Sociedad Española de Investigación sobre Cannabinoides

Sociedad Española de Investigación sobre Cannabinoides

Boletín electrónico abril-junio de 2025; nº 82
Editor@s: Iker Bengoetxea y Amaia Mimenza

Contenido:

1. Saludo de la Presidenta

Querido/as socio/as:

Espero que estéis muy bien, y con mucha fuerza y motivación en estas semanas previas al parón estival.

Quiero aprovechar este espacio para adelantaros algunos detalles sobre la Reunión Anual de la SEIC de 2025 que, como sabéis, se celebrará en Madrid. Concretamente, quería informaros de que ya tenemos confirmados tanto al ponente plenario como el *hot topic*. Para lo primero contaremos con Mauro Maccarrone, colega italiano que necesita poca presentación y con el que muchos/as de nosotros/as hemos colaborado durante las últimas décadas. No voy a mencionar aquí su valía científica pero sí me voy a atrever a destacar su bonhomía, que esperamos podáis disfrutar todos durante la reunión.

Con respecto al *hot topic*, hemos pensado que el proyecto VICT3R de creación de grupos control virtuales puede resultar de interés ya que gran parte de los/as socios/as de la SEIC trabajamos con animales. Tenemos la enorme suerte además de que una de nuestras socias (Olga Valverde) es una de las IPs del proyecto. Será ella de hecho la que se encargue de impartir la charla correspondiente al *hot topic* durante nuestra reunión. Tampoco necesita presentación la valía científica de Olga. Y como ni la RAE ni una IA me han sugerido un término femenino para hablar de la bonhomía de una mujer, con bonhomía te quedas, Olga.

Un abrazo fuerte y que tengáis un verano estupendo,
Cristina

2. Exploring the Therapeutic Potential of Linoleoylethanolamide (LEA) and its Derivative HTLE in Obesity and Associated Liver Syndrome.

Premio a la mejor publicación postdoctoral, 24ª Reunión anual de la SEIC, Córdoba (2024)

Marialuisa Francesca de Ceglia

Instituto de Investigación Biomédica de Málaga y Plataforma en Nanomedicina-IBIMA Plataforma BIONAND, Hospital Universitario Regional de Málaga, Málaga

Obesity and its associated complications, including metabolic fatty associated liver disease (MAFLD), pose significant challenges to global public health. The available therapies often come with numerous side effects and may not always be effective for all patients, highlighting the need for research into new agents that are less toxic and exhibit more specific and efficient activity [1].

In previous work from our laboratory, we investigated the effects of the administration of Linoleoyil ethanolamide (LEA) in a preclinical rat model of obesity, showing its efficacy in reducing body weight, food intake and ameliorating blood parameters such as triglycerides and total cholesterol through its action as agonist at the nuclear peroxisome proliferator-activated receptor alpha (PPARa). We also demonstrated that LEA administration reduced ALT and AST plasma values; however, it did not significantly improve liver fat deposition in obese [2].

In the awarded study [3], we evaluated the efficacy of hydroxytyrosol linoleoyl ether (HTLE), a LEA derivative with hydroxytyrosol (a potent antioxidant present in olive oil), with dual activity as a PPARa agonist and cannabinoid receptor 1 (CB1) antagonist. We administered lean and obese Zucker rats for 15 days with intraperitoneal HTLE (3 mg/kg) and then evaluated its safety profile, pharmacokinetics, impact on body weight, hepatic fat content, expression of key enzymes involved in lipogenesis/fatty acid oxidation, and antioxidant capacity.

HTLE had rapid absorption and reached a high concentration in plasma after administration, resulting in a long half-life, long-acting compound.

Biochemical analysis demonstrated a favorable safety profile for HTLE along with decreased concentrations of urea, total cholesterol, and aspartate aminotransferase AST transaminases in plasma. Notably, HTLE reduced the body weight and food intake in both lean and obese rats. HTLE reduced liver fat deposition and liver deposits in fat rats, through increasing the expression of enzymes related with lipid oxidation and decreasing lipogenesis-related ones. Moreover, HTLE successfully counteracted the redox imbalance associated with MAFLD in obese rats, attenuating lipid peroxidation and replenishing both glutathione and the overall antioxidant levels.

Based on our results in the Zucker rat model, HTLE emerges as a promising candidate with triple functionality as an anorexigenic, antisteatotic, and antioxidant agent, offering potential relief from MAFLD symptoms associated with obesity while exhibiting minimal side effects. In conclusion, our study positions HTLE as a highly promising compound for therapeutic intervention in MAFLD treatment, warranting further exploration in clinical trials.

REFERENCIAS

1. M. de Ceglia, J. Decara, S. Gaetani, and F. Rodríguez de Fonseca, "Obesity as a Condition Determined by Food Addiction: Should Brain Endocannabinoid System Alterations Be the Cause and Its

Modulation the Solution?," (in eng), Pharmaceuticals (Basel), vol. 14, no. 10, Sep 29 2021, doi: 10.3390/ph14101002.
2. R. Tovar et al., "Administration of Linoleoylethanolamide Reduced Weight Gain, Dyslipidemia, and Inflammation Associated with High-Fat-Diet-Induced Obesity," (in eng), Nutrients, vol. 15, no. 20, Oct 20 2023, doi: 10.3390/nu15204448.
3. R. Tovar et al., "Hydroxytyrosol Linoleoyl Ether Ameliorates Metabolic-Associated Fatty Liver Disease Symptoms in Obese Zucker Rats," (in eng), ACS Pharmacol Transl Sci, vol. 7, no. 5, pp. 1571-1583, May 10 2024, doi: 10.1021/acsptsci.4c00105.

