

# Annual report **2014**



FETAL MEDICINE  
RESEARCH CENTER

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## WELCOME FETAL I+D ANNUAL REPORT 2014

Once again this year, we present the annual report of the Fetal and Perinatal Medicine Research Team Fetal i+D.

In 2014 we have progressed in key areas to ensure the professional structure that requires a high-level scientific research. In this sense, the establishment of BCNatal as the result of the union of the Hospital Clinic and Hospital Sant Joan de Deu, has translated into united capabilities and joy, as well as into the incorporation of 2 new research lines: the first one based on the study of environmental factors in pregnancy, and a second one focused on inflammation in preterm birth.

Moreover, this year has served to consolidate our working model, increasing our scientific production, being recognized as a group of excellent research by the Generalitat of Catalonia and organizing one of the most important international congresses in obstetrics and gynecology worldwide, the ISUOG Barcelona. In the education area, we highlight the success of the first and second edition of Erasmus Mundus program in Fetal Medicine, which is already incorporating students with their own resources.

Like every year, one important challenge in our work is building a bridge between fetal medicine and society, something we have achieved by working closely with the Fetal Medicine Barcelona Foundation, responsible for disseminating all our knowledge in this field. Among the different initiatives, we are offering training courses, many of them international, and inatal, our social web for pregnant women that this year has reached 7 million visits.

Special mention to patients, families, funders, friends and collaborators without whom we could not have made it. The result of your support and our work are reflected in this annual report. We hope you enjoy it.

**Eduard Gratacós**  
*Director of Fetal i+D*





# 1. THE CENTER

- Fetal i+D  
Fetal Medicine  
Research Center
- Nature



## FETAL I+D FETAL MEDICINE RESEARCH CENTER

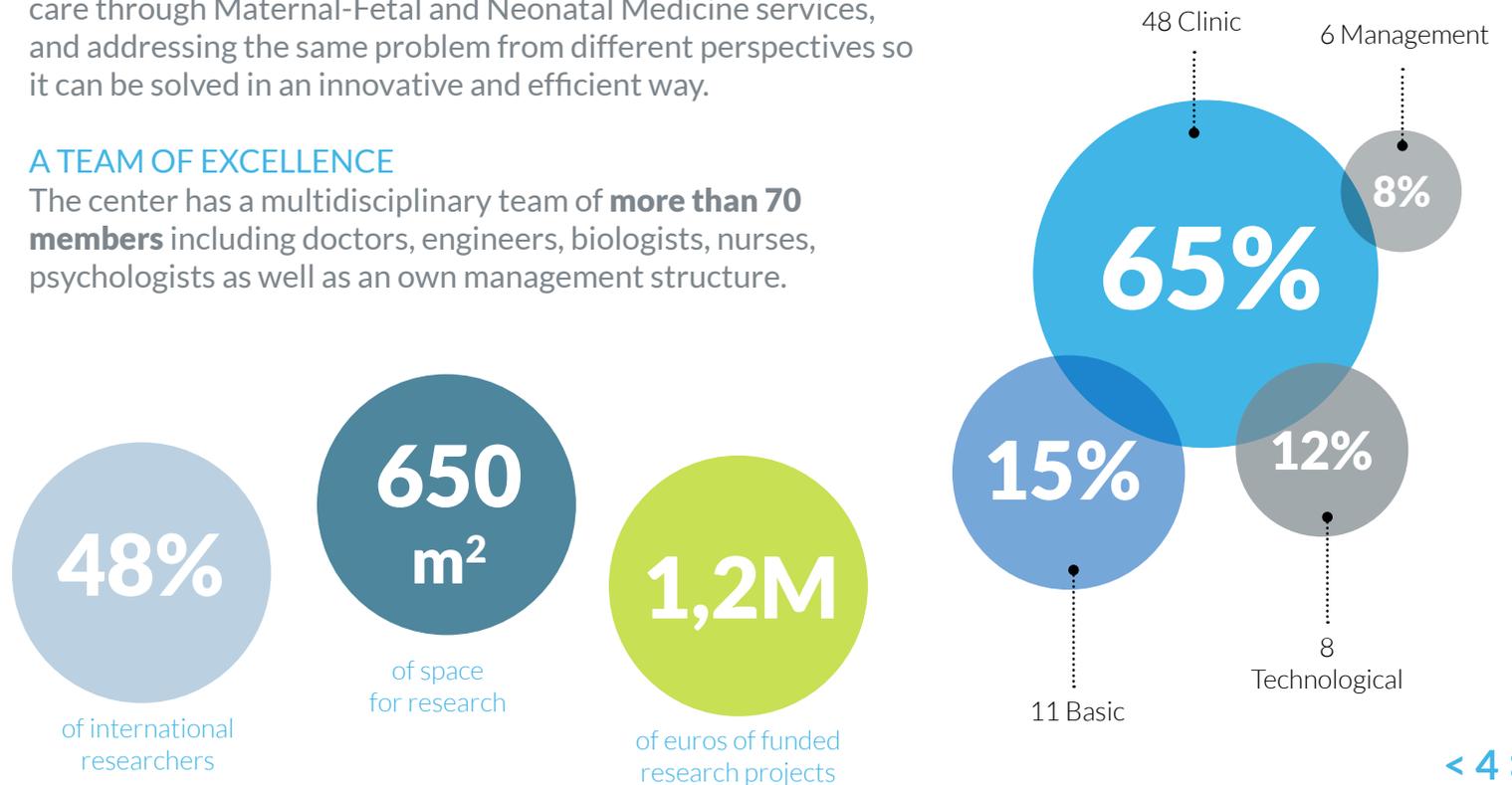
Fetal i+D is a multidisciplinary research center in fetal and perinatal medicine, recognized as one of the world's best research centers in the field, and linked to Hospital Clínic, Hospital Sant Joan de Deu and the University of Barcelona. One of the main goals of fetal i+D research is to demonstrate and characterize the profound impact that fetal life has on children and their future health for the rest of their lives. To do this, we identify the fetus as a patient, integrating prenatal and postnatal care through Maternal-Fetal and Neonatal Medicine services, and addressing the same problem from different perspectives so it can be solved in an innovative and efficient way.

### A TEAM OF EXCELLENCE

The center has a multidisciplinary team of **more than 70 members** including doctors, engineers, biologists, nurses, psychologists as well as an own management structure.

We are specialists in fetal and perinatal medicine. We cure before birth.

### HUMAN RESOURCES AREAS



## NATURE

**IDIBAPS:** The Biomedical Research Institute August Pi i Sunyer (IDIBAPS) is the first health research facility accredited by the national health system with a scientific productivity among the highest in Europe. Research is organized in five main areas that include nearly 60 research teams. Hospital Clínic Barcelona is one of the IDIBAPS foundational members.

**Clinic-Clinic Foundation:** The Hospital Clinic Barcelona is a centenary center and a reference in terms of clinical care and research in the south of Europe. The Clinic provides high-quality services focusing on patient care, a competitive biomedical research and great training opportunities. Its experience and history are the pillars of IDIBAPS activities. The Clinic Foundation for Biomedical Research (FCRB) is responsible for the administrative management of IDIBAPS.

**Sant Joan de Deu-Sant Joan de Deu Foundation:** The Hospital Sant Joan de Deu is a national leader and reference center for pediatric and obstetric-gynecologic assistance. It promotes basic and

translational research, organized in 8 research teams focused on maternal and pediatric areas. The Sant Joan de Deu Foundation provides service and support to the researchers at the hospital and to all research activities conducted.



