CURRICULUM VITAE

Part A. PERSONAL INFORMATION

First name	Beatriz		
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Open Researcher and Contributor ID (ORCID)		0000-0001-8107-1975	

A.1. Current position

Position	Senior Research Scientist (Científica Titular)		
Institution	Dairy Research Institute (IPLA), Spanish National Research Council (CSIC)		
Department		Technology and Biotechnology of Dairy Products	
Country	Spain	Phone number	+34 985 892 131
Key words	Molecular Microbiology; Microbial Biotechnology; Food Biotechnology; Lactic Acid Bacteria; Bacteriophages; Pathogenic and Food Spoilage Microorganisms; Biogenic Amines; Neuroactive Compounds; Oral Vaccines; Food-Grade Genetic Tools; Lactic Acid Bacteria producing Therapeutic Molecules; Animal Models		

A.2. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Biology (Best Thesis Award)	University of Oviedo, Spain	2002
Licensed in Biochemistry	University of Oviedo, Spain	2001
Licensed in Biology	University of Oviedo, Spain	1995

Part B. CV SUMMARY

I carried-out my Doctoral Thesis (1997-2002) at the Dept. of Biochemistry and Molecular Biology of the University of Oviedo (Spain), under the supervision of Dr. Sofia Ramos and Dr. Pedro Sánchez Lazo. My research was funded by 5 Pre-doctoral Grants (University of Oviedo and AECC [Asociación Española Contra el Cáncer]). My studies unravelled the molecular mechanisms by which calmodulin mediates the anti-estrogenic effects of melatonin in human breast cancer. Under this topic I published 4 SCI articles. I defended my Doctoral Thesis in October 2002 (Best Thesis Award in 2004).

Three days after the defence of my Thesis, I started my Post-doc at the IPLA-CSIC in the Molecular Microbiology Group, which is a Consolidated Group of the ISPA (Instituto de Investigación Sanitaria del Principado de Asturias, Asturias, Spain) and FINBA (Fundación para la Investigación y la Innovación Biosanitaria de Asturias, Asturias, Spain) since 2018. At IPLA, my main research lines have been focused in the study and use of lactic acid bacteria (LAB) to improve the safety, quality and functionality of fermented dairy products. From October 2002 to December 2006, I enjoyed 2 contracts associated to the dairy company CAPSA (Corporación Peñasanta S.A., Spain) and one I3P contract (CSIC). Under this topic I developed 4 molecular methods for the early quantification in milk of

bacteriophages that infect starter cultures used for the production of yogurt and cheese, which can prevent significant economic losses to the Dairy Industry. I have also collaborated with the implementation of a Quality Systems in CAPSA for the early detection of bacteriophages in raw milk, and published 8 research articles. I also was inventor of two Patents (1 previously licensed to CAPSA, 1 international).

From 2006 to 2010, I undertook a Post-doctoral research in USA under the supervision of Dr. Maria Gomes-Solecki at the NYMC (New York Medical College, NY, USA) - funded by a FAME (Fundación Alfonso Martín Escudero) Post-doctoral Grant (Spain) -; and at the UTHSC (University of Tennessee Health Science Centre, TN, USA). During this period, I developed oral vaccines based on lactobacilli against different infectious disease (Lyme disease and plague) and food allergies (peanut allergy). I have published 3 SCI articles in this topic.

In 2010, I returned to the Molecular Microbiology Group at IPLA thanks to a JAE-Post-doctoral Grant of 3 years (CSIC). I subsequently enjoyed 3 concatenated contracts associated to different Research Projects (totalling about 8 years). My main research line has been focused on a topic related to the Safety and Quality of Fermented Dairy Products: the biogenic amines (BA) produced by LAB. My studies were directed to assess the toxicity of these compounds, to study the factors involved in their biosynthesis and in the development of new strategies to prevent their accumulation in cheese. My research in this topic have greatly contributed to determine the LAB species mainly responsible of the accumulation BA in cheeses at high concentrations. I have characterized their physiology and technological aptitudes as starter or adjuvant cultures, as well as the genetics pathways involved in BA biosynthesis and their transcriptional regulation by physical-chemical factors. I also developed an *in vitro* model based on human intestinal cells in culture and the RTCA (Real Time Cell Analycer) technology, which was essential to determined that tyramine, histamine, putrescine and cadaverine are cytotoxic against human intestinal cells at food concentrations. Within this research topic I have published 59 research articles, and I was inventor of 2 Patents (2 previously licensed to CAPSA).