3. Hippocampal astrocytes: a new player in Alzheimer's disease?

Premio al mejor póster postdoctoral, 24ª Reunión anual de la SEIC, Córdoba (2024)

Carla Ramón Duaso

Cell-Type Mechanisms in Normal and Pathological Behavior Research Group, Hospital del Mar Research Institute, Barcelona

Alzheimer's disease (AD) is an age-related neurodegenerative disorder characterized by β-amyloid (Aβ) plaques, hyperphosphorylated tau tangles, and widespread cognitive and emotional impairments [1,2]. Increasing life expectancy has produced a dramatic rise in the number of AD cases that have become the 60–80% of all cases of dementia [3]. Among the key players, astrocytes—the most abundant glial cells in the brain—have emerged as active regulators of synaptic transmission, neuroinflammation, and neural metabolism. Disruptions in astrocyte function, including altered gliotransmitter release and metabolic deficits, have been increasingly implicated in AD pathology, potentially contributing to neuronal dysfunction and behavioral symptoms [4-6]. These effects appear to differ by sex and genetic background, highlighting the importance of personalized approaches to therapy. One pathway linking astroglial and neuronal function is the endocannabinoid system (ECS), composed of CB1 and CB2 receptors, endogenous ligands, and metabolic enzymes [7,8]. CB1 receptors, in particular, modulate both neuronal and astrocytic activity and have been shown to mitigate Aβ toxicity and cognitive decline in AD models when pharmacologically activated [9-13]. However, the precise mechanisms—especially those influenced by sex—remain poorly understood. Exploring the intersection between AD pathology, astrocyte dysfunction, and ECS signaling holds promise for the development of innovative, cell-type-specific therapeutic strategies.

In this study, we combined the APP/PS1 mouse model of AD with a pharmacological intervention at 3 months of age using the CB1 receptor cannabinoid agonist ACEA under a regimen of 21 consecutive days. At 4, 6, 9 and 12 months of age we performed a complete behavioural characterization (cognition, social-related tasks, depressive and anxiety-like states). To achieve this, we implemented an open-source tracking pipeline combining EzTrack®—a tool for background-subtraction-based tracking—and DeepLabCut™, a machine-learning-based software for precise pose estimation. These tools, together with with custom Python scripts, allowed us to extract high-resolution behavioral metrics and minimize human bias in the behavioral analysis. Notably, we observed significant sex-, genotype- and cannabinoid-related differences across different cognitive domains.

To further assess the underlying mechanisms and the potential role of astrocytes, we performed a single-cell RNA sequencing on hippocampal tissue from 6-months old male and female, wild-type and APP/PS1 mice under cannabinoid treatment during the presymptomatic period, in which we have started to explore astroglial-related mechanisms. Our preliminary analyses of these transcriptomic datasets suggest that astrocytes exhibit distinct molecular signatures that are modulated not only by the presence of the AD-like pathology but also by sex and cannabinoid treatment.

In addition, we functionally assess astrocyte activity *in vivo* by monitoring their calcium dynamics. We used the genetically encoded calcium indicator pZac2.1 gfaABC1D-cyto-GCaMP6f, targeting astrocytes specifically in both, the dorsal and ventral hippocampus. Six-month-old mice were tested in the novel object recognition test and a light-tone sensory preconditioning paradigm. Notably, differences in calcium signal amplitude and temporal dynamics were observed across task phases and varied depending on the animal's sex, genotype, and cannabinoid treatment. These findings suggest that hippocampal astrocytes are actively involved in cognitive and they are also differentially engaged depending on disease state and external modulation.

Overall, our data provide compelling evidence that astrocytes play a dynamic role in shaping cognitive outcomes in the context of AD. The convergence of behavioral, molecular, and in vivo functional data underscores the value of targeting astrocyte biology to better understand and potentially ameliorate the complex cognitive impairments associated with AD. Our findings highlight the importance of considering sex and genotype in preclinical studies and support the further investigation of cannabinoid-based interventions as modulators of astroglial function.

REFERENCIAS

1. Ferrer, I. Defining Alzheimer as a common age-related neurodegenerative process not inevitably leading to dementia. *Prog Neurobiol* 97, 38-51, doi:10.1016/j.pneurobio.2012.03.005 (2012).
2. Montine, T. J. *et al.* National Institute on Aging-Alzheimer's Association guidelines for the neuropathologic assessment of Alzheimer's disease: a practical approach. *Acta Neuropathol* 123, 1-11, doi:10.1007/s00401-011-0910-3 (2012).
3. Prince, M. *et al.* Recent global trends in the prevalence and incidence of dementia, and survival with dementia. *Alzheimers Res Ther* 8, 23, doi:10.1186/s13195-016-0188-8 (2016).
4. Attwell, D. & Laughlin, S. B. An energy budget for signaling in the grey matter of the brain. *J Cereb Blood Flow Metab* 21, 1133-1145, doi:10.1097/00004647-200110000-00001 (2001).
5. Gleichman, A. J. & Carmichael, S. T. Glia in neurodegeneration: Drivers of disease or along for the ride? *Neurobiol Dis* 142, 104957, doi:10.1016/j.nbd.2020.104957 (2020).
6. Zulfiqar, S., Garg, P. & Nieweg, K. Contribution of astrocytes to metabolic dysfunction in the Alzheimer's disease brain. *Biol Chem* 400, 1113-1127, doi:10.1515/hsz-2019-0140 (2019).
7. Busquets-Garcia, A. *et al.* Dissecting the cannabinergic control of behavior: The where matters. *Bioessays* 37, 1215-1225, doi:10.1002/bies.201500046 (2015).
8. Piomelli, D. The molecular logic of endocannabinoid signalling. *Nat Rev Neurosci* 4, 873-884, doi:10.1038/nrn1247 (2003).
9. Aso, E., Andres-Benito, P. & Ferrer, I. Delineating the Efficacy of a Cannabis-Based Medicine at Advanced Stages of Dementia in a Murine Model. *J Alzheimers Dis* 54, 903-912, doi:10.3233/JAD-160533 (2016).
10. Aso, E. & Ferrer, I. Cannabinoids for treatment of Alzheimer's disease: moving

toward the clinic. *Front Pharmacol* 5, 37, doi:10.3389/fphar.2014.00037 (2014).
11. Bisogno, T., Lauritano, A. & Piscitelli, F. The Endocannabinoid System: A Bridge between Alzheimer's Disease and Gut Microbiota. *Life (Basel)* 11, doi:10.3390/life11090934 (2021).
12. Karl, T., Cheng, D., Garner, B. & Arnold, J. C. The therapeutic potential of the endocannabinoid system for Alzheimer's disease. *Expert Opin Ther Targets* 16, 407-420, doi:10.1517/14728222.2012.671812 (2012).
13. Bonnet, A. E. & Marchalant, Y. Potential Therapeutical Contributions of the Endocannabinoid System towards Aging and Alzheimer's Disease. *Aging Dis* 6, 400-405, doi:10.14336/AD.2015.0617 (2015).

