

BIOGRAPHICAL SKETCH

NAME: Chiara Ciaccio

POSITION TITLE: Tenure-Track Researcher (Type B) of Biochemistry (BIOS-07/A)

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
University of Rome "Roma tre"	Biological Sciences	07/2000	Molecular Biology
University of Rome "Tor Vergata", Rome, Italy	Ph.D.	03/2005	Biochemistry and Molecular Biology

A. Personal Statement

I am a biochemist with over 20 years of experience in academic research. My scientific career has developed at the University of Rome Tor Vergata, where I progressed from a doctoral fellow to my current position as a tenure-track researcher (RTDb) in Biochemistry. My research has primarily focused on the structural and functional characterization of metalloproteins and redox-active enzymes, with particular attention to oxidative stress, protein misfolding, and the regulation of enzymatic activity under pathological conditions. My research journey began with a strong foundation in bioinorganic chemistry, which was further strengthened by international training as a visiting scientist at BOKU University in Vienna. Over time, my scientific interests have expanded to encompass biomedical applications, leading to significant contributions in the study of hemoprotein function, enzyme-substrate interactions, and the molecular mechanisms underlying diseases such as Rett syndrome, tuberculosis, and osteosarcoma. I have a particular interest in redox signaling pathways and the role of oxidative and proteolytic processes in disease pathogenesis.

I have participated in several national research projects and am currently the Principal Investigator of a funded university project examining the therapeutic potential of polyphenols as pro-oxidant agents in osteosarcoma. I am also actively engaged in collaborative initiatives funded by the Italian Ministry of Health. My work has led to over 75 peer-reviewed publications and a national patent for a diagnostic method for Rett syndrome. In parallel with my research, I have developed a robust teaching portfolio, delivering graduate courses in Chemistry and Biochemistry in both Italian and international programs, including in Albania. I also contribute to science dissemination and education by organizing international conferences and mentoring students. My current research efforts aim to further elucidate the crosstalk between redox metabolism and cancer signaling, with the long-term goal of identifying innovative molecular targets for therapy and diagnostics.

B. Positions and Research Experience

2023–present: Researcher RTDb in Biochemistry, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Italy

2008–2023: Research Technician with research responsibilities, Department of Experimental Medicine and Biochemical Sciences, University of Rome Tor Vergata, Italy

2017: National Scientific Qualification as Associate Professor, Competition Sector 05/E1, SSD BIO/10

2008–2009: Research Fellowship, University of Rome Tor Vergata

2006–2007: Postdoctoral Fellowship, University of Rome Tor Vergata

2006: Qualification at the National Council of Biology

2005–2006: Fellowship, University of Rome Tor Vergata

2002–2003: Visiting Scientist, Institute of Biochemistry, Metalloprotein Research Group, Department of Chemistry, BOKU – University of Natural Resources and Life Sciences, Vienna, Austria

Other Scientific Appointments and Activities

2025: Ad hoc reviewer for research proposals, Croatian Science Foundation

2023: Guest Editor, Special Issue on *Bone Cell Responses*, *International Journal of Molecular Sciences* (MDPI)

Conference Organization

2022: Organizing Committee Member, 21st International Conference on Oxygen Binding and Sensing Proteins (O2BIP), Rome

2005: Organizing Committee Member, COST Chemistry D21 Workshop on Metalloenzymes, Rome

Regular speaker at national and international conferences in biochemical sciences

C. Contributions to Science

Total Publications: 75+ peer-reviewed articles

H-index: 24 | **Citations:** 1925 (Scopus)

1. Study of the Antitumor Activity of Phytoestrogens in Osteosarcoma Models

I investigated the anticancer properties of dietary phytoestrogens in human osteosarcoma cells, focusing on their molecular targets and signaling pathways. My findings demonstrated that specific phytoestrogens modulate cell proliferation, apoptosis, and migration by interacting with estrogen receptors and redox-sensitive transcription factors—highlighting their potential as adjuvant agents in osteosarcoma therapy.

Selected publications:

- Buglione A., Gioia M., Sinibaldi F., Marini S., and **Ciaccio C.** Iron-Related Metabolic Targets in the Treatment of Osteosarcoma: Research Progress and Prospects. *Biomedicines*, 2025 (under review).
- Cimmino A, Gioia M, Clementi ME, Faraoni I, Marini S, **Ciaccio C.** Polydatin-Induced Shift of Redox Balance and Its Anti-Cancer Impact on Human Osteosarcoma Cells. *Curr Issues Mol Biol.* 2024 Dec 31;47(1):21.
- Cimmino A, Fasciglione GF, Gioia M, Marini S, **Ciaccio C.** Multi-Anticancer Activities of Phytoestrogens in Human Osteosarcoma. *Int J Mol Sci.* 2023 Aug 28;24(17):13344

2. Effect of mechanical Stimulation in the Metastatic Phenotype of Osteosarcoma

I contributed to studies on how mechanical stimuli influence osteosarcoma progression. Through in vitro biomechanical models, we investigated cytoskeletal remodeling, gene expression, and metastatic behavior in response to physical forces—uncovering the importance of the tumor microenvironment in cancer dissemination.