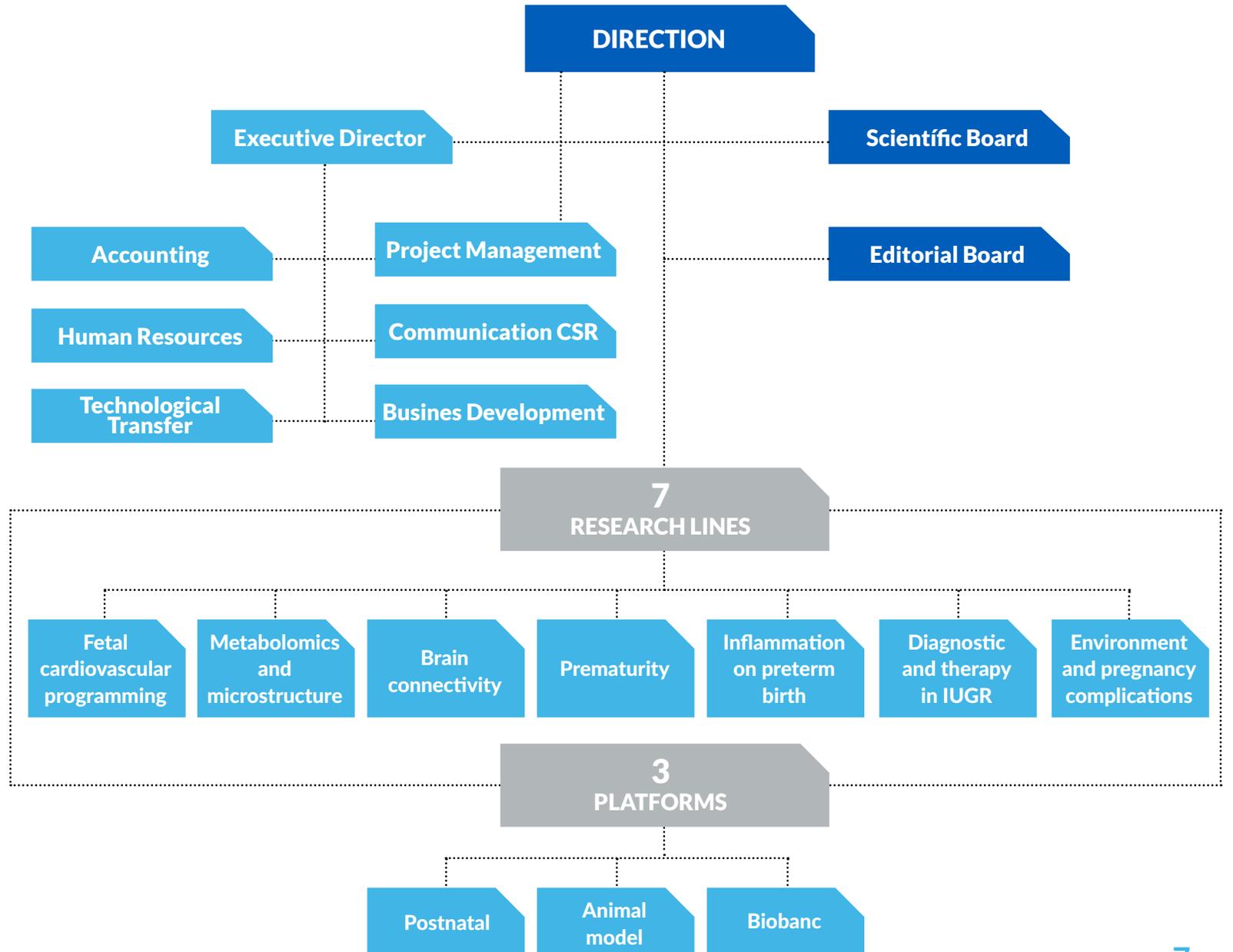


## 2. THE TEAM

- Organization chart
- Research lines
- Platforms
- Research management



# ORGANIZATION CHART



## RESEARCH LINES

Our seven research lines share a common main objective: to identify diagnostic methods and treatment of diseases with prenatal origin that have an impact on childhood and adult life.

Fetal i+D foresees the fetus as a patient, to which we can diagnose and treat certain diseases to minimize or even eliminate future consequences. Our research focuses especially on the heart and brain, given special importance to the fetal programming occurring during development in these organs.

We have expanded our research lines to cover all the areas of fetal medicine

RESEARCH LINES

Fetal cardiovascular programming

Metabolomics and microstructure

Brain connectivity

Prematurity

Inflammation on preterm birth

Diagnostic and therapy in IUGR

Environment and pregnancy complications

## Fetal cardiovascular programming

*This research line investigates those prenatal circumstances susceptible to condition an increased cardiovascular risk postnatal, such as intrauterine growth restriction (IUGR), in vitro fertilization techniques (IVF) or prematurity.*

The main objectives of the line include understanding the pathophysiological mechanisms of fetal cardiovascular programming to understand why children born with low birth weight have increased risk of cardiovascular diseases in adulthood. Longitudinal studies combined with animal models and computational models will allow us not only advance in the knowledge of this correlation, but also develop therapies to improve the cardiovascular prognosis of children who have suffered IUGR during development.

The Fetal Cardiovascular Programming research line brings together a multidisciplinary team of fetal medicine specialists,

pediatricians, epidemiologists, biologists and engineers.



**Coordinator:** Fátima Crispi

	UNDERSTANDING	PREDICTION	THERAPY
CLINICAL	Longitudinal studies: IUGR and cardiovascular disease in adulthood	Cardiovascular remodelling in IUGR	
BASIC	Ultrastructural remodelling of the cardiovascular system		Therapies in IUGR animal model
ENGINEERING	3D ultrastructural analysis of the cardiovascular system	Computational models of the fetal cardiovascular system	



“ We want to characterize cardiovascular changes occurring in prenatal adverse circumstances and how they persist in adult stages ”



**Predocs:**

Anna González  
Brenda Valenzuela  
Mérida Rodríguez  
Álvaro Sepúlveda  
Gulcin Gumus  
Patricia García  
Iosefine Stergiotou

**Postdocs:**

Elena Demicheva

**Collaborators:**

Bart Bijns

**Clinical fellows:**

Olga Gómez  
Laura Guirado  
Laura García

**Research fellows:**

Jozien Tanis  
Audrey Serafini  
Lidia Cornejo  
Mitsuru Matsushita

**COLLABORATIONS/  
ACKNOWLEDGEMENTS**

**National**

- Universitat de Barcelona
- Universitat Pompeu Fabra
- Centre Nacional d'Anàlisi Genòmica (CNAG)

**International**

- ALSPAC, University of Bristol, UK
- Oxford University, UK
- The Wellcome Trust Centre for Human Genetics, UK
- Medical University Graz, Austria
- Hadassah-Hebrew University Medical Centers Jerusalem, Israel
- European Synchrotron Radiation Facility, Grenoble, France
- Helmholtz-Zentrum Berlin, Germany

## Metabolomics and Microstructure

*The goal of this line is to define and isolate the metabolic and microstructural differences present in the brain of fetuses and children diagnosed with growth restriction or congenital heart disease who are at risk of having an abnormal neurodevelopment.*

The main objectives of this research line comprise understanding changes that occur both at the microstructure level and at the metabolic profile of fetuses, neonates and 1 year old children with fetal growth restriction congenital heart diseases. Image and spectroscopy magnetic resonance technologies are used to identify these differences. Identifying these differences will allow us to improve diagnosis and prognosis of these children.

The Metabolomics and Microstructure research line gathers fetal medicine specialists, biologists, biochemists, psychologists and pharmacists.



**Coordinator:** Magda Sanz-Cortés

	METABOLOMICS	MICROSTRUCTURE
CLINICAL	Study of the brain metabolism in fetus, neonates and 1-year-old babies with growth restriction or congenital heart diseases	Study of the cortical development and corpus callosum in fetus with growth restriction or congenital heart diseases
BASIC	Study of the metabolism and brain structure in growth restriction animal models Study of potential brain biomarkers of growth restriction to be translated into clinics	

“ Understanding metabolic differences in the brain of fetuses and children will allow us to detect those cases at risk of abnormal neurodevelopment ”



**Predocs:**

Rui Simoes

**Postdocs:**

Gabriela Egaña  
Jezid Miranda  
Carlos Victor Montefusco

**Research fellows:**

Lucía Vazquez  
Leandro Keselman  
Anna Granés

COLLABORATIONS/  
ACKNOWLEDGEMENTS

**National**

- Hospital Vall d’Hebron de Barcelona
- Hospital La Paz, Madrid
- Hospital 12 de Octubre, Madrid
- Universidad Autónoma de Barcelona

**International**

- Liverpool John Moores University, UK
- Oxford University, UK
- Hospital Descartes, Paris, France
- Foundation IRCCS Ca ‘Granda Ospedale Maggiore Policlinico, Milan, Italy
- University of Bologna, Italy

**Corporations**

- Perkin Elmer, Finland
- Transmural Biotech, Spain
- Siemens Healthcare, Spain

## Brain connectivity

*The main purpose of the line is the analysis of brain connections by magnetic resonance imaging for the early diagnosis of neurodevelopment abnormalities.*

Analysis of brain networks, also known as connectomics, allows us to objectively know the organization of the brain connections in each individual. This tool gives us the opportunity to correlate connectomics with neurodevelopment.

The development of a tool to analyse connectomics, which can be used in clinical and experimental studies, will allow us to assess brain connection networks in different scenarios such as ventriculomegaly, and to validate its use as a biomarker. Also, we will evaluate the changes that exist after application of therapy, demonstrating the ability of connectomics biomarkers to track different strategies of intervention.

The Brain Connectivity research line brings together a multidisciplinary team of fetal medicine specialists and engineers.



**Coordinator:** Elisenda Eixarch

	DEVELOPING	VALIDATING	MONITORING
CLINICAL/BASIC		Connectomics in patients with ventriculomegaly  Analysis of specific connectomic networks	
ENGINEERING	Tool to analyse connectomics in clinical and experimental studies	Connectomics in different experimental models	Changes in the connectivity after therapy in animal models

“Connectomics opens the door to a better understanding of brain fetal programming, a moment in which early intervention can be successful for early interventions”



**Postdocs:**

Emma Muñoz

**Predocs:**

Dafnis Batalle

Nadine Hahner

**COLLABORATIONS/  
ACKNOWLEDGEMENTS**

**National**

- Universitat Pompeu Fabra de Barcelona

**International**

- Center for the Developing Brain, King's College, UK
- Ecole Polytechnique Federal, Lausanne, Switzerland
- Hospital Universitaire Geneve, Switzerland

## Prematurity

*The goal of this line is advancing the knowledge and improving the management of preterm labor, one of the most frequent causes of perinatal morbidity and mortality.*

The prematurity research line focuses on detecting and optimizing management of patients with an actual risk of preterm labor, in order to prolong gestation and improve the neonatal prognosis. For that, we investigate non-invasive interventions that improve the ability of professional clinicians to deal with a risk of premature birth.

