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**Escola de Doctorat**

# **I Conference of Pre-doctoral Researchers Abstract Book**

**Elisabeth Pinart**, PhD (Editor)

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# **I Conference of Pre-doctoral Researchers**

Abstract Book

Elisabeth Pinart, PhD *Editor*

Volume I, 2017

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Part I  
Humanistic and social field



# EDUCATION



## **The optimisation of linguistic competency and learning to learn competency: the systematic and explicit use of learning strategies in Primary Education**

M<sup>a</sup> Isabel Almagro Nóbrega, M<sup>a</sup> Luisa Pérez Cabaní

*Universitat de Girona*

The aim of this doctorate is to explore how the use of explicit, systematic reading strategies optimizes competence in both language skills and learning how to learn. The theoretical and conceptual framework is based on the constructivist perspective of teaching and learning in school, and on the concept of the two core competences of this research.

In order to better comprehend this research, it is important to contextualize the school within the education system where it is immersed.

The investigation involved a single case study of a group of first-year primary school students, in which a teaching sequence comprising seven basic reading strategies was implemented. It analyses the interaction between the teacher and the students, and surmises how this systematic use leads students to employ different strategies in a text.

The instruments for the collection and analysis of data have been elaborated and evaluated by academics and professional experts.

The results showed, among other findings, that the explicit teaching of reading strategies in a systematic way leads to the vast majority of students being able to use a greater number of these reading strategies and developing a high degree of autonomy in their application.

It is noteworthy that a range of pupils at the beginning had weak reading skills and, based on the analysis of the results, they significantly increased their use of these strategies.

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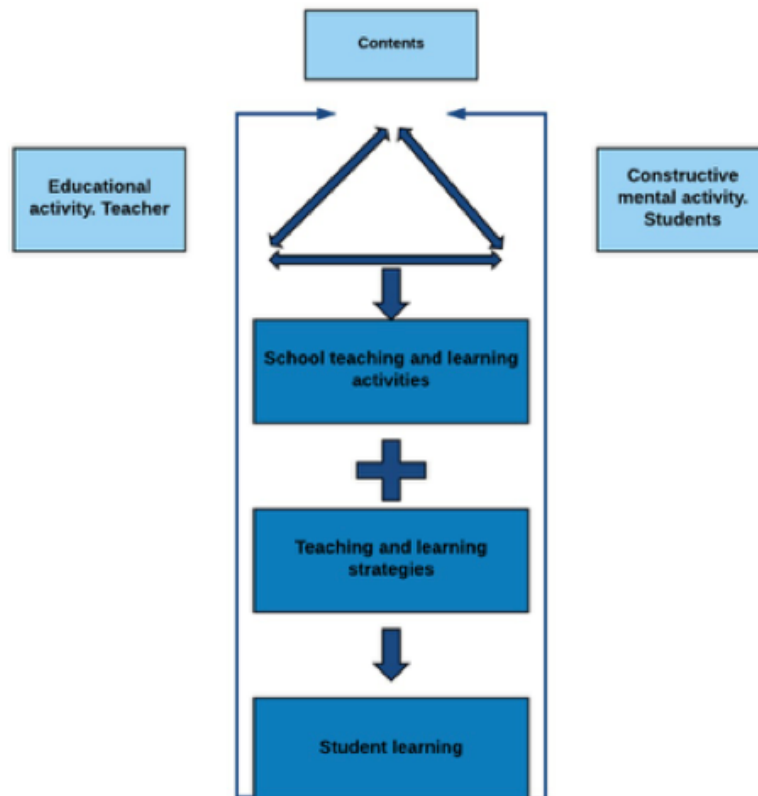


Figure 1. Teaching-learning process (adaptation)



## **The Dual Professional Training in Ecuador: Analysis of the implementation process in technical and technological higher education**

Narcisa E. Camacho, Joan Teixido Saballs

*Research Group in Collaborative Research for Educational Improvement,  
Faculty of Education and Psychology, University of Girona*

In the last ten years, higher education in Ecuador has become a cross-cutting issue of the national public policy agenda, with extensive international recognition in terms of access, tuition-free courses and equal opportunities for Ecuadorians. This process has positioned education as a right and a public good, and seeks to recover democratisation, as well as socio-economic and socio-cultural equity (Ramírez, 2016) through a relevant and quality education system committed to meeting global educational demands.

The public higher education system in Ecuador, at both technical and technological levels, has developed and implemented a new model of alternative education based on competencies called “dual vocational training” (Homs, 2016), which aims to create better job opportunities for Ecuadorians.

The main objective of this research is to evaluate the implementation of the dual vocational training model within the Comprehensive Child Development degree offered by the *Central Técnico* Higher Technological Institute (ITSCT) in Quito. The model was implemented as part of the Restructuring Public Higher Technical and Technological Education Project in Ecuador.

This research is based on a qualitative hermeneutic approach, in which an ethnographic method will be used to analyse, intervene in and eventually evaluate the case study. Following the ontological trail to the objective has led us to the first results and/or preliminary conclusions of this research regarding the ‘state of the art’ and the application of ‘semi-structured interviews’ from field work. First, the epistemic mapping of studies within the educational models of dual vocational training based on competencies in the Ecuadorian context represents a test-trial process, by which the best international practices are chosen for implementation. In addition, the trajectory of process and symbolic motivation for the implementation of the dual model for the degree in Comprehensive Child Development

according to the initial statement of its stakeholders, responds to the need to educate and professionalise educators before including them in the implementation of Children's Centres for Good Living projects.

This first phase of information-collecting and analysis has provided us with a vision and given us a holistic approach to the socio-technical construction (Latour, 1996) of this educational model from an objective and subjective order of actions, which will be the cross-cutting element for the triangulation of information and final evaluation of the research.

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## **Friendships and Intellectual Disabilities: Design, application and assessment of a training program addressed to develop socio-personal skills**

Gemma Diaz Garolera, Maria Pallisera Diaz

*University of Girona*

### **Introduction**

Social participation generally leads to social inclusion, but research shows that people with disabilities have less leisure opportunities than people without them (Small, Raghavan & Pawson, 2013; Sheldon & Storey, 2014). People with intellectual disabilities (ID) face social stigma and prejudices that limit their chances to experience social relationships. As social skills (SS) are developed as part of a learning process (Bandura, 1979, in Boluarte, Méndez & Martell, 2006), priority must be given to constructing and maintaining powerful social networks of young people with ID (Small et al., 2013). This paper presents the design, implementation and assessment of the Friendship & Social Skills Program (FSSP), which main aim is to improve the SS required to develop and maintain friendships and social networks for people with ID, contributing to the development of greater social competence.

### **Objectives**

- 1) Identify the SS required to establish and maintain friendships during the following phases: before the friendship, during the first moments, while maintaining it, and when it ends.
- 2) Design a training program to enhance the previously identified skills.
- 3) Carry out the training program with a group of young people with ID.
- 4) Assess the participants' learning, the design of the training program, and its implementation.

## **Method**

The program consists of 12 sessions with activities based on videos that introduce the different topics. The activities are designed so participants find them useful and relevant in their lives. The assessment is carried out during the program's implementation through interviews, focus groups, questionnaires and session recordings. In the first edition of the program, 10 people with ID between the ages of 18 and 30 participated. During the current edition, 12 teenagers aged from 16 to 19 are participating.

## **Results**

The first edition participants acquired additional knowledge about the skills needed to establish first contacts with others and increased their predisposition to take care of their friendships. They also had more resources to solve possible conflicts. It is important to remember, however, that the training of SS is not appreciable in the short term.

## **Conclusions**

The FSSP is a useful and transferable tool designed to meet the needs, identified in the social inclusion field, of people with ID. Improving people's knowledge about SS enhances their probability of succeeding in their friendships.

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## **Educational attention for left-behind children in rural China from the perspective of inclusive education**

Chengcheng Huang, Montserrat Vila Suñe, Maria Pallisera Diaz

*Faculty of Education and Psychology, University of Girona*

### **Introduction**

Left-behind children are a phenomenon in China that can be traced back to the 1980s. With deepening reforms and the opening up of the country, rural labor forces migrated into the cities to find work in the industrial urban zones. The increasing migration of the population from rural to urban areas leads to precarious living conditions for the migrant workers: poor housing, long working hours, terrible working conditions, etc. Meanwhile, in order to develop their careers, migrant workers devote all their time to working in the urban companies and manufacturers and they have to leave their children in the rural areas with other family members who help them raise their children. The aim of this study is to provide a generalization of the educational situation of left-behind children in China from the perspective of exclusive and inclusive education.

### **Objectives**

The objectives of this study are specified below:

- To investigate the difficulties that left-behind children face in schools and in their daily lives.
- To discover appropriate practices that may benefit daily lives of left-behind children.
- To provide educational proposals that may improve the educational and social inclusion of left-behind children.

### **Methodology**

The initial approach of this study is a theoretical and contextual review that serves as a reference and a basis for considering the design of the study.

At present, the study has developed a comprehensive literature review of the difficulties that left-behind children face in school and in their daily lives (objective 1).

We have used a qualitative method (documentary analysis) to collect the data, to conduct a documentary review of the research that has studied the problem of the left-behind children in rural China and to approach the different dimensions studied-the subjects treated, the methodologies followed, the sources of information or participants, the main results, etc. – in a comprehensive way.

### **Conclusion**

From the literature review, we find that the problems of left-behind children in rural China have attracted great in the Chinese society. Most of the previous studies have focused on educational and psychological aspects, mainly on the general living conditions, the quality of the guardian care, problems of family education, and extrinsic defects to understand and analyze the growing phenomenon of left-behind children. A clear example is provided by Lin (2003), who investigated the educational situation of abandoned children, including the type of guardians and their educational level. According to this research, left-behind children are specifically affected, in two important aspects of their lives: school performance and psychological behavior.

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## **My child has autism. Now what? The needs of families with recently diagnosed children**

Mario Montero Camacho, Montserrat Vilà

*Universitat de Girona (UdG)*

Autism spectrum disorder (ASD) encompasses a set of behaviours characterised by persistent communication and social interaction difficulties, with accompanying restricted or repetitive behaviour. ASD is a neurodevelopmental condition with a biological base. At this point in time, researchers have not identified a single molecular marker, meaning that clinicians have to diagnose autism through interviews and observations. In addition to this complexity, a number of studies show that the prevalence of ASD is rising in alarming numbers, currently reaching 1 in every 68 people. The latest studies show that the most effective approach to improve the lives of these children and their parents is to support, train and empower them from the very first moment that the parents find out about their child's condition. Authorities are most likely unaware of the financial burden that this will have on society. As a result, there is an urgent need to create a cost-effective model of support and early intervention for these families. The aim of this research is to create a post-diagnosis programme for families with young children with autism in Catalonia. In order to achieve this, the researcher has gathered and compared the few models of post-diagnosis support provided by public institutions around the world. An initial conclusion shows that these approaches include training for education professionals and parents together, resulting in greater knowledge and understanding of the child's world. These programmes facilitate confidence, trust and correct decision-making for the family of the child. The researcher has interviewed 30 parents of children with ASD in order to understand their needs, both during and after the diagnosis. Early findings indicate that, in a high percentage of these families, one of the parents (usually the mother) had to stop working or abandon a professional career. Also, although qualitative data reveals a severe lack of expertise and clear procedures in public institutions, families are more concerned about the lack of emotional support and understanding from people around them. Further analysis of the data will be needed to understand the complete picture and to create a post-diagnosis support programme to tackle the challenge of autism efficiently.

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## **Studying the empowering process of young people from Latin America in Catalonia<sup>1</sup>**

Sonia Paez de la Torre, Pere Soler Masó, Carles Feixa Pàmpols

*Institute of Educational Research, Department of Education, University of Girona*

This study explores the empowering process of young people between 20 and 34 from the Southern Cone of Latin America (Argentina, Chile and Uruguay) who, after a migratory experience, have been living for more than a year in Catalonia. Specifically, it explores the relationship between the social, cultural, economic and symbolic capital of these young people and their possibilities of empowerment.

This research seeks to ascertain whether migration, during the period of youth, can be thought of as a process of empowerment: an opportunity to increase an individual's capabilities, to develop self-confidence and a wide range of social skills. Host societies offer a series of educational, occupational, cultural and social opportunities which young immigrants access according to their interests and expectations for life. Whether or not these opportunities are offered or denied to them is often determined by a specific policy and legal framework and will affect their relationship with their environment, their integration in it and their empowerment.

To design the tools for this study, preliminary activities established contact with Latin American immigrants living in Catalonia to better understand their reality. At the same time, Pierre Bourdieu's theoretical model and its applications in the field of youth sociology, education and immigration studies, were reviewed. The "biogram" technique, proposed by Theodore Abel in 1947, was updated. In the field, a "Biogram A" was used to gather general information about the social, cultural and economic capital of 50 young people. Taking into account some pre-established variables, 24 participants were asked to complete a "Biogram B" to provide some specific aspects about the biographical path of these young people. The results led to the selection of 12 young people, who were then interviewed.

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1. This study is carried out with the support of the Universities and Research Secretariat of the Ministry of Business and Knowledge of the Government of Catalonia and also with the European Social Fund from the European Union. It is linked to the HEBE Project on youth empowerment and the moments, spaces and processes that contribute to it. MINECO- (National Programme of Research Aimed at the Challenges of Society) 2013. Ref.: EDU2013-42979-R. Dr Pere Soler Masó (IP).

The aim of this paper is to present the results obtained in the stage before the field work and in the first stage of it, and then to discuss some of the conclusions with the scientific community.

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HUMANITIES, HERITAGE  
AND CULTURAL STUDIES



## **Roman maritime religious rituals during the Second Punic War**

Gerard Cabezas, Toni Ñaco del Hoyo

*Universitat de Girona*

Ancient Romans considered the sea be a hostile and changing place, full of dangers and monsters. As a result, they believed it necessary to consecrate the gods, thereby ingratiating themselves to them, and that became common practice. The Second Punic War (218–201 BC) led the Roman armies to disperse through most of the western Mediterranean. This study investigates Roman religious rituals associated with the sea during this conflict. To date, comprehensive studies have been conducted on Greek maritime religiosity (M. Romero 2000) and on fear of the sea from a religious perspective (M. Romero 2012). However, the maritime implications of religious rituals have not been explored within a conflict of the magnitude of Second Punic War, or in a society that, for the previous decades, had been more obviously a land power. To explore those implications, this multidisciplinary study coordinates references to maritime rituals in classical writers such as Livy (XXIX, 27) with archaeological evidence, such as the rams found off the coast of the Aegadian Islands inscribed with a protector message associated with a god, the sanctuary caves scattered throughout the Mediterranean (C. Gómez - P. Vidal 1996), or some numismatic and epigraphic references, like the posthumous inscriptions for the missing at sea (A. Alvar 2010).

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## **The translators or the double exile of Catalan Republicans writers. The case of Irene Polo**

Mar Casas Honrado, Margarida Casacuberta Rocarols

*Universitat de Girona*

Throughout history, the concepts of translation and exile have been closely related. This was evident after 1939 in South American countries, where translation became a job for many exiled writers and journalists. It was especially true in the case of the Catalan people, who experienced some sort of linguistic exile that led them to develop most of their work in exile in Spanish, a language that, in many occasions, was not the language in which they normally worked. Therefore, in addition to political exile, a consequence of the Spanish Civil War (1936-1939), they suffered a not less painful linguistic exile.

The case of Irene Polo (Barcelona, 1909 – Buenos Aires, 1942) was not an exception. In the third decade of the twentieth century, she was one of the first journalists in Catalan history to fill the pages of the major Barcelona journals with written articles (close to 300), mainly in Catalan. Just before the beginning of the war she was forced into exile in South America, where she managed the actress Margarida Xirgu's theatre company for what she thought would be an enriching new experience with an expiry date. In reality, however, the outcome of the Spanish conflict turned it into a one-way ticket.

After the dissolution of Xirgu's theatre company, translation became a professional choice in exile, which allowed her to work in something close to what she adored: journalism. Only a few months later, however, she resigned when she got a more profitable working offer that allowed her to economically support herself, her mother and her sisters who had arrived in Buenos Aires on 20 of May 1939. Although journalism was one of the strongest motivations in her live, she never wrote again either as a journalist or as a translator. She committed suicide on 3 April 1942.

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## **Impact of the *Decreto 02/12/1955 por el que se reorganiza el Servicio Nacional de Excavaciones Arqueológicas* on Catalan archaeology**

Josep Farguell Magnet

*Universitat de Girona*

According to professor Francisco Gracia, the discipline of Catalan archaeological research at the time of the decree was divided into two main groups: one comprised of university or professional members, and the other controlled by Martínez Santa Olalla and entrusted mainly to local students. However, this last group was mainly organized by Catalan archaeological associations. From 1955 until the Government of Catalonia published decree 155/1981 of 11 June, these archaeological associations played an essential role in the framework of Catalan archaeology. A letter dated 31 January 1955 sent by professors Antonio García y Bellido, Pericot, Almagro, Maluquer de Motes, Del Castillo, Mergelina and Beltrán to the Minister of National Education, Joaquín Ruiz Jiménez, called for suppression of the *Comisaría General de Excavaciones Arqueológicas*. With the decree, the *Servicio Nacional de Excavaciones Arqueológicas (SNEA)* was created. From then on, Martínez Santa Olalla lost the power he had held in archaeology in Spain. Zone delegates had powers in archaeology-related matters, and were supposed to be archaeology professors. The zones coincided with university districts, under the chairmanship of the Director General of Fine Arts, Antonio Gallego Burín. However, in reality the situation was different, at least in most of the *comarques* (districts) of Catalonia. In Catalonia, there was just one area, which was the district that housed the University of Barcelona, but there were also four *diputacions* (provincial councils), which more or less effectively took care of the archaeological heritage in their towns. However, the most significant feature of Catalonia was the emergence of scientific hiking organizations at the end of the 19th and 20th centuries. Many of these associations had archaeological sections, which soon became independent archaeological associations, or gained some degree of independence. As a result of the decree of 1955, a new organizational framework regarding state archaeological excavations was implemented in 1956. The archaeological association phenomenon was very similar in different cities and *comarques* of Catalonia, but the specific characteristics of each place varied widely and determined the archaeological work carried out at each site. Two main factors had a considerable impact: first, the characteristics

of the people in the group; second, and more important, whether the group had to rely on politicians (the *Falange*) or academics to make their contribution to Catalan archaeology.

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## **Beyond dirty realism. Noise, Nocilla, history and blind spots in the contemporary Spanish novel. From Mañas to Cercas, to Fernández Mallo**

Matteo Lobina, Francesc Xavier Pla i Barbero

*Universitat de Girona*

This doctoral study focuses on a literary and cultural analysis of contemporary Spanish literature starting from the 1990. The variation of the Spanish novel in the contemporary era, which through creative and aesthetic ways has moved from the so-called traditional novel, requires an analysis that surpasses categorization by generations, without fixed categories in direct opposition.

The social picture depicted by *Historias del Kronen* (1994) and its four sequels, including *La pella* (2008), written by José Ángel Mañas represents a starting point for analysis of the change in identity perception in Spain through hyperrealist novels that challenge the present, depicted as cyclical, outside of history.