In 2020, when I obtained a fix position as Científica Titular at IPLA, I started working on a new research line focused in LAB that produce neuroactive compounds (NAC), and their application as starter cultures for the elaboration of NAC-enriched functional foods, as cellular factories for the overproduction of natural NAC, and also as psychobiotics for treating mental disorders (202270I145 [as Principal Investigator [PI], PID2020-112629RB-I00 and AYUD/2021/50916). I was recently awarded the Project PID2024-1557600B-100 as PI, funded with 260,000 €, to carry out research on bacteria producing NAC to improve mental health disorders and their potential for developing functional foods and as psychobiotics. So far, I have published 4 SCI articles in this topic.

I have published 81 scientific documents: 61 SCI articles (P10: 22; Q1: 49; Q2: 9; Q3: 2; Q4: 1; first author in 43; corresponding author in 19), 3 no SCI articles, 8 book chapters. My H-index (Scopus) is 28 (total citations: 2749). I have collaborated in 27 Research Projects as member of the research team and in 2 as PI. I have presented 24 oral communications and 41 poster presentation in congresses, and I was invited to give 3 talk presentations. I have supervised many students (pre-graduate [TFG], master [TFM], Erasmus +, etc.), and pre- and post-doctoral students. I was also supervisor of 1 Doctoral Thesis (*Summa cum laude*), and I am actually supervising another two (defences expected in 2026). I have participated in many scientific dissemination activities. I was granted with 3 "sexenios de investigación" (last in 2019).

Part C. RELEVANT MERITS

C.1. Publications (only the 10 most relevant of the last 10 years)

(‡Corresponding author, ♯ The authors contributed equally to the work)

1. Arranz D, Fernández E, Szekeres B, Carvalho A, **del Rio B**, Redruello B and Alvarez MA (2025). Tryptamine accumulates in cheese mainly via the decarboxylation of tryptophan by lactic acid bacteria. *Food Research International*, 199, 115380. First Decile (D1).

2. Redruello B, Arranz D, Szekeres B, **del Rio B** and Alvarez MA (2024). Identification of technological/metabolic/environmental profiles associated with cheeses accumulating the neuroactive compound tryptamine. *Food Chemistry*, 460:140622. D1.

3. **del Rio B**, Fernadez M, Redruello B, Ladero V, and Alvarez MA (2024). New insights into the toxicological effects of dietary biogenic amines. *Food Chemistry*, 435:137558. D1.

4. Villarreal L, Ladero V, Sarquis A, Martinez B, **del Rio B**‡ and Alvarez MA (2024). Bacteriocins against biogenic amine-accumulating lactic acid bacteria in cheese: nisin A shows the broadest antimicrobial spectrum and prevents the formation of biofilms. *J. of Dairy Science*, 107:4277. D1.

5. Redruello B, Szwengiel A, Ladero V, **del Rio B**, and Alvarez MA (2022). Are there profiles of cheeses with a high GABA and safe histamine content? *Food Control*, 132, 108491. First Quartile (Q1).

6. Redruello B, Saidi Y, Sampedro L, Ladero V, **del Rio B**‡, and Alvarez MA (2021). GABA-Producing *Lactococcus lactis* strains isolated from camel's milk as starters for the production of GABA-enriched cheese. *Foods*, 10, 633. Q1.

7. **del Rio B**‡, Redruello B, Fernández M, Martín MC, Ladero V and Alvarez MA (2020). The biogenic amine tryptamine, unlike β-phenylethyamine, shows *in vitro* cytotoxicity at concentrations that have been found in foods. *Food Chemistry*, 331:127303. D1.

