ACCADEMIA MEDICA DI ROMA

mercoledì 14 febbraio 2024, ore 16.00
Auditorium Prima Clinica Medica
Policlinico Umberto I, viale del Policlinico 155, Roma

La conferenza potrà essere seguita in presenza presso la sede sopra descritta oppure in streaming sulla piattaforma Zoom utilizzando il seguente link
https://uniroma1.zoom.us/j/92312414393?pwd=cDM2bTZ3VldoWEFjSnNJNXR6bmtJdz09
(Meeting ID: 923 1241 4393; Passcode: accademia)

Fabrizio Chiti

Full Professor, Section of Biochemistry,
Department of Experimental and Clinical Biomedical Sciences,University of Florence

Parlerà sul tema:

"Tossicità di aggregati proteici e malattie neurodegenerative"

La S.V. è invitata ad intervenire.

L'ACCADEMICO SEGRETARIO
ANTONIO MUSARO'

IL PRESIDENTE
VINCENZO BARNABA

Il certificato di partecipazione verrà rilasciato solo in presenza

Titolo dell'intervento
Tossicità di aggregati proteici e malattie neurodegenerative

Breve biografia
Fabrizio Chiti si è laureato nel 1995 in Scienze Biologiche presso l'Università di Firenze. Ha conseguito il Dottorato di Ricerca (D.Phil) in Chimica nel 1999 presso l'Università di Oxford (UK), sotto la supervisione del Prof. C.M. Dobson, con attività di ricerca sul folding proteico. Il suo lavoro post-doc, svolto nel campo dell'aggregazione proteica e della formazione di fibrille amiloidi, è stato svolto presso l'Università di Firenze per 2 anni e presso l'Università di Cambridge, Regno Unito, per 1 anno. Attualmente è Professore Ordinario di Biochimica presso l'Università di Firenze. La sua ricerca scientifica ha utilizzato un approccio multidisciplinare per chiarire i processi di misfolding proteico e i loro effetti sulla vitalità cellulare, l'effetto delle mutazioni sull'aggregazione proteica e le malattie associate, fino all'identificazione di strumenti di calcolo per prevedere l'impatto delle mutazioni sull'aggregazione proteica e le regioni di sequenza (hot spots) nella formazione di fibrille amiloidi. Successivamente si è concentrato sull'identificazione dei determinanti molecolari della tossicità degli aggregati proteici e del meccanismo di tossicità indotto dagli aggregati proteici nella neurodegenerazione, con l'obiettivo di identificare potenziali farmaci contro la neurodegenerazione e nuovi biomarcatori per la malattia di Alzheimer.

Abstract (English)
Peptides and proteins have an inherent tendency to convert from their native functional states into intractable amyloid aggregates. This phenomenon is associated with a range of human disorders, including Alzheimer and Parkinson diseases, type II diabetes, and a number of systemic amyloidoses. I will describe my contributions to this field, with particular reference to the advances made over the last 25 years in our understanding of its fundamentals and consequences. In particular, I will show how amyloid fibril formation is an inherent characteristic of most, if not all, proteins and how even endogenous proteins of our organism can transform into potential toxins when they form misfolded protein oligomers. I will show computational tools edited to predict the effect of mutations on amyloid fibril formation and the regions of the sequence involved in this process (hot spots). A description of the structural and biological characteristics of misfolded oligomers causing cell dysfunction will follow, with an aim to identify the structure-toxicity relationship of these aberrant species and the molecular mechanism through which they cause neurodegeneration. Finally, I will show potential therapeutic approaches against the oligomer-membrane interaction in the treatment of Parkinson's disease that has just ended a phase II clinical trial and potential other diseases, as well as oligomers can act as reliable biomarkers in Alzheimer's disease.