The literary punk rebellion within the research, fostered from Mañas's *El legado de Los Ramones* (2011), is linked to Agustín Fernández Mallos's *Proyecto Nocilla* (2013) □ *Nocilla Dream* (2006), *Nocilla Experience* (2008) and *Nocilla Lab* (2009) □ where, following the "post-poetic" path theorized by the author in his *Postpoesía: Hacia un nuevo paradigma* (2009) objects become protagonists in a web of connection that defines the corpus of the novel. We tried to interpret *Proyecto Nocilla* (2013) as a single project with multiple points of access and in which time, the perpetual present, is filled with hypertexts.

The strong investment in metafiction in Mañas and Mallo is then linked to the aesthetics of Javier Cercas who, since *Soldados de Salamina* (2001), has researched the role of the past in the present and has masked the limits of biography and imagination to describe a historical journey which gradually turns into a reflection on the process of writing a novel, and where the past always comes back, as a dimension of the present. In this sense, Cercas's work, extended here to include *Il punto cieco* (2016), and the novel *El Impostor* (2014), is bound to the concept of truth, where historical memory, distorted by marketing, can produce media monsters.

The analysis emphasizes how different literary approaches can reflect the desire of a literary space, the novel, as a place of research in the relationship between the individual and the hy-

per reality of the media landscape, and in the influence of history on the present by strengthening the relationship with the reader, as an active player in the construction of meaning.

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## **The Vienna Circle, Religious Language and John Hick's Eschatological Verification**

Alberto Oya

*LOGOS. Research Group in Analytic Philosophy. Universitat de Girona.*

The characteristic claim of the group of thinkers who refer to themselves as “The Vienna Circle” and who formed the philosophical movement now known as “Logical Positivism” was their acceptance of the so-called Verifiability Principle. To put it briefly, the Verifiability Principle is an empiricist criterion of meaning which says that only those statements that are verifiable by (i.e., logically deducible from) observational statements are cognitively meaningful.

Under the assumption that religious statements are not verifiable, it was concluded that religious language had no cognitive meaning. Religious language was reduced to some sort of emotive meaning or to the description of the religious attitude.

Some years later, John Hick in his “Theology and Verification” (1960) tried to argue that, even accepting the Verifiability Principle and without having to reduce religious language to the description of the religious attitude, one could claim that religious language is cognitively meaningful. Hick argues that the Christian claim of life after death provides us with a possibility of verifying religious belief.

In this conference I will argue that if we are to accept the Verifiability Principle in its classical Viennese formulation, which states that verifiability is a matter of logical deduction from observational statements, then there is no possibility of verifying religious statements apart from reducing them to the description of the religious attitude: unless we are going to argue that God can be reduced to non-theological, observational properties, religious statements cannot be logically deduced from observational statements.

So, in order to make sense of Hick's proposal, it seems that we must embrace some liberalized form of the Verifiability Principle. However, even in such a case, accepting Hick's proposal is highly problematic since, as Ewing pointed out (Ewing, 1937, p. 353), it would

imply accepting that a statement can be meaningful (i.e., 'There *is* life after death'), whereas its denial (i.e., 'There is *not* life after death') is meaningless: but the denial of a meaningful statement cannot be a meaningless pseudo-statement. And here the crucial point is that the verification of not-P does not involve the *absence* of some fact that verifies P, but the *presence* of some fact that verifies not-P.

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## **Philippe de Commynes at the Secretary of the Count-Duke: the Spanish translations**

Mariona Sánchez Ruiz, Jorge García López

*Universitat de Girona*

This communication briefly explains the line of investigation I am following at the moment. It is based on the figure and the work of Philippe de Commynes in Felipe IV's Court at the beginning of the 17th century. Initial field research and study on the preserved Spanish codex of Commynes, the manuscript Escorialensis J.I.6 and the manuscript BNE 17638 have led to the many hypotheses I am considering. These hypotheses are also related to the relationship between the Spanish testimonies and the French edition. Some important differences between the three texts suggest the possible importance of the Italian text as well. The methodology used is that of the critical edition of texts. In this case, a *collatio codicum* has been employed to know the origin of these differences. The discovery of the inventory of the library of the Count-Duke of Olivares is also important because it contains the manuscript Escorialensis J.I.6 instead of the manuscript BNE 17638 which is the one we expected to find. In this case, the methodology used reveals more about the history of this century to discover what was happening in those palatial surroundings. These theories are presented to provide objective content about the study of these manuscripts from the Court of Felipe IV in the 17th century.

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## **The poor relief network in the Girona diocese in 1772**

Céline Mutos Xicola<sup>1</sup>, Rosa Congost<sup>1</sup>, Montserrat Carbonell<sup>2</sup>

<sup>1</sup>*University of Girona.* <sup>2</sup>*University of Barcelona.*

This study is a part of a larger research project on poverty structure, poor relief and the survival strategies of indigent people in the second half of the 18th century in the Girona area.

This period experienced important changes, the culmination of a long process of evolution of charity concerns that had begun in medieval times. As Stuart Woolf has noticed, the poor were gradually identified as a potential hazard. The response was to lock them in hospice centers in order to control the aid they received and prevent the development of local charities and avoid disturbances.

The 18th century is traditionally characterized by the Church's almost exclusive role as provider of charity, which was offered mostly in urban areas. Poor relief in rural areas is less documented.

For this reason, we highlight the assistance existing in the Girona area at the time, perhaps more significant than expected, just ten years before the creation of the first workhouse, the *Hospici de Girona*. In addition, we emphasize that in a large number of cases, charity was promoted by local governments and individuals. Another reason to choose Girona was the quality of the archives available for such work.

The archives used for this study belong to the Arxiu de la Diputació. They are the result of a survey carried out in 1772 in all the parishes by the mayor of Girona to identify the assistance grid. The survey asked about the financial resources aimed at protecting indigents as well as the sick, orphans, the elderly and young women's dowries.

The result allows us to discover the hospital network across the diocese. Most of the documents contain significant descriptions of funding, financing arrangements and the kinds of assistance provided to the poor. In addition, this survey provided information about endowed charities available in all parishes, with an unsurprisingly overwhelming majority of the bread doles. Julie Marfany has investigated the efficiency of those bread doles.

This information makes it possible to draw up a map of local assistance and establish network routes of the sick people and foundlings. As a result, we are now aware of the scope of poor relief in the Girona area.



On the other hand, it has opened up a wide range of possibilities for further study based on the changes occurred with the opening of the *Hospici* and the increasing concentration of charity into an embryonic welfare state.

Finally, our goal is to continue to investigate the consequences of taking over all the charities to open the *Hospici*.

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# LAW, ECONOMIC AND BUSINESS



## **The legal foundation of the exclusionary rule in Spanish and Mexican legal systems**

Fernando Alday López Cabello, Teresa Armenta Deu

*Universitat de Girona – Dret Public - CEAPJ*

This study's main focus is on the creation and development of the exclusionary rule in two legal systems derived from the Continental tradition (the Spanish and the Mexican). The resemblance between both legal systems originates from a five-century old tradition of bilateral exchange of legal principles, models and legislation, facilitated by the colonization of Mexico in the 14<sup>th</sup> century. Although the resemblance between both systems is palpable, in 2008, Mexico drastically changed its law regarding criminal procedure, approaching an adversarial system more similar to that of the United States (albeit the exclusion of a jury). This change, paired with the Continental tradition, derived from legal bonds to Spain, will provide a rough terrain for the development of the newly constitutionalized exclusionary rule in Mexico's legal system. The Spanish experience and influence, though valuable, will prove itself useful in regards to the first stages of implementation and the so-called "expansionist stage", but will probably hinder further development in the "reductionist stage". This is explained by the jurisdictional creation of the "*conexión de antijuridicidad*" figure, which is impossible to implement in Mexico due to the placement of content regarding the exclusion of illegally obtained evidence in its Constitution's text. To support this thesis, the study will develop a method of comparative analysis of three legal systems, all involved in the creation and implementation of the exclusionary rule (United States, Mexico and Spain). This comparative law analysis will centre on the development and implementation of the rule, with special focus on its "legal foundation". Thus, the difference between "deterrent effect" and "fundamental rights violation" will be key to understanding the placement, development and limits of the exclusionary rule in each legal system. The results aim to explain several problems related to *judicial activism* and the appropriation of foreign legal concepts, as well as to provide a renewed and comparative legal analysis, which should provide foundations to better understand the American exclusionary rule, rethink the implementation of the "*conexión de antijuridicidad*" doctrine in Spain, and provide the Mexican legal system with a solid structure for the implementation and development of a legal framework for its own exclusionary rule doctrine.

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## **Excellence in services: expectations and impact of customer delight**

Dalilis Escobar Rivera, Martí Casadesús Fa, Alexandra Simon

*University of Girona*

In the current organizational environment characterized, among other aspects, by globalization, keeping and expanding exportable services quality depends heavily on evolving towards customer supply excellence, which translates into making them feel delighted, that is to go beyond the satisfaction of the needs. Conceived theoretically, delight has been treated as the natural evolution of satisfaction and thus is evidenced when analyzing the literature regarding quality.

The idea of having excellent services that cause affectively positive effects on customers begins with the work of Plutchik (1980) and the theory of emotions. Later, other authors like (Kumar, Olshavsky & King, 2001) focused on translating the results of Plutchik (1980) into the service marketing area. When analyzing the work of several authors and taking into account their theoretical positioning, it was detected that the delight is explained mainly from a cognitive perspective, which means it is measured through the passing of expectations. Another, smaller group of authors explain the delight from an affective perspective on the basis of the evolutionary-expressive theory of emotions. And, finally, a very small group of investigators explain it through a combination between cognitive and affective perspective.

The bias of the results and approaches in the research studies developed until now drove us to propose as the main objective of this investigation the development of a theoretical model that explains the delight of the client from a cognitive-affective perspective to improve organizational performance. From this model, a delight measurement scale will be constructed and applied to evaluate the proposal in an empirical way with structural equation modeling.

The main results include the proposal of the theoretical model based on a definition of delight provided by the authors. In the same way, there is a first version of the measurement scale that is in the process of reduction and validation. The researchers have considered a total of 23 relational hypotheses among the 17 variables of the model that will be verified in the empirical study; however, the research is in an early phase. With the validation of these

approaches, we propose to verify if the delight of clients can be measured and explained from the combination of these factors and their interrelation.

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## **Configuration of a high performance work system focusing on training practices and their impact on organizational performance in the Spanish context**

Alba Manresa, Andrea Bikfalvi, Alexandra Simon

*University of Girona*

Human resource (HR) practices are possible contributors to a firm's success (Ferris and Sikora, 2014). In this field, there is a pressing need for empirical research that addresses the contributions of HR practices to a company's ability to be creative and innovative (Kim and Ployhart, 2014). In recent years, firms have been implementing different HR practices. This research is focused on mapping the adoption of training and development practices for creativity and innovation (T&D4CI) in Spanish manufacturing, and analyzing the most influential determinants in implementing those training practices. Once the use and determinant factors of training are analyzed, a third objective is to analyze the impact that training and development (T&D) practices have on a company's innovative and financial performance. Finally, the authors have studied the elements which make up high-performance work systems (HPWS) and have considered the best combinations for better firm performance. The empirical evidence is built on the Spanish sub-sample of the European Manufacturing Survey (ISI, 2017) based on 2012 and 2015 rounds. The first results show that one third of the companies use the selected practices, and that this implementation is increasing over time, which means that most of them have not put these practices in place and have no intention of doing so in the future. Focusing on the factors influencing the implementation of training practices, the research shows that companies that have not innovated in the last three years, manufacture complex products and employ a value-added strategy are more likely to introduce those practices. Furthermore, the results reveal a positive relationship between T&D practices and innovation within firms through new products and new services but fail to show any relation between T&D practices and new-to-the-market innovation. However, a positive relationship is found with financial performance. Finally, the authors find that a specific combination of HPWS based on employee training, and better security and health conditions contribute to better firm performance. The value of this thesis lies in its ability to offer recent and relevant figures and data regarding the implementation and diffusion of training and development practices as well as their relationship with firm performance.

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## **Orchestrating organizational transformation for business model innovation towards servitization in the automotive industry**

Prasanna kumar kukkamalla, Anna Arbussa Reixach<sup>2</sup>, Andrea Bikfalvi<sup>2</sup>

*<sup>1</sup>Department of Business Administration and Product Design, <sup>2</sup>Department of Organization, Business Management, and Product Design. Universitat de Girona.*

Manufacturing firms in developed economies face intensive competitive pressure from emerging markets, environmental policies, customers' expectations, high production costs, and intensive competition from emerging economies especially in Asia, South America, and increasingly, the Middle East, which minimizes sales. This turbulence has led manufacturing firms in European countries to change their business paradigm. Many companies have shifted their core business operations, from selling products to offering services so as to create benefit in their value chain. Since the word "servitization" was first published in business literature (Vandermerwe & Rada 1988), it has become an emerging area of interest for the business world, policy makers and academics. Servitization is a key strategic choice for many leading manufacturers to gain differentiation from competitors by offering value-added services (Ahamed et al. 2013). However, carefully designing services is not an easy strategic choice for manufacturers. In order to succeed with servitization, a manufacturer is likely to need some new and alternative organizational principles, structures, and processes. Servitization requires change in organizational structure and culture and an innovative business model. Information on the organizational transformation during servitization in the automotive sector is lacking in the literature. Hence, this research aims to analyse the impact of the servitization transition on the internal organizational structure framing the business model.

### **Hypothesis, problem analysis**

This research aims to answer the following questions:

- How does organization structure change during servitization of the firm?
- How do business models change over the period of servitization?

**Methodology**

This thesis will use a qualitative methodology for data collection. Primary data will be gathered through semi-structure interviews ((Yin 1994; Kvale & Brinkmann 2009) and secondary data from external articles about the case-study company as well as internal information such as charts, financial data, objectives and other organizational information.

**Research context**

The researcher is carried out in collaboration with Automotive Industry Cluster of Catalonia in Barcelona and the 'SEAT Chair of Innovation at the IESE Business School, Barcelona.

Expected contributions from this research include providing

- A strategic map for organizational transformations
- A conceptual framework for business model innovations
- Practice guidelines for organization restructure

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## **Choosing education and redistribution when parental education matters**

Dilara Tosu, Elena Del Rey Canteli, Montserrat Vilalta Bufi

*Faculty of Economics, University of Girona*

This paper considers a situation in which redistributive tax is determined under majority rule and education decisions are based on individual ability and parental education. Our aim is to examine the interaction between educational opportunity, tertiary educational attainment and redistributive taxation. We simplify our analysis by considering a dynamic model in which individuals differ in their learning ability and family educational background. Individuals live only for one period. Each adult gives birth to one child and dies. Population is constant. Educated individuals earn a return in their income. The timing of the model is as follows. First, individuals vote on the income tax and then choose whether to study or not on the basis of their known ability and family background. We assume that higher education is private and financed by individuals, who have access to perfect capital markets. The government levies a proportional income tax on all individuals and redistributes the tax revenue as a per capita subsidy across individuals.

Education involves a cost which depends on the learning ability of individuals and the parental background. Thus, we focus on non-financial constraints to attaining higher education, due to parental background. The main assumption is that attaining higher education is more costly for those who have uneducated parents than for the individuals with educated parents. We support this crucial assumption with a large body of literature on this topic. In the US, Cameron and Heckman (1998) and Chevalier and Lanot (2002) in the UK, show that the effect of financial constraints on educational choice is less important than the effect of family background. The model developed in this paper is close in spirit to that of Del Rey and Racionero (2002). In contrast to their paper, we study the fiscal policy chosen through a political process and investigate its interaction with educational decisions.

The model predicts that countries with low return to education and high equality of opportunities will have high redistribution and low tertiary educational attainment. On the contrary, countries with high returns and high inequality will have low redistribution but high educational attainment. And we show that income taxation has a disincentive effect on

human capital investment. Optimal educational choices and redistribution thus turn out to be opposing objectives.

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PSYCHOLOGY, HEALTH  
AND QUALITY OF LIFE





## **The role of primary health care in improving the quality of life of patients with chronic venous disease**

M<sup>a</sup> Antonia Bonany Pagès, Mónica González-Carrasco

Universidad de Girona

*mabonany@gmail.com*

### **Objective**

CVD (Chronic venous disease) is a highly prevalent pathology that seriously impacts the quality of life of people affected by it. The objective is to develop a protocol to better manage it at the primary health care level by involving different health professionals and considering the patient's own perspective. This protocol reinforces coordination among professionals, improves early detection, applies more adequate treatments and improves communication between health professionals and patients.

### **Methodology and Results**

During an international phlebology meeting, phlebologists and other health care professionals from different backgrounds and different parts of the world organised a focus group in which was debated to develop a protocol especially focused on patients' quality of life. It was decided to base it on the analysis of quantitative and qualitative data collected obtained from the patients attended in the doctor's office of CVD.

A formal CVD training programme was carried out at the primary care level. A questionnaire was administered to primary health care professionals before and after a formal training programme on it. One of its objectives was to assess the perceived interest in developing a protocol to improve CDV detection and intervention. After the training, 85% of the participating professionals expressed interest in developing such a tool.

Another questionnaire will be administered to a primary health care steering committee constituted by physicians responsible for the financial and structural management of health at this level. An analysis of their answers will influence the design of the protocol, which will

address multidisciplinary aspects related not only to the work of doctors and nurses but also to health care structures and others aspects intended to make it applicable.

We have designed another questionnaire, to be managed by the primary-hospital joint committee. The committee is formed by primary and hospital health agents and health managers. The aim is to create synergies between the two levels to improve the care that patients receive.

Patient participation is essential within this process. We'll design a last questionnaire for them. Their point of view will complement that of the health professionals while giving importance to aspects not considered by the latter.

### **Conclusions**

Although the research is still incomplete, we believe that a protocol to manage CVD will help primary health care staff provide better clinical care and even improve their patients' quality of life. The active participation of patients in this process will assure we are to be aligned with a patient-based care paradigm.

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## **Psychological well-being in children and its associations with material deprivation**

Gemma Crous, Ferran Casas, Mònica González-Carrasco

*Quality of Life Research Institute, University of Girona*

*gemma.crous@udg.edu*

### **Introduction**

Psychological well-being (PWB) has been defined as a measure of living well and realizing one's human potentials more than an outcome or a psychological state (Deci & Ryan, 2008). A number of attempts have been made to measure PWB in adults at the country level, including a multidimensional model of psychological well-being that proposed six psychological dimensions: self-acceptance, environmental mastery, positive relations with others, autonomy, personal growth and purpose in life (Ryff & Keyes, 1995).

### **Objectives**

The study aims 1) to examine how the PWB instrument works across 15 countries using data from children and 2) to explore the associations between PWB and material deprivation.

### **Methods**

Using the Children's Worlds survey of 12-year-olds, children across 15 countries were chosen to participate. The sample totalled 14,971 children, with slightly less boys (48.8%) than girls (51.2%), and an age average of 12.05 years (SD = 0.620).

PWB and material deprivation were measured using two different instruments. The instrument used to measure PWB (The Children's Society, 2013) contains 6 items, one for each of the dimensions proposed by Ryff and Keyes. Material deprivation was calculated asking children whether or not they have access to 8 items (clothes in good condition to go to school in, a computer at home, Internet, mobile phone, books to read for fun, family car for

transportation, own room, and own stuff to listen to music), using an adaptation of a previous material deprivation measurement (Main & Bradshaw, 2012).