4. Adolescent exposure to the SPICE/K2 cannabinoid ABFUBINACA in female mice induces prepulse inhibition and structural plasticity alterations in adulthood

Premio a la mejor comunicación oral predoctoral, 24ª Reunión anual de la SEIC, Córdoba (2024)

Cristina Izquierdo Luengo

Faculty of Experimental Sciences, Universidad Francisco de Vitoria, UFV, 28223, Pozuelo de Alarcón, Madrid, Spain

Synthetic cannabinoids (SCBs), commonly found in Spice/K2 preparations, are increasingly recognized as potent drugs of abuse as they are proposed as an "alegal" alternative to marijuana consumption [1]. Among them, AB-FUBINACA is a member of the indazole carboxamide family of SCBs present in the latest Spice/K2 products [2, 3]. In addition, adolescence is known as a period of special vulnerability to the central effects of cannabinoids [4,5]. Therefore, the present study sought to investigate the long-term effects of adolescent AB-FUBINACA exposure in male and female mice, focusing on behavioral, molecular, and structural consequences. For that purpose, mice were treated with escalating doses of AB-FUBINACA during adolescence, and different behavioral tests were conducted in adulthood to assess anxiety, memory, sociability, depressive, and psychotic-like alterations. AB- FUBINACA exposure revealed several sex-dependent behavioral alterations. As a brief, in female mice, AB-FUBINACA induced anxiety-like behavior whereas males exhibited an anxiolytic-like effects. Recognition memory was also impaired in females but preserved in males. Importantly, prepulse inhibition test (PPI), a measure of sensorimotor gating associated with psychotic-like symptoms [6], was significantly disrupted in female, but not male mice. This psychotic-like alteration was also observed in females when the drug was administered directly in adulthood, indicating the potent pro-psychotic effect of AB-FUBINACA, regardless of the age of exposure. RNA sequencing of the prefrontal cortex of females treated with AB-FUBINACA during adolescence revealed upregulation of two genes, Plekhg2 and Sh3tc1, which correlated with PPI the deficits. Plekhg2 has been shown to participate in the correct synaptic and dendritic development [7]. Therefore, to further explore potential alterations, dendritic arborization and dendritic spines were evaluated though immunostaining techniques. AB-FUBINACA exposure during adolescence reduced dendritic arborization and the density of mature dendritic spines in the prefrontal cortex of female adult mice. As a whole, this study contributes to elucidating the potential long-term detrimental effects of this potent SCB when used during adolescence.

This work was published in February 2025 in iScience. You can find the DOI in the previous SEIC Bulletin (nº 81). I encourage you to read it for further details.

REFERENCIAS

1. Ford BM, Tai S, Fantegrossi WE, Prather PL. Synthetic Pot: Not Your Grandfather's Marijuana. *Trends Pharmacol Sci.* 2017; 38: 257–276.
2. Trecki J, Gerona RR, Schwartz MD. Synthetic Cannabinoid–Related Illnesses and Deaths. *New England Journal of Medicine* 2015; 373: 103–107.
3. Canazza I, Ossato A, Vincenzi F, Gregori A, Di Rosa F, Nigro F et al. Pharmaco-toxicological effects of the novel third-generation fluorinate synthetic cannabinoids, 5F-ADBINACA, AB-FUBINACA, and STS-135 in mice. In vitro and in vivo studies. *Hum Psychopharmacol* 2017; 32. doi:10.1002/hup.2601.
4. Rubino T, Parolaro D. The impact of exposure to cannabinoids in adolescence: Insights from animal models. *Biol Psychiatry.* 2016; 79: 578–585.
5. Rubino T, Parolaro D. Long lasting consequences of cannabis exposure in adolescence. *Mol Cell Endocrinol* 2008; 286: S108-113.
6. Carceles-Cordon M, Mannara F, Aguilar E, Castellanos A, Planagumà J, Dalmau J. NMDAR Antibodies Alter Dopamine Receptors and Cause Psychotic Behavior in Mice. *Ann Neurol* 2020; 88: 603–613.
7. Nishikawa M, Ito H, Tabata H, Ueda H, Nagata KI. Impaired Function of PLEKHG2, a Rho-Guanine Nucleotide-Exchange Factor, Disrupts Corticogenesis in Neurodevelopmental Phenotypes. *Cells* 2022; 11: 696.

5. Agenda

35th ICRS Annual Symposium 2025
6-10 julio 2025
Bloomington, USA
https://www.icrs.com/annual-symposium

5th Annual Meeting of the IRN iGPCR Net
7-9 julio 2025
Barcelona
http://www.i-gpcrnet.com

Gordon Research Conference (GRC)
17-22 agosto 2025
Waterville Valley, USA
https://www.grc.org/cannabinoid-function-in-the-cns-conference/2025/

20th Meeting of the Spanish Society for Neuroscience (SENC) 2025
3-5 septiembre 2025
Las Palmas de Gran Canaria
https://congresosenc.es/

International Congress on Neurodegenerative Diseases (ICND) 2025
15-17 septiembre 2025
Elche
https://ciiien.org/

38th ECNP Congress
11-14 octubre 2025
Amsterdam, The Netherlands
https://www.ecnp.eu/congress2025/

Society for Neuroscience (SfN) 2025
15-19 noviembre 2025
San Diego, EEUU
https://www.sfn.org/meetings/neuroscience-2025/

25ª Reunión Anual de la SEIC
27-29 noviembre 2025
Madrid

FENS Forum 2026
04-08 julio 2026
Barcelona
https://fensforum.org/

6. Últimas publicaciones sobre cannabinoides de investigadores/as españoles (periodo abril-junio 2025)

Anderson, G. N., Conway, C. C., Bravo, A. J., & Cross-Cultural Addictions Study Team (2025). Distress tolerance is linked with substance use motivations and problems in young adults across four continents. *Journal of personality*, *93*(3), 706–723. https://doi.org/10.1111/jopy.12963