8. Redruello B, Szwengiel A, **del Rio B** and Alvarez MA (2020). Identification of technological/metabolic/environmental profiles of cheeses with high GABA contents. *LWT- Food Science and Technology*, 130:109603. Q1.

9. **del Rio B**‡, Redruello B, Linares DM, Ladero V, Ruas-Madiedo P, Fernández M, Martín MC and MA Alvarez (2018). Spermine and spermidine are cytotoxic towards intestinal cell cultures, but are they a health hazard at concentrations found in foods? *Food Chemistry*, 269: 321-326. D1.

10. **del Rio B**‡♯, Redruello B♯, Linares DM, Ladero V, Martín MC, Fernández M, Ruas-Madiedo P and Alvarez MA (2017). The dietary biogenic amines tyramine and histamine show synergistic toxicity towards intestinal cells in culture. *Food Chemistry*, 218: 249-255. D1.

C.2. Congress (only the most relevant ones of the last 5 years)

C.2.1. Invited conferences and oral presentations

1. Arranz D, Fernández E, Szekeres B, Carvallo A, **del Rio B**, Alvarez M.A. and Redruello B. Development of a screening method for tryptamine-producing bacteria in cheese. 18th Meeting of the Spanish Network of Lactic Acid Bacteria (RedBAL). Oviedo, Spain. 5-6 June 2025. Oral presentation, speaker: Arranz D.

2. Sampedro L, Bauer C, Redruello B, **del Rio B** and Alvarez MA. First steps towards the construction of a GABA-producing *Lactococcus lactis* superstrain. 17th Meeting of the Spanish Network of Lactic Acid Bacteria (RedBAL). León, Spain. 6-7 June 2024. **Oral presentation**, speaker: Sampedro L.

3. Sarquis A, Ladero V, Sanchez-Llana E, Diaz M, **del Rio B**, Fernandez M, Alvarez MA. A plasmid encoded sortase-mediated pilus is involved in the formation of strong biofilms in histamine-producing *Lentilactobacillus parabuchneri*. 14th Symposium on LAB. Egmond aan Zee, The Netherlands. 27-31 August 2023. **Invited conference,** speaker: **del Rio B.**

4. Arranz D, Fernandez E, Ladero V, **del Rio B**, Redruello B. and Alvarez M. Tryptamine in cheeses: determination of its content and isolation of producing bacteria. 16th RedBAL. Madrid, Spain. 11 May 2023. **Oral presentation**, speaker: Arranz D.

5. **del Rio B**. Biogenic amines: a microbiological hazard affecting cheese safety. Institute of Functional Biology and Genomics (IBFG, CSIC), Salamanca, Spain. 30 October 2022. **Invited conference,** speaker: **del Rio B.**

6. Sampedro L, Redruello B, Saidi Y, Ladero V, **del Rio B** and Alvarez MA. *Lactococcus lactis* isolated from camel milk as starter culture for the production of GABA-enriched cheeses. 15th RedBAL. Valencia, Spain. 26-27 May 2022. **Oral presentation**, speaker: Sampedro L.

7. Redruello B, ..., **del Rio B** and Alvarez MA. Multivariate analysis led to the identification of cheese profiles with high GABA content. 2nd Food Chemistry Conference: Shaping the Future of Food Quality, Safety, Nutrition and Health. Sevilla, Spain. 17-19 September 2019. **Oral presentation**, speaker: Redruello B.

C2.2. Poster presentations

1. Sampedro L, Bauer C, Casado A, Redruello B, Álvarez M.A. and **del Rio B**. The biosynthesis of GABA in *Lactococcus lactis* is transcriptionally activated at acidic pH and enhances cell survival in highly acidic environment. 18th Meeting of the Spanish Network of Lactic Acid Bacteria (RedBAL). Oviedo, Spain. 5-6 June 2025.