Selected publications:

- Buglione, A.; Becerril Rodriguez, D.; Dogali, S.; Alloisio, G.; **Ciaccio, C.**; Luce, M.; Marini, S.; Campagnolo, L.; Cricenti, A.; Gioia, M. A ‘Spicy’ Mechanotransduction Switch: Capsaicin-Activated TRPV1 Receptor Modulates Osteosarcoma Cell Behavior and Drug Sensitivity. *Int. J. Mol. Sci.* 2025, 26, 8816.
- Buglione A, Alloisio G, **Ciaccio C**, Rodriguez DB, Dogali S, Luce M, Marini S, Cricenti A, Gioia M. GsMTx-4 venom toxin antagonizes biophysical modulation of metastatic traits in human osteosarcoma cells. *Eur J Cell Biol.* 2025 Mar;104(1):151469.
- Alloisio G., Becerril Rodriguez D., Luce M., **Ciaccio C.**, Marini S., Cricenti A. and Gioia M. Cyclic Stretch-Induced Mechanical Stress Applied at 1 Hz Frequency Can Alter the Metastatic Potential Properties of SAOS-2 Osteosarcoma Cells by *Int. J. Mol. Sci.* 2023, 24(9), 7686.
- Alloisio G.*, **Ciaccio C.***, Fasciglione G.F., Tarantino U., Marini S., Coletta M., Gioia M., Effects of extracellular osteoanabolic agents on the endogenous response of osteoblastic cells, *Cells*, 2021, 10(9), 2383. *These authors have equally contributed to the study (*Equal contribution)

3. Biochemical and functional characterization of hemoproteins with “ β -barrel” folding

I have investigated bacterial and mammalian hemoproteins with β -barrel architecture, focusing on ligand binding, redox properties, and oxidative stress responses. These studies advanced our understanding of how structural features regulate function and reactivity, especially under physiological and pathophysiological conditions.

Selected publications:

- **Ciaccio C**, Coletta, A., Coletta, M. Role of hemoglobin structural functional relationships in oxygen transport. *Molecular Aspects of Medicine*, 2022, 84, 101022.
- De Simone, G., di Masi, A., Fattibene, P., **Ciaccio C.**, Platas-Iglesias C., Coletta M., Pesce A., Ascenzi P., Oxygen-mediated oxidation of ferrous nitrosylated nitrobindins, *J Inorg Biochem.* 2021 Nov; 224:111579.
- De Simone G, di Masi A, Pesce A, Bolognesi M, **Ciaccio C**, Tognaccini L, Smulevich G, Abbruzzetti S, Viappiani C, Bruno S, Monaca SD, Pietraforte D, Fattibene P, Coletta M, Ascenzi P. Mycobacterial and Human Ferrous Nitrobindins: Spectroscopic and Reactivity Properties. *Int J Mol Sci.* 2021 Feb 7;22(4):1674.
- De Simone G, di Masi A, **Ciaccio C**, Coletta M, Ascenzi P. NO Scavenging through Reductive Nitrosylation of Ferric Mycobacterium tuberculosis and Homo sapiens Nitrobindins. *Int J Mol Sci.* 2020 Dec 10;21(24):9395.

4. Characterization of the molecular mechanisms involved in Cellular Stress and Homeostasis in Rett Syndrome

In the context of neurodevelopmental disorders, I studied the role of MECP2 deficiency in impairing cellular stress responses in Rett syndrome models. My work highlighted alterations in mitochondrial function, oxidative stress regulation, and proteostasis. These findings contribute to identifying potential molecular targets for therapeutic intervention aimed at restoring cellular homeostasis in Rett syndrome.

Selected publications:

- Sbardella, D., Tundo, G.R., Cunsolo, V., **Ciaccio, C.**, et al., Defective proteasome biogenesis into skin fibroblasts isolated from Rett syndrome subjects with MeCP2 non-sense mutations, *Biochimica et Biophysica Acta - Molecular Basis of Disease*, 2020, 1866(7), 165793.
- Di Pierro, D*, **Ciaccio, C.***, Sbardella, D., Coletta, M., et al., Effects of oral administration of common antioxidant supplements on the energy metabolism of red blood cells. Attenuation of oxidative stress-induced changes in Rett syndrome erythrocytes by CoQ10. *Molecular and Cellular Biochemistry*, 2020, 463(1-2), pp. 101-113. (**Equal contribution*)
- Sbardella D, Tundo GR, Coletta A, Marcoux J, Koufogeorgou EI, **Ciaccio C**, Santoro AM, Milardi D, Grasso G, Cozza P, Bousquet-Dubouch MP, Marini S, Coletta M. The insulin-degrading enzyme is an allosteric modulator of the 20S proteasome and a potential competitor of the 19S. *Cell Mol Life Sci.* 2018 Sep;75(18):3441-3456.
- **Ciaccio C**, Di Pierro D, Sbardella D, Tundo GR, Curatolo P, Galasso C, Santarone ME, Casasco M, Cozza P, Cortelazzo A, Rossi M, De Felice C, Hayek J, Coletta M, Marini S. Oxygen exchange and energy metabolism in erythrocytes of Rett syndrome and their relationships with respiratory alterations. *Mol Cell Biochem.* 2017 Feb;426(1-2):205-213.