## **Results**

First, a global view are presented using descriptive information from the pooled sample and then from each specific country. Then, the overlaps between PWB and material deprivation are analysed for each country.

Being deprived seems to be associated with PWB across all countries: more than 25% of all the deprived children also reported low PWB, and in South Korea the percentage was much higher (69%).

## **Conclusions**

Some initial implications and recommendations based on this research are presented, but further investigation and more data from children is required to complete the information about PWB from their point of view. We should take particular notice of what is happening and where it is happening, to be able to put socially excluded children at the top of the agendas of politicians from all over the world.

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## **Coping with voices: open dialogue**

Laia Gasull Masip, Beatriz Rodriguez Vega

*Universitat de Girona*

Research results suggest that avoiding or ignoring voices that generate suffering (auditory hallucinations), or refusing to discuss them, contributes to their continued and active existence (Corstens et al., 2013; Romme and Escher, 1993, 2000;). Beneficial interventions act on the interrelation between people who hear voices and their voices, and give a meaning to their existence based on their personal experiences. Holistic and flexible approaches toward the phenomenon of hearing voices are more productive and therefore advisable, because they deal with this experience in the context of each person's life.

The objective will be to evaluate the ability to experience the hearing of voices and reduce the negative impact of those voices on the subjective well being of the patient. That includes encouraging voice hearers to be functionally independent, improve relations with the voices and develop a feeling of pride, tranquillity and empowerment over their personal identity.

In this study I will present the results of the experience of three people who hear voices and how the choice of integrating treatment (group participation and discussion of the experience) has increased their quality of life.

The experience of hearing voices will be evaluated based on first- person accounts using a structured interview ("Interview with a person who hears voices", Romme and Escher, from the book "Accepting voices", 1993, 2000); and the voice hearers' quality of life through the Questionnaire for the Evaluation of Disabilities, WHO-DAS II (World Health Organization, final version approved in Spanish, February 2000).

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## **Advanced career designing for persons in recovery from substance use disorders: A mixed methods study**

María Kapanadze Kapanadze<sup>1</sup>, Beatriz Caparrós Caparrós<sup>1</sup>, Esperanza Villar Hoz<sup>1</sup>,  
Yaiza Martín Acosta<sup>2</sup>

<sup>1</sup> *Universitat de Girona*, <sup>2</sup> *Consorci Sanitari de Terrassa*

*mariakapanadze@euit.fdsll.cat*

### **Background**

The current globalized economy challenges the notion of permanent employment. Job seekers who must meet new career requirements also face increasing job precariousness. On an individual level, career development needs to respond to rapid social changes in a flexible and adaptable manner. Long-term unemployment is common among persons in recovery from substance use disorders (SUDs). Evidence-based intervention protocols are needed to improve career designing for vulnerable populations. This study examines whether advanced career designing intervention improves the employability of long-term unemployed in recovery from SUDs.

### **Method**

An intervention protocol was proposed to incorporate new theoretical developments on the moral perspective of employability. It was elaborated to improve the employability of the targeted group by empowering healthy lifestyles and moral identity awareness, thus strengthening their personal career designs. A mixed methods design was used. A non-randomized quasi-experimental study was conducted. Baseline and endline surveys were undertaken with intervals of 4 months (16 sessions), respectively, in the experimental and control groups. However, the control group followed the ordinary individual orientation programme. Participants were unemployed men and women between the ages of 26 and 61, persons in recovery from SUDs, abstinent for more than 3 months and referred to the interdisciplinary outpatient primary health care service. Changes in parameters of employability were compared with the control group using a two-way repeated measures (ANCOVA) of general linear model (RMGLM) (SPSS 24.0). The qualitative data was collected and analysed

based on the phenomenological tradition to explain the quantitative findings. Included in the analysis were the process diary, field notes and voice recordings of the sessions. The content analysis was undertaken using ATLAS.ti 7.0.

### **Results**

The experimental group showed improvements in their level of global self-esteem, their perception of personal competence, self-directed career management, internalization of moral identity, reduction of 'fear of selection processes', and decrease in boundaryless attitude. The results describe changes in participants' self-awareness during the process.

### **Conclusion**

The findings suggest that advanced career designing is an effective intervention to improve employability of people in recovery from SUDs. In addition, they led to prevention policy and vocational programme design recommendations for long-term unemployed at the preventative and follow-up stages of job insertion.

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## **Art therapy: The influence of dance therapy on patients with anxiety and related disorders**

Maryam Karimi, Marta Sadurní

*University of Girona*

This thesis presents artistic (Specifically dance therapy ) methods of treating patients with anxiety related disorders as alternatives to prescribed medicines. The goal of the thesis will be to encourage the mentioned patients to choose the alternative methods rather than consumption of the medicines as much as possible, and instead seeking their mental health improvement in a more self-sufficient , creative and of course artistic way.

The reference classification will be DSM5 , and the treatment process will include all the standard treatment steps from diagnosis to the point where the least possible symptoms of the disorder are observed.

The methodology used is a combination of theoretical and practical methods , including reviewing studies already conducted in this area, and in the stages, case studies of patients of anxiety related disorders, in a friendly, cooperative, understanding environment. Each and every element required of mental health improvement, such as mood, concentration, self-confidence, life expectancy, presence/absence of suicidal tendencies, thinking process, impulse control, insight, judgment, sleep patterns, and appetite, will be considered and carefully studied during the project.



Figure 1. Dance and movement therapy as an alternative way of treatment

The investigator, being a professional dancer for years and an alternative dance therapist herself, strongly believes that **art heals**, and **dance cures**, and that last two sentences are not just random slogans, but technically, and psychologically valid when it comes to mental health improvement. It has been proven, and the investigator will do her best to prove it yet again that by the end of the treatment process, the method used will help patients function much better in emotional, cognitive, physical and social aspects of their lives by the end of the treatment process in an absolutely self-reliant way, rather than being “controlled” mentally and physically by chemical medications to comply with social preferences.

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## **Effects of a program environment of psychomotor stimulation in improving overall growth and quality of life of the premature child and their caregivers**

Sònia Marcos Ruiz, Bernat-Carles Serdà Ferrer

*University of Girona*

rmsonia6@gmail.com

Prematurity is a worldwide reality (WHO, 2012). Although birth rates are progressively decreasing in Western world, the greater knowledge about preterm birth and the technical advances in neonatal medicine, the literature shows that the number of premature births continue to rise. Premature neonates (PN) have a higher risk of morbidity and psychosocial vulnerability than full-term neonates. This situation impacts their quality of life (QoL) (Leone et al., 2012).

A preterm birth has an enormous emotional impact on a family. Studies show that more intensive and adequate multi-dimensional care support for both children and parents increases the effect on the overall development of the child (Beeghly et al., 1995).

The main objective of this study is to evaluate the effects of a psychomotor stimulation program at home on child development and QoL.

A mixed-methods approach is used to study improving the QoL of PN and their caregivers.

The results and conclusions of the investigation are preliminary. The program of psychomotor stimulation improves child development and QoL. Transfer and progressive acquisition of the program enables parents to better understand their children's needs in their family environment, improving interaction and their mutual relationship. These factors contribute to the improvement of the parents' QoL.

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## **How excessive use of media and multitasking affects executive functions and academic performance in adolescents**

Maria de las Mercedes Martín Perpiñá, Ferran Viñas, Sara Malo

*Quality of Life Research Institute, Universitat de Girona*

merche\_martin77@hotmail.com

### **Introduction**

Technological advances have created a perceived need for users to always be connected to multiple media (Moeller, Powers & Roberts, 2010). Adolescents are the most frequent users of the Internet and are most likely to engage in media multitasking. As a result, they could become addicted to media platforms and less able to carry out tasks that require sustained attention (Rothbart & Posner, 2015). Many students report that they can listen to music, watch TV, scan e-readers, check e-mail and communicate with friends through social media while studying or doing homework without any loss in performance (Courage, Bakhtiar, Fitzpatrik, Kenny & Brandeau, 2015).

### **Objective and Hypothesis**

Based on the previous literature review, the main objective of this study is to explore how excessive use of the media and multitasking affects executive functions and academic performance in adolescents. We expect to find differences by age and by gender. We hypothesize that adolescents who media multitask more frequently report more symptoms of 'dysexecutive syndrome' and that their learning and performance will be poorer.

### **Method**

Data for this study were collected at six secondary schools in Girona (Catalonia). Participants came from all four levels of obligatory secondary education, both years of baccalaureate study and some formative cycles. The final sample included 1200 adolescents aged 11 to 18. On two separate occasions, participants filled in a questionnaire which took approximately 1 hour to complete. The questionnaire included ad hoc questions and two standardized

scales to explore the different variables: the Dysexecutive Questionnaire (Pedrero-Pérez et al., 2011) and Media use and media multitasking (Baumgartner et al., 2014).

### **Conclusions**

A high percentage of adolescents reported an excessive use of Information Communication Technologies (ICT) and academic problems because of it. Findings show that adolescents who engage in media multitasking while doing homework report more problems related with executive functions. Excessive use of technologies and media multitasking may be positively related to specific components of executive functions.

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## **Development of emotional intelligence in primary school-age children through mindfulness practice**

Alexandre Maset Castelló, Mònica Cunill Olivas

*University of Girona*

alexmaset@veie.es

Different studies show that students who have greater emotional intelligence also have better levels of psychological adjustment and well-being, a higher quality and quantity of interpersonal networks, better social support and higher academic performance as well as dealing with stressful situations more easily (Fernández-Berrocal and Extremera, 2004). The formal practice of mindfulness facilitates the development of emotional intelligence, specifically emotional awareness (Wehry, 2015). We can define emotional awareness as the capacity to become aware of one's own emotions, including the ability to grasp the emotional climate of a particular context, naming emotions, understanding the emotions of others and becoming aware of the interaction between emotion, cognition and behaviour. Emotional awareness is the first step in moving on to other emotional competencies (Bisquerra, 2000). The aim of this study is to test the effectiveness of constant mindfulness practice in increasing the capacity for emotional awareness. A descriptive study has been carried out. The sample is composed of 100 students, aged 6 to 12, who participated in an eight-month emotional intelligence programme, which included mindfulness training exercises once a week (Figure 1). For data collection, the CAMM questionnaire, administered prior to the start and again at the end of the programme, was used. Participants showed a greater tendency to concentrate, self-regulate their attention and be emotionally aware. The inclusion of mindfulness training in emotional intelligence programmes leads to significant improvements in school children's emotional awarene



Figure 1. Children practicing mindfulness

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## **The impact of anxiety, depression and pain on patients undergoing chronic haemodialysis treatment**

Afra Masià Plana, Montserrat Planes Pedra, Maria Eugènia Gras Pérez

*Universitat de Girona*

### **Introduction**

The lives of patients undergoing chronic haemodialysis treatment are subject to different stressful and threatening situations from the moment of diagnosis. The impact of emotional disorders can play a role in adaptive behaviour and can be a determinant to the progress of the chronic illness (DeJean M. et al. 2013).

Negative emotions such as anxiety and depression can worsen the course of chronic kidney disease, interfere within its treatment and modulate perceptions of its symptoms (Kizilcik et al. 2012), significantly increasing the morbidity and mortality of patients (Páez et al. 2009).

### **Objectives**

1. Acknowledge the levels of anxiety and depression by gender in patients undergoing chronic haemodialysis treatment.
2. Identify the patients who suffer from anxiety and depression by diagnostic categories and by gender.
3. Analyse the correlation between de different levels of anxiety, depression and pain.

### **Method**

The research was performed using a quantitative, cross-sectional methodology. Patients (138 in number) from the four haemodialysis centres in the metropolitan area of Girona, Spain were interviewed. To evaluate the pain level, data were collected using the Hospital Anxiety and Depression Scale (HADS) and the Visual Analogue Scale (VAS).

## Results

1. Mean scores in anxiety and depression are higher in women than in men but differences are not significant ( $p>0.05$ ).
2. Clinical anxiety was diagnosed in 19.6% of the patients and 16% suffer from clinical depression. More women (22.4%) than men (18.4%) suffer from clinical anxiety and depression, but differences by gender are only significant in anxiety ( $p<0.05$ ).
3. The levels of anxiety ( $r=0.417$ ) and depression ( $r=0.451$ ) and pain are positively and significantly correlated. Patients who suffer high levels of pain also suffer higher levels of anxiety and depression than patients who suffer lower levels of pain.

## Conclusions

A comprehensive training program staffed by a multidisciplinary team is needed to detect possible symptoms and treat or prevent anxiety and depression among patients in chronic haemodialysis treatment programs. Individualised nursing care plans are fundamental to avoid emotional disorders and improve quality of life of the patients undergoing chronic haemodialysis treatment.

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## **Homonationalism in Catalonia**

Núria Sadurní Balcells, Jose Antonio Langarita, Marisela Montenegro, Pilar Albertín Carbó

Universitat de Girona

*nuria.sadurni.balcells@gmail.com*

Homonationalism is a conceptual framework which allows for the understanding of how LGBT politics have been instrumentalized in the construction of a colonial political differentiation (Puar, 2007). Within this framework, Catalonia can be understood as a territory with a discourse of progress aligned with European discourses of progress (Sadurní Balcells & Pujol Tarrés, 2015). In this PhD project, I aim to understand how homonationalist discourses are constructed in Catalonia. More specifically, I aim to identify homonationalist discourses, analyze the construction of otherness that constitutes homonationalism in Catalonia, explore the relationship between homonationalism and secessionist discourses, and explore resistances and counter-homonationalist strategies.

Different methodologies which will help me achieve these objectives. I am implementing a critical discourse analysis on news items by four Catalan newspapers – La Vanguardia, Diari Ara, El Periódico, and La Directa - which have been shared on Facebook, as well as the comments made about these items on Facebook. To further explore the resistance and specific counter-homonationalist strategies, I am going to articulate with activists from different parts of Catalonia. On the other hand, I will carry out a working group with various activists in Barcelona. Finally, narrative productions, based on Balasch & Montenegro (2003), will be built with activists from across Catalonia in order to articulate with them.

The preliminary results of this research show an interesting intersection between transnational notions of homonationalism in Catalonia as a colonial discourse towards non-Western populations as well as an articulation of Catalan secessionist discourses with homonationalist positions specifically aimed at differentiation from Spain.

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# TOURISM



## ***Slow Tourism: conceptualization of a model for new destinations***

Valeria Ayala Ancamil, Joaquim Majó Fernández

*Universitat de Girona*

The Slow Movement, based on pleasure and enjoyment, has grown in the last few years and become a popular trend. This is the case with Slow Food and *Citta Slow*, both highly institutionalized, with periodic meetings, government structures and certification programmes. In this context, a question arises: Could we be seeing a new type of tourism related with the movement? It has been identified as new sustainable tourism or sustainable tourism in contemporary form (Clancy, 2012).

### **Hypothesis**

The management of a slow destination responds to destination image and marketing needs.

Objectives

- ✓ To know the inhabitants' point of view.
- ✓ To analyse the available offer of Slow Tourism.
- ✓ To profile Slow Tourists by analysing the demand.
- ✓ To conceptualize Slow Tourism and contribute to the literature on the matter.

### **Methodology**

The techniques used in this study include the analysis of scientific literature, grey literature and specific documentation such as institutional reports – where these exist – as well as technical studies, conference proceedings related with models, trends, and image or destination marketing and spaces.

In parallel, case studies will be developed, using qualitative techniques as the main tool of analysis, such as semi-structured, in-depth interviews with several stakeholders of the sectors that have been identified in the objectives. An exploratory poll among the residents will also be conducted. To conclude the research, a destination promoted as Slow shall be

visited to observe and speak in an informal manner with the inhabitants, entrepreneurs and visitors on location.

Quantitative methods will be used to analyse and evaluate the results.

### **Conclusions**

Among trends or paradigms related to the environment or sustainability, a new concept has arisen. Slow is a concept that reflects a life philosophy, an ideology, a way of acting and doing, all within an anti-globalization and anti-standardization movement that makes it even more interesting and even confrontational.

No specific studies of Slow demand have been carried out, and although certain tourism products and marketing actions show a development of the supply, the tourists' predisposition towards slow tourism is still largely unknown. Therefore, collecting data and producing statistics is necessary to know if this phenomenon's impact is relevant or if it is simply a trend imposed by some destinations' marketing actions, which seek to profit from the boom of the Slow movement.

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## **Identity and gastronomy: Accommodation's supply analysis in the Girona region**

Sara Forgas-Serra, Joaquim Majó, Lluís Mundet

*Universitat de Girona*

### **Objective**

This work aims primarily to be an approach to the reality of the food that tourists can enjoy when visiting the province of Girona, through an analysis of the cuisine in tourist accommodations around the region. We want to examine how gastronomy is used as a tourism resource in the region from the point of view of the supply of different accommodations and whether they enhance Catalan cuisine or tend to serve generic food that could be found elsewhere in the world.

As the main objective of this research is to know what the status of the gastronomic offer in tourist accommodations is, a classification will be done to understand the scenario in general and the specific situation of each enterprise in relation to Catalan cuisine. In this way, and taking advantage of 2016 having been declared the *Year of Gastronomy and Wine Tourism* by the Catalonia Tourist Board (Generalitat de Catalunya, 2016a), it aims to highlight the gastronomic heritage of the province and position the region as a reference for traditional Catalan cuisine.

### **Methodology**

To carry out this research it was necessary, initially, to review documents and literature on what has already been written about tourism and gastronomy. An inventory of tourist accommodations that offer food has been generated from a Catalan Government (2016b) database. The food offered will be analyzed and appropriately classified. The analysis will be conducted in three phases: by observing accommodations' websites; evaluating their menus; and realizing interviews. Thus, the methods used in this study involve content analysis, of both the websites and the menus, and qualitative analysis through interviews.

## Conclusions

Currently, the project is still at an early stage, therefore final conclusions haven't been reached. For the moment, we can conclude that, as Poulain (2008) has remarked, there is growing interest in local eating habits, regional cuisines and traditional products, all considered to be an expression of identity and cultural resistance to the uniformity of taste. Countries and territories are taking interest in culinary heritage and several trends have manifested themselves: the search for cultural authenticity and quality foods, a concern for food safety, the protection of original foods, and an awareness of local food value for tourism development (Handsuh, 2000).

Although the interest in local and traditional gastronomies is growing, policies concerning the offer of those cuisines to tourists are still needed.

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## **Social carrying capacity in European Heritage Towns: A case study in Besalú**

Vanessa Muler González, Lluís Coromina, Núria Galí Espelt

*University of Girona*

This study assesses carrying capacity levels operationalized through residents' tourism impact perceptions in the heritage town of Besalú, Spain. Additionally, it assesses the impact that tourism dependence and other socio-demographic variables have on carrying capacity. From a theoretical perspective, this study combines social carrying capacity with social exchange theory.

### **Objectives and hypothesis**

The main objective of this article is to assess social carrying capacity operationalized through impact perceptions in the heritage town of Besalú, Spain. A secondary objective is to study the impacts of different variables on social carrying capacity operationalized through residents' perceptions. Taking a social exchange theory (SET) approach, four hypotheses are evaluated. The first one is that the study area, Besalú, is at carrying capacity limits. The second and third ones stem from a SET approach stating that tourism dependence correlates positively with impact perceptions. The fourth hypothesis, also stemming from a SET approach, is that tourism-dependent residents welcome more tourists than other residents.

