oficina receptora:	OEPM Madrid
Su referencia:	901 049
Solicitante:	Universidad de Córdoba
Número de solicitantes:	2
País:	ES
Título:	Ghrelin-O-acil transferasa (GOAT) y sus usos

- Patent extension to PCT was carried out on November 28<sup>th</sup>, 2016, patent number: **PCT/ES2016/070844**.

Número de presentación	300214586
Solicitud Número PCT	PCT/ES2016/070844
Fecha de recepción	28 noviembre 2016
Oficina Receptora	Oficina Española de Patentes y Marcas, Madrid
Referencia del expediente del solicitante o mandatario	901 871
Solicitante	UNIVERSIDAD DE CÓRDOBA
Número de solicitantes	2
País	ES
Título de la invención	Ghrelin-O-acil transferasa (GOAT) y sus usos



# XVI Encuentro de Cooperación Farma-Biotech

## 2. The Product: f) Pitfalls & Risks to be considered

### Risk Plan

POSITIVE	NEGATIVE
HIGH IMPORTANCE	HIGH IMPORTANCE
- Early licensing of the asset	- Bad proof of concept results - Appearance of a good novel biomarker - KOLs negative opinion of the asset
MEDIUM IMPORTANCE	MEDIUM IMPORTANCE
- Access to new funds through other grants or private investors	- Industry not interested in GOAT after valorization - Negative Market Research or Budget Impact study
LOW IMPORTANCE	LOW IMPORTANCE
NA	- Delay in receiving the materials

### Contingency Plan (three main risks)

- **Bad proof of concept results:**
  - To identify subgroups of patients wherein GOAT could be a good biomarker (i.e. diabetic, obese or elderly patients),
  - To combine GOAT with other biomarkers to develop a stronger test
  - To explore the utility of GOAT as prognostic, instead of diagnostic, tool.
- **Negative Market Research or Budget Impact study:**
  - To implement methodological improvements
  - To explore putative combinations with other markers in order to increase the power of the asset.
- **KOLs negative opinion of GOAT.**
  - To prepare scientific papers and documents comparing PSA with GOAT in order to convince scientific society of GOAT abilities and possible impact.

## Content

### 1. The Institution

### 2. The Product

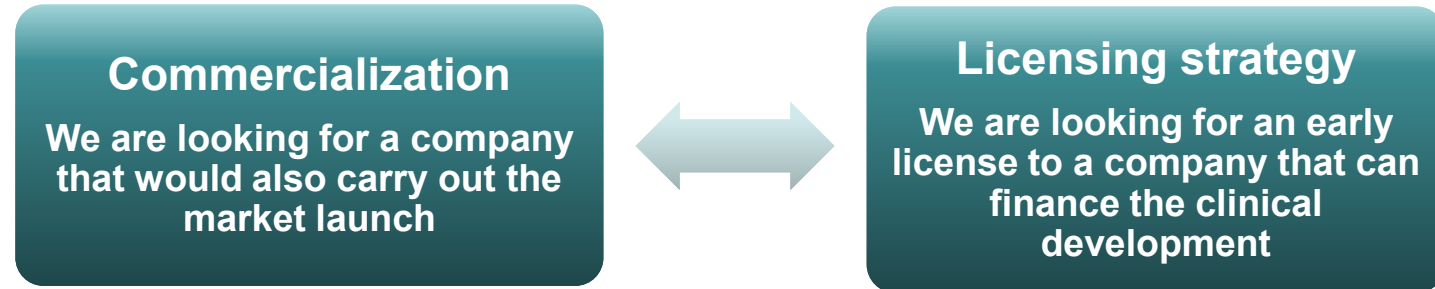
- a) Target Indications
- b) Innovative mechanisms of action
- c) Differential features facing the market
- d) Current status of development
- e) IPR protection
- f) Pitfalls & Risks to be considered

### 3. Partnering Opportunities



# XVI Encuentro de Cooperación Farma-Biotech

## 3. Partnering Opportunities



***“COLLABORATION is the best way to become the translational research into reality.”***

**We offer you the opportunity to participate in the development, manufacturing and exploitation of an strategic opportunity in prostate cancer biomarker area.**



## GOAT (Ghrelin-O-aciltransferase), a new biomarker for prostate cancer screening



**Madrid, 14 de noviembre de 2017**