One of the main research tools in the prematurity line is the quantitative textures analysis of images obtained by ultrasound. This tool may also be useful to better predict the outcome of the labor induction.

The research line brings together fetal medicine specialists, bioengineers and technical support.



**Coordinator:** Montse Palacio

	DIAGNOSIS	MANAGEMENT	THERAPY
CLINICAL & BIOENGINEERING	Quantitative texture analysis of fetal lungs in risk pregnancies		Study of therapies for the successful treatment of bacterial vaginosis
	Quantitative texture analysis of the cervix to predict the outcome of delivery induction and the risk of preterm birth		

“ It is crucial to improve diagnosis  
delivery risk of preterm to intervene  
and improve the perinatal outcomes ”



**Predocs:**

Núria Baños  
Federico Migliorelli

**Technical support:**

Maribel Grande

**Master students:**

Andrea Salazar

COLLABORATIONS/  
ACKNOWLEDGEMENTS

**International**

- University Hospitals Leuven, Belgium
- University Hospital Hradec Kralove, Czech Republic
- Helsinki University Hospital, Finland
- University Medical Center Groningen, Netherlands
- Azienda Ospedaliero-University S.Orsola-Malpighi Bologna, Italy
- Institute for Mechanical Systems at ETH Zurich, Switzerland

**Corporations**

- Astraia Software GmbH, Germany
- Transmural Biotech, Spain

## Inflammation in preterm birth

*This line seeks to define biomarkers using advanced non-invasive technologies to identify intraamniotic inflammation in women at risk of preterm delivery.*

The presence of intraamniotic inflammation is the most frequent known cause of preterm birth, especially in early gestational ages. Currently, the only method for diagnosis is an invasive procedure, the amniocentesis. A main objective of the line is to characterize biomarkers to predict intraamniotic inflammation using non-invasive techniques.

The use of advanced technologies such as proteomics or metabolomics may allow a better diagnosis and effective management of patients at risk for premature birth.

The inflammation in preterm birth research line combines fetal medicine specialists, biochemists,

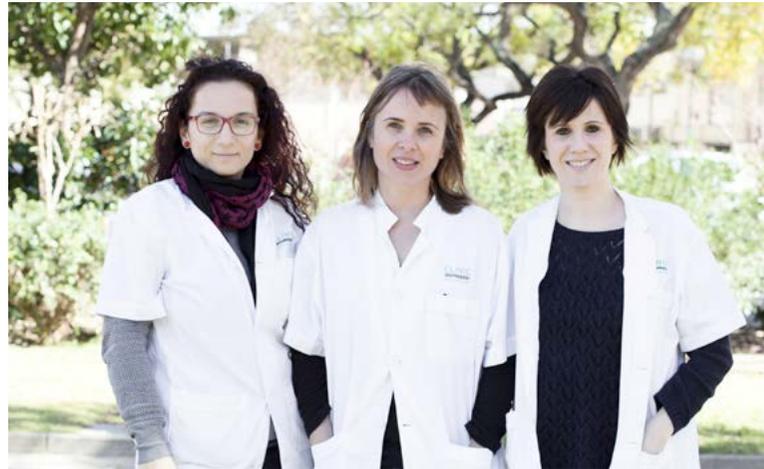
statisticians and technical support.



**Coordinator:** Teresa Cobo

	BIOMARKERS	VALIDATION
BASIC	Study of proteomic and metabolomic biomarkers in cervix-vaginal samples	Development of predictive algorithms of intraamniotic inflammation through the combination of biomarkers and maternal characteristics
CLINICAL	Prospective validation of the use of biomarkers to predict intraamniotic inflammation in a non-invasive manner	

“ Predicting intraamniotic inflammation with non-invasive techniques will improve the management of women at high risk of premature birth ”



**Technical support:**  
Maribel Grande  
Ana Belén Sánchez

### COLLABORATIONS/ ACKNOWLEDGEMENTS

#### National

- Research Centre Prince Philippe de Valencia

#### International

- University of Gothenburg, Sweden
- University Hospital Hradec Kralove, Czech Republic
- The University of Texas Medical Branch, Galveston, Texas, United States

#### Corporations

- Hologic, United States

## Diagnosis and therapy in IUGR

*The line of Diagnosis and Therapy in Intrauterine Growth Restriction (IUGR) aims to identify before birth those babies with growth restriction problems that may have an adverse perinatal outcome or a suboptimal neurodevelopment.*

Babies with intrauterine growth restriction (IUGR) have an increased risk of complications before and after birth. Moreover, they can have alterations in their neurodevelopment.

Minor neurodevelopmental alterations induced by IUGR do not involve major consequences, but they are increasingly recognized as a family and social problem.

Therefore, the correct definition and diagnosis of IUGR is especially important because it will establish the usefulness of implementing preventive measures during pregnancy and childbirth, as well as therapies during the first childhood.

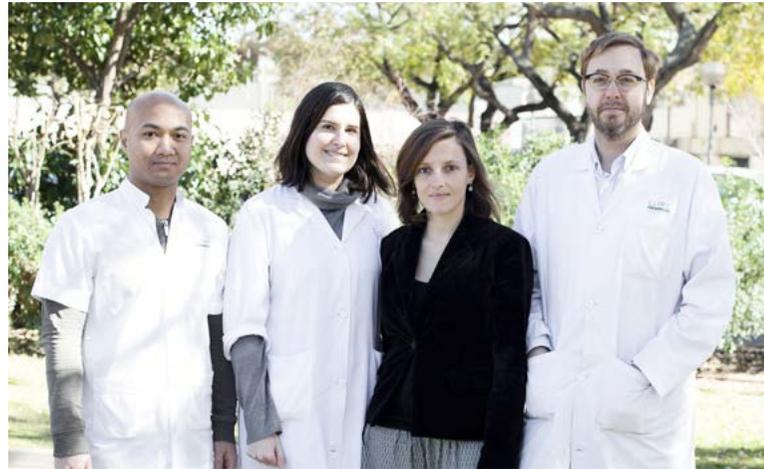
This research line gathers fetal medicine specialists, psychologists and technical support.



**Coordinator:** Francesc Figueras

	DIAGNOSIS	THERAPY
CLINICAL	Development of IUGR detection methods: new definition and prediction of brain damage	Clinical assays to prevent IUGR and preeclampsia
ANIMAL MODEL	Neurodevelopmental study in IUGR animal model	Study of the effect of therapies in IUGR animal model

“Improving the diagnosis and management of growth-restricted pregnancies will prevent fetal neurodevelopment alterations”



**Predocs:**

Miriam Illa  
Stefania Triunfo  
TriRahmat Basuki

**Research fellows:**

Francesca Crovetto  
Anna Peguero

COLLABORATIONS/  
ACKNOWLEDGEMENTS

**International**

- University College of London, UK

## Environment and pregnancy complications

*This line aims to measure the influence of environmental factors, such as exposure to tobacco, alcohol, drugs and environmental toxins (heavy metals and pesticides) in growth restriction or other pregnancy complications.*

Toxic exposure during pregnancy can have severe effects over fetal growth and neurodevelopment. It is necessary to characterize prenatal exposure to abuse substances (tobacco, alcohol, drugs) and environmental toxics (heavy metals such as lead and mercury, or pesticides such as DDT) during gestation to understand their effects on fetal development.

Our goal is to characterize the effect of this exposure during pregnancy to improve our knowledge and the prediction of complications such as growth restriction.

This research line combines fetal medicine specialists, pathologists, biologists and technical support.



**Coordinator:** Lola Gómez-Roig

	CHARACTERIZATION	PREDICTION
CLINICAL	Study of the effect of environmental toxics exposure during pregnancy	Risk of prediction of pregnancy complications due to environmental factors
BASIC	Study of the toxic and metabolic exposure during pregnancy	



“ We want to assess how environmental factors affect pregnancy, in order to improve the prediction of complications like growth restriction ”



**Predocs:**

Sally Sabra  
Edurne Mazarico

COLLABORATIONS/  
ACKNOWLEDGEMENTS

**National**

- Hospital Vall d’Hebron, Barcelona
- Hospital del Mar-IMIM, Barcelona

**International**

- Mount Sinai Hospital, New York, United States

**Other contributors:**

- ICFO. Institute of Photonic Sciences
- Pablo de Olavide University, Seville
- Bioengineering at the University of Zaragoza
- University of Chile Clinical Hospital, Santiago de Chile
- UZ Leuven, Belgium
- University of Lund, Sweden
- Imperial College, London
- KK Women’s & Children’s Hospital, Singapore



## 2. THE TEAM

# PLATFORMS

“ Our 3 platforms give support to the research activity of our group ”

### Biobanc



**Coordinator:** Fàtima Crispi  
**Responsible:** Anna González  
**Technical support:** Maria Martín

The biobank is an organized collection of human biological samples and related clinical information preserved for research purposes. The biobank platform aims to obtain, store, manage and distribute large collections of human biological samples of phenotypes and diseases in fetal medicine.