Arqueros, M., Perez-Diez, I., Garcia-Ramos, A., Ayad-Ahmed, W., Sanchez, A., & de la Torre-Luque, A. (2025). Addiction profile is associated with suicidal behavior and repetition of non-suicidal self injury: a latent profile analysis study in a schooled adolescents. *European child & adolescent psychiatry*, 10.1007/s00787-025-02712-x. Advance online publication. https://doi.org/10.1007/s00787-025-02712-x

Ayerra, L., Abellanas, M. A., Vidaurre, C., Basurco, L., Tavira, A., Luquin, E., Clavero, P., Mengual, E., Collantes, M., Peñuelas, I., de Martin-Esteban, S. R., Grether, U., Hillard, C. J., Romero, J., Hervás-Stubbs, S., & Aymerich, M. S. (2025). Activation of central cannabinoid type 2 receptors, but not on peripheral immune cells, is required for endocannabinoid-mediated neuroprotection in Parkinson's disease. *Brain, behavior, and immunity*, *128*, 600–611. Advance online publication. https://doi.org/10.1016/j.bbi.2025.04.037

Belackova, V., Petruzelka, B., Cihak, J., Michailidu, J., & Mravcik, V. (2025). Getting "The whole picture": A review of international research on the outcomes of regulated cannabis supply. *The International journal on drug policy*, *142*, 104796. Advance online publication. https://doi.org/10.1016/j.drugpo.2025.104796

Bengoetxea de Tena, I., Pereira-Castelo, G., Martínez-Gardeazabal, J., Moreno-Rodríguez, M., Manuel, I., Martínez, C., Vaz, B., González-Ricarte, J., Álvarez, R., Torres-Mozas, A., Peccati, F., Jiménez-Osés, G., Rodríguez de Lera, A., & Rodríguez-Puertas, R. (2025). Synthesis and Pharmacological Characterization of a Novel Cannabinoid Receptor 1 Antagonist. *ACS Omega, 10(22),* 22747–22759. https://doi.org/10.1021/acsomega.4c11355

Bellver-Sanchis, A., Ribalta-Vilella, M., Lillo, J., Ortuño-Sahagún, D., Franco, R., Pallàs, M., Navarro, G., & Griñán-Ferré, C. (2025). Neuroprotective effects of G9a inhibition and cannabinoid receptor activation in Alzheimer's disease through a pharmacological approach. *Neurotherapeutics : the journal of the American Society for Experimental NeuroTherapeutics*, e00616. Advance online publication. https://doi.org/10.1016/j.neurot.2025.e00616

Beriain, S., Fernandez-Moncada, I., Pereiro, X., Eraso-Pichot, A., Vecino, E., & Marsicano, G. (2025). The Endocannabinoid System in Retinal Müller Glia: Lessons From Astrocyte Research. *Neurochemical research*, *50*(4), 206. https://doi.org/10.1007/s11064-025-04457-0

Boals, A. G., Collier, D. M., Romero, J. R., Hillard, C. J., & Park, F. (2025). Lack of Cannabinoid Type 2 Promoter Activity in Normal or Injured Kidneys Using a Cnr2-GFP Reporter Mouse. *Cannabis and cannabinoid research*, *10*(3), 400–408. https://doi.org/10.1089/can.2024.0142

Borràs-Pernas, S., Sancho-Balsells, A., Patterer, L., Wang, M., Del Toro, D., Alberch, J., Schibano, D., Espel, J., Heybeck, M., Scheidel, B., & Giralt, A. (2025). Low-dose cannabidiol treatment prevents chronic stress-induced phenotypes and is associated with multiple synaptic changes across various brain regions. *Neuropharmacology*, *277*, 110526. https://doi.org/10.1016/j.neuropharm.2025.110526

Borrega-Roman, L., Hoare, B. L., Kosar, M., Sarott, R. C., Patej, K. J., Bouma, J., Scott-Dennis, M., Koers, E. J., Gazzi, T., Mach, L., Barrondo, S., Sallés, J., Guba, W., Kusznir, E., Nazaré, M., Rufer, A. C., Grether, U., Heitman, L. H., Carreira, E. M., Sykes, D. A., … Veprintsev, D. B. (2025). A universal cannabinoid CB1 and CB2 receptor TR-FRET kinetic ligand-binding assay. *Frontiers in pharmacology*, *16*, 1469986. https://doi.org/10.3389/fphar.2025.1469986

Cañizares, S., Nuño, L., Barrio, P., Forner-Puntonet, M., Gavotti, C., Monràs, M., Gavín, P., Navinés, R., Flores, L., Barrios, M., Andreu, A., Molero, J., Jimenez, A., Vidal, J., & Lligoña, A. (2025). Alcohol and Other Substance Screening in Bariatric Surgery Candidates: Utility of Self-Report and Toxicology Tests, Including Ethyl-Glucoronide. *Obesity surgery*, *35*(4), 1242–1250. https://doi.org/10.1007/s11695-025-07774-z

Cheuque, R. P. R., Romero, I. M. V., González, L. A., Jiménez-Gallo, D., & Barrios, M. L. (2025). Nail changes in cannabis arteritis. *International journal of dermatology*, *64*(6), 1108–1109. https://doi.org/10.1111/ijd.17541

Christofi, F. L., Abalo, R., & Browning, K. N. (2025). Special Issue "Enteric Neuropathy From Basic to Clinical Practice". *Neurogastroenterology and motility*, e70095. Advance online publication. https://doi.org/10.1111/nmo.70095

Gómez-Acero, L., Varriano, F., Sánchez-Fernández, N., Ciruela, F., Soria, G., & Aso, E. (2025). Long-lasting behavioral, molecular and functional connectivity alterations after chronic THC exposure during adolescence in mice. *Progress in neuro-psychopharmacology & biological psychiatry*, 111422. Advance online publication. https://doi.org/10.1016/j.pnpbp.2025.111422