Abstract (Italiano)
Peptidi e proteine hanno una tendenza intrinseca a convertirsi dai loro stati funzionali nativi in aggregati amiloidi aberranti. Questo fenomeno è associato ad una serie di condizioni patologiche, tra cui le malattie di Alzheimer e di Parkinson, il diabete di tipo II e una serie di amiloidosi sistemiche. Descriverò i miei contributi in questo campo, con particolare riferimento ai progressi compiuti negli ultimi 25 anni nella comprensione dei suoi aspetti fondamentali e delle sue conseguenze. In particolare, mostrerò come la formazione di fibrille amiloidi sia una caratteristica intrinseca della maggior parte delle proteine, se non di tutte, e come anche le proteine endogene del nostro organismo possano trasformarsi in potenziali tossine quando formano oligomeri proteici mal ripiegati (*misfolded*). Mostrerò strumenti computazionali in grado di predire l'effetto delle mutazioni nella formazione delle fibrille amiloidi e le regioni di sequenza coinvolte in questo processo (*hot spots*). Seguirà una descrizione delle caratteristiche strutturali e biologiche degli oligomeri *misfolded* che causano disfunzione cellulare, con l'obiettivo di identificare la relazione struttura-tossicità di queste specie aberranti e il meccanismo molecolare attraverso il quale causano neurodegenerazione. Infine, mostrerò potenziali approcci terapeutici contro l'interazione oligomero-membrana nel trattamento del morbo di Parkinson che ha terminato la fase II di un trial clinico e di altre potenziali malattie, così come gli oligomeri possono agire come biomarcatori affidabili nella malattia di Alzheimer.

Fabrizio Chiti - Curriculum vitae

Personalia

Name:	Fabrizio Chiti
Work address:	Section of Biochemistry Dept. of Experimental and Clinical Biom. Sciences Università di Firenze Viale Morgagni 50 50134 Firenze (Italy)
Phone (lab)	+39-055-2751220
Phone (mobile)	+39-333-9810032
e-mail	fabrizio.chiti@unifi.it
web page	https://www.sbsc.unifi.it/vp-209-gruppo-chiti.html
Place/Date of birth:	Florence (Italy) on 7th July 1971
Sex:	Male
Nationality:	Italian
Marital Status:	Married to Giada Socci since 1999, two children.

Education

20/12/1995	M.Sc. Degree (Laurea vecchio ordinamento) in Biological Sciences at the University of Florence (Italy). Final marks were 110/110 cum laude et encomium.
20/05/2000	PhD degree (D.Phil) in Chemistry at the University of Oxford (United Kingdom) with a thesis titled "Folding Studies of Acylphosphatase". Supervisor was Prof. Christopher M. Dobson. Examiners were Martin Karplus and Alan Fersht.

Research Experience

01/10/1996 - 31/01/2000	Ph.D. student in the laboratory of the Prof. C. M. Dobson, Department of Chemistry, University of Oxford (United Kingdom)
01/02/2000 - 31/01/2002	Post-doc in the laboratory of Prof. G. Ramponi, Department of Biochemistry, University of Florence (Italy)
01/02/2002 - 31/10/2002	Post-doc in the laboratory of Prof. C. M. Dobson, Department of Chemistry, University of Cambridge (UK)
01/11/2002 – 30/12/2010	Associate Professor of Biochemistry, affiliated to the Department of Biochemistry for research and to the Faculty of Medicine for teaching, University of Florence (Italy)
30/12/2010 - present	Full Professor of Biochemistry, Department of Biomedical Experimental and Clinical Sciences, Section of Biochemistry, University of Florence (Italy)