### Postnatal



**Coordinator:** Ángela Arranz  
**Technical support:** Maria Martín

The postnatal platform intends to ensure neonatal monitoring of all patients participants in different research projects, as well as to guarantee the perception of quality and excellence in the research team by users.

### Animal model



**Coordinator:** Míriam Illa  
**Support:** Laura Pla

The animal model platform is responsible for the management of all the experimental projects in the research team, coordinating UB platform of animal facilities, the IDIBAPS management area, the ethics committee, the biobank platform and other institutions such as the medical imaging platform of IDIBAPS.

## RESEARCH MANAGEMENT TEAM



**Coordinator:**

Luis Enciso

**Support:**

Maite Aguilera  
Mercedes Alonso  
Estefania Callado  
Gemma Fornons  
Balma Gil  
Pere Lorente  
Irene Puga

The excellent research that our team develops is not possible without a specialized management team. In that sense, the departments of project management, purchase, human resources, IT, business development and internationalization, communication and CSR work in concert to, among other things:

- Support the scientific activity of researchers at Fetal+D and promote fetal medicine research
- Coordinate research projects in order to ensure the expected results
- Manage efficiently the funds for research activities and promote the efficient use of resources and infrastructure
- Contribute to the professional growth of team members to ensure their future employability
- Ensure ethics and the application of ethical principles in the research
- Promote the transfer of results and facilitate understanding of our progress into the society, the scientific community and the economic system



### 3. PROJECTS i+D+i

- Research projects 2014
- Clinical and technological transfer



## RESEARCH PROJECTS 2014

### Ended in 2014

Efecto de la terapia antihipertensiva prenatal sobre el remodelado cardiovascular en la restricción de crecimiento intrauterino.

Dra Fátima Crispí  
Instituto de Salud Carlos III (ISCIII). PI11/00051.  
01/01/2012 - 31/12/2014

Ácido acetil salicílico para la mejora de la invasión trofoblástica en gestantes con Doppler patológico de las uterinas a las 11-14 semanas de gestación.

Dr Francesc Figueras  
Ministerio de Sanidad, Política Social e Igualdad. EC11-169.  
01/01/2012 - 31/12/2014

eVV- endoVascularVision: new endoscopic tools for real time vascular assisted vision.

Dr Eduard Gratacós  
European Commission. 251356.  
01/09/2010 - 30/08/2014

Evaluación del valor predictivo de mal resultado perinatal del perfil proteómico y metabólico cérvico-vaginal en pacientes con amenaza de parto prematuro y rotura prematura de membranas.

Dra Montse Palacio  
Instituto de Salud Carlos III (ISCIII). PI10/01308.  
01/01/2011 - 31/12/2014

Estudio del neurodesarrollo a través de distintas técnicas de resonancia nuclear magnética y su asociación con el neurodesarrollo.

Dra Magda Sanz-Cortés

Fundación Dexeus Salud de la Mujer  
7/3/2012 - 6/3/2014

Evaluación de la utilidad de la indometacina como tratamiento de soporte en pacientes con amenaza de parto pretérmino y alto riesgo d inflamación intraamniótica: EUD RA-CT : INDO GEST 2010-022998-33.

Dra Montse Palacio  
Instituto de Salud Carlos III (ISCIII). EC041047.  
01/01/2011 - 31/12/2014

### Ongoing in 2014

Prevención de la lesión neurológica por hipoxia crónica perinatal en un modelo animal de coneja gestante.

Dr Francesc Figueras  
Instituto de Salud Carlos III (ISCIII). PI12/00851.  
01/01/2013 - 31/12/2015

EVERREST - Does vascular endothelial growth factor gene therapy safely improve outcome in severe early-onset fetal growth restriction?

Dr Eduard Gratacós  
European Commission. 305823.  
01/01/2013-31/12/2018

Identificación de biomarcadores de remodelado subcelular en la programación fetal de disfunción cardiovascular por retraso de crecimiento intrauterino.

Dr Eduard Gratacós  
Ministerio de Economía y Competitividad. SAF2012-37196.  
01/01/2013 - 31/12/2015



### 3. PROJECTS i+D+i

Evaluación de la función cardiovascular en gemelos supervivientes a una transfusión feto-fetal severa tratada por cirugía fetal.

Dr Eduard Gratacós  
Fundacion de Investigacion Medica Mutua Madrileña.  
AP116192013.  
22/06/2013 - 21/06/2015

Biomarcadors quantitius d'imatge: Nous mètodes per a la predicció del neurodesenvolupament anormal en nens amb retard de creixement fetal basats en connectòmica.

Dr Eduard Gratacós  
Obra Social Fundación la Caixa  
03/12/2010 - 30/06/2015

Evaluación de la función cardiovascular en gemelos supervivientes a una transfusión feto-fetal tratada por cirugía fetal.

Dr J.M. Martinez  
Instituto de Salud Carlos III (ISCIII). PI12/02230.  
01/01/2013 - 31/12/2015

### **Started in 2014**

Diagnóstico precoz y prevención de disfunción cardiovascular en niños concebidos mediante técnicas de reproducción asistida.

Dra Fátima Crispi  
Fundació Agrupació Mútua. FUNDAGRUP\_PREMI13\_01.  
01/01/2014 - 31/12/2015

Grup de medicina Maternofetal i Neonatal.

Dr Eduard Gratacós  
Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR). 2014\_SGR\_928.  
01/01/2014 - 31/12/2016

A multidisciplinary research programme for the evaluation of diagnostic techniques and intervention measures for prenatal brain damage using growth restriction as a model.

Dr Eduard Gratacós  
Cerebra Research Fund  
01/01/2014 - 31/12/2019

Prevenint les conseqüències neurològiques i cardiovasculars de les malalties fetals.

Dr Eduard Gratacós  
Obra Social Fundación la Caixa  
12/12/2014 - 12/12/2017

Desarrollo de biomarcadores basados en conectividad cerebral para el diagnóstico precoz de las alteraciones del neurodesarrollo de origen prenatal.

Dra Elisenda Eixarch  
Instituto de Salud Carlos III (ISCIII).PI042902.  
01/01/2014 - 31/12/2016

Aplicación del estudio de la conectividad cerebral para el diagnóstico precoz de las alteraciones del neurodesarrollo de origen prenatal.

Dra Elisenda Eixarch  
Fundación Dexeus Salud de la Mujer  
31/1/2014-30/01/2016

## CLINICAL AND TECHNOLOGICAL TRANSFER. CLINICAL GUIDELINES AND CALCULATORS

### CLINICAL GUIDELINES

An important contribution of our research team into clinical practice is the collaboration in preparing clinical guidelines. This activity allows us to integrate some of our research results into clinical practice, optimizing patient care, preventive measures and treatment in the health system. Most of the guidelines in which we have participated can be found on the research team website.

“ *This year, our clinical definitions are incorporated in the Australian-New Zealand College guidelines and International Society of Ultrasound in Obstetrics* ”

We have participated in the preparation of 20 local, national and international guidelines

### 7 Available calculators:

GESTACIONAL **Hernia** Doppler  
Preeclampsia **ANEMIA**  
**FETAL GROWTH**  
**Monozygotic twins**

### CALCULATORS

We have transformed the clinical guidelines into clinical calculators, a tool that allows different types of accurate calculations to assist in handling different clinical situations. Specifically, one of the calculators we have developed is fetal growth based on our research results on the prediction and management of small for gestational age fetuses in order to improve perinatal outcomes.