Colominas-González, E., De Antonio, M., Masip, M., Martin Conde, M. T., Cardona, G., Fresán Restituto, D., Comas, D., Roch, M. A., López, B., Torres-Bondia, F. I., Retamero, A., Knobel, H., & Luque, S. (2025). Complementary and alternative medicine in HIV care: frequency of consumption, risks and interactions with antiretroviral therapy. *European journal of hospital pharmacy : science and practice*, *32*(3), 266–271. https://doi.org/10.1136/ejhpharm-2024-004118

Del Rio Forero, D., Marín, C. P., Sastre, M. T. M., Kpanake, L., & Mullet, E. (2025). Mapping Colombians' positions on national policies to control tobacco and marijuana consumption: a pilot study. *Substance abuse treatment, prevention, and policy*, *20*(1), 16. https://doi.org/10.1186/s13011-025-00646-w

Dempster, E. L., Wong, C. C. Y., Burrage, J., Hannon, E., Quattrone, D., Trotta, G., Rodriguez, V., Alameda, L., Spinazzola, E., Tripoli, G., Austin-Zimmerman, I., Li, Z., Gayer-Anderson, C., Freeman, T. P., Johnson, E. C., Jongsma, H. E., Stilo, S., La Cascia, C., Ferraro, L., La Barbera, D., … Di Forti, M. (2025). Methylomic signature of current cannabis use in two first-episode psychosis cohorts. *Molecular psychiatry*, *30*(4), 1277–1286. https://doi.org/10.1038/s41380-024-02689-0

Dudek, K. A., Paton, S. E. J., Binder, L. B., Collignon, A., Dion-Albert, L., Cadoret, A., Lebel, M., Lavoie, O., Bouchard, J., Kaufmann, F. N., Clavet-Fournier, V., Manca, C., Guzmán, M., Campbell, M., Turecki, G., Mechawar, N., Flamand, N., Lavoie-Cardinal, F., Silvestri, C., Di Marzo, V., … Menard, C. (2025). Astrocytic cannabinoid receptor 1 promotes resilience by dampening stress-induced blood-brain barrier alterations. *Nature neuroscience*, *28*(4), 766–782. https://doi.org/10.1038/s41593-025-01891-9

El-Hammadi, M. M., Martín-Navarro, L., Berrocoso, E., Álvarez-Fuentes, J., Crespo-Facorro, B., Suárez-Pereira, I., Vázquez-Bourgon, J., & Martín-Banderas, L. (2025). Enhanced Metabolic Syndrome Management Through Cannabidiol-Loaded PLGA Nanoparticles: Development and In Vitro Evaluation. *Journal of biomedical materials research. Part A*, *113*(5), e37916. https://doi.org/10.1002/jbm.a.37916

El-Hammadi, M. M., Small-Howard, A. L., Fernández-Arévalo, M., Turner, H., & Martín-Banderas, L. (2025). Effects of combined CBGA and cannabis-derived terpene nanoformulations on TRPV1 activation: Implications for enhanced pain management. *International journal of pharmaceutics*, *679*, 125766. https://doi.org/10.1016/j.ijpharm.2025.125766

Estrada-Valencia, R., Túnez, I., Tinkov, A. A., Aschner, M., López-Goerne, T., Pedraza-Chaverrí, J., & Santamaría, A. (2025). The Inhibition of Fatty Acid Amide Hydrolase-4 Affords Neuroprotection in a Toxic Model Induced by 6-Hydroxydopamine in Caenorhabditis elegans Nematodes. *Molecular neurobiology*, 10.1007/s12035-025-05104-z. Advance online publication. https://doi.org/10.1007/s12035-025-05104-z

Fusaro, L., Bangari, D. S., Pasterkamp, R. J., Fernández-Ruiz, J., Youssef, S. A., & Sharma, A. K. (2025). Neurodegenerative Diseases: Pathogenesis and Preclinical Models for Translational Drug Discovery. *Toxicologic pathology*, 1926233251339105. Advance online publication. https://doi.org/10.1177/01926233251339105

García, G., Ahluwalia, J., Candal-Pedreira, C., Teijeiro, A., Rey-Brandariz, J., Guerra-Tort, C., Mourino, N., Casal-Acción, B., Varela-Lema, L., & Pérez-Ríos, M. (2025). The prevalence and characterisation of energy drink consumption in North America: A systematic review. *Public health*, *242*, 117–123. https://doi.org/10.1016/j.puhe.2025.02.035

García-Atienza, P., Millán-Santiago, J., Lucena, R., Cárdenas, S., Armenta, S., Herrero-Martínez, J. M., & Martínez-Pérez-Cejuela, H. (2025). Functionalized toothpicks for solid-phase microextraction of drugs from oral fluids. *Analytica chimica acta*, *1365*, 344243. https://doi.org/10.1016/j.aca.2025.344243

García-Estrada, J., Luquin, S., Pesqueda-Cendejas, K., Ruiz-Ballesteros, A. I., Campos-López, B., Meza-Meza, M. R., Parra-Rojas, I., González-Castañeda, R. E., Ramos-Lopez, O., & De la Cruz-Mosso, U. (2025). Malnutrition in Substance Use Disorders: A Critical Issue in Their Treatment and Recovery. *Healthcare (Basel, Switzerland)*, *13*(8), 868. https://doi.org/10.3390/healthcare13080868

García-Pérez, Á., González-Roz, A., Secades-Villa, R., Aonso-Diego, G., Weidberg, S., & Yoon, J. H. (2025). Assessment of contextualized reinforcement pathology in a community sample of young adult substance users. *Alcohol, clinical & experimental research*, 10.1111/acer.70050. Advance online publication. https://doi.org/10.1111/acer.70050

Garnsey, C. L., Gnall, K. E., Emrich, M., Park, C. L., Starkweather, A. R., Xu, W., Groessl, E. J., & Huedo-Medina, T. B. (2025). Baseline Participant Characteristics are Associated With Engagement in a Movement-Based RCT for Chronic Low-Back Pain. *American journal of health promotion : AJHP*, *39*(5), 744–755. https://doi.org/10.1177/08901171251315014

Garrido, J., Corral, C., García-Valverde, M. T., Hidalgo-García, J., Ferreiro-Vera, C., & Martínez-Quesada, J. J. (2025). Subcanopy and Inter-Canopy Supplemental Light Enhances and Standardizes Yields in Medicinal Cannabis (*Cannabis sativa* L.). *Plants (Basel, Switzerland)*, *14*(10), 1469. https://doi.org/10.3390/plants14101469

