

Curriculum Vitae

INFORMAZIONI PERSONALI

Nome IGNAZIO
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FORMAZIONE TITOLI

PROFESSIONAL EXPERIENCE:

2026-to present

Assistant Professor in Biochemistry

Department of Chemical and Pharmaceutical Biological Sciences and Technologies - University of Palermo, Italy

2024-2026

Postdoctoral researcher in Biochemistry funded by Umberto Veronesi Foundation

-Winner of the **competitive** Post-doctoral Fellowships 2025 - 2 Years Grant

OPUNTIA - Inflammation related antiProliferative effects of bioaccessible fraction of Opuntia Ficus Indica fruit: Sicilian diet meets AI for the prevention of intestinal neoplastic transformation

-Winner of the **competitive** Post-doctoral Fellowships 2024 - 1 Year Grant

NeGePrE - Comparison of cytotoxicity of tobacco smoke and vapor/aerosol extracts derived from Next-Generation Products on human Erythrocytes

Department of Chemical and Pharmaceutical Biological Sciences and Technologies - University of Palermo, Italy

2023-2024

Postdoctoral researcher in Biochemistry funded by Regione Siciliana

Effect of the bioactive phytochemical Indicaxanthin in an insulin-related neurodegeneration cell model

Supervised by Prof. Luisa Tesoriere

Department of Chemical and Pharmaceutical Biological Sciences and Technologies - University of Palermo, Italy

Investigation of the protective effects of the phytochemical Indicaxanthin, in an insulin-related neurodegeneration *in vitro* model using SHSY-5Y cells and methylglyoxal. Our preliminary results show that Indicaxanthin restore the insulin-signaling, inhibiting the over-expression of protein TAU through the modulation of IRS-1/AKT/GSK3 pathway.

EDUCATION:

2022

PhD Europaeus in Molecular and Biomolecular Sciences – thesis in Biochemistry

Cigarette smoke induces p38 MAPK-initiated and Fas-mediated eryptosis

Supervised by Prof. Luisa Tesoriere and Dr. Alessandro Attanzio

Department of Chemical and Pharmaceutical Biological Sciences and Technologies - University of Palermo, Italy

Since smoker subjects have a higher level of eryptotic RBCs, in my thesis I deepened a possible pathway foreseeing the use of an *ex vivo* model using RBCs and cigarette smoke extract. The data obtained provides evidence that, in mature erythrocytes, stimulation of p38 MAPK by cigarette smoke extract may sensitizes the cells to Fas-induced caspase activation driving the cell fate toward programmed death. A pathway that at the best of our knowledge had never been investigated. In the light of the detrimental effects of eryptotic RBCs on both endothelial cells and platelets that include vascular inflammation and blood clotting, the results suggest p38 MAPK as a potential molecular target for preventing excessive eryptosis in smokers and mitigate the associated vaso-occlusive complications.

2021-2022

Period of research abroad

Supervised by Prof. Antonio Cilla Tatay and Prof. Guadalupe Garci a Llatas

Department of Food Science and Nutrition, Faculty of Pharmacy - University of Valencia, Spain

During my PhD course, in parallel with my doctoral project, I spent 6 months abroad evaluating anti-eryptotic effect of plant sterols and Indicaxanthin at nutritional relevant concentration, in an *ex vivo* model using RBCs and cigarette smoke extract.

2019

Master's degree in Pharmaceutical Sciences

Increased circulating eryptotic red blood cells in smokers is associated with antioxidant status and C-reactive protein levels

Supervised by Prof. Luisa Tesoriere

University of Palermo, Italy

The results obtained during my experimental thesis have demonstrated, for the first time, that in healthy subjects the inflammatory state and oxidative environment caused by cigarette smoke are associated with increased level of eryptotic erythrocytes, a relationship not yet described.

2019

Qualified as Pharmacist

Italy

In agreement with regulations, I can practice the profession EU-wide.