<http://medicinafetalbarcelona.org/calc/>  
has received more than:

**175.000**

visits during 2014



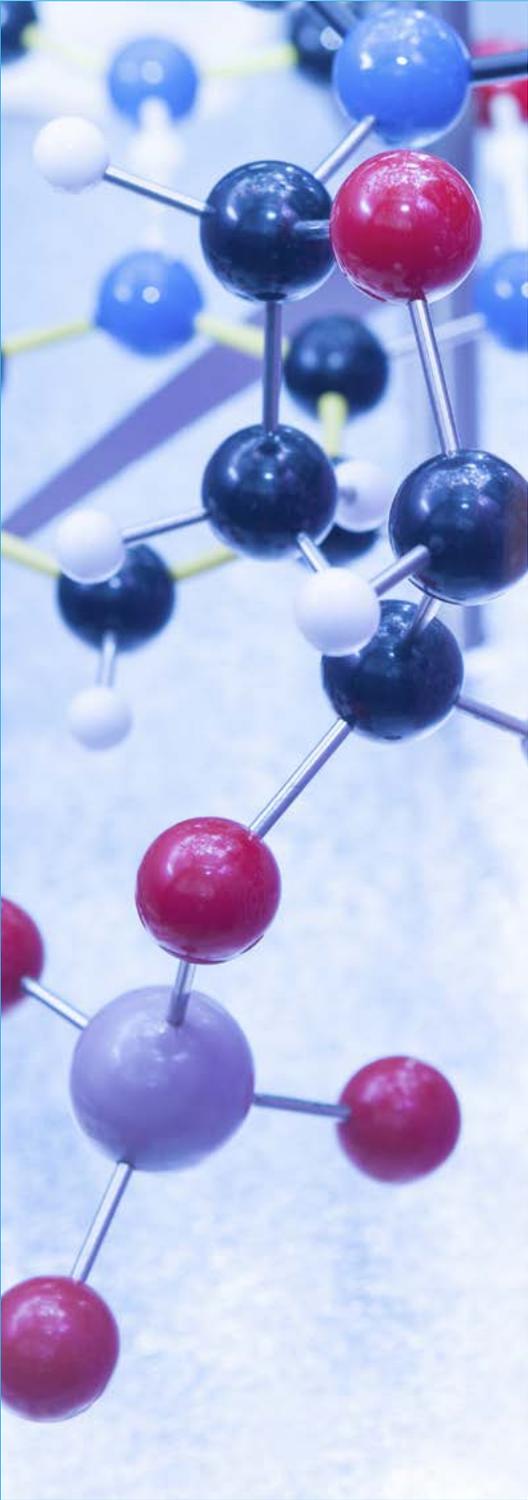
## 4. RESULTS

- Scientific production.  
Papers published
- Participation in  
congresses
- Academic results.  
Theses defended,  
stays and awards



## SCIENTIFIC PRODUCTION. PAPERS PUBLISHED

1. Batalle D, Muñoz-Moreno E, Arbat-Plana A, Illa M, Figueras F, Eixarch E, Gratacós E (2014) [Long-term reorganization of structural brain networks in a rabbit model of intrauterine growth restriction](#). *Neuroimage* 100:24–38
2. Benavides-Serralde A, Hernández-Andrade E, Cruz-Martinez R, Cruz-Lemini M, Scheier M, Figueras F, Mancilla-Ramirez J, Gratacós E (2014) [Doppler evaluation of the posterior cerebral artery in normally grown and growth restricted fetuses](#). *Prenat Diagn* 34:115–120
3. Bonet-Carne E, Palacio M, Cobo T, Perez-Moreno A, Lopez M, Piraquive JP, Ramirez JC, Marques F, Gratacós E (2014) [Quantitative Ultrasound Texture Analysis Of Fetal Lungs To Predict Neonatal Respiratory Morbidity](#). *Ultrasound Obstet Gynecol*. doi: 10.1002/uog.13441
4. Chambers AE, Mills WE, Mercade I, et al (2014) [The utility of circulating LHCGR as a predictor of Down's syndrome in early pregnancy](#). *BMC Pregnancy Childbirth* 14:197
5. Cobo T, Jacobsson B, Kacerovsky M, Hougaard DM, Skogstrand K, Gratacós E, Palacio M (2014) [Systemic and local inflammatory response in women with preterm prelabor rupture of membranes](#). *PLoS One* 9:e85277
6. Cobo T, Kacerovsky M, Jacobsson B (2014) [Amniotic fluid infection, inflammation, and colonization in preterm labor with intact membranes](#). *Am J Obstet Gynecol* S0002-9378:00640–1
7. Crispi F, Bijmens B, Sepulveda-Swatson E, et al (2014) [Post-Systolic Shortening by Myocardial Deformation Imaging as a Sign of Cardiac Adaptation to Pressure Overload in Fetal Growth Restriction](#). *Circ Cardiovasc Imaging* 7:781–787
8. Crispi F, Cruz-Lemini M, Gratacós E (2014) [Reply](#). *Ultrasound Obstet Gynecol* 43:109
9. Crovetto F, Crispi F, Scazzocchio E, Mercade I, Meler E, Figueras F, Gratacós E (2014) [First-trimester screening for early and late small-for-gestational-age neonates using maternal serum biochemistry, blood pressure and uterine artery Doppler](#). *Ultrasound Obstet Gynecol* 43:34–40
10. Crovetto F, Figueras F, Triunfo S, Crispi F, Rodríguez-Sureda V, Peguero A, Domínguez C, Gratacós E (2014) [Added Value of Angiogenic Factors for the Prediction of Early and Late Preeclampsia in the First Trimester of Pregnancy](#). *Fetal Diagn Ther* 35:258–266
11. Crovetto F, Figueras F, Triunfo S, Crispi F, Rodríguez-Sureda V, Domínguez C, Llurba E, Gratacós E (2014) [First trimester screening for early and late preeclampsia based on maternal characteristics, biophysical parameters and angiogenic factors](#). *Prenat. Diagn*. doi: 10.10:
12. Cruz-Lemini M, Crispi F, Valenzuela-Alcaraz B, Figueras F, Gómez O, Sitges M, Bijmens B, Gratacós E (2014) [A fetal cardiovascular score to predict infant hypertension and arterial remodeling in intrauterine growth restriction](#). *Am J Obstet Gynecol* 210:552.e1–552.e22
13. Cruz-Martinez R, Gratacós E (2014) [Endoscopic fetal surgery](#). *Ginecol Obstet Mex* 82:325–36



## 4. RESULTS

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## 4. RESULTS

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**64**

**PAPERS  
PUBLISHED**

This is the number of papers published by the group in 2014 in more than 20 different scientific journals, including the most relevant journals in the field of "obstetrics and gynecology"



**218,16**

**IMPACT  
FACTOR**

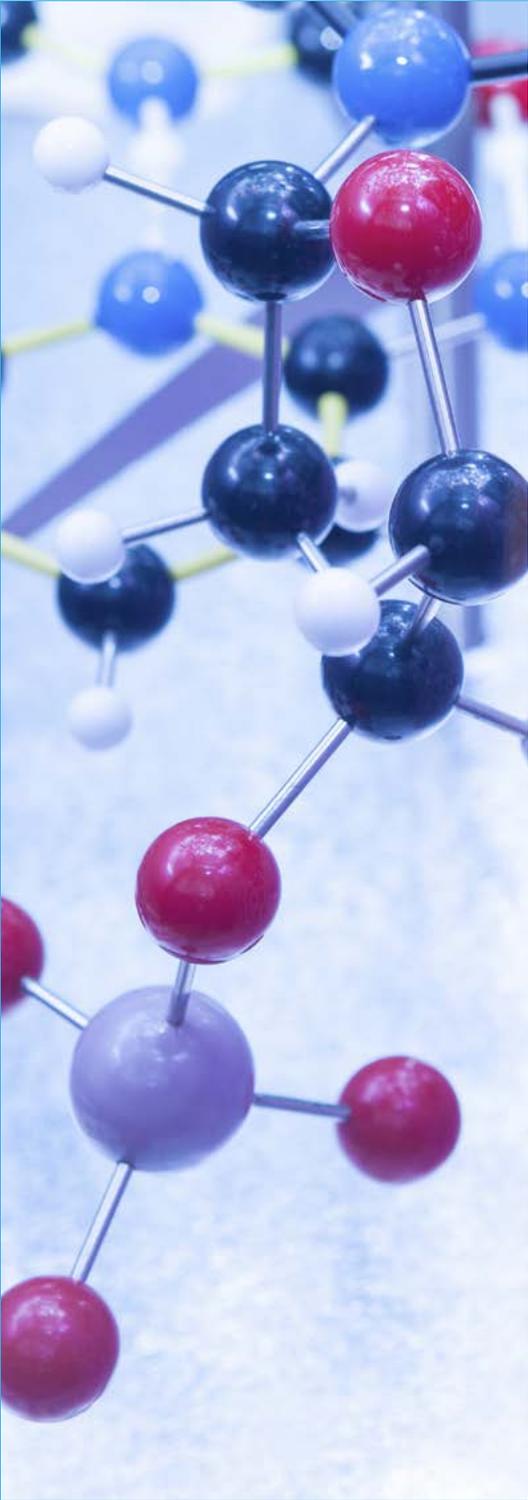
We highlight the paper 61 published in the journal *Circulation*, which has a impact factor of 15.202



**33**

**PAPERS IN FIRST  
DECILE**

Of a total of 46 articles in the first quartile, 33 were published in magazines that due to their factor impact, are placed in the first decile within its category, showing the excellence of the research group.