### **Methodology**

The questionnaire was designed to cover impact perceptions in areas previously identified in the literature and through five in-depth interviews. The answers all fell within a five-point Likert scale ranging from "strongly disagree" to "strongly agree". The first step in analyzing the survey data was the creation of an index of consensus to establish the unanimity or lack thereof on perceptions of impacts. Contingency tables were then made relating first the independent variables (tourism dependence and socio-demographic variables) to impact perceptions and willingness to accept more tourists and then relating the independent variables among themselves. Chi square tests were performed to rank the variables in terms

of their association to impact perceptions and willingness to accept more tourists. These tests revealed the power of the SET variable of tourism dependence compared to other socio-demographic variables.

### **Conclusions**

The findings indicate that the willingness of residents to enter into and remain in an exchange relationship is affected primarily by tourism dependence and to a lesser extent by gender and education. Besalú appears to be approaching capacity limits regardless of residents' perceptions of positive and negative impacts of tourism. Additionally, the utility of impact perceptions to operationalize carrying capacity is refuted since a low willingness to accept more tourists does not correspond with negative perceptions of tourism impacts. It is also refuted that tourism dependence affects perceptions.

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## **Methodological approach for redefining tourism destinations based on the tourists' travel patterns**

Isabel Paulino

*Universitat de Girona*

Destination boundaries are hard to define, as they are constantly produced and reproduced through complex practices and discourses. Destinations may appear totally different in terms of shape, content and relationships, depending on the point of view from which they are experienced (tourists, tourism companies, destination managers and local people).

The traditional and simplest way of delineating tourism destinations has taken local, regional and national administrative boundaries for granted. On the other hand, tourists' travel patterns within a destination may not correspond to its political borders (Paulino & Prats, 2013). These patterns usually consist of a network or a track between several attraction places, which may be surrounded by other non-tourism spaces. Depending on tourists' travel patterns and characteristics of their visits, regional destinations may be larger or smaller and may or may not overlap (Dredge, 1999).

We propose to redefine tourism destinations, from the tourists' point of view, by prioritizing functionality criteria and identifying the most suitable destinations for tourists' consumption purposes). Tourism destination areas should, therefore, be understood as the sum of tourism attractions that are interrelated as the result of tourists' travel patterns. These patterns may create a network with several overlapping spaces spreading out over the borderlines.

Tourists' travel patterns within a destination must be considered when identifying these 'new' destinations. A literature review has been conducted to find methodologies to achieve that goal. Some research has questioned the current way of delimitating tourism destinations and proposes more balanced approaches to redefine tourism destinations (Beritelli, Reinold, Laesser & Bieger, 2015). The literature review also includes other papers whose main objective was not to redefine tourism destinations. However, the methodologies they use to detect and analyse tourism travel patterns within a destination may be useful to achieve this paper's goal.

The greatest challenge of this research has been finding a method capable of identifying these new destinations. This paper compares different methods useful for detecting travel

patterns within attractions and proposing new destination areas based on the functionality of those travel patterns.

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## **Sustainable Tourism and Development: Analysis of the effectiveness of development aid programmes in Colombia as models to support local sustainability**

Milena Santiago E., Alfons Martinell S.

*University of Girona*

Studies of the impacts of tourism on sustainability seek to establish and measure the impact that this activity has generated in different countries, especially in vulnerable tourist destinations, focusing on the economic, cultural and environmental aspects, especially sustainable tourism policies and management strategies. The rehabilitation of targets affected by tourism and developing sustainable and consistent tourism activity in terms of respect for and preservation of resources will reduce poverty through job creation in local communities and preserve cultural identities.

Tourism as an economic activity during the last decades, has experienced continued growth and increased diversification becoming one of the fastest developing economic sectors in the world (UNWTO, 2013). It is a key factor in supporting developing countries to control, monitor and mobilize resources in the search for strategic alternatives to contribute to the inclusion and sustainable development of tourism in local communities through the implementation of the Sustainable Development.

The object of the study is to analyse the development of Colombian sustainable tourism through the effectiveness of development aid programmes that have a tourist approach and that seek to reduce poverty, promote gender equality and ensure environmental sustainability through the development of successful and innovative activities that favour social and economic growth while minimizing the potential negative impacts. In short, the aim is to design a methodological tool to analyse and evaluate sustainable tourism planning processes.

The study explores the role, impact and effectiveness of aid programs focused on the sustainable development of tourism in local communities in different regions of Colombia, and identifies the most relevant aspects of planning and developing sustainable tourism. The research has been divided into three phases: first, identification and analysis of the development aid programmes, their location and their influence on the tourist activity through the case study research method; second, identification discussion and of the impacts and

the effectiveness of the implementation of tourism in a sustainable manner; and third, proposals and guidelines. Content analysis reveals that some aspects of the development aid programmes in the tourist activity that can be successful, but without the full involvement of all the stakeholders, they may not produce the expected results, and may even produce negative impacts, which would make tourism an unsustainable product in the long term.

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Part II  
Science and Technology field



# CHEMISTRY



## Synthesis of fused tricyclic systems by Rh(I)-catalysed [2+2+2] cycloaddition reactions

Daniel Cassú Ponsatí, Anna Pla Quintana, Anna Roglans Ribas.

*Facultat de Ciències, Universitat de Girona*

Transition-metal catalysed [2+2+2] cycloaddition reactions of unsaturated substrates represent one of the most elegant and versatile methods in organic chemistry to prepare highly functionalized cyclic compounds. In these processes, three carbon-carbon bonds are generated in a single reaction step with high atom economy.<sup>1</sup>

Our research group is devoted to the study of these cycloaddition reactions using rhodium as a catalyst by involving allenes as unsaturations to obtain polycyclic systems that would be difficult to obtain using other synthetic pathways.<sup>2</sup> Here we study the Rh-catalysed [2+2+2] cycloaddition reactions concerning linear substrates that entail an alkyne, an alkene and an allene motifs.

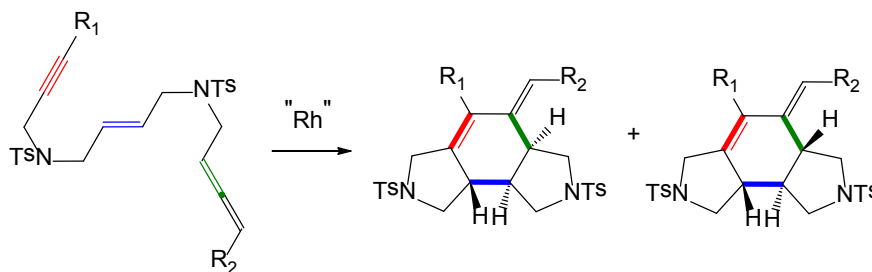


Figure 1. [2+2+2] cycloaddition reaction of linear alkyne-alkene-allene substrate

In addition, DFT calculations were used to make a theoretical approximation and propose a suitable mechanistic pathway, which helped establish the participation order of the unsaturations and justify the differences observed between the catalytic species employed. Furthermore, several empirical tests were carried out to support the proposed mechanism. These tests consisted in the use of NMR and ESI-MS techniques to detect reaction precursors or intermediates.

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## Approaches for developing ligand scaffolds of non-heme iron and manganese catalysts

Carlota Clarasó<sup>1</sup>, Miquel Costas<sup>1</sup>, Alfons Polo<sup>2</sup>

<sup>1</sup> *Institut de Química Computacional i Catàlisi, Departament de Química, Facultat de Ciències, Universitat de Girona, 17071, Girona, Spain. carlota.claraso@udg.edu*

<sup>2</sup> *Departament de Química, Facultat de Ciències, Universitat de Girona, 17071, Girona, Spain.*

### Introduction

The selective oxofunctionalization of hydrocarbons is an important goal in synthetic organic chemistry because of their inert nature [1]. Selective oxidation of C-H and C=C moieties with excellent levels of region- and stereocontrol is accomplished in nature through oxygenase enzymes. Mimicry of structural aspects of enzyme active sites by synthetic transition metal complexes is regarded as a promising strategy to develop C-H and C=C oxidation catalysts [1].

Non-heme iron and manganese based catalysts have been developed as promising systems for enzymatic oxidation processes; some of them can catalyze oxidative reactions by metal centred mechanisms, avoiding radical pathways. [2] The complexes that use N4-donor aminopyridine ligands (Figure 1) are shown as one of the most successful catalysts for chemo-, regio- and enantioselective transformations of organic substrates with peroxide type oxidants.

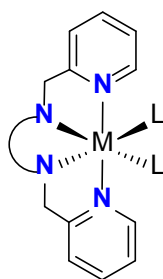


Figure 1. Schematic representation of metal complexes with N4 ligands

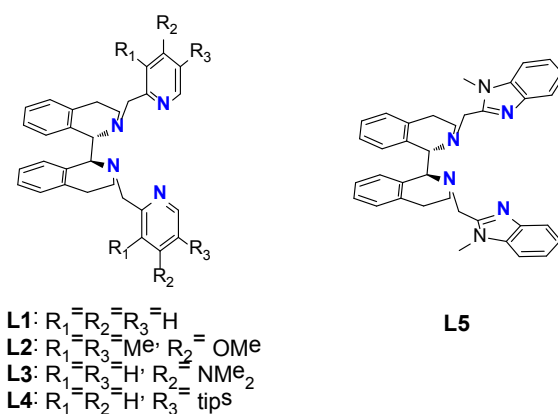
### Objective

In this project we aim to widen the structural versatility of those ligands. So, we focus on the elaboration of a chiral diamine backbone, different than the usual ones. We envision

that this modification will allow us to extend the reactivity and the substrate scope and to diversify their selectivity.

## Methodology

A new family of aminopyridine and aminobenzimidazole tetradentate ligands (L1-L5, Scheme 1), which contains an octahydrobiisoquinoline (OHBIQ) as a diamine, has been prepared. The corresponding iron and manganese triflate complexes were synthesized and well characterized using spectrometric and spectroscopic techniques.



Scheme 1. Tetradentate ligands used in this work

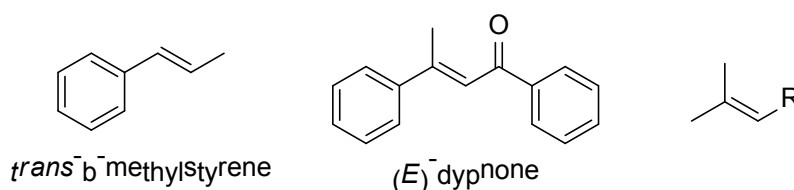
Asymmetric epoxidation is a valuable reaction because chiral epoxides are versatile building blocks in synthetic organic chemistry, and it has been targeted as the reaction of interest for the application of the new catalysts [3]. All these complexes were tested as catalysts with  $H_2O_2$  as a terminal oxidant in the asymmetric epoxidation of substrates that remain too difficult for current oxidation technologies.

## Conclusions

The X-ray structures of the complexes showed a distorted octahedral geometry at the metal centre and the ligand coordinates in a cis-□-topology. Fe-N bond distances were characteristic of high-spin  $Fe^{II}$  complexes, which agree with the  $^1H$ -NMR spectra of those complexes. The UV-vis spectra of all the complexes were analysed and also electrochemistry experiments were carried out to assess their redox properties.



The preliminary asymmetric epoxidation results were very promising. Reactions are performed in short reaction times, employing aqueous hydrogen peroxide as an oxidant. The present approach is appealing as some challenging substrates (**Scheme 2**) are epoxidized in good to excellent yields and high enantiomeric excess.



Scheme 2. Promising substrates

Further studies will be devoted to optimize the reaction conditions for those substrates and to extend their application to oxidation of other families of challenging substrates.

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## **Design and synthesis of lipopeptides derived from BP100 with activity against plant pathogens**

Àngel Oliveras, Lidia Feliu, Marta Planas

*Facultat de Ciències, Universitat de Girona*

Plant diseases caused by bacteria and fungi are currently one of the major problems in agriculture, producing important economic losses. The solution to this problem relies on the use of copper, sulphur derivatives, antibiotics or fungicides. These compounds are efficient; however, they are regarded as serious environmental contaminants. Moreover, antibiotics are not allowed in many countries and their use is hampered by the appearance of resistant strains (Agrios, 2005).

Antimicrobial peptides have emerged as a good alternative to traditional pesticides. They display a broad spectrum of activity and do not easily facilitate the development of microbial resistance (Baltzer & Brown, 2011). In this context, the *Laboratori d'Innovació en Processos i Productes de Síntesi Orgànica* (LIPPSO) research group, in collaboration with the *Centre d'Innovació i Desenvolupament en Sanitat Vegetal* (CIDSAV) research group, has identified the peptide H-Lys-Lys-Leu-Phe-Lys-Lys-Ile-Leu-Lys-Tyr-Leu-NH<sub>2</sub> (BP100), which displays high antibacterial activity in vitro and has low hemolytic activity (Badosa et al., 2007).

The acylation of antimicrobial peptides is a strategy to increase their biological activity and their stability to protease degradation (Mandal, et al., 2013). Based on these considerations, the aim of this research project was to prepare lipopeptides derived from BP100, incorporating an acyl chain at the N-terminus or at the side-chain of each residue of the sequence.

The solid-phase synthesis of the N-terminus acylated peptides involved: (i) the preparation of the N-terminal Fmoc-protected peptidyl resin; (ii) the removal of the Fmoc group; (iii) the acylation with the corresponding fatty acid; and (iv) the cleavage of the lipopeptide from the support.

The synthesis of the lipopeptides containing the acyl group at the side-chain of one residue of the sequence involved: (i) preparation of the protected peptidyl resin bearing a Lys(ivDde) at the acylation site; (ii) N-terminal Fmoc group removal and acetylation; (iii) selective ivDde group removal; (iv) acylation with the corresponding fatty acid; and (v) cleavage of the lipopeptide from the support. Lipopeptides were obtained in purities ranging from 92 to >99% after purification and were characterized by mass spectrometry.

All lipopeptides were screened for their antimicrobial activity, hemolysis and phytotoxicity. Interestingly, the lipopeptides bearing a butanoyl group were the most active, bearing also low hemolytic and phytotoxic activity.

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## Cobalt-catalyzed C-H functionalization: Isolation of reaction intermediates and mechanism elucidation

Oriol Planas, Steven Roldan, Vlad Martin-Diaconescu, Josep Maria Luis,  
Anna Company, Xavi Ribas

*Institut de Química Computacional i Catàlisi (IQCC), Universitat de Girona*

In recent years, high-oxidation state cobalt catalysis has emerged as a valuable approach for to construct organic molecules,[1] although the reported methodologies, the synthesis of organometallic aryl-Co(III) species through C-H activation still remains in its infancy.[2] Our group has been interested in the use of cobalt catalysts to functionalize C-H bonds,[3] focusing on the mechanistic aspects of these transformations. Thus, this contribution describes the preparation and characterization of stable aryl-Co(III) compounds (NMR, HRMS, X-Ray) through C(sp<sup>2</sup>)-H activation within a 12-membered macrocyclic ligand.[4] It also discloses subsequent insights obtained from the application of the isolable aryl-Co(III) intermediates in alkyne annulation reactions as well as from the insertion of diazo compounds (Figure 1). [4]

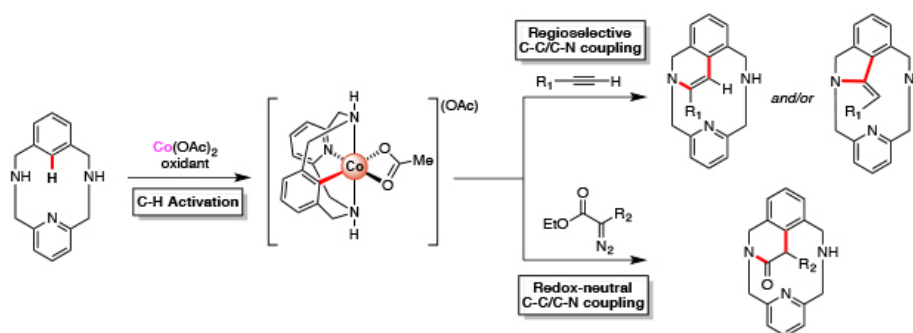


Figure 1. Isolation of aryl-Co<sup>III</sup> and reactivity with alkynes and diazo compounds

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# ENVIRONMENT





## **Sessile oak forests in the Montseny Natural Park (NE Iberian Peninsula)**

Jordi Bou Manobens, Lluís Vilar Sais

*LAGP - Flora i Vegetació, Institut de Medi Ambient, Universitat de Girona*

The southernmost populations of sessile oak (*Quercus petraea*) in the NE of the Iberian Peninsula are located at the xeric limit for the distribution of the species. These populations will be the first to show the effect of climate change, therefore the study of sessile oak in Montseny is very important. However, much of the information about recent developments and the current situation in these forests is unknown. The aim of this study is to identify the current distribution and structure of these forests and also describe the forest dynamic over the last 50 years. To learn more about sessile oak forests, we produced a high resolution map (1:5000) of them in the Montseny area and performed a diachronic analysis. At same time, we inventoried sessile oak stands to assess the forest structure. The results show that *Q. petraea* currently covers 64.1 ha and is found between 450 and 1150 m above sea level with a predominantly southern exposure. The mean density is 1215.3 stems ha<sup>-1</sup> and the mean basal area 42.4 m<sup>2</sup> ha<sup>-1</sup>. Most of the stands have an intermediate structure, with only a few mature structures. The stands have changed a lot since 1956; 44% of what is now dense forest was much more dispersed and 11% of it consisted of open spaces or brush. This is as a consequence of the abandonment of the traditional forestry activity in the second half of the last century, which has had an important impact on the species composition of the sessile oak stands. In conclusion, during the last 50 years, the sessile oak forests have been recovering from previous forestry activity in the massif, which should be taken into account if we want to predict the future status of these forests in the xeric limit, because the effects of climate change can be masked by this dynamic.

## **Coastal dune systems on the Catalan shore: historical evolution and future prospects**

Carla Garcia-Lozano, Josep Pintó

*Department of Geography, University of Girona*

Coastal dunes are an essential part of beach-dune systems. Dune systems have their own intrinsic values and provide a range of goods and services, including protection of tangible goods located on the shoreline affected by waves, storms, and sea erosion. Dunes act as repositories of biodiversity that have their exclusive habitat in dune communities, and unique plant communities and landforms offer aesthetic values of great significance.

Nevertheless, dune systems on developed coasts have suffered a drastic decline in geomorphological and ecological quality throughout the last century (McLachlan and Brown 2006). Urban development is the main cause of dune system degradation and of their disappearance all over the world. Nowadays, the morphological and ecological status of beach-dune systems in urban beaches is precarious: the few dune systems that still remain are generally small, degraded and isolated.

The aim of this project is to assess changes in coastal landscapes that occurred in the last century in Catalonia (Spain, NW Mediterranean Sea) and their future prospects, which depend on the beach characteristics.

A classification and location of the state of dune-systems existing nowadays on the Catalan shore is presented. Data from photographic, cartographic and documentary sources from the early-20th century has been examined to measure the historical transformation of coastal dune systems, and this data has been contrasted with current orthophotomaps and field work carried out by the research group during the last few years.

More than 75% of the dunes from the early-20th century have disappeared due to urbanization processes related to tourism development. In the majority of beaches, few dunes remain untouched. Dune systems have been drastically reduced due to human pressure, and they are now seriously threatened. Currently in Catalonia, the most extensive dune systems are located in the Empordà region (Gulf of Roses and Bay of Pals) and the Ebro Delta.