2018

Curricular internship

Pharmacy Palermo by Dr. Calogero Palermo - Palazzo Adriano, Palermo, Italy

My degree included 900 hours of internship in pharmacy for obtaining the title. During these I mostly supplied medicines accordingly with National Health Service regulations to the patients, dealing information and health education on the population, managed the products through specific electronic systems and gained experience in terms of administration of the pharmacy and tax disciplines.

2017

Extra-curricular internship abroad in laboratory

Supervised by Dr. Antonio Cilla Tatay

Area of Biochemistry and Molecular Biology, Faculty of Pharmacy - University of Valencia, Spain

Before to start my experimental thesis at University of Palermo, I spent 40 days at Bionutest lab for starting to manage cell cultures and for value antioxidant effects of anthocyanins and polyphenols extracted by plant species.

2010

High school leaving qualification in Scientific Studies

Liceo Scientifico G. D'Alessandro - Bagheria, Palermo, Italy

ASSOCIAZIONI SCIENTIFICHE

From 2025

ECCO member

European Crohn's and Colitis Organisation (ECCO)

From 2021

FEBS member

Federation of European Biochemical Societies (FEBS)

SIB member

Italian Society of Biochemistry and Molecular Biology (SIB)

PUBBLICAZIONE

1. Giardina, I.C., Makran, M., **Restivo, I.**, Pappalardo, F., Garcia-Llatas, G., Barbalace, M.C., Tesoriere, L., Cilla, A., Attanzio, A. (2026) Anti-Inflammatory Activity of In Vitro Digested Manna in a Caco-2 and RAW264.7 Cells Co-Culture Model of Inflammatory Bowel Disease. *Antioxidants*. 15(5):601. <https://doi.org/10.3390/antiox15050601>
2. Massaro, A., Allegra, M., Pollara, F. M., Calandrino, A., Tesoriere, L., & ***Restivo, I.** (2026). Tobacco heating product aerosol triggers PKC-dependent eryptosis: Biochemical insights. *Chemico-Biological Interactions*, 431, 112011. <https://doi.org/10.1016/j.cbi.2026.112011>
3. Barbera, M., Cucina, A., Sciarba, L., Garofalo, G., Allegra, M., Indelicato, S., Ioppolo, A., Marra, F. P., Gaglio, R., Piazzese, D., Avellone, G., Tesoriere, L., Settanni, L., & **Restivo, I.** (2026). Functional bread produced with olive mill wastewater lowers oxidative stress in healthy adults. *Food Bioscience*, 60, 108581. <https://doi.org/10.1016/j.fbio.2026.108581>
4. **Restivo, I.**, & Hmeljak, J. (2026). Research highlights: Hidden gems. *FEBS Journal*, 293(7), 1882–1885. <https://doi.org/10.1111/febs.70350>
5. Mauro, M., Attanzio, A., Buzzanca, C., et al. (2026). Supplemented feed for broiler chickens: The influence of red grape pomace and grape seed flours on meat characteristics. *Animals*, 16(2), 280. <https://doi.org/10.3390/ani16020280>
6. Terzo, S., Calvi, P., **Restivo, I.**, Massaro, A., Tesoriere, L., Fernández-Real, J. M., Giardina, M., Amato, A., Mulè, F., & Allegra, M. (2025). Opuntia ficus-indica fruit consumption improves insulin resistance in mice with diet-induced obesity. *Journal of the Science of Food and Agriculture*. Advance online publication. <https://doi.org/10.1002/jsfa.70038>
7. Tkachenko, A., Alfihili, M. A., Alsughayyir, J., Attanzio, A., Mamun Bhuyan, A. A., Bukowska, B., Cilla, A., Quintanar-Escorza, M. A., Föller, M., Havranek, O., Jilani, K., Onishchenko, A., Pretorius, E., Prokopiuk, V., **Restivo, I.**, Tesoriere, L., Virzi, G. M., & Wieder, T. (2025). Current understanding of eryptosis: Mechanisms, physiological functions, role in disease, pharmacological applications, and nomenclature recommendations. *Cell Death & Disease*, 16(1), 467. <https://doi.org/10.1038/s41419-025-07784-w>
8. Longo, F., Massaro, A., Mauro, M., Allegra, M., Arizza, V., Tesoriere, L., & ***Restivo, I.** (2025). Cooperative interaction of hyaluronic acid with epigallocatechin-3-O-gallate and xanthohumol in targeting the NF- κ B signaling pathway in a cellular model of rheumatoid arthritis. *Antioxidants*, 14, 713. <https://doi.org/10.3390/antiox14060713>