## 4. RESULTS

- Angiogenic factors vs Doppler surveillance in the prediction of adverse outcome among late-pregnancy small-for-gestational-age fetuses. *Ultrasound Obstet Gynecol* 43:533–40
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39. Mazza E, Parra-Saavedra M, Bajka M, Gratacós E, Nicolaides K, Deprest J (2014) In vivo assessment of the biomechanical properties of the uterine cervix in pregnancy. *Prenat Diagn* 34:33–41
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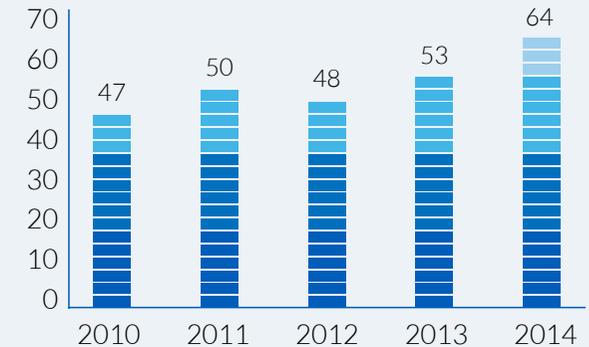
## 4. RESULTS

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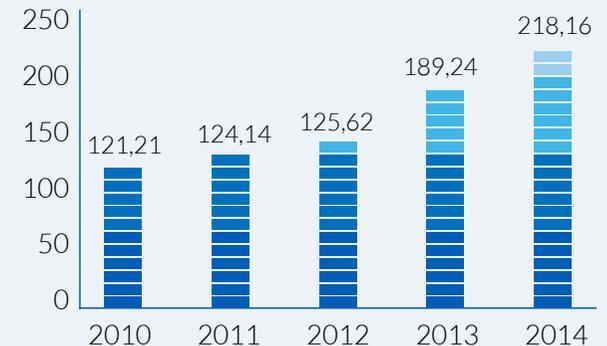
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## EVOLUTION 2010-2014

*Increase in published papers*



*In impact factor*

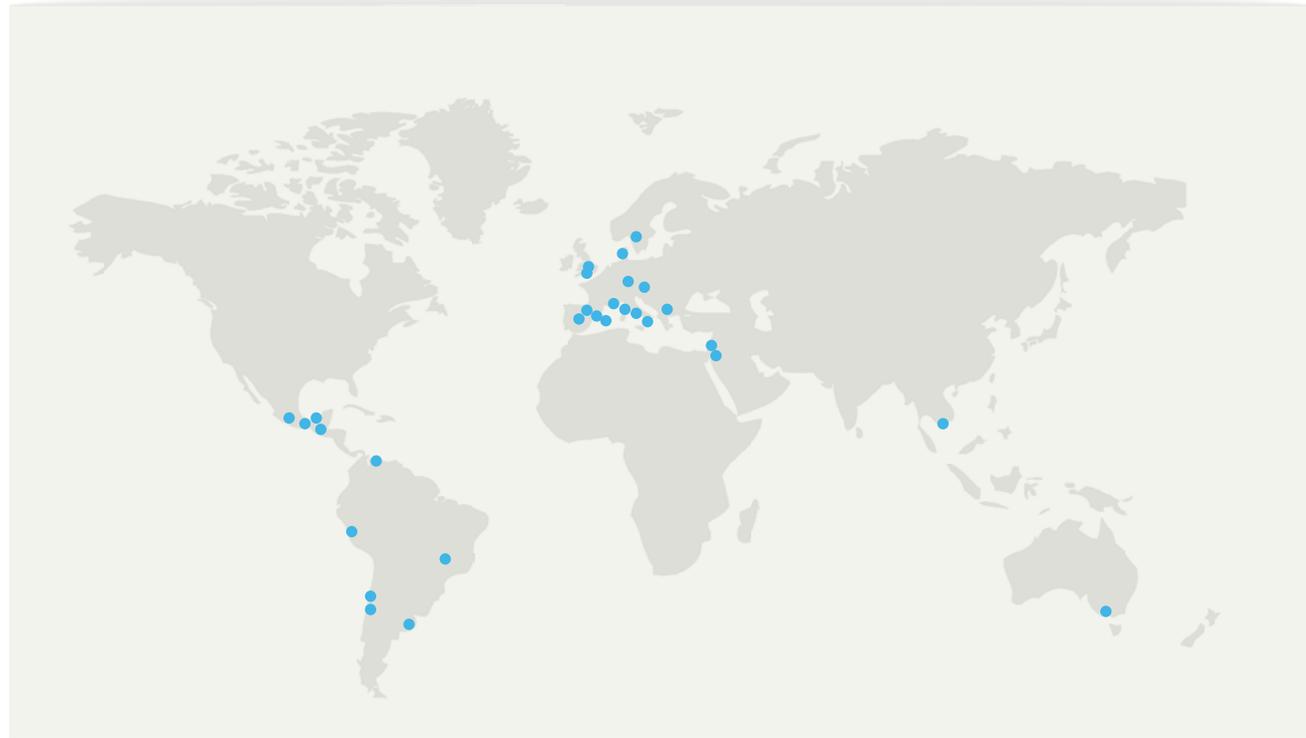




#### 4. RESULTS

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## SCIENTIFIC PRODUCTION



Invitations to international congresses

52

18

Posters in international congresses

30

Oral presentations in international congresses



## Participation in internacional congresses 2014

### FEBRUARY

28-01  
ISUOG Advanced Course: "Fetal Anomalies and CNS" (London, UK)

### MARCH

5-8  
16th World Congress of Gynecological Endocrinology (Florence, Italy)

6-9  
XV National Congress of sterility and reproductive health with international participation (BASRH) (Borovets, Bulgaria)

26-29  
International Society of Gynecological Endocrinology 16th World Congress 2014 (ISGE 2014) and 2014 Fetal Physiology Satellite Symposium (Florence, Italy)

28-29  
IX Simposio CEVIM - Restricción de crecimiento fetal (Las Condes, Chile)

30-2  
PREBIC 2014 Annual Meeting and Workshop (Geneva, Switzerland)

### APRIL

11  
Simposio de Actualidades en Obstetricia y Medicina Materno-Fetal (Monterrey, Mexico)

### MAY

8-9  
Curso Patología Fetal (Queretaro, Mexico)

8-10  
II Congreso Argentino Diagnóstico Prenatal SADIPT 2014 (Buenos Aires, Argentina)

12-16  
Joint Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM) and the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB) (Milan, Italy)

14  
Advanced course in obstetrics and gynecology (Milan, Italy)

20-24  
European spontaneous preterm birth congress, PREBIC (Svenvorg, Denmark)

22-24  
1st European Spontaneous Preterm Birth Congress (Svenvorg, Denmark)

24-26  
COGI / MSRM Congress (Barcelona, Spain)

30-31  
International Conference on Highlights on Stillbirth and Maternal Mortality (Palermo, Italy)

### JUNE

4-7  
24th European Congress on Perinatal Medicine (Florence, Italy)

15-17  
EUROMIT International meeting on mitochondrial pathology (Tampere, Finland)

19-20  
Congreso Muncial de deleción 22q11 (Palma de Mallorca, Spain)

29-3  
13th World Congress in Fetal Medicine (Nice, France)

### JULY

4-6  
Frontiers in Cardiovascular Biology meeting (Barcelona, Spain)

### AUGUST

6-8  
SAUMB 2014 (Buenos Aires, Argentina)

13-15  
48th Congress in G&O (Brasilia, Brazil)

21-23  
I Congreso Internacional Medicina Fetal (Lima, Peru)

## Participation in internacional congresses 2014

### SEPTEMBER

- 1 European Society of Cardiology Congress (Barcelona, Spain)
- 3-6 8th World Congress of Perinatal Medicine in Developing countries (Cancún, México)
- 8 Symposium on Pregnancy complications and offspring cardiovascular health (Oxford, UK)
- 14-17 ISUOG World Congress 2014 (Barcelona, Spain)
- 17-20 Symposium Cardio Fetal XV Congreso Soc. Latina Cardiología y Cirugía Cardiovascular (Barcelona, Spain)
- 30-3 20° Congreso Peruano Ginecología y Obstetría (Lima, Peru)

### OCTOBER

- 1-3 3rd International Conference on Fetal Growth (Oxford, UK)

- 2 COMEGO (Oxford, UK)
- 3 35th national Conference Section of Ultrasound diagnostic in Brno (Brno, Czech Republic)
- 7 Cerebra annual conference (London, UK)

- 6-7 4th Monash Cardiovascular Symposium (Melbourne, Australia)

- 14 I Symposium Internacional de Patología Quirúrgica Fetal: Enfoque Multidisciplinar de la Patología de Tórax y Cuello Fetal (Madrid, Spain)

- 16-18 Symposium en Obstetricia y Ginecología (Santiago de Chile, Chile)

- 17 Symposium on fetal medicine (Feldkirch, Austria)

- 17-21 5th Congress of the European Academy of Paediatric Societies (Barcelona, Spain)

- 27-18 KKH Maternal-Child Hospital and Singapore Health - 10th ISUOG Outreach Course (Singapur, Singapur)

### NOVEMBER

- 4-6 Annual Meeting of the Israel Maternal Fetal Medicine Soc. & XI Fetal Medicine meeting (Tel Aviv, Israel)

- 14-15 I Congreso CEDIUL Medicina Fetal (Barranquilla, Colombia)

- 16-19 TWINS 2014 3rd World Congress on Twin Pregnancy; 15yh Congress ISTS (Budapest, Hungary)

- 26-28 COMEGO XI Curso Internacional Medicina Fetal (México DF, México)

### DECEMBER

- 15 5th Annual Meeting of the Israel Society of Placenta Research (Jerusalem, Israel)