Academic Honours

07/10/1996 - 08/10/1998	"Marie Curie" Fellowship from the European Commission (no. BI04CT965113)
09/10/1998 - 08/01/1999	Research Prize (Premio di Ricerca) from the Italian Society of Biochemistry
01/02/1999 - 31/01/2000	"Giuseppe Guelfi" Training Fellowship (Borsa di Perfezionamento) from the Accademia Nazionale dei Lincei (no. 33/cc)
01/05/1999 - 31/08/1999	Training fellowship (Contributo per Attività di Formazione) from the Consorzio Interuniversitario Biotecnologie (no. 681/u/MM/cp/98)
01/02/2000 - 31/01/2002	Research Fellowship from the Italian Telethon Foundation (no. 453.bi)
13/09/1999	Prize from the publishing company McGraw-Hill at the 44th Congress of the Italian Society of Biochemistry as "author of a significant paper published from 1998 to 1999"
23/09/2000	Gold Medal from the Italian Society of Biochemistry as author of the most significant poster presented at the 45th Congress of the Italian Society of Biochemistry
27/10/2003	"Jean-Francois LeFèvre Lecture" at the Ecole Supérieure de Biotechnologie de Strasbourg (ESBS)
01/01/2006 - 31/12/2008	Member of the *EMBO Young Investigator Programme* for years 2006-2008.
01/01/2005 - Present	Member of the Editorial Board of *Protein Engineering Design and Selection*
01/01/2005 - 31/12/2007	Member of the Editorial Board of *Amyloid*
01/01/2006 - Present	Member of *the Centre of Excellence DENOTHE (Faculty of Medicine, University of Florence, Italy)*
25-28/03/2006	Elected Main organiser of the *"EMBO-FEBS workshop on amyloid formation"* (Florence, Italy, 25-28 March 2006)
21-25/07/2007	Elected as one of two Meeting Chairs of the 21st Annual Symposium of the Protein Society (Boston, Massachusetts, July 21-25, 2007)
23-26/09/2008	Elected a one of four main organisers of the 53th Congress of the Italian Society of Biochemistry (Riccione, Italy, 23-26 September 2008)
01/01/2008 - 31/12/2008	Member of the Italian Scholarship Advisory Committee of the Giovanni Armenise-Harvard Foundation for years 2008-2010
24/06/2010	"Roncaglia-Mari" Award for the year 2010 as a main contributor in Science (the Award was presented by the Accademia Nazionale dei Lincei in the presence of the President of the Italian Republic)
01/01/2015 - Present	Member of the Academia Europaea
12/09/2017 - Present	Member of the Editorial Board of *J Biol. Chem.*
01/01/2019 - Present	Coordinator of the Technical-Scientific Committee (CTS) of the Associazione Italiana Ricerca Alzheimer (Airalzh)
01/03/2020 - Present	Coordinator of the PhD Course of Biomedical Sciences of the university of Florence (ca. 40 professors, 10 new PhD students per year)
16/10/2021 – Present	Member of *Sigma Xi*, the historical Scientific Research Honorary Society.

Meetings, Seminars and Lectures

- 104 Lectures at International Meetings
- 27 Invited Lectures at National Meetings
- ca. 40 Invited seminars (Italy or abroad)
- Ca. 1800 hours of teaching (from AA 2002-2003 to AA 2021-2022)

Most Significant publications

198 publications in peer-reviewed journals (source Scopus)
H-index = 62 (source Scopus) or 68 (source Google Scholar)
Ca. 23,349 citations (source Scopus) or 31,193 (source Google Scholar)
Most significant publications include:

1. Chiti F., Webster M., Taddei N., Clark, A., Stefani M., Ramponi G. and Dobson C.M. (1999). Designing conditions for in vitro formation of amyloid fibrils. *Proc. Natl. Acad. Sci. USA* 96, 3590-3594. IF=10.700
2. Chiti F., Taddei N., Webster P., Hamada D., Fiaschi T., Ramponi G. and Dobson C.M. (1999). Acceleration of the folding of acylphosphatase by stabilisation of local secondary structure. *Nature Struct. Biol.* 6, 380-387. IF=18.371
3. Chiti F., Taddei N., White P.M., Bucciantini M., Magherini F., Stefani M. and Dobson C.M. (1999). Mutational analysis of acylphosphatase reveals the importance of topology and contact order in protein folding. *Nature Struct. Biol.* 6, 1005-1009. IF=18.371