Regeneration of dune systems is crucially important in this context (Nordstrom and Mauriello 2001; Nordstrom 2008). The feasibility of current dunes has been studied taking into account the width of the beach and the land cover of landscape surrounding beaches. On the other hand, the beaches which are likely to hold dunes are located according to the width of the beach.

Nowadays most of dune systems in Catalonia are not developed due to human pressure on the beaches. Only dune systems in natural protected wetlands in the Aiguamolls de l'Empordà and the Ebro Delta have the appropriate characteristics to maintain themselves in the future. However, 230 of the beaches in Catalonia have widths of more than 35 meters, which is wide enough to hold dunes if appropriate integrated beach management is implemented.

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## **Cross-border cooperation in Europe: an uncertain scenario for Interreg actors and projects**

Javier Martín-Uceda, Margarida Castañer Vivas

*Environmental and Territorial Analysis and Planning (APTA) Research Group.*

*Universitat de Girona.*

Centralized states have traditionally considered border areas to be peripheral, hindering their capacity for social and economic development. Within the European Union, borders have become points of contact, creating a new role for border areas (ESPON, 2006). Conscious of this, European authorities have developed policies and instruments, such as Interreg, to facilitate and consolidate cooperation (Perkmann, 2003). Regional and local authorities and agents have become new actors in border cooperation (Letamendía, 2010), creating new networks in different scales.

The aim of this research is to analyse cross-border cooperation in the European Union resulting from Interreg. Specific objectives include:

- a) Examining projects, actors and territorial impact of Interreg funds in different border areas to compare results.
- b) Detecting other forms of cooperation that respond to different historical, geographical and/or institutional realities and sharing experiences that could be useful in the future.
- c) Checking why the same European policy and financial tools lead to different, more or less effective and efficient, results.
- d) Checking whether different boundaries of the same state face the same challenges.
- e) Gathering examples of best practices that interested authorities and agents may wish to export.

The methodology was developed in a previous research project focused on the Spanish-French border and carried out by the APTA research group. It is used to create a database made up of three tables, related to a common project. The first table contains general information, such as the name, the leader, the funding and the geographic code of cross-border projects. The second table holds information on all the partners participating in the projects, all the stakeholders and their geographic codes. The last table lists the territories where the

projects have a direct impact, also with the geographic code of each territory. The research will use the same methodology to focus on different borders areas: Spanish-Portuguese, Polish-German and Austrian-Italian.

Using the geographic codes in the database, a cartographic analysis can be developed to help understand the results.

All the cooperation funded by the European Union for more than 30 years is now facing an uncertain future. The new scenario of political change in the European Union can have an important impact on borders areas and cross-border cooperation.

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## **Cultural values of ecological restoration in coastal wetlands: The case study of Life Pletera (Costa Brava)**

Josep Pueyo-Ros, Anna Ribas, Rosa M. Fraguell

*Department of Geography, University of Girona*

In our research, we evaluated the cultural sustainability of Life Pletera: an ecological restoration project in a coastal wetland of the Costa Brava (Spain). Cultural sustainability means attaining a good ecological status which is conserved in the long term by cultural values (Nassauer, 2004). Hence, rising cultural sustainability is crucial to obtaining citizen commitment to ecological restoration projects. To assess the cultural sustainability of the Life Pletera project, we surveyed visitors to Pletera and l'Estartit (the closest touristic town) to collect data about current and potential visitors to the wetland (n=266). The surveys provided information about visitors' socioeconomic profile, current attitudes toward wetlands, opinions regarding the project and future attitudes towards wetlands.

In a quantitative approach, we developed a Contingent Travel Cost Model to assess the marginal value of recreational services due to ecological restoration (Eiswerth et al., 2000). The main finding was that ecological restoration will not significantly modify the recreational demand. To improve the understanding of recreational demand, we developed a cluster analysis. We used *mclust* for R, which generates the best possible model following Bayesian information criterion. Three groups were identified: *Indifference* (109), *Preservation* (81) and *Recreation* (42). We compared the evaluation of the project (using a ten-point Likert scale) and the frequency variation (difference between future and current visits per year) and found significant differences between *Preservation* and the other two groups. The main conclusion was that visitor profiles determine recreational demand after restoration: recreational value will increase for visitors interested in the wetland whereas it will decrease for visitors interested in the beach.

Next, a qualitative approach was developed to understand the preferences and perceptions of visitors. We used a post-hoc classification methodology, including open-ended questions in the survey to not restrict visitors' answers (Gee and Burkhard, 2010). We compared the outcome categories with an evaluation of the project using a ten-point Likert scale. Our results showed that the most valued aspect of the wetland was tranquillity. In addition, age

and place attachment were found to be linked to attitudes regarding ecological restoration, especially landscape changes. The main positive aspect of the project was the improvement of ecological and aesthetical values; the main negative one was access restriction.

In conclusion, ecological restoration is generally well perceived by visitors as shown by Likert-scale comparisons, although it depends on visitors' profiles. However, the qualitative approach showed that the cultural perceptions of some visitors are not in line with ecological restoration actions that imply landscape changes or restrictions on previous uses. This must be taken into account to raise the project's cultural sustainability.

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## **Research on the urban experiences of the elderly: notes on the methodology used and first results**

Anna Serra Salvi

*Universitat de Girona*

In the framework of a doctoral thesis that aims to analyse geographically and explore bridges of interaction between urban projects in the public space and the dynamics of the daily use people make of them from a gender perspective, this research has been carried out with an explicitly intersectional and cross-generational approach. Among the different groups referred to in this thesis (children, young, adults, and elderly), this paper offers insight into the methodological challenges involved in research with older people and highlights some of the first results, from a constructive perspective. To address the urban experiences of the elderly, three different research methods were employed: in-depth interviews, focus groups and meetings. As this research was focused on the elderly and conducted in areas such as nursing homes, it required a review of the methodology initially planned. The study is based on two areas in the city of Girona: Santa Eugenia de Ter-Can Gibert del Pla, and Germans Sabat-Taijala-Domeny Nord (Figure 1).

Most of the people we met in the nursing homes were women over 80 years of age. At that age, they face physiological, physical and psychological barriers. In addition, in a context where the Catalan and the Spanish languages and cultures coexist, the elderly must adapt their language when talking to each other, pay attention to nationalist sentiments, and deal with the coexistence of politically correct discourse and xenophobic expressions.

Through in-depth interviews, focus groups and assembly meetings, we have collected people's life experiences as related to some of the historical events of the city. The research concludes that the loss of health and/or mobility, as well as of purchasing power, related to old age determines their quality of life. When doing research with the elderly, it becomes very clear that understanding the space is helping us to understand people's life. For this reason, this paper highlights the utmost importance of adapting research to the characteristics of the subjects that researchers investigate in the field.



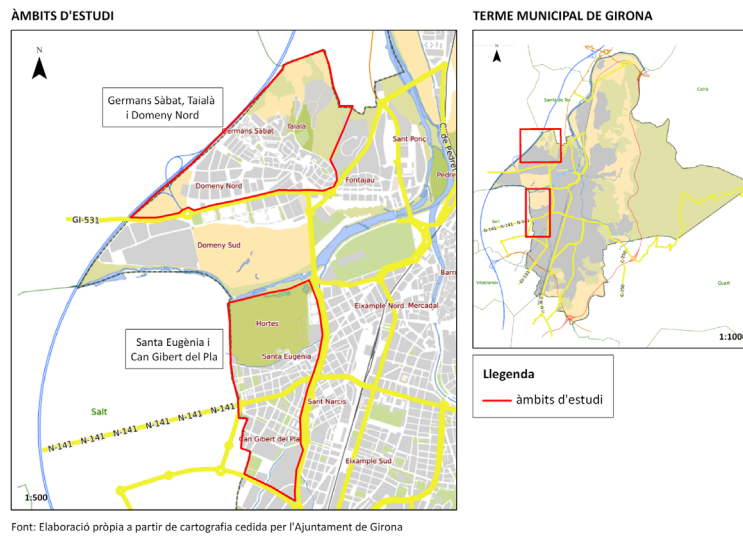


Figure 1. Field of study

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## **Cold water species in a warming Mediterranean Sea: *Argentina sphyraena* as a case study**

A. Serrat, M. Muñoz, J. Lloret

*Universitat de Girona*

In a context of climate change, populations of exploited cold water species inhabiting relatively temperate seas are facing physiological stress and constriction of their distribution range that adds to the impact of fishing. Using the Lesser silver smelt (*Argentina sphyraena*) as a case study, we evaluate the condition and reproductive status of a cold water species that are affected by sea warming in the northwestern Mediterranean Sea. We describe for the first time several life history traits of *A. sphyraena* (condition, reproductive cycle, fecundity, breeding strategy, oocyte recruitment and egg quality) and evaluate links between them. Moreover, we contrast condition and reproduction parameters in two study areas that differ in environmental conditions: the Gulf of Lion and the Balearic Sea. *A. sphyraena* is a capital breeder with group-synchronous oocyte development and determinate fecundity. Mesenteric fat is the major lipid deposit and a good indicator of condition status. It can be estimated by visual scaling, which is a fast, easy and accurate technique. Our results showed that this species performs better in the current environmental conditions of the Gulf of Lion than in the warmer Balearic Sea as evidenced by lower condition status and a different reproductive strategy in which the lower egg quality is compensated by increased batch fecundity. These findings point out that suboptimal environmental conditions induced by sea warming may have a critically harmful influence on cold water species life history traits, ultimately affecting their abundance and distribution.

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**MOLECULAR BIOLOGY,  
BIOMEDICINE AND HEALTH**



## **Pain and mood state responses in mice after reserpine-induced myalgia**

Beltrán Álvarez-Pérez<sup>1\*</sup>, Meritxell Deulofeu<sup>1\*</sup>, José Miguel Vela<sup>2</sup>,

Pere Boadas-Vaello<sup>1</sup>, Enrique Verdú<sup>1</sup>

<sup>1</sup>Research Group of Clinical Anatomy, Embryology and Neuroscience (NEOMA), Department of Medical Sciences, University of Girona, Girona Spain. <sup>2</sup>ESTEVE, Drug Discovery and Preclinical Development Parc Científic de Barcelona, Barcelona, Spain. \*Co-first authors.

### **Introduction and aims**

Fibromyalgia syndrome (FMS) is an illness characterized by chronic widespread pain (CWP). Patients may experience a variety of additional symptoms, such as disturbed sleep, fatigue, anxiety, depression, digestive alterations or headache. Common to all is chronic pain and other somatic symptoms, but without apparent tissue damage or inflammation. In addition, the physiopathology of FMS is not well characterized. Consequently, the diagnosis and treatment of FMS patients is complicated, and animal models are necessary to better understand FMS. One of the most commonly used models is the reserpine-induced myalgia (RIM), which is well studied in rats but not in mice. The aim of the present study is to evaluate, through functional and behavioural tests, changes in hyperalgesia, allodynia and mood states during the first 6 weeks post-induction of FMS using several patterns of reserpine administration in mice.

### **Methods**

Adult female CD1-ICR mice were subjected to subcutaneous administration of reserpine three (RIM3), four (RIM4) and six (RIM6) times. Control animals received only the reserpine's vehicle of dilution. Pain responses were then evaluated using Hargreaves' and von Frey hair tests, and mood states were evaluated using anxiety-like behaviour (dark-light box) and depression-like behavioural (forced-swim) tests. All of these tests were evaluated weekly during the first 6 weeks post-induction of RIM.

### **Results**

Our results indicate that during the first 5 weeks post-induction of FMS, animals from the RIM3, RIM4 and RIM6 experimental groups showed significant thermal hyperalgesia with

respect to control animals, whereas at 6 weeks only RIM6-mice maintained significant hyperalgesia. The withdrawal threshold to mechanical stimuli with von Frey hairs was only lower in RIM4- and RIM6-mice with respect to control mice for 6 weeks post-induction of FMS, but no significant differences were seen. At 6 weeks post-induction, only the immobility time of RIM6-mice was significantly higher than in control animals when assessed in the forced-swim test. No significant differences were seen between RIM-mice and control animals in the dark-light box test.

### **Conclusion**

Our results indicate that reserpine injection causes a long-lasting thermal hyperalgesia that is associated with depressive behaviour in RIM6-mice. These findings suggest that RIM6 may be a good experimental model to investigate FMS pathophysiology and may be used to evaluate several pharmacological treatments.

### **Acknowledgements**

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## **Polyphenols in the treatment of thermal hyperalgesia in Swiss mice subjected to chronic constriction injury of the sciatic nerve**

Anna Bagó-Mas<sup>1</sup>, Beltrán Álvarez-Pérez<sup>1</sup>, Núria Fiol<sup>2</sup>, Isabel Villaescusa<sup>2</sup>,  
Enrique Verdú<sup>1</sup>, Pere Boadas-Vaello<sup>1</sup>

<sup>1</sup>*Grup de Recerca d'Anatomia Clínica, Embriologia i Neurociència (NEOMA), Departament de Ciències Mèdiques, Universitat de Girona, Girona.* <sup>2</sup>*Grup de Recerca de Metalls i Medi ambient, Departament d'Enginyeria Química, Agrària i Tecnologia Agroalimentària, Universitat de Girona, Girona.*

### **Introduction**

The International Association for the Study of Pain (IASP) defines *peripheral neuropathic pain* as pain caused by a lesion or disease of the peripheral somatosensory nervous system. Neuropathic pain is apparently common in the general population with a prevalence of 10% and has become an emotional, social and economic problem. Current neuropathic pain treatments only partially relieve neuropathic pain in 40-60% of patients. For this reason, new pharmacological strategies are being investigated. Among them, the use of polyphenols is promising because preclinical experimental evidence shows that polyphenolic compounds exert antinociceptive effects in animal models of neuropathic pain. It is well known that epigallocatechin-3-gallate (EGCG), the most abundant flavanol in green tea, reduces thermal hyperalgesia after chronic constriction injury (CCI) in mice and rats.

### **Aims**

Compare the effects of EGCG and a polyphenolic plant extract on thermal hyperalgesia in mice subjected to CCI, based on the hypothesis that treatment with polyphenols and/or polyphenolic extracts reduces hyperalgesia associated with CCI in female Swiss mice.

### **Methods**

Female Swiss CD1 mice were subjected to chronic constriction injury (CCI) of the sciatic nerve. The animals were then treated with EGCG or with a polyphenolic plant extract at 10, 15 and

20 mg/kg, intraperitoneally daily during the first week post-surgery. At 0, 7, 14, 21 and 28 days post-surgery, thermal hyperalgesia was evaluated using the Hargreaves test. To obtain the polyphenolic extract, the plant material was cut and sifted to achieve a particle size between 0.5 and 1 mm. Three grams of the particles obtained were placed in 50 mL of a saline extraction solution in a flask connected to a condenser and left stirring at 100°C for 2 hours. To quantify polyphenols in the extract, the Folin-Ciocalteu method with gallic acid as standard was used.

### **Results**

The EGCG doses of 10 and 15 mg/kg reduced thermal hyperalgesia to 14 days post-injury while the dose of 20 mg/kg reduced it to 21 days post-injury. The doses of 10 and 15 mg/kg of polyphenolic extract reduced thermal hyperalgesia to 7 days post-injury. The dose of 20 mg/kg of polyphenolic extract caused the death of the animals.

### **Conclusions**

The EGCG-tested doses significantly reduced thermal hyperalgesia in female Swiss mice subjected to CCI, whereas only doses of 10 and 15 mg/kg of the new polyphenolic plant extract have effect in the short term.

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## **A systematic review and meta-analysis of 19 memantine randomized clinical trials in Alzheimer's disease**

Blanco-Silvente L, Capellà D, Castells X

*Department of Medical Sciences. University of Girona.*

### **Objective**

To evaluate the efficacy, safety and treatment discontinuation of memantine as monotherapy or in combination with cholinesterase inhibitor (ChEI) for patients with Alzheimer's disease (AD).

### **Methods**

A systematic review and meta-analysis of randomized, placebo controlled clinical trials (RPCCT) was performed. The main outcomes were all-cause treatment discontinuation, discontinuation due to adverse events (AEs) and efficacy on cognitive function. Secondary outcomes were efficacy on patient global change, efficacy on neuropsychiatric symptoms, efficacy on activities on daily living (ADL), discontinuation due to lack of efficacy (LoE), patients with AEs, patients with serious AEs and mortality. Odds ratio (OR) was calculated for dichotomous outcomes and standardized mean difference (SMD)<sup>[1]</sup> for continuous ones, pooled using a random effects model. The risk of bias was assessed with the Cochrane tool<sup>[2]</sup>.

### **Results**

Nineteen RPCCTs were included, twelve investigated memantine as monotherapy, six in combination with ChEI and one with a factorial design, involving 5,069 patients. No difference between memantine and placebo were found on all-cause treatment discontinuation found (OR= 0.94 95%CI 0.79, 1.11) and discontinuation due to AEs (OR= 1.13 95%CI 0.88, 1.46). Memantine was slightly more efficacious than placebo for improving cognitive function [SMD=0.13 95%CI 0.04, 0.22], global AD symptomatology [SMD=0.16 95%CI 0.09, 0.24], neuropsychiatric symptoms [SMD=0.12 95%CI 0.02, 0.23] and ADLs [SMD=0.10 95%CI 0.01, 0.18]. Discontinuation due to LoE was lower with memantine than with placebo [OR= 0.43

95%CI 0.24, 0.79]. The effect size of memantine on cognitive symptoms was larger in monotherapy than in combination with ChEI (SMD=0.24 95% 0.11, 0.37 vs 0.04 -0.09, 0.16; p=0.03). No differences were found between memantine and placebo on any safety outcome.

### **Conclusion**

The efficacy of memantine is clinically irrelevant, particularly when it is used in combination with ChEI. While memantine seems safe, the risk-benefit relationship is poor. The recommendation of using in monotherapy for AD patients is weak and unjustifiable in combination with ChEI.

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## **Differential single nucleotide polymorphism distribution between adherent-invasive *E. coli* (AIEC) and non-AIEC strains from the human intestine**

Carla Camprubí-Font, Mireia López-Siles, Meritxell Ferrer-Guixeras, Carles Abellà-Ametller, Jesús Garcia-Gil, Margarita Martinez-Medina<sup>1</sup>

*Biology, University of Girona, Girona, Spain*

### **Introduction**

The molecular basis of adherent-invasive *Escherichia coli* (AIEC) pathogenicity, a pathotype associated with Crohn's disease, still needs to be well resolved<sup>1</sup>. Nowadays, this pathotype is identified with time-consuming techniques based on phenotypic screening of cultured bacteria<sup>2</sup>; obtaining new molecular tools would be of great significance.

Our aim was to search for genetic elements putatively involved in the AIEC phenotype in order to find signature sequences to specifically identify this pathotype.

### **Material and Methods**

Comparative genomics of three *E. coli* strain pairs from different phylogroups, which consisted of one AIEC and one non-AIEC of identical pulsotype, was performed. This approach was designed to increase the chance of finding AIEC-specific sequences. The genomes of the six strains were sequenced *de novo* by combining paired-end libraries of Illumina HiSeq and PacBio. SPAdes was used to assemble the reads and Harvest was performed to compare pairs in relation to an AIEC reference genome (UM146). Only non-synonymous single nucleotide polymorphisms (SNPs) in coding regions were selected. We performed Sanger sequencing to confirm the presence of SNPs and to evaluate the distribution of the SNPs in a collection of 22 AIEC and 29 non-AIEC isolates. Nucleotides for each SNP were analysed taking into account AIEC phenotype, adhesion and invasion indices by  $\chi^2$  test or Kruskal-Wallis test, as required. Binary logistic regression was applied to assess the usefulness of particular variants to AIEC screening.