2. Arranz D, Carvalho A, Szekeres B, Fernández E, **del Rio B**, Redruello B and Alvarez MA. Factors that control the tryptamine biosynthesis in *Latilactobacillus curvatus* strains isolated from cheese. 16th Meeting of the Spanish Network of Lactic Acid Bacteria (RedBAL). Faculty of Veterinary, Complutense University of Madrid, Madrid, Spain. 11-12 May 2023.

3. Arranz D, Fernández E, **del Rio B**, Redruello B, Alvarez MA. Tryptamine accumulates in cheese via lactic acid bacteria-driven tryptophan decarboxylation. 14th Symposium on Lactic Acid Bacteria (LAB14). Egmond aan Zee, The Netherlands. 27-31 August 2023.

4. Sarquis A, Ladero V, Sanchez-Llana E, Diaz M, **del Rio B**, Fernandez M, Alvarez MA. A plasmid encoded sortase-mediated pilus is involved in the formation of strong biofilms in histamine-producing *Lentilactobacillus parabuchneri*. 14th Symposium on Lactic Acid Bacteria (LAB14). Egmond aan Zee, The Netherlands. 27-31 August 2023.

5. Szekeres B, **del Rio B**, Ladero V, Redruello B and Alvarez MA. Characterization of Győr-moson-sopron megyei csemege PGI cheese: Isolation of lactic acid bacteria able to produce GABA. 16th Meeting of the Spanish Network of Lactic Acid Bacteria (RedBAL). Faculty of Veterinary, Complutense University of Madrid, Madrid, Spain. 11-12 May 2023.

6. Sampedro L, Bauer C, Saidi Y, Ladero V, Redruello B, **del Rio B** and Alvarez MA. Dairy GABA producing *Lactococcus lactis* isolation, genomic and technological characterization, and optimization of GABA production. 14th Symposium on LAB (LAB14). Egmond aan Zee, The Netherlands. 27-31 August 2023.

C.3. Research projects (only the 10 most relevant of the last 10 years)

1. PID2024-155760OB-100. Bacteria producing neuroactive compounds to improve mental health disorders: potential for developing functional foods and as psychobiotics. Funded by the Ministry of Science, Innovation and Universities (MCIN), State Research Agency (AEI, Spain). PI: Ladero V and **del Rio B** (IPLA-CSIC). 01/09/2025 – 31/08/2029. 260,000 €. **Principal Investigator.**

2. ResilCrops. Harnessing circular economy to improve crop resilience in the Atlantic Area. Interreg Atlantic Area 2021-2027, Co-funded by the European Regional Development Fund (ERDF), European Union. PI: Andrés Borges (IPNA-CSIC). 01/10/2025 - 02/04/2028. 2,642,346.26 €. **Member of the research team.**

3. IDE/2024/000736. Grant from the Principality of Asturias for Excellence Research Groups. Funded by SEKUENS (Asturias, Spain) and ERDF (EU). PI: Alvarez MA, (IPLA-CSIC). 01/01/2025-31/12/2026. 121,500 €. **Member of the research team.**

4. PID2020-112629RB-I00. Lactic acid bacteria producing neuroactive compounds. Funded by MCIN/AEI/10.13039/501100011033 (Spain). PI: Ladero V and Alvarez MA (IPLA-CSIC). 01/09/2021-31/08/2025. 248,050 €. **Member of the research team.**

5. 202270I145. Optimización de parámetros tecnológicos para obtener quesos funcionales enriquecidos en ácido gamma-aminobutírico (GABA). Funded by the CSIC (Spain). **PI: del Rio B** (IPLA-CSIC). 3/11/2022 - 30/06/2024. 5,000 €. **Principal Investigator.**

6. AYUD/2021/50916. Grant from the Principality of Asturias for Excellence Research Groups. Funded by the FICYT (Foundation for the Promotion of Scientific and Technological Research in Asturias, Asturias, Spain) and ERDF (EU). PI: Alvarez MA (IPLA-CSIC). 01/01/2021-31/12/2023. 118,500 €. **Member of the research team.**

