Part A. PERSONAL INFORMATION

CV date	10/05/2022

First and Family name	Francisco Tenllado		
Social Security, Passport, ID number	07471594K	Age	55
Researcher codes	WoS Researcher ID *(*)*	E-5804-2016	
	SCOPUS Author ID*(*)*		
	Open Researcher and Contributor ID (ORCID) **	0000-0002-5349-7642	

(*) At least one of these is mandatory
(**) Mandatory

A.1. Current position

Name of University/Institution	Consejo Superior de Investigaciones Científicas/Centro de Investigaciones Biológicas Margarita Salas			
Department	Microbial and Plant Biotechnology			
Address and Country	Ramiro de Maeztu, 9 Madrid 28040			
Phone number	91-8373112	E-mail	tenllado@cib.csic.es	
Current position	Científico Titular		From	16-6-2003
Key words	Plant virus; pathogenesis mechanisms; viral synergism; antiviral defense; control strategies			

A.2. Education

PhD	University	Year
Biological Sciences	Universidad Autónoma Madrid	1995

A.3. JCR articles, h Index, thesis supervised…

Sexenios: 4 (1992-2015) Number of thesis supervised: 5
Total number of publications: 53 Total number of citations: 1606
Average number of citations: 30.3
Publications in the first quartile (Q1): 42
H-index: 23

Part B. CV SUMMARY *(max. 3500 characters, including spaces)*

Scientific-technical achievements: i) a biotechnological procedure to control plant virus based on the production of virus specific, double stranded RNA in bacteria and its exogenous application on plants. The direct use of exogenous dsRNA molecules in plants for blocking the multiplication of viruses in cells by RNA interference had not been described before in the literature. This achievement was patented and commercially evaluated by a company specialized on non-transgenic biological solutions (Bio-Oz Biotechnologies, Israel. Patent CSIC PCT/ES02/00319); ii) The elicitation of defense responses in a compatible plant/virus interaction that ultimately leads to systemic necrosis -a form of programmed cell death (PCD)- was qualitatively similar to an incompatible interaction that triggers the hypersensitive response (HR). These studies support an emerging theme that systemic necrosis and HR-associated necrosis involve similar physiological, molecular, and biochemical features. Systemic necrosis is merely an uncontrolled or incomplete HR-associated necrosis response that is triggered in distal tissues when the localized HR fails to limit virus spread; iii) Oxylipin metabolism is a critical component that positively regulates the process of PCD during compatible plant–virus interactions but does not play a role in restraining virus accumulation *in planta*. Thus, oxylipin metabolism is proposed to be implicated not only in HR-associated resistance response against bacteria and fungi but also in systemic necrosis disease induced by compatible plant–virus interactions. Therefore, I propose a common role for oxylipins as a shared signaling component of cell death during both compatible and incompatible plant-pathogen interactions.

Scientific-technical objectives: Current projections of the Intergovernmental Panel on Climate Change suggest that climate change and global trade combined will favor both, the appearance of new disease outbreaks in crops, and they being more frequently exposed to abiotic stresses. Since losses in crop yields derived from abiotic stresses largely exceed those caused by viruses, increases in the

tolerance of virus-infected plants, or progenies derived from them, to biotic/abiotic stresses compared to plants exposed only to the abiotic stress is of clear interest to the agro-industrial sector. My Group pursues its research studies at several levels: **A)** it performs molecular studies on the functions of proteins and nucleic acid relevant to the establishment and the outcomes of compatible infections; **B)** it studies on whole plants/plant tissues effects of defined environment conditions, in particular those associated to climate change, on parameters such as viral titers, infection symptoms, induced tolerance to other biotic or abiotic stresses, or the horizontal dispersal of infection by vectors; **C)** it studies the effects of such compatible infections on the fitness of the infected plants and on the responses of virus-infected plants to abiotic stresses and to infection by other viruses or pathogens, as well as potential epigenetic basis for those responses.

Part C. RELEVANT MERITS

C.1. Publications (including books)

- Del Toro F, Sun H, Robinson C, Jiménez Á, Covielles E, Higuera T, Aguilar E, Tenllado F, Canto T. (2022). In planta vs viral expression of HCPro affects its binding of non-plant 21-22 nt small RNAs, but not its preference for 5´-terminal adenines, or its effects on small RNA methylation. New Phytol. 233:2266–2281. doi: 10.1111/nph.17935. A

-Moreno, M., Ojeda, B., Hernández-Walias, FJ., Sanz-García, E., Canto, T., Tenllado, F. (2022). Water deficit improves reproductive fitness in Nicotiana benthamiana plants infected by Cucumber mosaic virus. Plants. 11:1240. https://doi.org/10.3390/plants11091240.

-Necira K, Makki M, Sanz-García E, Canto T, Djilani-Khouadja F, Tenllado F. (2021). Topical Application of *Escherichia coli*-Encapsulated dsRNA Induces Resistance in *Nicotiana benthamiana* to Potato Viruses and Involves RDR6 and Combined Activities of DCL2 and DCL4. Plants. 10(4):644.