9. **Restivo, I.**, Badalamenti, N., Bruno, M., Giardina, I. C., Massaro, A., Allegra, M., Tesoriere, L., & Attanzio, A. (2025). Antioxidant activity of Pressafonin-A isolated from Sicilian *Ferulago nodosa* (L.) Boiss. roots and its proapoptotic effect through ROS-dependent p53/p21Waf1/Cip1 pathway in human melanoma A-375 cells. *Journal of Food Biochemistry*. <https://doi.org/10.1155/jfbc/835397>
10. **Restivo, I.**, Sciarba, L., Indelicato, S., Allegra, M., Lino, C., Garofalo, G., Bongiorno, D., Davino, S., Avellone, G., Settanni, L., Tesoriere, L., & Gaglio, R. (2025). Repurposing olive oil mill wastewater into a valuable ingredient for functional bread production. *Foods*, *14*, 1945. <https://doi.org/10.3390/foods14111945>
11. Massaro, A., Calvi, P., **Restivo, I.**, Giardina, M., Mulè, F., Tesoriere, L., Amato, A., Nuzzo, D., Picone, P., Terzo, S., & Allegra, M. (2025). Kumquat fruit administration counteracts dysmetabolism-related neurodegeneration and the associated brain insulin resistance in high-fat diet-fed mice. *International Journal of Molecular Sciences*, *26*, 3077. <https://doi.org/10.3390/ijms26073077>
12. Zarrella, S., Miranda, M. R., Covelli, V., **Restivo, I.**, Novi, S., Pepe, G., Tesoriere, L., Rodriguez, M., Bertamino, A., Campiglia, P., Tecce, M. F., & Vestuto, V. (2025). Endoplasmic reticulum stress and its role in metabolic reprogramming of cancer. *Metabolites*, *15*, 221. <https://doi.org/10.3390/metabo15040221>
13. Terzo, S., Amato, A., Calvi, P., Nuzzo, D., Palumbo-Piccione, A., Giardina, I. C., Massaro, A., **Restivo, I.**, Attanzio, A., Tesoriere, L., Allegra, M., & Mulè, F. (2024). Positive impact of indicaxanthin from *Opuntia ficus indica* fruit against high-fat diet-induced neuronal damage and dysbiosis. *Neural Regeneration Research*. <https://doi.org/10.4103/NRR.NRR-D-23-02039>
14. **Restivo, I.**, Giardina, I. C., Barone, R., Cilla, A., Burgio, S., Allegra, M., Tesoriere, L., & Attanzio, A. (2024). Indicaxanthin prevents eryptosis induced by cigarette smoke extract by interfering with active Fas-mediated signaling. *BioFactors*, *50*(5), 997–1008. <https://doi.org/10.1002/biof.2051>
15. Mauro, M., Vazzana, M., Attanzio, A., Gurrieri, E., **Restivo, I.**, Badalamenti, R., Corazza, E., Sallemi, S., Russello, S., Fabbri, A., et al. (2023). The effects of red-grape seed and pomace-flour dietary supplementation on broiler chickens. *Sustainability*, *15*, 16289. <https://doi.org/10.3390/su152316289>
16. **Restivo, I.**, Basilicata, M. G., Giardina, I. C., Massaro, A., Pepe, G., Salvati, E., Pecoraro, C., Carbone, D., Cascioferro, S., Parrino, B., et al. (2023). A combination of polymethoxyflavones from *Citrus sinensis* and prenylflavonoids from *Humulus lupulus* counteracts IL-1-induced differentiated Caco-2 cell dysfunction via modulation of NF- κ B/Nrf2 activation. *Antioxidants*, *12*, 1621. <https://doi.org/10.3390/antiox12081621>