Gómez-Acero, L., Sánchez-Fernández, N., Subirana, P., Ciruela, F., & Aso, E. (2025). Striatal dopamine D_2, adenosine A_{2A} and cannabinoid CB_1 receptors balance as a target against non-cognitive symptoms in a mouse model of Alzheimer's disease. *Pharmacology, biochemistry, and behavior*, *249*, 173970. https://doi.org/10.1016/j.pbb.2025.173970

González-Moreno, A., Pérez-Ríos, M., Guerra-Tort, C., Santiago-Pérez, M. I., Teijeiro, A., Martin-Gisbert, L., García, G., Candal-Pedreira, C., & Rey-Brandariz, J. (2025). Evolution of the prevalence of alcohol consumption and characterization of hazardous consumption in Spain: 2005-2022. Evolución de la prevalencia de consumo de alcohol y caracterización del consumo de riesgo en España: 2005-2022. *Medicina clinica*, *164*(10), 106909. https://doi.org/10.1016/j.medcli.2025.106909

González-Roz, A., Castaño, Y., Secades-Villa, R., Janssen, T., Vallejo-Seco, G., & Blanco, C. (2025). Impulsivity traits moderate the longitudinal association between mental health and hazardous cannabis use in emerging adults. *Drug and alcohol review*, *44*(4), 1049–1061. https://doi.org/10.1111/dar.14047

Grancha, T., Garcia-Atienza, P., Armenta, S., Herrero-Martínez, J. M., Percoco, R. M., Armentano, D., Ferrando-Soria, J., & Pardo, E. (2025). Efficient removal of drugs of abuse from drinking water using metal-organic frameworks. *Journal of materials chemistry. A*, 10.1039/d5ta01530h. Advance online publication. https://doi.org/10.1039/d5ta01530h

Häge, A., Krämer, R., Dunlap, M., Mechler, K., Müller-Vahl, K. R., & Nagy, P. (2025). Emerging therapeutic approaches for Tourette syndrome and other tic disorders - a systematic review of current clinical trials. *European child & adolescent psychiatry*, *34*(6), 1719–1729. https://doi.org/10.1007/s00787-024-02637-x

Kosar, M., Perera, T., Ganzoni, R. L. Z., Sarott, R. C., Borrega-Roman, L., Vitale, R. M., Ligresti, A., Rufer, A. C., Guba, W., Grether, U., Carreira, E. M., Veprintsev, D. B., & Sykes, D. A. (2025). Profiling Allosteric Modulators of CB_1R with an Allosteric Fluoroprobe. *Angewandte Chemie (International ed. in English)*, *64*(20), e202421885. https://doi.org/10.1002/anie.202421885

Lozza, I., Martín-Sabroso, C., Hurtado-Marcos, C., Montejo-Rubio, C., Fraguas-Sánchez, A. I., & Torres-Suárez, A. I. (2025). Cannabidiol-loaded-injectable depot formulation for the treatment of triple-negative breast cancer: design, development, in-vitro and in-ovo evaluation of its anticancer activity. *International journal of pharmaceutics*, *678*, 125710. https://doi.org/10.1016/j.ijpharm.2025.125710

Madrid-Gambin, F., Haro, N., Mason, N. L., Mallaroni, P., Theunissen, E. L., Toennes, S. W., Pozo, O. J., & Ramaekers, J. G. (2025). Metabolomic profiling of cannabis use and cannabis intoxication in humans. *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*, *50*(6), 920–927. https://doi.org/10.1038/s41386-025-02082-7

Mariani, Y., Dalla-Tor, T., Garavaldi, T., Julio-Kalajzić, F., Gisquet, D., Gomez-Sotres, P., Cannich, A., Gambino, G., Drago, F., Serrat, R., Hurel, I., Chaouloff, F., Pouvreau, S., Bellocchio, L., Marsicano, G., & Covelo, A. (2025). Astroglial CB_1 Reveal Sex-Specific Synaptic Effects of Amphetamine. *Glia*, 10.1002/glia.70026. Advance online publication. https://doi.org/10.1002/glia.70026

Mateu-Mollá, J., Pérez-Gálvez, B., & Villanueva-Blasco, V. J. (2025). Pharmacological treatment for substance use disorder: A systematic review. *Addictive behaviors*, *163*, 108242. https://doi.org/10.1016/j.addbeh.2024.108242

Matheson, J., Nigatu, Y., Elton-Marshall, T., Rueda, S., Ali, F., Hamilton, H. A., Rehm, J., Le Foll, B., & Imtiaz, S. (2025). Changes in the Sex/Gender Gap in Cannabis Use in Ontario, Canada From 2001 to 2019. *Drug and alcohol review*, 10.1111/dar.14072. Advance online publication. https://doi.org/10.1111/dar.14072

Misa Garcia, A., & Ferro Rodríguez, S. (2025). Cannabis hyperemesis syndrome: an emerging clinical and public health challenge. *European journal of hospital pharmacy : science and practice*, *32*(4), 393. https://doi.org/10.1136/ejhpharm-2024-004369

Molina, V., Díez, Á., Fernández-Linsenbarth, I., Osorio-Iriarte, E., Beño-Ruiz de la Sierra, R., Martín-Santiago, O., Rodríguez-Valbuena, C., Fiorini-Talavera, J. C., & Arjona, A. (2025). Influence of recent cannabis use on altered spectral entropy modulation and connectivity strength in patients with psychosis. *European archives of psychiatry and clinical neuroscience*, 10.1007/s00406-025-02004-0. Advance online publication. https://doi.org/10.1007/s00406-025-02004-0

Montagud-Romero, S., González-Portilla, M., Mellado, S., Grandes, P., de Fonseca, F. R., Pascual, M., & Rodríguez-Arias, M. (2025). Oleoylethanolamide effects on stress-induced ethanol consumption: A lipid at the crossroads between stress, reward and neuroinflammation. *Progress in neuro-psychopharmacology & biological psychiatry*, *138*, 111365. https://doi.org/10.1016/j.pnpbp.2025.111365