-Hou, W, Singh, RP, Martins, V, Tenllado, F*, Franklin, G, Pires Dias, AC*. (2021). Transcriptional responses of *Hypericum perforatum* cells to *Agrobacterium tumefaciens* and differential gene expression in dark glands. Functional Plant Biology**.** 48(9) 936-947.. *co-corresponding author.

-Tenllado, F and Canto, T. Effects of a Changing Environment on the Defenses of Plants to Viruses. (2020). Current Opinion in Virology**.** 42:40–46.

-Hou, W, Singh, RP, Zhao, P, Martins, V, Aguilar, E, Canto, T, Tenllado, F*, Franklin, G, Pires Dias, AC*. [2020]. Overexpression of polygalacturonase-inhibiting protein (PGIP) gene from Hypericum perforatum alters expression of multiple defense-related genes and modulates recalcitrance to Agrobacterium tumefaciens in tobacco. Journal of Plant Physiology. 253, 153268.

-Hou W, Singh RK, Zhao P, Martins V, Aguilar E, Canto T, Tenllado F*, Franklin, G, Pires Dias AC*. [2020]. Transgenic expression of Hyp-1 gene from Hypericum perforatum L. alters expression of defense-related genes and modulates recalcitrance to Agrobacterium tumefaciens. Planta, 251:13.

- Aguilar, E, Del Toro F, Figueira-Galán, D., Hou, W, Canto, T, and Tenllado, F. (2020). Virus infection induces resistance to Pseudomonas syringae and to drought in both compatible and incompatible bacteria-host interactions, which are compromised under conditions of elevated temperature and CO_2 levels. Journal of General Virology. 101:122-135

-Aguilar, E, Del Toro F, Brosseau, C., Moffett, P., Canto, T, and Tenllado, F. (2019). Cell death triggered by the P25 protein in Potato virus X-associated synergisms results from ER stress in Nicotiana benthamiana. Molecular Plant Pathology. 20:194-210.

-Del Toro FJ, Choi KS, Rakhshandehroo F, Aguilar E, Tenllado F, Canto T. (2018). Ambient conditions of elevated temperature and CO_2 levels are detrimental to the probabilities of transmission by insects of a Potato virus Y isolate and to its simulated prevalence in the environment. Virology. 530, 1-10

-Del Toro, F. J., Mencía, E., Aguilar, E., Tenllado, F., Canto, T. (2018). HCPro-mediated transmission by aphids of purified virions does not require its silencing suppression function and correlates with its ability to coat cell microtubules in loss-of-function mutant studies. Virology 525, 10-18.

-Aguilar, E, Cutrona, C, Del Toro F, Vallarino, J, Osorio, S, Pérez-Bueno, ML, Barón, M, Chung BN, Canto, T, and Tenllado, F. (2017). Virulence determines beneficial trade-offs in the response of virus-infected plants to drought via induction of salicylic acid. Plant, Cell and Environment, 40, 2909–2930.

C.2. Research projects and grants

- Reference: COOPA20465. Title: Application of a nontransgenic, RNA interference approach in potato cultivars for sustained protection against viral synergism in Tunisia. Principal investigator: FRANCISCO TENLLADO PERALO Affiliation: CIB-CSIC. Funding body: I-COOP-CSIC. Date: 01/01/2021-31/12/2022 Funding: 24.000 €

- Reference: PID2019-109304RB-I00. Title: Caracterización de factores virales, de la planta y ambientales, que son determinantes de efectos en infecciones compatibles de virus de rna en plantas**.** Principal investigators: TOMÁS CANTO CEBALLOS (IP1) y FRANCISCO TENLLADO PERALO (IP2). Affiliation: CIB-CSIC. Funding body: Ministerio de Ciencia e Innovación. Date: 01/07/2020-31/06/2023 Funding: 90.000 €

- Reference: BIO2016-75619-R. Title: Efectos de las infecciones virales en las respuestas de las plantas a estreses bióticos y abióticos combinados, bajo condiciones ambientales asociadas al cambio climático. Principal investigators: FRANCISCO TENLLADO PERALO (IP1) y TOMÁS CANTO CEBALLOS (IP2) Affiliation: CIB-CSIC. Funding body: Ministerio de Economía y Competitividad. Date: 01/01/2017- 31/12/2019. Funding: 85.000 €

- Reference: COOPA20310. Identificación mediante secuenciación masiva de factores que modulan la severidad de la infección en el patosistema PYVV-Patata en Colombia. Principal investigator: TOMÁS CANTO CEBALLOS Affiliation: CIB-CSIC. Funding body: I-COOP-CSIC. Date: 01/01/2018- 31/12/2019. Participation: Investigator. Funding: 20.000 €

- Reference: BIO2013-47940-R. Title: Función de determinantes de patogenicidad viral en los balances que se establecen en interacciones compatibles virus RNA-planta. Principal investigators: TOMÁS CANTO CEBALLOS (IP1) y FRANCISCO TENLLADO PERALO (IP2). Affiliation: CIB-CSIC. Funding body: Ministerio de Economia y Competitividad. Date: 01/01/2014- 31/12/2016 Funding: 121.000 €

C.3. Contracts

Title: Exposition “Viva la Diferencia”. Company: Fundación "la Caixa". Date: 1/10/2008-31/07/2010. Principal investigator: José Ramón Díaz-Ruíz. Participation: Investigator. Funding: 9.766,22 €

C.4. Patents

Inventors: Tenllado Peralo, Francisco and Díaz Ruíz, José Ramón. Title: A method to interfere with a virus infection in plants. National Reference: 200101593. Priority countries: Spain. Date: 6-7-2001. International Reference: PCT/ES02/00319. Holder entity: CSIC. Patent License: Bio-Oz Biotech.Ltd.