17. Pojero, F., Gervasi, F., Fiore, S. D., Aiello, A., Bonacci, S., Caldarella, R., Attanzio, A., Candore, G., Caruso, C., Ligotti, M. E., Procopio, A., **Restivo, I.**, Tesoriere, L., Allegra, M., & Accardi, G. (2023). Anti-inflammatory effects of nutritionally relevant concentrations of oleuropein and hydroxytyrosol on peripheral blood mononuclear cells: An age-related analysis. *International Journal of Molecular Sciences*, *24*, 11029. <https://doi.org/10.3390/ijms241311029>
18. Gambino, G., Giglia, G., Allegra, M., Di Liberto, V., Zummo, F. P., Rappa, F., **Restivo, I.**, Vetrano, F., Saiano, F., Palazzolo, E., Avellone, G., Ferraro, G., Sardo, P., & Di Majo, D. (2023). “Golden” tomato consumption ameliorates metabolic syndrome: A focus on the redox balance in the high-fat-diet-fed rat. *Antioxidants*, *12*(5), 1121. <https://doi.org/10.3390/antiox12051121>
19. **Restivo, I.**, Attanzio, A., Tesoriere, L., Allegra, M., Garcia Llatas, G., & Cilla, A. (2023). A mixture of dietary plant sterols at physiological serum concentration inhibits the extrinsic pathway of eryptosis induced by cigarette smoke extract. *International Journal of Molecular Sciences*, *24*(2), 1264. <https://doi.org/10.3390/ijms24021264>
20. Di Prima, G., Belfiore, E., Migliore, M., Scarpaci, A. G., Angellotti, G., **Restivo, I.**, Allegra, M., Arizza, V., & De Caro, V. (2022). Green extraction of polyphenols from waste bentonite to produce functional antioxidant excipients for cosmetic and pharmaceutical purposes: A waste-to-market approach. *Antioxidants*, *11*(12), 2493. <https://doi.org/10.3390/antiox11122493>
21. Attanzio, A., **Restivo, I.**, Tutone, M., Tesoriere, L., Allegra, M., & Livrea, M. A. (2022). Redox properties, bioactivity and health effects of indicaxanthin, a bioavailable phytochemical from *Opuntia ficus indica*, L.: A critical review of accumulated evidence and perspectives. *Antioxidants*, *11*, 2364. <https://doi.org/10.3390/antiox11122364>
22. **Restivo, I.**, Attanzio, A., Giardina, I. C., Di Gaudio, F., Tesoriere, L., & Allegra, M. (2022). Cigarette smoke extract induces p38 MAPK-initiated, Fas-mediated eryptosis. *International Journal of Molecular Sciences*, *23*, 14730. <https://doi.org/10.3390/ijms232314730>
23. **Restivo, I.**, Attanzio, A., Tesoriere, L., Allegra, M., Garcia Llatas, G., & Cilla, A. (2022). Anti-eryptotic activity of food-derived phytochemicals and natural compounds. *International Journal of Molecular Sciences*, *23*(6), 3019. <https://doi.org/10.3390/ijms23063019>
24. Culletta, G., Allegra, M., Almerico, A. M., **Restivo, I.**, & Tutone, M. (2022). In silico design, synthesis, and biological evaluation of anticancer arylsulfonamides endowed with anti-telomerase activity. *Pharmaceuticals*, *15*, 82. <https://doi.org/10.3390/ph15010082>