7. IDI/2018/000114. Grant from the Principality of Asturias for Excellence Research Groups. Funded by PCTI 2018-2020 (Science, Technology and Innovation Plan of Asturias, Asturias, Spain) and ERDF (EU). PI: Alvarez MA (IPLA-CSIC). 01/01/2018-31/12/2020. 160,000 €. **Member of the research team.**

8. ProMedFoods. Promotion of local Mediterranean fermented foods through a better knowledge and management of microbial resources. Funded by the ERA-NET ARIMNet2, 7th Framework Programme (EU) and INIA (National Institute for Agricultural and Food Research and Technology, Spain). PI: Alvarez MA (IPLA-CSIC). 01/10/2017-30/09/2020. 75,000 €. **Member of the research team.**

9. AGL2016-78708-R. Biogenic amines: toxicity, factors involved in their biosynthesis, and new strategies to prevent their accumulation in fermented foods. Funded by the AEI (Spain) and ERDF (EU). PI: Alvarez MA and Martin MC (IPLA-CSIC). 01/01/2017-3/06/21. 185,000 €. **Member of the research team.**

10. GRUPIN14-137. Grant from the Principality of Asturias for Excellence Research Groups. PCTI 2013-2017 (Asturias, Spain) and ERDF (EU). PI: Alvarez MA (IPLA-CSIC). 08/08/2015 - 31/12/2017, 156,600 €. **Member of the research team.**

11. AGL2013-45431-R. Understanding the accumulation of biogenic amines in cheese: From toxicology to elimination. MINECO (Ministry of Economy and Competitiveness, Spain). PI: Fernández M and Martín MC (IPLA-CSIC). 01/12/2014 - 30/12/2017. 170,000 €. **Member of the research team.**

C.4. Contracts, technological or transfer merits

C.4.1. Contracts

1. PC-04-14. Detection of bacteriophages in the Dairy Industry using Real-Time PCR. CAPSA (Corporación Alimentaria Peñasanta S.A., Asturias, Spain)/ FICYT. PI: Martín MC (IPLA-CSIC). 01/12/2004 - 30/04/2006. 69,776 €.

2. PC-CIS01-03. Fast detection of bacteriophages in the Dairy Industry. CAPSA/ FICYT (Asturias, Spain). PI: Alvarez MA (IPLA-CSIC). 01/05/2002 - 31/12/2003. 138,538 €.

C.4.2. Patents

1. Alvarez MA, Martín MC, Martínez N and **del Rio B** (2011). No. publication: ES2353887. Oligonucleótidos sintéticos para la detección de enterobacterias lactosa positivo. Priority country: Spain. Owner entity: CSIC/CAPSA. Licensed to CAPSA in 15th September 2006.

2. **del Rio B**, Martín MC, Martinez N, Magadán AH y Miguel A. Álvarez (2010). No. publication: ES2326349. Detección de bacteriófagos que infectan *Lactobacillus delbrueckii* mediante reacción en cadena de la polimerasa cuantitativa a tiempo real (QRT-PCR) y su uso. Priority country: Spain. Owner entity: CSIC/CAPSA. Licensed to CAPSA in 5th May 2008.

3. Fernández M, **del Rio B,** Linares DM and Álvarez MA (2009). No. publication: ES2310063. Detección de bacterias del ácido láctico productoras de histamina mediante reacción en cadena de la polimerasa a tiempo real (QRT-PCR) y su uso. Priority country: Spain. Owner entity: CSIC/CAPSA.

4. **del Rio B**, Mª Cruz Martín MC, Ana G. Binetti AG, Ariza M, Magadán AH, Fernández M and Alvarez MA (2008). No. publication: ES2276597. Detección e identificación de bacteriófagos de bacterias del ácido láctico mediante reacción en cadena de la polimerasa múltiple (MULTI-PCR) y sus aplicaciones. Priority country: Spain. Extension countries: Internacional (PCT/ES06/070084). Owner entity: CSIC/CAPSA. Licensed to CAPSA in 5th May 2008.