C.5. Participation in advisory tasks

- Member of the Editoral Board of “Plants”. MDPI (ISSN 2223-7747; CODEN: PLANCD).
- Member of the Committee “Escala de Investigador Distinguido de los Organismos Públicos de Investigación”. 2019.
- Member of the Committee “Escala de Científicos Titulares de los Organismos Públicos de Investigación”. 2017.
-President of the Committee “Escala de Titulados Superiores Especializados del Consejo Superior de Investigaciones Científicas”. 2009.

-Evaluator of Research Projects for the ANEP and Fundación CajaCanarias (2009- 2011, 2017, 2019).
- Evaluator of Research Projects for the Agencia Nacional de Promoción Científica y Tecnológica de Chile (CONICYT, 2013) and Argentina (FONCYT, 2006).
- Evaluator of Research Projects for the Consejería de Innovación, Ciencia y Empresa de la Junta de Andalucía. (2009 y 2010).

C.6. Teaching Activity

- Professor at the Máster "Virología". Universidad Complutense de Madrid. 2015-current
- Professor at the Doctoral Programme "Biotecnología y Recursos Genéticos de Plantas y Microorganismos Asociados". Universidad Politécnica de Madrid. 2007-2014.
- Professor at the "Curso de Formación Profesorado". Centro Territorial de Innovación y Formación Madrid-Norte (CTIF) de la Comunidad de Madrid. 2018
- Supervising, training and mentoring of 11 Master and Bachelor students

C.7. Divulgation activities

- Tenllado, F., and Díaz Ruiz., J.R. (1996). Resistencia transgénica frente a los tobamovirus de pimiento mediada por la replicasa viral. Phytoma 84, 38-43.
- Barajas, D., Atencio, F.A., Tenllado, F., and Díaz-Ruíz, J.R. (2006**).** Silenciamiento por RNA: de la regulación de la expresión génica a la defensa antiviral. BioJournal nº 4.
- Tenllado, F., y Díaz-Ruíz, J.R. (2007). El silenciamiento génico y el control de enfermedades en plantas. Phytoma, 192: 54-58.
- Tenllado, F., Pacheco, R. y Llave, C. (2016). Proceso patogénico I: Metabolismo primario, señalización y virus. En: Enfermedades de las plantas causadas por virus. E. Moriones, M.A. Ayllón, C. Llave y M. Cambra (eds). Bubbok-SEF, España.

C.8. Thesis directed

-Title: Identificación de factores de virulencia determinantes de necrosis en infecciones compatibles planta-virus y su papel en la respuesta a estreses abióticos asociados al cambio climático. DOCTORANDO: EMMANUEL AGUILAR PARRAS**.** Universidad Complutense de Madrid. 2013-2017. Calificación: Sobresaliente Cum laude. https://www.educacion.gob.es/teseo/mostrarRef.do?ref=433995.

-Title: Caracterización de la necrosis sistémica inducida por la interacción sinérgica entre el Virus X de la patata y potyvirus en Nicotiana benthamiana. DOCTORANDO**:** PACHECO PIÑA, REMEDIOS. Universidad Politécnica de Madrid. 2008-2014. Calificación: Sobresaliente Cum laude. https://www.educacion.gob.es/teseo/mostrarRef.do?ref=1075551

Title: Análisis comparativo de la expresión e interferencia génica de dos acetilcolinesterasas en *Blattella germanica* (L) (Dyctioptera, Blattellidae) y en *Leptinotarsa decemlineata* (Say) (Coleoptera, Chrysomelidae). DOCTORANDO: LOIC REVUELTA LUIS. Universidad Politécnica de Madrid. Calificación: Sobresaliente Cum laude. 2004-2010. https://www.educacion.es/teseo/mostrarRef.do?ref=856125

Title: Análisis de nuevas estrategias basadas en silenciamiento génico para el control de enfermedades virales en plantas. DOCTORANDO: YOLANDA MARISOL VARGAS CONCHA. Universidad Politécnica de Madrid. Calificación: Sobresaliente Cum laude. 2001-2005. https://www.educacion.es/teseo/mostrarRef.do?ref=400743

Title: Estudio del mecanismo de resistencia transgénica a virus en plantas basado en fenómenos de silenciamiento génico: resistencia en plantas portadoras del gen HC-Pro del virus de la sharka (PPV). DOCTORANDO: DANIEL BARAJAS RAMÍREZ. Universidad Complutense de Madrid. Calificación: Sobresaliente Cum laude. 2001-2005.

Francisco

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