25. Gaglio, R., Barbera, M., Tesoriere, L., Osimani, A., Busetta, G., Matraxia, M., Attanzio, A., **Restivo, I.**, Aquilanti, L., & Settanni, L. (2021). Sourdough “ciabatta” bread enriched with powdered insects: Physicochemical, microbiological, and simulated intestinal digesta functional properties. *Innovative Food Science & Emerging Technologies*, 72, 102755. <https://doi.org/10.1016/j.ifset.2021.102755>
26. Cilla, A., López-García, G., Barberá, R., Frazzitta, A., **Restivo, I.**, Tesoriere, L., & Attanzio, A. (2021). Antiproliferative effects of bioaccessible fractions of honeys from Sicilian black honeybee (*Apis mellifera* ssp. *sicula*) on human colorectal carcinoma cells. *International Journal of Food Science & Technology*, 57(5), 2636–2645. <https://doi.org/10.1111/ijfs.15169>
27. Gaglio, R., Barbaccia, P., Barbera, M., **Restivo, I.**, Attanzio, A., Maniaci, G., Di Grigoli, A., Francesca, N., Tesoriere, L., Bonanno, A., Moschetti, G., & Settanni, L. (2021). The use of winery by-products to enhance the functional aspects of the fresh ovine “primosale” cheese. *Foods*, 10(2), 461. <https://doi.org/10.3390/foods10020461>
28. Gaglio, R., **Restivo, I.**, Barbera, M., Barbaccia, P., Ponte, M., Tesoriere, L., Bonanno, A., Attanzio, A., Di Grigoli, A., Francesca, N., Moschetti, G., & Settanni, L. (2021). Effect on the antioxidant, lipoperoxyl radical scavenger capacity, nutritional, sensory and microbiological traits of an ovine stretched cheese produced with grape pomace powder addition. *Antioxidants*, 10, 306. <https://doi.org/10.3390/antiox10020306>
29. **Restivo, I.**, Attanzio, A., Tesoriere, L., & Allegra, M. (2021). Suicidal erythrocyte death in metabolic syndrome. *Antioxidants*, 10, 154. <https://doi.org/10.3390/antiox10020154>
30. **Restivo, I.**, Tesoriere, L., Frazzitta, A., Livrea, M. A., Attanzio, A., & Allegra, M. (2020). Anti-proliferative activity of a hydrophilic extract of manna from *Fraxinus angustifolia* Vahl through mitochondrial pathway-mediated apoptosis and cell cycle arrest in human colon cancer cells. *Molecules*, 25(21), 5055. <https://doi.org/10.3390/molecules25215055>
31. Allegra, M., D’Anneo, A., Frazzitta, A., **Restivo, I.**, Livrea, M. A., Attanzio, A., & Tesoriere, L. (2020). The phytochemical indicaxanthin synergistically enhances cisplatin-induced apoptosis in HeLa cells via oxidative stress-dependent p53/p21/waf1 axis. *Biomolecules*, 10(7), 994. <https://doi.org/10.3390/biom10070994>
32. Allegra, M., **Restivo, I.**, Fucarino, A., Pitruzzella, A., Vasto, S., Livrea, M. A., Tesoriere, L., & Attanzio, A. (2020). Proapoptotic activity of 4-hydroxynonenal: A new potential physiopathological role for lipid peroxidation products. *Biomolecules*, 10(5), 770. <https://doi.org/10.3390/biom10050770>