## Results and Conclusions

Comparative genomics identified 18 SNPs between the strains of the D-phylogroup pair, 17 in the B2-pair and 30 in the B1-pair that met the selection criteria. Of those, 24 SNPs (found in 13 genes) were confirmed by Sanger sequencing and further analysed in the strain collection. Three of the SNPs-encompassing genes were related with adhesion/invasion and two with stress tolerance. Three SNPs resulted in differential nucleotide distribution between AIEC and non-AIEC strains ( $p < 0.016$ ), showing that some nucleotides were more closely associated with one phenotype or another. In addition, these SNPs also presented association with adhesion and invasion strain capacities ( $p < 0.006$ ). Interestingly, through regression analysis, we found that a strain having a guanine in one of these polymorphisms has a 14.2% probability of showing an AIEC phenotype, whereas if it has another nucleotide base, the probability is increased to 62.5% ( $p = 0.008$ ).

Our study corroborates that there is no AIEC-specific genetic marker that is widely distributed across all AIEC strains. Nonetheless, three SNPs putatively involved with the AIEC phenotype have been described and one of them could be applied in AIEC screening.

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## **Mortality in diving accidents in Spain: observations on causes and circumstances of death**

Josep Maria Casadesús<sup>1,3</sup>, Fernando Aguirre<sup>2</sup>, Anna Carrera<sup>3</sup>, Joan San<sup>3</sup>, Francisco Reina<sup>3</sup>

<sup>1</sup>*Institute of Legal Medicine and Forensic Sciences of Catalonia (Division of Girona, Spain).*

<sup>2</sup>*Specialized Underwater Activities Police, GEAS-Guardia Civil (Girona, Spain).* <sup>3</sup>*Research Group in Clinical Anatomy, Embryology and Neuroscience (NEOMA), Department of Medical Sciences, University of Girona (Spain).*

### **Introduction**

Diving is one of the most popular underwater activities on the Spanish coast. Despite the precautions taken, diving deaths do occur. Asphyxia by drowning is the main cause; others reasons include arterial gas embolism, decompression sickness, natural pathology and trauma. Epidemiological data on mortality in diving in Spain does not exist.

The aim of this study is to collect the data referring to all the diving-related deaths since 2014 and to carry out prospective studies to provide more additional information about this kind of death.

### **Material and Methods**

The Observatory for Diving Accidents Fatalities (OMAB, in Spanish) was established in 2014 by the University of Girona and the Secretary of State for Security (Directorate General of the Civil Guard). We have conducted a unique prospective collection of both technical and police data from the 23 headquarters of the Specialized Underwater Activities Police. All the judicial files of each analyzed case were accessible in accordance with Regulation 1/2005 regarding accessory aspects of judicial proceedings and/or the databases of Forensic Pathology Services of the Institute of Legal Medicine and Forensic Sciences. We have analyzed data from 01 January 2014 to 01 January 2016 to evaluate our efficacy in this type of observation and improve these registers. We have performed multivariable statistical analysis (frequency table, IBM-SPSS statistical package).

### **Results and Conclusions**

A total of 35 cases have been documented through the OMAB: 13 cases of snorkelling and breath-hold diving and 22 with self-contained underwater breathing apparatus (scuba). Sex distribution was 31 men (88.5%) and 4 women (11.5%). The range of ages indicates that 57% of the fatalities were between the 4-th and 6-th decade of life, with the most prevalent age range between 60 and 69 (26%). The cause of death is known in 11 of 35 cases: drowning (73%), arterial gas embolism (9%) and natural pathology (18%).

The work of the OMAB will allow the collection of technical-police and medical-forensic data in a regulated and standardized manner. The data could be used for the preparation of descriptive and prospective studies of diving fatalities in our area. Protocols must be developed to highlight the risk factors and avoid unsafe behaviour in recreational as well as in professional diving.

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## **Detection and estimation of the increasing trend of cancer incidence in relatively small populations**

Rina Chen<sup>1</sup>, Enrique Y. Bitchatchi<sup>2</sup>

<sup>1</sup>BioForum, Applied Knowledge Center, Ness-Ziona Israel. <sup>2</sup>University of Girona, Girona Spain

### **Background**

Detection and estimation of trends in cancer incidence rates are commonly achieved by fitting the standardized rates to a Joinpoint log-linear regression. The efficiency of this approach is inadequate when applied to a relatively small incidence. We compared that approach with the Cuscore test with respect to detecting a log-linear increasing trend of chronic myelomonocytic leukaemia (CMML) in data sets simulated to match a province of about 700,000 inhabitants.

### **Methods**

For better efficiency, we replaced the standardized rate as the dependent variable with a continuous statistic that reflects the inverse of the standardized incidence ratio (SIR). Both procedures were applied to data sets simulated to match published results in the Girona Province (Spain). We also present the use of the *q-interval* in displaying the temporal pattern of the events. This approach is demonstrated by analyses of CMML diagnoses in Gerona County (1994–2008).

### **Results**

The Cuscore was clearly more efficient than the regression in detecting the simulated trend. The relative efficiency of the Cuscore is likely to be maintained in even larger incidences. The use of graphical displays in providing clues regarding interpretation of the results is demonstrated.

**Conclusions**

The Cuscore test coupled with visual inspection of the temporal pattern of the events seems to be more efficient than regression analysis in detection and interpretation of incidence cases suspected to be at an elevated risk. A confirmatory analysis is expected to weed out 75% of the superfluous significant results.

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## **Study of caveolin-1 expression in experimental models of cerebral ischemia and treatment with rt-PA**

Comajoan P<sup>1,2</sup>, Huguet G<sup>1,2</sup>, Gubern C<sup>1</sup>, Sanchez JM<sup>1,3</sup>, García-Yébenes I<sup>4</sup>, Lizasoain I<sup>4</sup>, Serena J<sup>1</sup>, Castellanos M<sup>5</sup>, Kádár E<sup>1,2</sup>

<sup>1</sup>Cerebrovascular Pathology Research Group, Department of Neurology, Girona Biomedical Research Institute (IdIBGi), Dr. Josep Trueta University Hospital, Girona. <sup>2</sup>Cellular and Molecular Neurobiology Research Group, Department of Biology, University of Girona (UdG), Girona. <sup>3</sup>Neurovascular Research Unit, School of Medicine, Universidad Complutense de Madrid, Madrid. <sup>4</sup>Analytical and Environmental Chemistry Research Group, Department of Chemistry, University of Girona (UdG), Girona. <sup>5</sup>Neurology Service, University Hospital Complex of A Coruña, A Coruña.

According to the World Health Organization, stroke is the second leading cause of death in the world (2015). Despite all the recent studies, thrombolysis with recombinant tissue plasminogen activator (rt-PA) is the only approved treatment for acute ischemic stroke. However, approximately 8% of the rt-PA-treated patients suffer a symptomatic intracerebral haemorrhage due to the disruption of the blood brain barrier (BBB). Disruption of the BBB results in increased permeability and subsequent passing of erythrocytes through this structure when the functionality of the BBB components (endothelial cells, astrocytes, pericytes and/or basal membrane) is seriously damaged. Caveolin-1 is a protein that plays a key role in the regulation of transmembrane traffic and cellular permeability. In this work, effects on cav-1 protein levels have been studied after ischemic conditions and rt-PA administration using an *in vitro* BBB model and an *in vivo* mouse model of haemorrhagic transformation by delayed rt-PA administration after *in situ* thromboembolic stroke.

Cav-1 levels significantly decreased after 2.5h of oxygen-glucose deprivation (OGD) and 6h of reperfusion with rt-PA. At 24h of reperfusion, cav-1 levels significantly increased in the OGD condition but not when rt-PA was added. *In vivo*, serum levels of cav-1 decreased significantly at 3h post-occlusion of the middle cerebral artery (MCAO) and this decrease was maintained at 6h only in the MCAO + rt-PA group. At the brain tissue level, a significant increase of cav-1 was observed in the ischemic zone at 24h post-MCAO, and was higher in the rt-PA group. The levels of cav-1 in tissue correlate positively with oedema, infarct vol-

ume, haemorrhagic area and the metalloproteinase-9 serum levels at 24h post-MCAO. At 3h post-MCAO, serum levels of cav-1 correlate negatively with the haemorrhagic area at 24h post-MCAO.

These results show that rt-PA modulates the expression of cav-1 in response to cerebral ischemia, identifying cav-1 as a potential therapeutic target although further studies are needed.

## Trafficking of the sodium channel $\beta 2$ Subunit in polarized cells

Cortada, Èric<sup>1</sup>, Riuró, Helena<sup>1</sup>, Brugada, Ramon<sup>1,2</sup>, Vergés, Marcel<sup>1,2</sup>

<sup>1</sup>Cardiovascular Genetics Group, Girona Biomedical Research Institute (IDIBGI); <sup>2</sup>Medical Sciences Department, University of Girona School of Medicine

The sodium channel  $\beta 2$  subunit is a transmembrane protein with an extracellular immunoglobulin-like (Ig-like) loop and a short cytoplasmic tail. It promotes localization of the cardiac voltage-gated sodium ( $\text{Na}_v$ ) channel to the correct plasma membrane region of cardiomyocytes. The  $\text{Na}_v$  channel is essential for the heart's electrical conduction. Pathogenic mutations in  $\beta 2$  result in fewer  $\text{Na}_v$  channels at the cell surface and altered channel properties, leading to severe cardiac conditions like Brugada Syndrome and atrial fibrillation [1,2].

We have found that  $\beta 2$  localizes at the apical surface in polarized epithelial cells [3]. Little is known about apical localization signals. Solving mechanistically how  $\beta 2$  reaches the correct plasma membrane domain will help to understand how pathogenic mutations in  $\beta 2$  are associated with disease.

### Hypothesis

Correct trafficking to and localization at subdomains of the plasma membrane is determined by specific sequence motifs of  $\beta 2$ .

### Methodology

To find out what determines  $\beta 2$  apical localization, we generated various versions of  $\beta 2$  by mutating potentially key residues, and expressing these as YFP-fusion proteins in MDCK and HEK293T cells. These mutants include 181STOP, lacking the cytoplasmic tail; C127A, to prevent formation of the disulfide bond that holds the extracellular Ig-like loop; and N42,66,74Q, to eliminate its three N-glycosylation sites.

We performed cell surface biotinylation to study the presence of  $\beta 2$  at the plasma membrane in HEK cells and at the apical or basolateral subdomains of MDCK cells. We also imaged the

cells by immunofluorescence to address colocalization of  $\alpha 2$  with subcellular markers, such as calnexin, an endoplasmic reticulum marker.

## Conclusions

All variants of  $\alpha 2$  maintained the apical localization in polarized MDCK cells. Since we did not alter the transmembrane domain (TM), our data suggest that this domain may determine  $\alpha 2$  plasma membrane targeting and localization. This agrees with our previous results [3], which led us to propose that the  $\alpha 2$  TM domain determines its association with cholesterol-rich membrane regions. Nevertheless, three point mutations preventing N-glycosylation resulted in less  $\alpha 2$  expression at the cell surface and shifted its localization to cytoplasmic structures. In addition, as a result of the C127A mutation, which altered the conformation of the Ig-like loop, most of the protein localized intracellularly, with very little  $\alpha 2$  at the cell surface.

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## **Fingerprint of human multiple myeloma peripheral blood serum by MALDI-TOF**

Meritxell Deulofeu<sup>1</sup>, Pere Boadas-Vaello<sup>1</sup>, Lubomír Prokeš<sup>2</sup>, Petr Vanhara<sup>3</sup>, Josef Havel<sup>2</sup>,  
Victòria Salvadó<sup>4</sup>

<sup>1</sup>Research Group of Clinical Anatomy, Embryology and Neuroscience (NEOMA), Department of Medical Sciences, University of Girona, Girona, Catalonia (Spain). <sup>2</sup>Department of Chemistry, Faculty of Science, Masaryk University, Brno, Czech Republic. <sup>3</sup>Department of Histology and Embryology, Faculty of Medicine, Masaryk University, Brno, Czech Republic. <sup>4</sup>Department of Chemistry, Faculty of Science, University of Girona, Girona, Catalonia (Spain)

### **Background and aims**

Multiple myeloma (MM) is a type of cancer formed in the plasma cells. The function of these cells is to produce antibodies against body infections. In MM, tumour cells accumulate in the bone marrow, resulting in an abnormal antibody production, which can cause different problems, e.g. kidney failure. There are many tests to diagnose MM, but taking into account its malignant character, a fast and easy diagnostic method is required. Thus, the main objective of the present study is to identify the fingerprint of human multiple myeloma peripheral blood serum by MALDI-TOF.

### **Methods**

First, to optimize MALDI-TOF conditions (i.e. matrix selection and serum dilution) and obtain the maximum possible peaks without losing intensity or quality, foetal bovine serum (FBS) samples were analysed. To this end, FBS was diluted at 1:1, 1:10, 1:50, and 1:100 ratios and applied to different matrices, such as sinapinic acid (SA),  $\alpha$ -Cyano-4-hydroxycinnamic acid (CHCA) and 2,5-dihydroxybenzoic acid (DHB). Moreover, gold nanoparticles (AuNPs) were added to the matrices to improve the quality of the spectra. Different matrix application methods were also tested: mix of matrix and sample, spotting sample first, and spotting matrix first. After determining the most optimal conditions, human control serum (HCS) and human multiple myeloma serum (HMMS) samples were then analysed by MALDI-TOF.

Artificial neural networks (ANN) and other statistical approaches were applied to classify the samples and identify HMMS peaks.

## Results

Different serum peaks were obtained with all the matrices tested, except those containing AuNPs. Despite this, the SA matrix with a 1:10 serum dilution produced the best combination in terms of intensity and quality of the mass spectra. Therefore, this combination was used to analyse the HCS and HMMS. Statistical approaches revealed 3 characteristic HMMS peaks on the mass spectra.

## Conclusions

This previous results suggest that the MALDI-TOF MS is a very useful way to obtain the fingerprint of human multiple myeloma peripheral blood serum and that this method may be a promising diagnostic tool for multiple myeloma. Despite these good results, more experimental studies are needed before it can be used for diagnosis.

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## **Pre-season hip adductors squeeze strength values and associations with past-season groin pain**

Ernest Esteve<sup>1,2</sup>, Michael S. Rathleff<sup>3,4</sup>, Jordi Vicens-Bordas<sup>1,2</sup>, Mikkel B. Clausen<sup>5,6</sup>, Per Hölmich<sup>5</sup>, Lluís Sala<sup>1</sup>, Kristian Thorborg<sup>5,7</sup>

<sup>1</sup>*Sportclínic, Physiotherapy and Sports Training Centre, Girona, Spain.* <sup>2</sup>*School of Health and Sport Sciences (EUSES), Universitat de Girona, Salt, Spain.* <sup>3</sup>*SMI, Department of Health Science and Technology, Faculty of Medicine, Aalborg University, Aalborg, Denmark.*

<sup>4</sup>*Department of Occupational Therapy and Physiotherapy, Aalborg University Hospital, Soendre Skovvej 15, 9000 Aalborg, Denmark.* <sup>5</sup>*Sports Orthopedic Research Center, Department of Orthopaedic Surgery, Amager-Hvidovre Hospital, Copenhagen University, Hvidovre, Denmark. Copenhagen University Hospital Amager-Hvidovre, Denmark.*

<sup>6</sup>*Bachelor's Degree Programme in Physiotherapy, Department of Physiotherapy and Occupational Therapy, Faculty of Health and Technology, Metropolitan University College, Copenhagen, Denmark.* <sup>7</sup>*Physical Medicine and Rehabilitation - Copenhagen (PMR-C), Amager-Hvidovre Hospital, Copenhagen University, Hvidovre, Denmark.*

### **Introduction and Purpose**

Hip adductor muscles weakness and history of groin injury have both been identified as strong risk factors for sustaining a new groin injury (Whittaker et al., 2015), although their relationship has never been investigated. The purpose of the present study is to investigate if past-season groin pain, and its duration, is associated with preseason hip adductor muscle squeeze strength values in Spanish male footballers.

### **Methods**

In a cross-sectional study design, a total of 303 players (age = 23 ±4 years; weight = 74.0 ±7.9 kg; height = 178.1 ±6.3 cm) from 17 Spanish male amateur football teams were included. Self-reported information about current groin pain, history of past-season groin pain and its duration were collected. Hip adductor squeeze strength values were obtained using a reliable test procedure in two different tests: 1) long-lever (LL) squeeze strength test (resistance placed between the ankles, and 0 degrees of hip flexion), 2) short-lever (SL) squeeze strength

test (resistance placed between the knees, and 45 degrees of hip flexion (Light & Thorborg, 2016). Standard multiple regressions, including current groin pain and age as covariates, were performed.

## Results

Players with past-season groin pain (n=123) showed no difference in hip adductor strength compared to players without past-season groin pain (n=180) (2.91 (95% CI 2.43 to 3.39) Nm/kg vs 2.99 (95% CI 2.64 to 3.34) Nm/kg in LL; and 2.04 (95% CI 1.70 to 2.38) Nm/kg vs 2.07 (95% CI 1.82 to 2.32) Nm/kg in SL;  $p > .05$ ), when adjusting for current groin pain and age. However, the subgroup of players who reported a duration of past-season groin pain for more than 6 weeks (n=27) had significantly lower preseason hip adductor strength values in both LL and SL squeeze test compared to players without past-season groin pain (LL mean difference: -.459 (95% CI -.694 to -.225) Nm/Kg,  $p < .001$  and SL mean difference: -.237 (95% CI -.404 to -.069) Nm/Kg,  $p < .05$ ).

## Conclusion

Players with past-season groin pain for more than 6 weeks showed lower preseason hip adductor strength in the LL (15% lower) and SL (12% lower) squeeze adduction tests compared to players without past-season groin pain. Football players who suffered from past-season groin pain for more than 6 weeks are very likely to start the new football season with a high-risk profile including both a previous history of groin pain and hip adduction weakness.

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## **Gene regulation during cork seasonal growth**

Sandra Fernández-Piñán, Pau Boher, Marçal Soler, Marisa Molinas,

Mercè Figueras, Olga Serra

*Universitat de Girona, Laboratori del Suro, Campus Montilivi, E-17003, Girona, Spain*

### **Introduction**

Cork (phellem) is a water-resistant tissue that constitutes the outer bark of trees and also occurs in roots and wounded tissues. It is made of suberized cell walls that protect the plant from dehydration, solar irradiation and pathogen attack. The cork oak (*Quercus suber*) produces a particularly thick and pure phellem, widely used for industrial applications. However, the commercial value of cork depends on the environmental factors occurring during its formation.

### **Material and methods**

To understand how cork formation is modulated, we analysed the cork oak transcriptome by sequencing the cork tissue during the growing season. A minimum of three replicates were harvested and sequenced using the Illumina platform and further validated by qPCR analysis at three different time points – April, June and July – selected for their contrasted temperature and humidity conditions. Specifically, April corresponds to growth initiation after the winter pause, June to the maximum growth of the tissue, and July to high tissue growth but under stressful summer conditions. The transcripts identified by RNAseq were functionally annotated using the Blast2Go platform and manually classified through a literature review.