## Participation in national congresses 2014

### MARCH

10-12

VII Reunión Anual CIBER de Enfermedades Raras (Madrid, Spain)

### APRIL

20-22

6º Curso de Formación continuada de la Asociación de Ginecología y Obstetricia de Aragón (Zaragoza, Spain)

### MAY

6

Symposium Nacional: "30 anys de Tècniques de Reproducció Assistida a Espanya" (Barcelona, Spain)

16-18

28th National Congress of OBGYN Echography (Pamplona, Spain)

### JUNE

13-15

24 Congreso Nacional de la Sección de Medicina Perinatal de la Sociedad Española de Obstetricia y Ginecología (Zaragoza, Spain)

27

IX Curso Intensivo de Introducción a la Investigación en neurociencias: Buscando el origen temprano de los trastornos mentales de la edad adulta (Barcelona, Spain)

### OCTOBER

16

5th edition of ICFO's Light for Health event: LIGHT & PEDIATRICS (Barcelona, Spain)

17-18

3ª Reunión Científica GINEP (Málaga, Spain)

17

Jornada de Actualización sobre la predicción y prevención del parto pretérmino (Madrid, Spain)

31

Jornada "Alimentación y nutrición en los 1.000 primeros días: impacto en la salud a largo plazo" (Madrid, Spain)

### NOVEMBER

13-14

First Spanish Meeting on Translational Sciences in Cardiology (Barcelona, Spain)

81

Exposiciones en congresos nacionales e internacionales

## ACADEMIC OUTPUT: THESES DEFENDED, INTERNATIONAL STAYS AND AWARDS



### Doctoral theses

CANDIDATE	TITLE	SUPERVISORS	PLACE AND DATE
Elena Scazzocchio	Predicción de la preeclampsia y sus complicaciones	Francesc Figueras, Eduard Gratacós	UB, 20/02/2014
Stefania Triunfo	Patterns of maternal and neonatal vascular adaptations in placental disease	Francesc Figueras, Eduard Gratacós	Catholic University of the Sacred Heart, 31/03/2014
Iosifina Stergiotou	Patterns of maternal and neonatal vascular adaptations in placental disease	Fàtima Crispi, Eduard Gratacós	UB, 10/04/2014
Miguel Parra	Placental findings in late-onset small for gestational age (SGA): correlation with Doppler signs, perinatal and neurodevelopment outcome	Francesc Figueras, Eduard Gratacós	UB, 12/06/2014
Anna González	Multiscale characterization of cardiac remodeling induced by intrauterine growth restriction at organ, cellular and subcellular level	Fàtima Crispi, Bart Bijmens, Eduard Gratacós	UB, 26/06/2014
Gabriela Egaña	Neuroimaging assessment of Cortical Development and Corpus Callosum as predictive markers of neurodevelopmental outcome in small for gestational age fetuses	Magda Sanz-Cortés, Eduard Gratacós	UB, 27/06/2014
Dafnis Batallé	Brain connectivity network models based on multi-modal MRI to study brain reorganization of prenatal origin using intrauterine growth restriction as a model	Elisenda Eixarch, Eduard Gratacós	UB, 17/06/2014
Elisenda Bonet-Carné	Investigation of quantitative imaging biomarkers for assessing perinatal outcomes	Eduard Gratacós, Ferran Marqués	UB, 20/11/2014

## 4. RESULTS

### **Research Visits** Research fellowships

FELLOW	COUNTRY OF ORIGIN	PROJECT	SUPERVISOR
Jozién Tanis	Holland	Annular displacement in fetal growth restriction: online M-mode versus spatiotemporal image correlation (STIC)	Fàtima Crispi
Audrey Serafini	Italy	Long-term consequences of fetal cardiovascular programming	Fàtima Crispi
Mitsuru Matsushita	Japan	Measurement of aortic intimal-medial thickness in children	Fàtima Crispi
Kai Lit	Singapour	Clinical calculator for preoperative prediction of intrauterine fetal death and preterm delivery	Elisenda Eixarch, JM Martínez, Eduard Gratacós
Leandro Keselman	Israel	Prediction of abnormal neurodevelopment in children with congenital heart disease from by studying the metabolism and cerebral microstructure through fetal MRI	Magda Sanz-Cortés
Nadine Hahner	Deutschland	Perinatal imaging biomarkers for early identification of abnormal neurodevelopment associated to ventriculomegaly	Elisenda Eixarch

RESEARCHER	PROGRAM	PLACE AND DATE	TRAINING CTIVITIES
Federico Migliorelli	Premio final de residencia Emili Letang	UB, Spain, June	Evaluation of predictive elements in the induction of delivery and development of an algorithm for prediction
Laura Garcia	Premio final de residencia Emili Letang	UB, Spain, June	Fetal cardiovascular programming in pregnancies infected with human HIV virus
Ioana Patrascioiu	Premio final de residencia Emili Letang	UB, Spain, June	Fetal cardiometabolic programming: methylation study in clock genes and steroids in small for gestational age newborns
Anna Peguero	Premio final de residencia Emili Letang	UB, Spain, June	Role of placental growth factor in the management of non-severe preeclampsia: randomized study



## 4. RESULTS

### Awards

RESEARCHER	AWARD	CONGRESS AND DATE	DETAILS
Rui Simoes	ISMRM Merit Award: Summa Cum Laude	Joint Annual Meeting of ISMRM and ESMRMB, Italy, May	Assessment of Late-Onset IUGR in the Fetal Brain Using 1H-MRS
Elisenda Eixarch	PhD Extraordinary Award (2011/12)	UB, Spain, June	Brain reorganization in an experimental model of intrauterine growth restriction
Magda Sanz-Cortés	Top Abstract	ISUOG World Congress 2014, Spain, September	Differences in term brain cortical development and metabolism assessed by magnetic resonance in fetuses with major congenital heart defects
Francesca Crovetto	Short oral presentation - Aneuploidy and fetal anomalies - first trimester	ISUOG World Congress 2014, Spain, September	A potential role of circulating LHCGR forms for the prediction of pre-eclampsia in the first trimester of pregnancy
Francesca Crovetto	Oral communication - Maternal and fetal Doppler including fetal growth	ISUOG World Congress 2014, Spain, September	The role of angiogenic factors for first trimester screening of fetal growth restriction
Mónica Cruz	Short oral presentation - Maternal and fetal Doppler including fetal growth	ISUOG World Congress 2014, Spain, September	Fetal cardiovascular programming in growth restricted 6 month-old infants with and without catch-up growth
Elisenda Bonet-Carné	Short oral presentation - Ultrasound in term and preterm labour	ISUOG World Congress 2014, Spain, September	Quantitative ultrasound texture analysis of fetal lungs to predict neonatal respiratory morbidity



## 5. EDUCATION

- fetalMed PhD EMJD



## TRAINING IN FETAL AND MEDICINE ERASMUS MUNDUS FETALMED PHD

FetalMed PhD main objective is the crossdisciplinary training of professionals in fetal medicine that will be able to provide solutions from academia, research and industry.

FetalMed PhD is a interdisciplinary program in Fetal and Perinatal Medicine in collaboration with three of the best European Universities and research centers in the field: Fetal Medicine Research Center (University of Barcelona, Spain), and Universities of Leuven (Belgium) and Lund (Sweden).

This platform facilitates the training of professionals capable of tackling and providing effective and comprehensive solutions to health problems and at the same time it seeks to promote the development of new products and processes for different sectors of society.

Also, the program wants strengthen centers of research and make capacity building of institutions and people in countries around the world by promoting international networking and collaborative projects between entities driving the program, countries of origin and universities and training centers participants.

The first edition, launched in October 2013, counts with 10 participants, and the second edition, with 9 participants, are being developed with success in the three sites of the program.

*fetalMed PhD, the first international Erasmus Mundus doctorate in fetal medicine, is the main training project linked to fetal i+D*

## ERASMUS MUNDUS FETALMED PHD 2014

In the first edition  
of *Erasmus Mundus*  
WE HAVE INCORPORATED  
**10 STUDENTS FROM**  
10 NATIONALITIES

PHD STUDENT	COUNTRY OF ORIGIN	THESIS PROJECT	SUPERVISOR
Mérida Rodríguez	Cuba	Influence of intrauterine environment in cardiovascular risk at different stages of individual life cycle and its related factors.	Fàtima Crispi
Núria Baños	Spain	Cervical consistency index and quantitative cervical texture analysis by ultrasound as predictors of cervical ripening in labour induction and preterm delivery.	Montse Palacio
Tri Rahmat Basuki	Indonesia	Neonatal Neurobehavioral Outcomes between Induction of Labor and Elective Cesarean Delivery in Late-onset IUGR with Signs of Brain Redistribution	Francesc Figueras
Hatice Gülcin Gumus	Turkey	Intrauterine fetal therapy of Intrauterine Growth Restriction	Fàtima Crispi
Zahra Masoumi	Iran	The role of syncytiotrophoblast microparticles and embryonic stem cell derived microvesicles in placental hematopoiesis and trophoblast differentiation in relation to preeclampsia	Stephan Hansson, Mattias Magnusson
Julio Alberto Jiménez	Chile	Perinatal cell based therapeutic interventions to modulate lung development in the prevention of bronchopulmonary dysplasia	Jan Deprest, Jaan Toelen, Jaroen Vanorbeek
Patrice Eastwood	United Kingdom	Perinatal Medical Interventions for Congenital Diaphragmatic Hernia	Jan Deprest, Jaan Toelen, De Coppi
Anton Baranov	Rusia	Prediction of uterine rupture by ultrasound in women with previous caesarean	Olga Vikhareva, Kjell Salvesen
Stefania Triunfo	Italy	A new definition of intrauterine growth restriction for improving the detection of fetuses at risk	Francesc Figueras, Eduard Gratacós
Nikhil Sindhwani	Italy	Geometrical and biomechanical characterization of pelvic floor structures and reconstructions using 3D medical images	Jan Deprest



## 6. FETAL MEDICINE BARCELONA FOUNDATION

- Fetal i+D EDUCATION
- inatal.org
- Other projects



## FETAL MEDICINE BARCELONA FOUNDATION

In 2013 the Fetal Medicine Barcelona Foundation was launched. It aims to transfer the knowledge in Fetal Medicine to all society areas, and it has consolidated its teaching and disseminating activities 2014. Profits generated are intended to both research and scholarships for students without resources, in an effort to spread knowledge worldwide.