Montik, N., Crescenzi, D., Marzocchini, C., Lubinski, I., Grementieri, L., Peruzzi, S., Lombó, M., Ciavattini, A., & Carnevali, O. (2025). The Role of the Endocannabinoid System in Human Gametogenesis. *International journal of molecular sciences*, *26*(9), 3996. https://doi.org/10.3390/ijms26093996

Morales-Pastor, A., Miljuš, T., Dieguez-Eceolaza, M., Stępniewski, T. M., Ledesma-Martin, V., Heydenreich, F. M., Flock, T., Plouffe, B., Le Gouill, C., Duchaine, J., Sykes, D. A., Nicholson, C., Koers, E. J., Guba, W., Rufer, A. C., Grether, U., Bouvier, M., Veprintsev, D. B., & Selent, J. (2025). Multiple intramolecular triggers converge to preferential G protein coupling in the CB_2R. *Nature communications*, *16*(1), 5265. https://doi.org/10.1038/s41467-025-60003-0

Moreno-Fernández, M., Luján, V., Baliyan, S., Poza, C., Capellán, R., de Las Heras-Martínez, N., Morcillo, M. Á., Oteo, M., Ambrosio, E., Ucha, M., & Higuera-Matas, A. (2025). A Hidden Mark of a Troubled Past: Neuroimaging and Transcriptomic Analyses Reveal Interactive Effects of Maternal Immune Activation and Adolescent THC Exposure Suggestive of Increased Neuropsychiatric Risk. *Biological psychiatry global open science*, *5*(3), 100452. https://doi.org/10.1016/j.bpsgos.2025.100452

Moreno-Rodríguez, M., Bengoetxea de Tena, I., Martínez-Gardeazabal, J., Pereira-Castelo, G., Llorente-Ovejero, A., Manuel, I., & Rodríguez-Puertas, R. (2025). Cannabinoid agonist WIN55,212-2 prevents scopolamine-induced impairment of spatial memory in rats. *European journal of pharmacology*, *998*, 177612. https://doi.org/10.1016/j.ejphar.2025.177612

Mostert, C. M., Ibanez, A., Merali, Z., Jaguga, F., & Udeh-Momoh, C. (2025). An international treaty to regulate misuse of alcohol and cannabis. *Nature medicine*, 10.1038/s41591-025-03764-x. Advance online publication. https://doi.org/10.1038/s41591-025-03764-x

Olivier, L., Andreu, H., de Juan, O., Ochandiano, I., Salmerón, S., Fernández-Plaza, T., Colomer, L., Vieta, E., Giménez-Palomo, A., & Pacchiarotti, I. (2025). Cannabis and tobacco use in bipolar disorder: Associations with early onset, psychotic symptoms, and relapse risk (2015-2019). *Journal of affective disorders*, *382*, 30–38. https://doi.org/10.1016/j.jad.2025.04.026

Ortiz-Peregrina, S., Martino, F., Casares-López, M., Granados-Delgado, P., Anera, R. G., & Castro Torres, J. J. (2025). Visual function and vehicle driving performance under the effects of cannabidiol: A randomized cross-over experiment. *Addiction (Abingdon, England)*, *120*(5), 975–983. https://doi.org/10.1111/add.16746

Pérez-Diego, M., Angelina, A., Pat, Y., Maldonado, A., Sevilla-Ortega, C., Martín-Cruz, L., Yazici, D., Rückert, B., Sokolowska, M., Martín-Fontecha, M., Akdis, M., Akdis, C. A., & Palomares, O. (2025). Cannabinoid WIN55,212-2 restores bronchial epithelium by regulating oxidative stress and STAT6 phosphorylation. *The Journal of allergy and clinical immunology*, S0091-6749(25)00551-2. Advance online publication. https://doi.org/10.1016/j.jaci.2025.05.002

Pons-Cabrera, M. T., Caballería, E., Navarro-Cortés, L., Borràs, R., Barrio, P., Manthey, J., Batalla, A., Oliveras, C., Sagué-Vilavella, M., Balcells, M., Pintor, L., & López-Pelayo, H. (2025). Substance use and psychiatric comorbidities among medical inpatients: associations with length of stay, health-related quality of life, and functioning, with consideration for gender. *Journal of psychiatric research*, *186*, 322–330. https://doi.org/10.1016/j.jpsychires.2025.04.006

Raïch, I., Lillo, J., Rebassa, J. B., Griñán-Ferré, C., Bellver-Sanchis, A., Reyes-Resina, I., Franco, R., Pallàs, M., & Navarro, G. (2025). Cannabidiol as a multifaceted therapeutic agent: mitigating Alzheimer's disease pathology and enhancing cognitive function. *Alzheimer's research & therapy*, *17*(1), 109. https://doi.org/10.1186/s13195-025-01756-0

Razmovski-Naumovski, V., Martin, J. H., Chye, R., Phillips, J. L., Lintzeris, N., Solowij, N., Lee, J., Lovell, M., Noble, B., Galettis, P., Brown, L., Fazekas, B., Clark, K., Luckett, T., McCaffrey, N., Currow, D. C., Agar, M. R., & Cannabinoids for Cancer Symptoms Research Group (CCSRG) (2025). Design Considerations for Medicinal Cannabis Clinical Trials in People Receiving Palliative Care. *Journal of pain and symptom management*, *69*(5), e395–e408. https://doi.org/10.1016/j.jpainsymman.2025.02.009

Rodríguez-Sáez, J. L., Martín-Antón, L. J., Salgado-Ruiz, A., & Carbonero-Martín, M. Á. (2025). Emerging adulthood, socioemotional variables and mental health in Spanish university students. *BMC psychology*, *13*(1), 531. https://doi.org/10.1186/s40359-025-02804-y

Rojas-Valverde, D., Stocco de Camargo, R., Calleja-González, J., Muñoz-Jiménez, J., Tuesta, M., Badri Al-Mhanna, S., Ziegenfuss, T. N., Cannataro, R., & Bonilla, D. A. (2025). Re: "Cannabis Is Not Doping" by Aguiar. *Cannabis and cannabinoid research*, *10*(3), 491–492. https://doi.org/10.1089/can.2024.0034