5. Functional characterization of Insulin-Degrading Enzyme in Amyloidogenic Peptide Processing

I explored the role of IDE in the degradation of amyloidogenic peptides such as A β and amylin, which are implicated in neurodegenerative and metabolic diseases. My research included biochemical assays and structural analysis to understand how IDE recognizes and processes different substrates. This work supports the development of IDE-targeted strategies to modulate peptide aggregation and toxicity in diseases like Alzheimer's and type 2 diabetes.

Selected publications:

- Sbardella D, Tundo GR, Coletta A, Marcoux J, Koufogeorgou EI, **Ciaccio C**, Santoro AM, Milardi D, Grasso G, Cozza P, Bousquet-Dubouch MP, Marini S, Coletta M. The insulin-degrading enzyme is an allosteric modulator of the 20S proteasome and a potential competitor of the 19S. *Cell Mol Life Sci.* 2018 Sep;75(18):3441-3456.
- Tundo GR, Di Muzio E, **Ciaccio C**, Sbardella D, Di Pierro D, Polticelli F, Coletta M, Marini S., Multiple allosteric sites are involved in the modulation of insulin-degrading-enzyme activity by somatostatin. *FEBS J.* 2016 Oct;283(20):3755-3770
- Tundo G.R., **Ciaccio C.**, Sardella D., Marini S., and Coletta M., Somatostatin modulates insulin-degrading-enzyme metabolism: implication for alzheimer's disease pathogenesis. *PLoS One.* 2012;7(4):e34376.
- **Ciaccio C**, Tundo GR, Grasso G, Spoto G, Marasco D, Ruvo M, Gioia M, Rizzarelli E, Coletta M., Somatostatin: a novel substrate and a modulator of insulin-degrading enzyme activity, *J Mol Biol.* 2009 Feb 6;385(5):1556-67

6. Characterization of Structure–Function Relationships in Peroxidases

I conducted an in-depth analysis of various peroxidase enzymes, examining how environmental factors such as pH, metal ions, and oxidative stress influence their structure and catalytic activity. By integrating biochemical, spectroscopic, and structural approaches, I elucidated mechanisms underlying peroxidase function and regulation, contributing to their potential application in biotechnology and medicine.

Selected publications:

- **Ciaccio C**, De Sanctis G, Gambacurta A, Coletta M, rhEPO (Recombinant human eosinophil peroxidase): expression in *Pichia pastoris* and biochemical characterization. *Biochem J*. 2006; 395(2): 295-301.
- De Sanctis G., **Ciaccio C.**, Fasciglione GF., Fiorucci L., Gioia M., Sinibaldi F., Marini S., Santucci R., Coletta M., Effect of axial coordination on the kinetics of assembly and folding of the two halves of horse heart cytochrome c., *J Biol Chem*. 2004, 279(51): 52860-8.
- **Ciaccio C**, De Sanctis G, Marini S, Sinibaldi F, Santucci R, Arcovito A, Bellelli A, Ghibaudi E, Ferrari Rosa P, Coletta M., Proton linkage for CO binding and redox properties of bovine lactoperoxidase. *Biophys J*. 2004; 86: 448-54.
- **Ciaccio C**, Rosati A, De Sanctis G, Sinibaldi F, Marini S, Santucci R, Ascenzi P, Welinder KG, Coletta M., Relationships of ligand binding, redox properties, and protonation in *Coprinus cinereus* peroxidase. *J Biol Chem*. 2003; 278(21):18730-7.

(Additional publications listed in full CV or upon request)

Patent

"Rapid Diagnostic Method for Rett Syndrome" (Patent Number 102016000117469, applied 21/11/2016). Patent Owner: University of Rome Tor Vergata.

Research Support

Ongoing

- University of Rome Tor Vergata
RSA 2024 | Principal Investigator
"Targeting Oxidative Stress in Osteosarcoma: The Role of Polyphenols as Pro-Oxidant Agents in Cancer Treatment"
(2025–present)
- Italian Ministry of Health
IMMUNO HUB T4-CN-02 | Research Unit Member
CUP: E83C22004390001 (2024–present)

Completed

- University of Rome Tor Vergata
Beyond Borders 2019 | Research Unit Member
"Identification of a new method for the diagnosis of Rett syndrome based on defective autophagy" (2019–2020)
- Ministry of University and Research
PRIN 2011 – prot. 200993WWF9_003 | Research Unit Member
- "Functional characterisation and modulation of enzymes involved in the evolution of tuberculosis infection" (2011–2013)
- Ministry of University and Research
PRIN 2007 – prot. 2007SFZXZ7_002 | Research Unit Member
"Multiple functional aspects in haemoproteins from Arctic and Antarctic organisms" (2008–2010)