4. Hamada D., Chiti F., Guijarro J.I., Kataoka M., Taddei N. and Dobson C.M. (2000). Evidence concerning rate-limiting steps in protein folding from the effects of trifluoroethanol. *Nature Struct. Biol.* 7, 58-61. IF=18.371
5. Chiti F., Taddei N., Bucciantini M., White P., Ramponi G. and Dobson C.M. (2000). Mutational analysis of the propensity for amyloid formation by a globular protein. *EMBO J.* 19, 1441-1449. IF=13.783
6. Chiti F., Taddei N., Baroni F., Capanni C., Stefani M., Ramponi G. and Dobson C.M. (2002). Kinetic partitioning of protein folding and aggregation. *Nature Struct. Biol.* 9, 137-143. IF=18.371
7. Bucciantini M., Giannoni E., Chiti F., Baroni F., Formigli L., Zurdo J., Taddei N., Ramponi G., Dobson C.M. and Stefani M. (2002). Inherent toxicity of aggregates implies a common origin for protein misfolding diseases. *Nature* 416, 507-511. *first three authors contributed equally to the work. IF=69.504
8. Chiti F, Calamai M, Taddei N, Stefani M, Ramponi G, Dobson CM. (2002). Studies of the aggregation of mutant proteins in vitro provide insights into the genetics of amyloid diseases. *Proc. Natl. Acad. Sci. USA* 99, 16419-16426. IF=10.700
9. Chiti F, Stefani M, Taddei N, Ramponi G, Dobson CM. (2003). Rationalization of the effects of mutations on peptide and protein aggregation rates. *Nature* 424, 805-808. IF=69.504
10. Ventura S, Zurdo J, Narayanan S, Parreño M. Mangues R, Reif B, Chiti F, Giannoni E, Dobson CM, Aviles FX. and Serrano L. (2004). Short amino acid stretches play an important role in protein amyloid formation. The SH3 case. *Proc. Natl. Acad. Sci. USA*, 101, 7258-63. IF=10.700
11. Fowler SB, Poon S, Muff R, Chiti F, Dobson CM, Zurdo J. (2005). Rational design of aggregation-resistant bioactive peptides: reengineering human calcitonin. *Proc. Natl. Acad. Sci. USA* 102, 10105-10110. IF=10.700
12. Bemporad F, Calloni G, Campioni S, Plakoutsi G, Taddei N and Chiti F (2006). Sequence and Structural Determinants of amyloid fibril formation. *Acc. Chem. Res.* 39, 620-627. IF=24.466
13. Chiti F and Dobson CM (2006). Protein misfolding, functional amyloid, and human disease. *Annu. Rev. Biochem*. 75, 333-366. IF=27.258
14. Luheshi LM, Tartaglia GG, Brorsson AC, Pawar AP, Watson IA, Vendruscolo M, Lomas DA, Dobson CM, Crowther DC (2007). Systematic *in vivo* Analysis of the Intrinsic Determinants of Amyloid β Pathogenicity. *PloS Biol.* 5, e290. IF=9.593
15. Monsellier E and Chiti F (2007). Prevention of amyloid-like aggregation as a driving force of protein evolution. *EMBO Rep.* 8, 737-742. IF=9.039
16. Soldi G, Bemporad F, Chiti F (2008). The Degree of Structural Protection at the Edge ,-Strands Determines the Pathway of Amyloid Formation in Globular Proteins. *J. Am. Chem. Soc*. 130, 4295-302. IF=16.383
17. Bemporad F, Gsponer J, Hopeharuoho HI, Plakoutsi G, Stati G, Stefani M, Taddei N, Vendruscolo M, Chiti F (2008). Biological function in a non-native partially folded state of a protein. *EMBO J*. 27, 1525-1535. IF=13.783
18. Calloni G, Lendel C, Campioni S, Giannini S, Gliozzi A, Relini A, Vendruscolo M, Dobson CM, Salvatella X, Chiti F. (2008). Structure and dynamics of a partially folded protein are decoupled from its mechanism of aggregation. *J. Am. Chem. Soc.* 130, 13040-13050. IF=16.383
19. Chiti F and Dobson CM (2009). Amyloid formation by globular proteins under native conditions. *Nature Chem. Biol*. 5, 15-22. IF=16.284
20. Campioni S, Mannini B, Zampagni M, Pensalfini A, Parrini C, Evangelisti E, Relini A, Stefani M, Dobson CM, Cecchi C, Chiti F. (2010). A causative link between the structure of aberrant protein oligomers and their toxicity. *Nature Chem. Biol.* 6, 140-147. IF=16.284
21. De Simone A, Dhulesia A, Soldi G, Vendruscolo M, Hsu STD, Chiti F, Dobson CM (2011). Experimental Energy Surfaces Reveal the Mechanisms of Maintenance of Protein Solubility. *Proc. Natl. Acad. Sci. USA,* 108*,* 21057-21062*.* IF=10.700
22. Belli M, Ramazzotti M, Chiti F. (2011). Prediction of amyloid aggregation in vivo. *EMBO Rep.* 12, 657-663. IF=9.421
23. Bemporad F, Chiti F (2012). Protein misfolded oligomers: experimental approaches, mechanism of formation, and structure-toxicity relationships. *Chem. Biol.* 19, 315-327. IF=9.039
24. Motamedi-Shad N, Garfagnini T, Penco A, Relini A, Fogolari F, Corazza A, Esposito G, Bemporad F, Chiti F (2012) Rapid oligomer formation of human muscle acylphosphatase induced by heparan sulfate. *Nature Struct. Mol. Biol.* 19, 547-554. IF=18.371
25. Mannini B, Cascella R, Zampagni R, van Waarde-Verhagen MAWH, Meehan S, Roodveldt C, Campioni S, Boninsegna M, Penco A, Relini A, Kampinga HH, Dobson CM, Wilson MR, Cecchi C, Chiti F (2012). Molecular mechanisms used by chaperones to reduce the toxicity of aberrant protein oligomers. *Proc. Natl. Acad. Sci. USA* 109, 12479-12484. IF=10.700
26. Cascella R, Capitini C, Fani G, Dobson CM, Cecchi C, Chiti F. (2016). Quantification of the relative contributions of loss-of-function and gain-of-function mechanisms in TDP-43 proteinopathies. *J. Biol. Chem.* 291, 19437-19448. IF=5.485
27. Perni M, Galvagnion C, Maltsev A, Meisl G, Müller MB, Challa PK, Kirkegaard JB, Flagmeier P, Cohen SI, Cascella R, Chen SW, Limboker R, Sormanni P, Heller GT, Aprile FA, Cremades N, Cecchi C, Chiti F, Nollen EA, Knowles TP, Vendruscolo M, Bax A, Zasloff M, Dobson CM. (2017). A natural product inhibits the initiation of α-synuclein aggregation and suppresses its toxicity. *Proc. Natl. Acad. Sci. USA.* 114, E1009-E1017. IF=10.700
28. Chiti F, Dobson CM. (2017). Protein Misfolding, Amyloid Formation, and Human Disease: A Summary of Progress Over the Last Decade. *Annu. Rev. Biochem.* 86, 27-68. IF=27.258