### **Results and conclusions**

Twenty-nine genes were selected as representative of pathways and processes for cork formation and twenty-six of them showed statistically significant differences, supporting the RNAseq data. The comparison between time points showed that the transcriptome was highly similar during the cork maximum activity, between June and July, but highly dif-

ferred when the cork growth starts (April). Differentially expressed genes between months were grouped according to their expression pattern in 10 clusters. This showed that when temperature is relatively low and humidity high (April), the genes related with meristem regulation and cell wall modification were upregulated, whereas when temperature is higher (June and July), the upregulated genes were related with stress, synthesis of fatty acids and secondary metabolism. Our results shed some light on cork development and may allow the identification of new candidate genes to be used as markers of quality-cork to assist plant breeding.

## **Cultural adaptation and validation of the *Breakthrough Pain Assessment Tool* in people with cancer**

Ferreira-Santos MC<sup>1</sup>, Suñer-Soler R<sup>1</sup>, Porta R<sup>1,2</sup>, Juvinyà D<sup>1</sup>

<sup>1</sup>University of Girona. <sup>2</sup>Catalan Institute of Oncology Girona

### **Introduction**

Cancer is the second leading cause of death in Spain. This disease has many associated symptoms, of which pain is the most common and feared. Pain, specifically *breakthrough cancer pain* (BCP) is present in 40–95% of patients, affecting all dimensions of their lives and decreasing their quality of life.

### **Objectives**

The present study aims to culturally adapt and validate Catalan and Spanish versions of the *Breakthrough Pain Assessment Tool* (BAT) in persons with cancer. In addition, it will study the main characteristics of pain, profiles of people affected by it and their quality of life.

### **Material and Methods**

From June to November 2015, the BAT was culturally adapted through translation and back-translation from English to Spanish and Catalan. Later, pilot study was conducted. From March 2016 to February 2017, we proceeded to validate the scale, presenting it to 102 patients over 18 years of age, diagnosed with cancer and with BCP, and hospitalized in the Catalan Institute of Oncology in Girona. We applied BAT and QLQ-C30.

### **Results**

All 102 patients understood the BAT. They had an average age of 60 years (sd 11.6), 62% were men, 43% had finished high school/college, and 79% lived with family. Of the total sample, 24.5% had lung cancer, 14.6% had intestinal cancer, 7.3% pancreatic cancer, and 7.2% cancer of the head and neck and other types. Of the total, 87.8% had stage IV tumors. 94.1% were

admitted urgently, and 47.5% specifically for pain control. Breakthrough pain occurs with mobilization (82.4%), is spontaneous (58.8%), incidental (54.5%), and unpredictable (55.9%). Almost all of them (97.1%) explain episodes of VAS>5 and just under one-fifth (19.6%) developed psychiatric co-morbidity. In terms of frequency and duration, 46.1% have 3–4 episodes a day and for 31.4% of them the episodes last less than 5 minutes. In 89.5% of the cases, the pain only decreases with rescue medication. In 74.5% of them, the pain interferes very much with daily activities, considering the poor health and quality of life of more than half of the patients.

### **Conclusions**

The BAT is considered a comprehensive and useful tool. BCP is more prevalent in patients with lung cancer and in the last stages of the disease (stage IV). Most patients were admitted urgently and for symptom control, including pain that has been difficult to control because of its features. This type of pain is very intense and of short duration. It produces anxious-depressive states and affects patients' quality of life.

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## **Silencing of $\alpha$ 2,3-sialyltransferases in pancreatic cancer cells**

Pedro Enrique Guerrero<sup>1</sup>, Laura Miró<sup>1</sup>, Judith Vinaixa<sup>2</sup>, Neus Martínez-Bosch<sup>2</sup>,  
Montserrat Ferrer-Batallé<sup>1</sup>, Silvia Barrabés<sup>1</sup>, Rafael de Llorens<sup>1</sup>, Pilar Navarro<sup>2</sup>,  
Esther Llop<sup>1</sup>, Anna Massaguer<sup>1</sup>, Rosa Peracaula<sup>1</sup>

<sup>1</sup>*Department of Biology, University of Girona, Girona.* <sup>2</sup>*IMIM-Hospital del Mar Medical  
Research Institute, Barcelona.*

Pancreatic ductal adenocarcinoma (PaC) has the lowest five-year survival rate (about 5%) of all cancer types and it is the only carcinoma that shows an increasing tendency in cancer deaths in both genders. This dismal outlook may be attributed to its late diagnosis, usually made after metastases have occurred, because the early stages of pancreatic cancer are usually asymptomatic<sup>(1)</sup>. PaC diagnosis and treatment has hardly improved in the last years, challenging the scientific community to find potential new therapeutic targets.

In this work the altered glycosylation characteristic of PaC has been studied to define new possible tumour targets for improving the treatment. One of the characteristic glycans found in PaC is the carbohydrate antigen sialyl-Lewis x (SLe<sup>x</sup>), which is expressed on tumour glycoproteins and glycolipids, and promotes the invasive and metastatic potential of PaC cells<sup>(2-3)</sup>. Its synthesis is catalyzed in the later stages by specific  $\alpha$ 2,3-sialyltransferases, ST3Gal III and ST3Gal IV. In this work, these specific sialyltransferases involved in tumour progression have been evaluated as new tumour targets to reverse the invasive and metastatic phenotype of PaC cells.

The gene expression of ST3Gal III and ST3Gal IV determined by real time PCR and the SLe<sup>x</sup> expression determined by flow cytometry and western blot were evaluated in a panel of seven PaC cells (Capan-2, Panc 10.05, Capan-1, HPAF-II, SW 1990, BxPC-3 and AsPC-1) of different differentiation stages and metastatic potential. The cells that had a higher expression of SLe<sup>x</sup>, Capan-1 and BxPC3, were selected to be silenced using lentiviral particles with specific shRNAs against the target sialyltransferase genes. The silenced PaC cells showed a reduction of up to 90% of the aforementioned sialyltransferases. Studies are now in progress to determine the reduction in SLe<sup>x</sup> expression and the influence of their decrease on PaC cell adhesive and invasive properties.

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## **A novel SCN1B variant found in a child diagnosed with Brugada Syndrome and Epilepsy decreases both cardiac-type (Na<sub>v</sub>1.5) and brain-type (Na<sub>v</sub>1.1) sodium currents**

Rebecca Martinez, Elisabet Selga, Fabiana Scornik, Guillermo Perez, Ramon Brugada

*Institut d'Investigació Biomèdica de Girona (IdIbGi)-Universitat de Girona*

### **Introduction**

Voltage-gated sodium channels are responsible for initiating the action potentials in cardiac and neuronal cells, among other excitable tissues. Variants located on genes encoding for these channels or their regulatory subunits have been related to both heart and brain arrhythmias. In particular, variants in the SCN5A gene, encoding the alpha subunit of the cardiac sodium channel (Na<sub>v</sub>1.5), have been tightly linked to Brugada Syndrome (BrS), which is an inherited arrhythmogenic disease associated with sudden cardiac death<sup>1</sup>. Likewise, variants in the SCN1A gene, encoding the alpha subunit of the neuronal sodium channel (Na<sub>v</sub>1.1), have been described to cause Generalized Epilepsy with Febrile Seizures plus (GEFS+), a complex autosomal dominant disorder. Furthermore, variants in the SCN1B gene, which encodes the auxiliary  $\beta$ 1 subunit of the sodium channel, have been found to cause either BrS or GEFS+<sup>2</sup>.

We identified a missense mutation (D103V) in the SCN1B gene in a child diagnosed with both BrS and GEFS+. We hypothesized that this mutation in a protein that modulates both cardiac and brain sodium channels is responsible for the combined clinical phenotype of the patient.

### **Objectives**

The aim of this work was to determine the possible deleterious effect of the  $\beta$ 1 mutant protein on the cardiac- and neuronal-type currents.

### **Methods**

We used human embryonic kidney cells to co-express the Na<sub>v</sub>1.5 or Na<sub>v</sub>1.1 channel with either the Wild Type (WT)  $\beta$ 1 subunit or  $\beta$ 1 subunit harboring the mutation D103V. We studied sodium currents using the whole cell patch-clamp technique.

## Results

We found a marked decrease in sodium current density in cells co-expressing the Na<sub>v</sub>1.5 or Na<sub>v</sub>1.1 channel with the mutant  $\alpha 1$  compared to co-expression with WT  $\alpha 1$ . The biophysical properties of the current were not affected by the mutation in either condition.

## Conclusions

Our results suggest that the decrease in both cardiac-type and brain-type sodium currents caused by the missense mutation SCN1B\_D103V could underlie the combined pathophysiological phenotype of the patient.

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## **Flagging performance of Sysmex XN platelet channels**

Anna Marull

*Universitat de Girona*

### **Introduction**

Blood smear reviews are particularly important when platelet counts are depressed. Ethylene diamine tetraacetic acid dependent pseudothrombocytopenia (EDTA-PTCP) is a laboratory artifact in which where large clumps of platelets can be observed in smears. The newest automated hematology analyzers offer a new PLT-F channel for platelet counts in addition to the PLT-I channel. At a given threshold, a PLT clump flag is reported by the instrument. The aim of this study is to know whether PLT clump flag sensibility and the specificity of these channels can be useful as good blood smear indicators.

### **Material and methods**

We used peripheral blood collected in EDTA-K3 tubes; complete blood counts were analyzed by a Sysmex-XN analyzer; PLT counts were determined using the impedance (PLT-I) and fluorescence (PLT-F) channels. We included samples with the following conditions: PLT clump flag in the PLT-I channel and/or thrombocytopenia ( $<100 \times 10^3 \mu\text{L}$ ). Peripheral blood smear analysis was used as a gold standard method. Data were analyzed using the computerized Statistical Package for Social Sciences (SPSS) version 20.0.

### **Results**

We analyzed 24,563 routine hospital samples (December 2015). The most observed condition was thrombocytopenia 72%, whereas the PLT clump prevalence rate was 18%. All these samples were reanalyzed in PLT-F to confirm these results.

The PLT clump flag showed 41% sensitivity in the PLT-I channel and 72% sensitivity in the PLT-F channel. The specificity shown was 96% in the PLT-I channel and 98% in PLT-F channel (rate with 95% confidence intervals).

## Discussion and conclusions

The Sysmex-XN system with its PLT-F channel showed a satisfactory NVP (Negative Predictive Value) as well as good sensitivity and specificity rates. In thrombocytopenia cases, retests are not useful to confirm the measurement. In patients in whom a PLT clump flag is present, a PLT-F retest could be essential to consideration of a blood smear review.

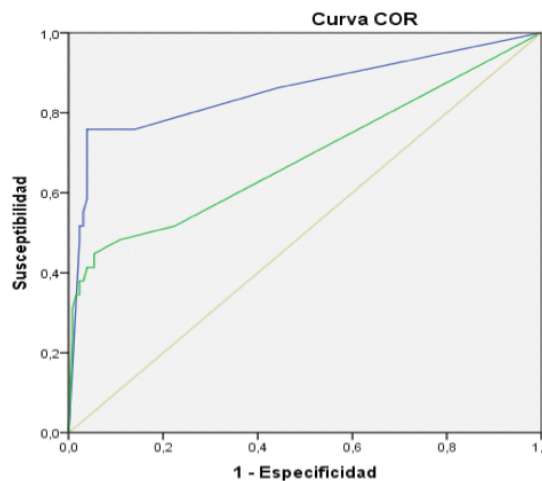


Figure 1. A significant AUC (area under curve) was obtained in ROC analysis PLT-F flag: 0.855 (IC 95%: 0.760–0.950;  $p < 0.001$ )

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## **Characterization of genetic variation on transcription factor binding sites near human genes associated with Brugada syndrome**

Mel·lina Pinsach-Abuin<sup>1,2,3</sup>, Bernat del Olmo<sup>\*1,2</sup>, Jesus Mates<sup>\*1,2</sup>, Jing Zhang<sup>3</sup>, Daria Merkurjev<sup>3</sup>, Catarina Allegue<sup>1,2</sup>, Sergiy Konovalov<sup>3</sup>, Farah Sheikh<sup>3</sup>, Miquel Duran<sup>4</sup>, Ramon Brugada<sup>1,2</sup>, Ivan Garcia-Bassets<sup>3</sup>, Sara Pagans<sup>1,2</sup>

<sup>1</sup>*Department of Medical Sciences, University of Girona (UdG), Girona, Spain;* <sup>2</sup>*Biomedical Research Institute of Girona (IDIBGI), Dr. Josep Trueta Hospital, Spain;* <sup>3</sup>*Department of Medicine, University of California, San Diego (UCSD), La Jolla, CA, USA;* <sup>4</sup>*Institute of Computational Chemistry and Catalysis, University of Girona, Girona, Spain. \*Equal contribution.*

Each human individual harbors thousands of variants within non-coding genomic regions involved in gene regulation. These genetic variants may disrupt the interaction between transcription factors (TFs) and DNA<sup>1</sup>, altering gene expression, which contributes to phenotypic disparity among individuals and their distinct susceptibility to disease and response to pharmacological treatments. To gain insight into the contribution of non-coding variants to human disease, we aimed to characterize non-coding variants in cardiac regulatory regions using Brugada syndrome (BrS) as a cardiac disease model. BrS is an electrical heart disease explained in only 25-30% of patients by genetic variation within coding regions of cardiac ion channels (*SCN5A*, *SCN2B*, *SCN3B*, *CACNA1C*, *CACNA2D1* and *CACNB2*). Using information about topological organization of the human genome<sup>2</sup>, chromatin accessibility, histone marks, and binding of transcriptional regulators over BrS-associated genes in cardiac cells, we identified approximately 1,300 non-coding regions potentially relevant to BrS. We selectively captured and sequenced these regions in a cohort of n=89 BrS patients without genetic variants at coding regions of BrS-associated genes that could explain the BrS phenotype. Using a very stringent combination of mappers and variant callers, we identified 6,584 non-coding variants with an average of 1,418 per patient. The vast majority of these variants were unique for each individual although we found short combinations of them (haplotypes) shared by several patients. Of all the variants identified, 5,388 correspond to single nucleotide variants (SNVs) and 1,196 to indels (526 insertions and 670 deletions). To gain more insight into the functional relevance of these 6,584 non-coding variants, we performed chromatin immunoprecipitation followed by high-throughput sequencing (ChIP-seq) to generate TF binding profiles from iPSC-derived cardiomyocytes. The identified re-

gions with binding of cardiac TFs were overlapped with the 6,584 non-coding variants found in the 89 BrS patients. Using a machine-learning algorithm<sup>3</sup>, we have predicted the potential effects of personal haplotypes on cardiac TF binding. This prediction is further supported by experimental validation in luciferase reporter assays. Together, we have identified a rich variety of non-coding variants within BrS-associated TF binding sites that may explain some human cases of this cardiac disease.

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## **Difficult venous access: Evaluating the difficulty of intravenous catheterisation and the use of ultrasound**

Laia Salleras-Duran<sup>1</sup>, Concepció Fuentes-Pumerola<sup>2</sup>,  
Carme Bertran-Noguer<sup>2</sup>, Aurora Fontova-Almató<sup>3</sup>

*<sup>1</sup>Emergency Department, Hospital of Figueres, Fundació Salut Empordà, Girona, Spain.*

*<sup>2</sup>Nursing Department, University of Girona, Girona, Spain.<sup>3</sup>Hospital of Figueres,  
Fundació Salut Empordà, Girona, Spain.*

The term difficult venous access describes a situation in which a nurse must make multiple puncture attempts before succeeding in accessing a patient's vein. A way to evaluate the likelihood of difficult venous access is needed to employ available technology to address this problem.<sup>1-2</sup>

This study aimed to create an instrument to evaluate patients who present difficult venous access characteristics, and to define the success of the puncture, identify the number of attempts needed to accomplish it and assess the pain when ultrasound is used to insert the venous line, comparing it to the usual technique.

### **Methodology**

Items included in the scale for difficult venous access were selected from literature searches of recent publications<sup>3</sup>, and by various expert nurses. Patients who were treated in the Emergency Department in the Hospital de Figueres and needed a venous catheter were used to validate the instrument by the predictive validation. To ensure harmony among observers, patients were randomly selected for analysis.

Both the usual technique and the ultrasound-guided technique were analysed in a clinical trial study of patients who presented difficult venous access. The patients were randomly divided into two groups: intravenous access through an ultrasound-guided technique or intravenous access through the usual technique. Outcomes measured included puncture success, puncture attempts and pain, measured with verbal rating scale (VRS) from 0 to 10 points.

## Results and Conclusions

The difficult venous access scale had three items: difficulty of vein visualisation, difficulty palpating veins and having a previous history of difficulty of puncture, all scored from 0 to 5 points. A total of 384 cases were included. Of the people that required more than two puncture attempts, 93.8% had a value that was superior to 2 on the scale ( $p < 0.001$ ). Alpha of Cronbach: 0.909. Coefficient of interclass correlation: 0.860.

The sample selected for analysis consisted of 125 patients (64 ultrasound-guided, 61 usual technique). The ultrasound-guided technique proved successful in 95.3% of the cases and the usual technique in 91.8%. The number of attempts was 0.64 times higher for the usual technique ( $p = 0.001$ ) and the mean VRS was 4.7 (SD: 2.916).

The difficult venous access scale is an instrument that predicts the difficulty of intravenous catheter insertion. Using the ultrasound-guided catheterisation technique resulted in less puncture attempts than using the regular technique. All patients who experienced intravenous catheterisation expressed moderate pain.

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TECHNOLOGY



## **Greedy Geometric Routing in Word-metric Spaces**

Daniela Aguirre Guerrero, Lluís Fàbrega i Soler, Pere Vilà Talleda

*Universitat de Girona*

Data center networks (DCNs) connect hundreds of thousands of computers and, as a result of the exponential growth in the number of nodes in DCNs, the design of scalable (compact) routing schemes plays a pivotal role in their optimal operation. Traditional trends in the design of DCN architectures have led to solutions in which specialized routing schemes and network topologies are interdependent [1].

My doctoral research proposes a new routing scheme that is compact and independent of the DCN topology, called Word-Metric-based Greedy Routing (WMGR) [2]. In the WMGR scheme each node is assigned to a coordinate (or label) in the word-metric space (WMS) of an algebraic group. Then, nodes forward data packets to an adjacent node which is the nearest to the destination node in the WMS. With respect to the number of nodes, the WMGR scheme achieves scalable routing tables, labels and forwarding decision time. Additionally, the proposed scheme finds paths close to the shortest ones, whereas in Cayley graphs and trees, it finds the shortest paths. Work planned for the last year of the research consists of adding fault-tolerance and load-balancing by using the algebraic tools of automatic groups [3].

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## **Common mobile environment for validation of commercial transactions using complementary virtual currencies**

Paulo Nicolás Carrillo Peña<sup>1</sup>, Josep Lluís de la Rosa i Esteva<sup>1</sup>, Clara Inés Peña de Carrillo<sup>2</sup>

<sup>1</sup>*Universitat de Girona.* <sup>2</sup>*Universidad Autónoma de Bucaramanga, Colombia*

Currently, digital/virtual currencies (Lee, 2015) created for specific purposes are growing rapidly. However, their adoption would be made easier and more natural by reducing many existing barriers including a lack of confidence in their use, the effort involved in their maintenance and dissemination, the centralized management required and the static access.