ALTRE ATTIVITÀ

PARTICIPATION IN SCIENTIFIC CONFERENCES:

From 2021

2 chair session, 8 oral presentations and 6 poster presentations:

1. Tobacco heating product aerosol extract triggers PKC-dependent eryptosis via Ca²⁺ signaling and cytoskeletal disruption. **Poster presentation** at 63th National Congress of Italian Biochemistry and Molecular Biology Society.

Palermo - 10-12 settembre **2025**.

2. **Chairman** for Speed talk session at Nutrition, Environment, And Biomembranes: Interaction And Emerging Perspectives a Joint Meeting of the SIB Groups 'Nutrition and Environment' & 'Membranes'. Bologna, Italy – 27th-29th May 2025;

3. Synergistic Effects of Hyaluronic Acid, Epigallocatechin-3-O-gallate, and Xanthohumol on NF-κB Pathway Modulation in a Rheumatoid Arthritis Model. **Oral presentation** at Nutrition, Environment, And Biomembranes: Interaction And Emerging Perspectives a Joint Meeting of the SIB Groups 'Nutrition and Environment' & 'Membranes'. Bologna, Italy – 27th-29th May 2025;

4. Comparison of Cytotoxicity of Tobacco Smoke and Vapor/Aerosol Extract Derived from Next-generation Products on Erythrocytes. **Selected Flash Talk** at 3rd FEBS-IUBMB-ENABLE Congress. Singapore – 4th-6th

December 2024;

5. Eryptotic activity of aerosol extract derived from heated tobacco products. Oral presentation at Meeting "Intersezioni" of the regional SIB section of Puglia-Basilicata-Calabria and Sicily. Messina, Italy – 3rd-5th October 2024;
6. Kumquat fruit intake ameliorates dysmetabolism-related neurodegeneration in the high-fat diet-fed mice. Poster presentation at 48th FEBS Congress. Milan, Italy- 29th June-3th July 2024;
7. Phytochemical Indicaxanthin from *Opuntia ficus-indica* (L. Mill) fruit at nutritional relevant plasma concentration inhibits eryptosis induced by cigarette smoke extract. Poster presentation at National Congress of Italian Biochemistry and Molecular Biology Society 2023. Florence, Italy - 7th-9th September 2023;
8. Evaluation of the neuroprotective potential of Indicaxanthin from *Opuntia ficus indica* fruit against dysmetabolism-related neurodegeneration in high-fat-diet-fed mice. Selected oral presentation at Young Scientists' Forum 2023 (YSF 2023) and Poster presentation at 47th FEBS Congress. Tours, France - 6th-12th July 2023;
9. Nutritional relevant concentrations of indicaxanthin and a mixture of plant sterols inhibit extrinsic-pathway of eryptosis induced by cigarette smoke extract. Poster presentation at 1st FEBS-IUBMB-ENABLE Congress Seville, Spain - 16th-18th November 2022;
10. Cigarette smoke extract induced extrinsic eryptosis initiated via p38 MAPK. Selected oral presentation at FEBS-IUBMB-PABMB Congress 2022 - The Biochemistry Global Summit. Lisbon, Portugal – 9th-14th July 2022;
11. Anti-eryptotic activity of indicaxanthin and a mixture of plant sterols at physiological concentrations against cigarette smoking extracts. Poster presentation at 3rd International Conference on Food Bioactives & Health. Parma, Italy – 21th-24th June 2022;
12. Cigarette smoke extract-induced eryptosis is modulated by p38 MAPK-ceramide axis and inhibited by indicaxanthin. Selected oral presentation at SIB 33nd "A. Castellani" National meeting of PhD students in Biochemical sciences. Brallo di Pregola, Italy - 6th-9th June 2022;
13. Nobiletin and xanthoumol extracted by agri-food industrial waste exert synergistic anti-inflammatory effects. Oral presentation at Supramed National Meeting. Palermo, Italy – 28th April 2022;
14. Cigarette smoke extract induces eryptosis by Death Inducing Signaling Complex (DISC) assembly leading to ceramide formation and p38 MAPK activation. Oral presentation at SIB 32nd "A. Castellani" National meeting of PhD students in Biochemical sciences. Brallo di Pregola, Italy - 13th-16th September 2021.