29. Cascella R, Fani G, Capitini C, Rusmini P, Poletti A, Cecchi C, Chiti F. (2017). Quantitative assessment of the degradation of aggregated TDP-43 mediated by the ubiquitin proteasome system and macroautophagy. *FASEB J.* 31:5609-5624. IF=5.834
30. Fusco G, Chen SW, Williamson PTF, Cascella R, Perni M, Jarvis JA, Cecchi C, Vendruscolo M, Chiti F, Cremades N, Ying L, Dobson CM, De Simone A. (2017). Structural basis of membrane disruption and cellular toxicity by α-synuclein oligomers. *Science* 358:1440-1443. IF=63.832
31. D'Andrea C, Foti A, Cottat M, Banchelli M, Capitini C, Barreca F, Canale C, de Angelis M, Relini A, Maragò OM, Pini R, Chiti F, Gucciardi PG, Matteini P. (2018). Nanoscale Discrimination between Toxic and Nontoxic Protein Misfolded Oligomers with Tip-Enhanced Raman Spectroscopy. *Small* 14:e1800890. IF=15.153
32. Limbocker R, Chia S, Ruggeri FS, Perni M, Cascella R, Heller GT, Meisl G, Mannini B, Habchi J, Michaels TCT, Challa PK, Ahn M, Casford ST, Fernando N, Xu CK, Kloss ND, Cohen SIA, Kumita JR, Cecchi C, Zasloff M, Linse S, Knowles TPJ, Chiti F, Vendruscolo M, Dobson CM. (2019). Trodusquemine enhances $A\beta_{42}$ aggregation but suppresses its toxicity by displacing oligomers from cell membranes. *Nature Commun.* 10:225. IF=17.694
33. Vivoli Vega M, Nigro A, Luti S, Capitini C, Fani G, Gonnelli L, Boscaro F, Chiti F. (2019). Isolation and characterization of soluble human full-length TDP-43 associated with neurodegeneration. *FASEB J.* 33:10780-10793. IF=5.834
34. Errico S, Lucchesi G, Odino D, Muscat S, Capitini C, Bugelli C, Canale C, Ferrando R, Grasso G, Barbut D, Calamai M, Danani A, Zasloff M, Relini A, Caminati G, Vendruscolo M, Chiti F. (2020). Making biological membrane resistant to the toxicity of misfolded protein oligomers: a lesson from trodusquemine. *Nanoscale* 12:22596-22614. IF=8.307
35. Ghadami SA, Chia S, Ruggeri FS, Meisl G, Bemporad F, Habchi J, Cascella R, Dobson CM, Vendruscolo M, Knowles TPJ, Chiti F. (2020). Transthyretin Inhibits Primary and Secondary Nucleations of Amyloid-β Peptide Aggregation and Reduces the Toxicity of Its Oligomers. *Biomacromolecules* 21, 1112-1125. IF=6.979
36. Cascella R, Chen SW, Bigi A, Camino JD, Xu CK, Dobson CM, Chiti F, Cremades N, Cecchi C (2021). The release of toxic oligomers from α-synuclein fibrils induces dysfunction in neuronal cells. *Nature Commun.* 12:1814. IF=17.694
37. Chiti F, Kelly JW. (2022). Small molecule protein binding to correct cellular folding or stabilize the native state against misfolding and aggregation. *Curr. Opin. Struct. Biol.* 72:267-278. IF=7.786
38. Limbocker R, Errico S, Barbut D, Knowles TPJ, Vendruscolo M, Chiti F, Zasloff M. (2022). Squalamine and trodusquemine: two natural products for neurodegenerative diseases, from physical chemistry to the clinic. *Nat. Prod. Rep.* 39:742-753. IF=15.111
39. Cascella R, Bigi A, Riffert DG, Gagliani MC, Ermini E, Moretti M, Cortese K, Cecchi C, Chiti F. (2022). A quantitative biology approach correlates neuronal toxicity with the largest inclusions of TDP-43. *Sci. Adv.* 8:eabm6376. IF=14.980
40. Fani G, La Torre CE, Cascella R, Cecchi C, Vendruscolo M, Chiti F. (2022). Misfolded protein oligomers induce an increase of intracellular Ca^{2+} causing an escalation of reactive oxidative species. *Cell Mol Life Sci.* 79:500. IF=9.234