### FETAL I+D EDUCATION

#### *The educational platform of the group*

With a wide range of on-site and online courses on the most important issues on fetal medicine, Fetal i+D education reflects more than 15 years of experience in clinical practice, training and research.

2014 has been a year of consolidation and implementation of substantial improvements and new projects, including:

- Launching of the Virtual Fellow in Fetal Medicine, which will be start in 2015, in order to meet the demand and need for advanced

training in maternal and fetal care. There were 12 positions and the demand was more than 200. The duration is one year. Training consists of an initial theoretical and practical part and a second practice on-site. The theoretical and practical part includes performing an online training through modules of basic knowledge acquisition of advanced fetal medicine. This part is supported by an interactive platform with discussion forums and lectures by experts.

- We have launched a line of co-organized courses with Latin America, which has been increasing. The first two courses have been in Mexico: Fetal Pathology and Fetal Medicine.
- In addition to having a new web platform, we have released our virtual Campus, which implies a great improvement for our users, in the performance of exams and the issuing of diplomas for example.

IN NUMBERS



**800**

Students in our on-site courses

**80%**  
from Spain

**20%**  
from Portugal and Latin America



**1.000**

students in the online courses

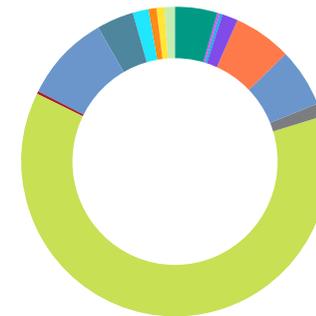
**60%**  
from Spain

**40%**  
from Portugal and Latin America

TESTIMONY

*“The courses show algorithms that can be applied into practical work; besides the presentation of recent studies, it also define lines of action”*

*Dr. G. Bufalino*



- Argentina **56**
- Ecuador **19**
- Portugal **20**
- Bolivia **2**
- Spain **740**
- Uruguay **12**
- Brazil **3**
- India **2**
- Venezuela **10**
- Central America **20**
- Italy **1**
- Other English-speaking **10**
- Chile **72**
- Mexico **111**
- Colombia **73**
- Peru **45**

## inatal.org

### *Health begins before birth*

This is the first interactive portal on pregnancy carried out in close collaboration with a reference center for Fetal Medicine. A commitment of our research team to approach pregnant women, spreading knowledge and establishing a virtual community of support, which thanks to its reliability and impartiality, today is the sector leader and is recommended by many medical specialists to their patients. What are our strengths? Consultation forums, moderated by prestigious professionals of the team.

In 2014:

- We have expanded the contents, especially those relating to nutrition and vaccines recommended during pregnancy.
- We have completed the application for mobile devices that allow a personalized follow-up of the pregnancy, monitoring the evolution of the baby and the mother over 42 weeks.
- We have launched an e-shop, a new way to raise funds for research through a non-profit sales platform.

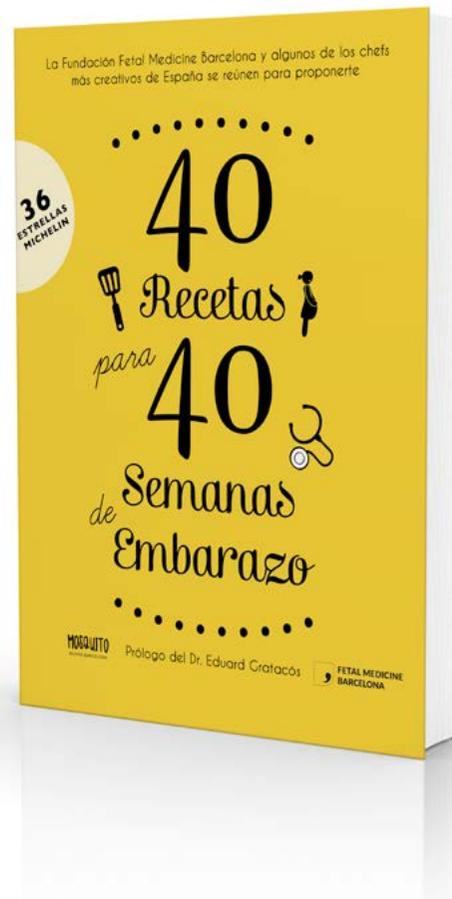


The evolution of pregnancy week by week is the section most visited each day in inatal

### IN NUMBERS



## OTHER PROJECTS



### 40 RECIPES FOR 40 WEEKS OF PREGNANCY

The first cookbook for pregnant women in which participates 19 chefs with Michelin stars (Carme Ruscalleda, the Roca brothers, Quique Dacosta...) and the best specialists in fetal medicine. The book was launched on April 23 (World Book Day) for € 9.90 and all benefits are allocated to research.

### SOCIAL EVENT: "THE HEALTH BEGINS BEFORE BIRTH. THE IMPACT OF NUTRITION DURING PREGNANCY AND EARLY INFANCY"

In June 14th, it was held at the Cosmocaixa Barcelona a ceremony to unveil the advances in research of the group, where many families with children attended. Besides the book presentation, there was a symposium that counted with the participation of Eduard Gratacós, scientific director of inatal, Ada Parellada, chef of Semproniana restaurant, nutritionist Magda Carlas and pediatrician José Manuel Rodríguez-Miguélez. They for talk about the importance of nutrition during the pregnancy and the first years of baby's life.



## 7. MEDIA

- Fetal i+D in the spotlight



## FETAL I+D IN THE SPOTLIGHT

Fetal Medicine is an emerging field increasingly featured in the media, as demonstrated by the rise of media impact registered in 2014. With more than 100 appearances, Fetal i+D group is a national and international reference in fetal research, fetal surgery and therapy.

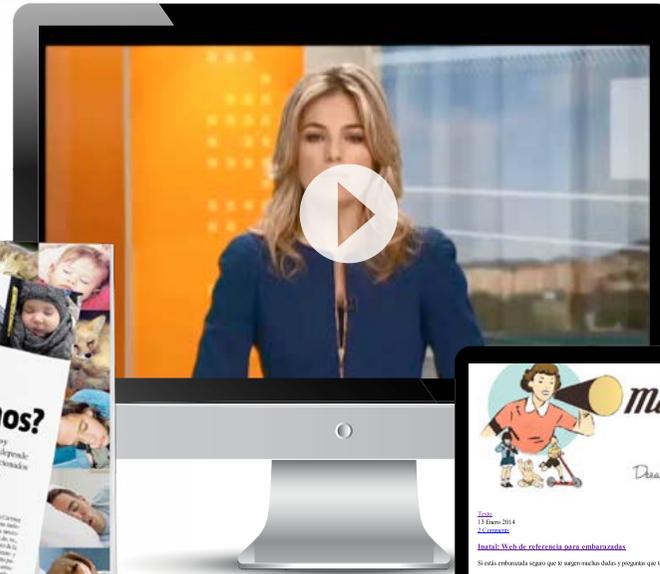
We highlight two of the most important news of 2014:

- Presentation of the Erasmus Mundus Fetalmed PhD international program, funded with 7M euros by the European Commission
- Worldwide launch of QuantusFLM, a revolutionary technic to determine lung maturity without the need of invasive tests

We have also participated in several social documentaries like “Why do we sleep?” (El Magazine, La Vanguardia), where Eduard Gratacós

explained if fetuses dream, or “The first 1000 minutes if a baby life” (ES, La Vanguardia), where Fàtima Crispi explained how breastfeeding is the best gift that you can provide to a baby.

*We are leaders in fetal medicine at the media with over 150 appearances press, radio, television and online media*



## SPONSORS:



Co-funded by the  
Erasmus+ Programme  
of the European Union



<http://medicinafetalbarcelona.org/en/research>