Sancho-Domingo, C., Carballo, J. L., Coloma-Carmona, A., Pelegrín Muñoz, A., & van-der Hofstadt, C. (2025). Alcohol and cannabis as sleep aids among adolescents and associations with sleep quality and problematic use. *Addictive behaviors*, *165*, 108304. https://doi.org/10.1016/j.addbeh.2025.108304

Serrano, M., Saumell-Esnaola, M., Ocerin, G., García del Caño, G., Soria-Gómez, E., Mimenza, A., Puente, N., Bonilla-Del Río, I., Ramos-Uriarte, A., Reguero, L., Christie, B. R., Rodríguez de Fonseca, F., Rodríguez-Arias, M., Gerrikagoitia, I., & Grandes, P. (2025). Omega-3 Fatty Acids Mitigate Long-Lasting Disruption of the Endocannabinoid System in the Adult Mouse Hippocampus Following Adolescent Binge Drinking. *International Journal of Molecular Sciences*, *26*(12), 5507. https://doi.org/10.3390/ijms26125507

Szerman, N., Vega, P., Roncero, C., Peris, L., Grau-López, L., & Basurte-Villamor, I. (2025). Cariprazine as a maintenance treatment in dual schizophrenia: a 6-month observational study in patients with schizophrenia and cannabis use disorder. *International clinical psychopharmacology*, *40*(3), 167–175. https://doi.org/10.1097/YIC.0000000000000568

Targa, A. D. S., Dos Santos-Lima, G. Z., Rodrigues, L. S., Cavalcante, S. F., Fontenele-Araújo, J., Torterolo, P., Fagotti, J., Ilkiw, J., Noseda, A. C. D., Trombetta-Lima, M., Dorieux, F., Dominico, P. S., Sogayar, M. C., Andersen, M. L., Stern, C. A., & Lima, M. M. S. (2025). The cannabinoid CB_2 receptor: improvement of sleep or memory in rotenone model of Parkinson's disease. *European journal of pharmacology*, *1000*, 177745. https://doi.org/10.1016/j.ejphar.2025.177745

Teijeiro, A., Pérez-Ríos, M., García, G., Martin-Gisbert, L., Candal-Pedreira, C., Rey-Brandariz, J., Guerra-Tort, C., Varela-Lema, L., & Mourino, N. (2025). Consumption of energy drinks among youth in Spain: trends and characteristics. *European journal of pediatrics*, *184*(6), 365. https://doi.org/10.1007/s00431-025-06177-7

Tognin, S., Vieira, S., Oliver, D., Cullen, A. E., Kempton, M. J., Fusar-Poli, P., Mechelli, A., Dazzan, P., Merritt, K., Maat, A., de Haan, L., Lawrie, S. M., van Amelsvoort, T., Arango, C., Nelson, B., Galderisi, S., Bressan, R., Kwon, J. S., Mizrahi, R., PSYSCAN Consortium, … McGuire, P. (2025). PSYSCAN multi-centre study: baseline characteristics and clinical outcomes of the clinical high risk for psychosis sample. *Schizophrenia (Heidelberg, Germany)*, *11*(1), 66. https://doi.org/10.1038/s41537-025-00598-x

Vélez Pérez, L., Carmona Márquez, J., González Ponce, B. M., & Fernández Calderón, F. (2025). Psychometric properties of the Spanish simultaneous alcohol and cannabis motives measure (S-SMM) and its short form (S-SMM-SF) among young adults. *The American journal of drug and alcohol abuse*, 1–11. Advance online publication. https://doi.org/10.1080/00952990.2025.2484532

West, N. E., Konstan, M. W., Flume, P. A., VanDevanter, D. R., Magaret, A., Mazurek, H., Amelina, E. L., Laki, I., Chiron, R., Sutharsan, S., Columbo, C., Dorkin, H. L., Downey, D., Sole, A., Hjelte, L., Tullis, E., Dgetluck, N., Dinh, Q., Constantine, S., White, B., … JBT101-CF-002 Study Group (2025). Cannabinoid receptor 2 agonist, lenabasum, for the treatment of pulmonary exacerbations in cystic fibrosis. *Journal of cystic fibrosis : official journal of the European Cystic Fibrosis Society*, S1569-1993(25)00111-0. Advance online publication. https://doi.org/10.1016/j.jcf.2025.03.015

Wreven, E., de Adana, M. S. R., Hardivillé, S., Gmyr, V., Kerr-Conte, J., Chetboun, M., Pasquetti, G., Delalleau, N., Thévenet, J., Coddeville, A., Herrera, M. J. V., Hinden, L., Espínola, I. C. B., Duro, M. G., Salido, L. S., Linares, F., Bermúdez-Silva, F. J., Tam, J., Bonner, C., Egan, J. M., … González-Mariscal, I. (2025). Correction: Pharmaceutical targeting of the cannabinoid type 1 receptor impacts the crosstalk between immune cells and islets to reduce insulitis in humans. *Diabetologia*, *68*(4), 902. https://doi.org/10.1007/s00125-025-06372-z

Composición de la Junta Directiva de la SEIC

Presidenta: Cristina Sánchez (Universidad Complutense de Madrid)

Vicepresidente: Andrés Ozaita (Universidad Pompeu Fabra, Barcelona)

Secretaria: Onintza Sagredo (Universidad Complutense de Madrid)

Tesorera: Nadine Jagerovic (Instituto de Química Médica-CSIC, Madrid)

Vocales:

Nagore Puente (Universidad del País Vasco)

Patricia Rivera (Hospital Universitario Regional de Málaga-IBIMA)

Leyre Urigüen (Universidad del País Vasco)

Cristina Miralpeix (INSERM, Neurocentre Magendie, Burdeos, Francia)

Gunter van der Walt (Universidad Autónoma de Barcelona)

Dirección de contacto de la SEIC

Sociedad Española de Investigación sobre Cannabinoides (SEIC)
Departamento de Bioquímica y Biología Molecular
Facultad de Medicina, Universidad Complutense
Ciudad Universitaria, s/n, 28040 Madrid
Teléfono: 913941450/4; e-mail: **info@seic.es**
Dirección Web: **http://www.seic.es**
Dirección redes sociales: **rrsseic@seic.es**