This research proposes a solution to this problem through the design of a common mobile environment (see Figure 1), defined as a sustainable ecosystem to boost businesses supported by virtual social networks that allow agreements signed between pairs to be validated by other pairs using the Blockchain technology (Mougayar, 2016).

Special attention will be given to this process through strategies of cooperation between the network participants (Gajendra, 2014) designed to speed up response times in the confirmation and insurance of data into the Blockchain and the corresponding update of the participants' wallets. "EurakosNext" (Carrillo, Peña and De la Rosa, 2016) is a cryptocurrency used as test bed. It has evolved from the "Eurakos" virtual currency developed in Girona (Spain), which has been conceived as an intersection of crowdfunding and lending, mobility, pre-paid cards, cash back banking products, and virtual currencies for enhancing prosumer negotiation at the worldwide scale with a "glocal" approach.

### **Context**

The proposed ecosystem uses as a base the Ethereum framework (Ethereum, 2015) since it offers open source and allows the development of specific technological pieces that can be integrated to achieve a common goal concerning the trusted validation of transactions.

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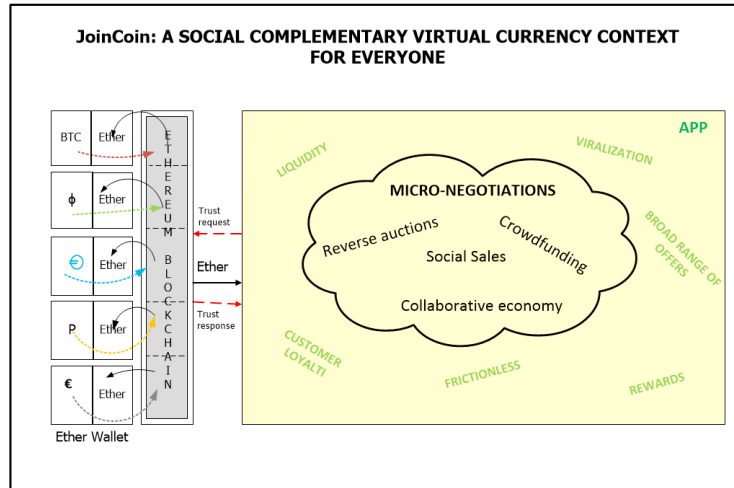


Figure 1. Architecture of the proposed environment to validate transactions using any kind of virtual currency

## **The Transformation of the Design Studio into New Learning Spaces: A Study on the Integration Process between Academia and Professional Practice**

Marta Masdéu Bernat, Josep Fuses Comalada.

*Department of Architecture and Construction Engineering, University of Girona*

The architectural profession is currently experiencing major changes. Studios are reinventing themselves to adapt to professional demands. For that reason, new forms of professional practice related to the integration of collaborative working methods, the diversification of professional activity or the intensive use of digital technologies are emerging.

The role of the architect is also evolving towards other professional profiles. Architects are no longer privileged professionals with a combination of artistic and technical knowledge; they interact with other professionals who have more specialized expertise. Consequently, architects must update their skills to meet changing requirements. They must know how to network, to collaborate in multidisciplinary teams and to develop instrumental expertise in digital technologies.

However, the training of architects continues to focus on traditional educational models which do not respond to current needs. In particular, the Design Studio -the core of architectural education- has certain limitations that should be reformulated. Recently, schools have begun to review their programmes in order to improve the professional training that students of architecture receive. As a result, the Design Studio is being transformed into a new hybrid and delocalized learning space that establishes a direct relationship with the profession, encourages more active participation within and outside the school, and promotes the use of digital technologies.

This thesis entails a holistic study of the transformation of the Design Studio into new learning spaces and its relation to current changes in the profession. Furthermore, it speculates on the future development of the Design Studio, proposing possible lines of evolution. For instance, the Design Studio could be replaced by a Digital Design Lab based on interconnectivity and interdisciplinarity. Digital technologies would act as a transformative element, facilitating the environments where new educational practices will be developed, and the teaching of architecture would turn into a participatory and research-based process that

would integrate actors from academia, professional practice and society. Finally, two new Design Studios are proposed and a self-assessment form is included for teachers who want to reformulate their teaching methods and adapt them to current professional circumstances. These proposals could be explored as future lines of research.

The working methodology used includes different research strategies. Professionals and academics have responded to questionnaires and have been interviewed to know their opinions. Moreover, several cases have been studied to verify the generic approach of the thesis. Documentary sources have also been used to establish a theoretical framework. The following works have contributed significantly to the development of the thesis. *Changing Architectural Education. Toward a New Professionalism* (David Nicol and Simon Pilling eds., 2000) discusses the way in which students can be better prepared to meet new challenges facing the profession. *Design Studio Pedagogy: Horizons for the Future* (Ashraf M. Salama and Nicholas Wilkinson eds., 2007) is a comprehensive collection of views of architects and design educators from various parts of the world that delves into a number of contemporary studio pedagogy issues (digital technologies, cognitive styles, decision-making). *Spatial Design Education. New Directions for Pedagogy in Architecture and Beyond* (Ashraf M. Salama, 2015) offers a critical analysis of the continuously evolving profession and the way in which design education reacts to their demands.

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## **Composite materials from a bio-based polyamide and high yield natural fibres: a solid alternative to glass fibre-reinforced polypropylene**

Helena Oliver-Ortega<sup>1</sup>, Mònica Ardanuy<sup>2</sup>, Pere Mutjé<sup>1</sup>

*<sup>1</sup>University of Girona / LEPAMAP group, Department of Chemical and Agricultural Engineering and Agrifood Technology. <sup>2</sup>Polytechnic University of Catalunya / Materials Science and Metallurgic Engineering Department*

Composite materials are produced by mixing two or more phases to obtain new materials that combine the properties of the mixed phases. One of the most successful examples of such materials is glass fibre-reinforced polypropylene (GF-PP) composites. The higher stiffness and strength of GF increase the comparatively poor mechanical properties of PP and allow the use of these composite materials in applications where high mechanical performance and low weight are required, such as the automotive field. However, GF fibres are fragile, which restrict their recyclability, and their manipulation is unhealthy. In addition, PP is derived from oil, a non-renewable resource with an uncertain future. These drawbacks have promoted research towards new greener composite materials to replace GF-PP composites.

The main objective of this research is to produce biocomposites from pine fibres and polyamide 11 (PA11), a 100% bio-based polymer obtained from castor oil that has similar mechanical properties to PP. Moreover, PA11 has a melting temperature of 189°C, allowing it to be reinforced with lignocellulosic fibres, without any degradation of the fibres during processing. Additionally, the capacity of the PA11 to bond with lignocellulosic fibres by H-bonds could lead to the establishment of a strong interphase between the polymer and reinforcement, enough to avoid the use of a coupling agent (necessary in the case of PP and other polyolefins). On the other hand, compared to GF, the pine fibres used in this research had suitable mechanical properties and low cost.

The pine fibre-reinforced polyamide 11 (Pine fibres-PA11) composites will be mechanically and thermally characterized as part of their evaluation. Their tensile and flexural modulus and strength will be analysed and modelled using well-known models applied by the LEPAMAP research group and other researchers. The composites' fracture energy and the energy to propagate them will be determined through impact tests. The main thermal tran-



sitions and degradation temperatures will be studied using thermal characterization. Additionally, the thermal and acoustic insulation properties and the water uptake behaviour of the composite materials will be tested for their potential applications. Finally, the obtained materials, together with the evaluated properties, a final piece modelling will be carried out in order to determine its viability of the composite in the automotive industrial sector.

To date, the main conclusions of this research are the feasibility, in mechanical and processability terms, of Pine fibres-PA11 composites as substitutes for GF-PP composites.

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## **The effect of interdependency matrices on failure spreading in interdependent critical infrastructures that involve telecommunication networks**

Diego F. Rueda, Eusebi Calle

*Universitat de Girona*

Telecommunication networks play a vital role in support of the communication services of several interdependent critical infrastructures (CIs), including banking and financial services, emergency and government services, the water supply, and power grids. Consequently, failures that occur to one infrastructure can directly and indirectly affect other infrastructures and impact large geographic regions with catastrophic consequences. In this work, we focus on failures caused by targeted attacks. When the topological structure of a single network is considered, it is possible to determine which attack will produce the greatest damage. Thus, it would be interesting to identify changes arising in failure spreading when two CIs are interconnected. The two interdependent critical infrastructure scenarios considered for study are (1) an interdependent telecommunication network modeled as two Erdős-Rényi (ER) random graphs and (2) a power grid connected to a telecommunications network.

In the interdependent CIs to be studied, each node in one network depends on one and only one node in another network to continue functioning, and vice versa. Therefore, when a targeted attack occurs on a node, the dependent node in the other network is simply removed and does not allow the attack to propagate to other nodes. In targeted attacks, the most important nodes are the first to be removed from a network. Several metrics have been proposed to identify the critical nodes in networks and discern the probability that a node will be attacked initially and become inactive. These metrics are based on graph theory (e.g., degree or betweenness centrality metrics), network failure analysis, or “real-world” features (e.g., number of affected users or sociopolitical considerations).

To analyze the effect of interdependency matrices on failure spreading in interdependent CIs, the network robustness for three matrices is analyzed under targeted attacks. The three interdependency matrices are: (i) *High Centrality Interdependency Matrix* ( $B_{HC}$ ), where high centrality nodes in one network are connected to high centrality nodes in the other network; (ii) *Low Centrality Interdependency Matrix* ( $B_{LC}$ ), where the high centrality nodes in one net-

work are connected to low centrality nodes in the other network; and *Random Interdependency Matrix* ( $B_{RA}$ ), where the nodes among networks are connected randomly without consideration for their centrality measures. Results indicate that the interdependency matrices can identify new critical parts in the networks and that an attack in one network can change when it spreads to another network. In addition, by selecting a suitable interdependency matrix, the robustness level under targeted attacks can be also improved.

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# WATER SCIENCE AND TECHNOLOGY



## **Enrichment and isolation of bacterial species with potential capacity for octamethyl-cyclotetrasiloxane (D4) degradation**

Ellana Boada, Frederic Gich, Lluís Bañeras

*Group of Molecular Microbial Ecology, Institute of Aquatic Ecology (IEA),  
University of Girona, Campus Montilivi, E-17003 Girona, Catalonia, Spain*

Cyclic volatile methylsiloxanes (VMS) are a subgroup of siloxanes, which are silicone compounds containing Si–O bonds with organic radicals (mostly methyl groups). Octamethyl-cyclotetrasiloxane (D4) is the most abundant within all the VMS. It is present in biogas derived from widely used industrial and consumer silicone containing products. VMS can greatly reduce the efficiency of energy recovery from biogas causing corrosion in engines. In addition, ecotoxicity values indicate that D4 can cause harm to some organisms at very low concentrations (Dewil, *et. al.*, 2007). Conventional biogas upgrading technologies have been developed for siloxane removal from biogas. However, the application of these methods is associated with high consumption of energy and chemicals (Muñoz *et al.* 2015). In this context, biotechnology approaches can offer a low-cost and environmentally friendly alternative to conventional technologies.

The main objective of this research work is to enrich, isolate and identify bacterial species able to grow with D4 as a sole carbon source and to further characterize the isolates by means of molecular techniques and biodegradation assays (Leslie, *et. al.*, 1996). The main hypothesis of this work is that bacteria able to cope with D4 degradation must be present and abundant in wastewater treatment plants (WWTPs) containing organosilicones. Accordingly, anoxic enrichments with mineral media containing D4 as a sole carbon source adsorbed to activated carbon were set up using anoxic sludge from a WWTP and periodically transferred in new mineral media during 6 months. A total of 35 bacterial isolates were obtained from the enrichments in solid medium using only D4 as a carbon source. Subsequent sequencing of the 16S rRNA gene allowed the identification of the species *Alicyclophilus denitrificans*, *Ciceribacter lividus*, *Pseudomonas aureginosa* and *Pseudomonas citronellolis*. The isolates were tested for D4 biodegradation kinetics in liquid media and preliminary results suggests that the isolates are able to grow on D4 as a unique carbon source.

The second objective is to characterize the community composition and diversity of the microbial community present in the anoxic enrichments and to compare the main representative groups with the isolated strains. DNA samples were extracted from the enrichments, the 16S rRNA was amplified with universal primers 515F and 806R and the amplicons were sent to Core Genomics for MiSeq sequencing (Texas, USA). Preliminary analysis showed that the retrieved isolates only represent a minor fraction of the microorganisms present in the enrichment, suggesting that other metabolisms and microbial interactions may be important for D4 biodegradation.

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## **Ammonia oxidizing archaea and bacteria on *Typha latifolia* roots are highly dependent on conductivity**

Elena Hernández-del Amo<sup>1</sup>, Iva Sakmaryová<sup>2</sup>, Gal·la Ramis<sup>1</sup>, Frederic Gich<sup>1</sup>, Lluís Bañeras<sup>1</sup>

<sup>1</sup>Group of Molecular Microbial Ecology, Institute of Aquatic Ecology (IEA), University of Girona, Campus Montilivi, E-17003 Girona, Catalonia, Spain. <sup>2</sup>Institute for Nanomaterials, Advanced Technologies and Innovation, Technical University of Liberec, Studentská 2, 461 17, Liberec, Czech Republic

Ammonium is a common nitrogen contaminant in freshwater systems. Oxidation of ammonia in water and sediments is highly dependent on the availability of oxygen. Emergent macrophytes, such as *Typha latifolia*, increase oxygen concentrations in the rhizoplane due to continuous oxygen leakage from roots, thus generating an aerobic microenvironment in close contact with the root surface. However, its impact on the abundance and the activity of nitrifiers has not been extensively quantified. Nevertheless, vegetation coverage and plant species selection are essential elements in the oxidation of ammonium in constructed wetlands (CW) and in ensuring a good ecological state of natural freshwater systems<sup>1</sup> as revealed by PCR-denaturing gradient gel electrophoresis (DGGE).

The aim of this study was to determine if oxygen permeability affected the spatial distribution of ammonia-oxidizing archaea (AOA) and bacteria (AOB) on the root surface of *Typha latifolia* collected from a constructed wetland (CW) and along the conductivity gradient of a river estuary. Oxygen leakage at different root sections was estimated as potential diffusion rates from oxygen micro-profiles. AOA and AOB diversity and abundance in root sections (basal, medium, apical) were inferred by barcoded amplicon Illumina sequencing of the 16S rRNA gene, and quantitative PCR of *amoA* and 16S rRNA genes.

AOA and AOB abundance increased significantly in high conductivity waters (>3,000 mS/cm). This increase was especially evident in the constructed wetland, independently of the root section considered. Higher potential diffusion rates were found at the middle sections of roots and coincided with AOA enrichment. AOB showed a more heterogeneous distribution and higher values were found either in the middle or the basal section depending on the location. Relevant nitrifying bacteria were related to the *Thermodesulfobionaceae* in high

conductivity areas and to *Nitrospiraceae* in low conductivity areas. In contrast, *Nitrososphaeraceae* (AOA) were highly represented in high conductivity areas <sup>2,3</sup>.

Overall, we were able to show that water conductivity and plant roots exerted a selection effect on ammonia oxidizers, although this effect may be limited to small portions of the root surface, matching changes in oxygen leakage.

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## **Multiple stressors and freshwater biofilms: a microcosm approach to the interaction between climate change-related variables and chemical pollutants**

Ferran Romero, Vicenç Acuña, Sergi Sabater

*Institut Català de Recerca de l'Aigua (ICRA)*

Freshwater ecosystems are threatened by multiple stressors (i.e. physical, chemical and biological) which add to those associated with climate change. While the impact of stressors as separate entities is reasonably understood, the combined impact of chemical stressors within the context of climate change is less known, particularly regarding the potential interactions that may take place. Resolving the effects of multiple stressors in ecosystems is complicated because natural variation increases uncertainty. This may be partially solved by means of controlled laboratory experiments. The present work aims to detect interactions between co-occurring stressors on river biofilm communities. To that purpose, an experimental approach using microcosms was applied following a full-factorial design. Laboratory-grown biofilms were exposed to a set of chemical and physical stressors, and their combinations. Physical stressors included warming and desiccation, as representative of climate change-related stress. Chemical stressors included the herbicide diuron and the antibiotic erythromycin, as examples of agricultural and urban pollutants, respectively. Biofilms were exposed to these stressors for a short time (40h), and the response of a set of variables was investigated. These variables included structural and functional-level endpoints, as well as genetic biomarkers. The results brought to light a non-negligible number of significant interactions. Physical stressors originated the strongest responses and significantly interacted with chemicals, indicating the potential for climate change-related stressors to interact with chemical pollution.

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## **Habitat size effect on macrofauna community in Mediterranean temporary ponds**

Irene Tornero, Jordi Sala, Stéphanie Gascón, Núria Àvila, Xavier D. Quintana, Dani Boix

*Institut d'Ecologia Aquàtica, Universitat de Girona*

Aquatic environments have often been considered as islands in the extensive literature on the species-area relationship. One of the principles of the “island biogeography theory” is the relationship between the size of an island and its species richness, a relationship that has been observed in a wide range of organisms, from macro- to microorganisms. Published studies on the relationship between water body size and species richness in temporary waters have produced contradictory results. Environmental factors such as water trophic state, habitat structure, and spatial connectivity within the ecosystem can modulate the effect of pond size on the structure and composition of the macrofauna community. Our aim was to test the importance of pond size in macrofaunal community structure and composition. The study was carried out in twelve temporary ponds situated near the village of Vila Nova de Milfontes (SW Portugal). We chose these specific ponds to include the broadest possible range of pond sizes available in the study area. In order to evaluate the water trophic state of the ponds, we measured water characteristics such as dissolved inorganic nutrients, total nutrients, planktonic chlorophyll a content and fulvic acid concentration, and we calculated the trophic index (TRIX) (Vollenweider *et al.*, 1998) for each pond. The macrofauna samples were taken using a dip net with a diameter of 22 cm and a mesh size of 250 µm. The maximum surfaces of the different ponds were estimated using the Google Maps Area Calculator Tool and the spatial connectivity between the ponds calculated following Henriques-Silva *et al.* (2013). In addition, the following community structure parameters were calculated: the taxa richness, the Shannon-Wiener index and the Index of Faunal Originality (IFO) (Puchalski, 1987). We performed a PCA to determine the characteristics that best explained the variability in the physical and chemical dataset and an NMDS to visualize the similarities in pond composition. Moreover, we used simple linear regression models to analyze if the community structure parameters responded to pond size. We found that pond size was not related to any of the three environmental factors included in this study. Moreover, our results noted an unclear relationship between pond size and macrofauna, since we found a significant effect on community composition but did not find any effect on

community structure parameters. We concluded that the high connectivity among ponds could be responsible for the observed pattern.

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**Escola de Doctorat i Postgraus**

Parc Científic i Tecnològic

Edifici Jaume Casademont

C/ Pic de Peguera, 15

17003 Girona

Secretèria acadèmica:

Tel. +34 972 41 80 48

Secretèria econòmica:

Tel. +34 972 41 80 06

[sec.edoctorat@udg.edu](mailto:sec.edoctorat@udg.edu)

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