Book Chapters

- Chiti F (2006). Chapter titled "*The influence of hydrophobicity, secondary structure propensity and charge in protein aggregation"* for the book *Protein Misfolding, Aggregation, and Conformational Diseases*. Vladimir N. Uversky and Anthony L. Fink Editors, Kluwer Academic / Plenum Publishers, pp. 43-59.
- Campioni S, Monsellier E and Chiti F (2010). Chapter titled "Why proteins misfold?" for the book "Protein Misfolding Diseases: Current and Emerging Principles and Therapies" Marina Ramirez-Alvarado, Chris Dobson, Jeff Kelly editors, John Wiley and Sons, pp 3-20.
- Bemporad F, Chiti F (2012). Chapter titled "Pathways of amyloid formation" for the book "Amyloid Fibrils and Prefibrillar Aggregates: Molecular and Biological Properties" Daniel Otzen editor, Wiley-VCH, pp. 151-166.

Patents

- "Computational method and apparatus for predicting polypeptide aggregation or solubility". Patented at the University of Cambridge (Patent no. US 7930157 B2). Sublicenced to Lonza ltd
- "Method and apparatus for assessing polypeptide aggregation". Patented at the University of Cambridge (Patent no. US 8155888 B2). Sublicenced to Lonza ltd
- "Detection of an amyloidogenic partially folded species using capillary electrophoresis". Patented at the University of Pavia. Now discontinued

Funding

• TELETHON	Rientro Cervelli 2000	Principal Investigator.	Euro 51,650
• MIUR	FIRB 2004-Internazionalizzazione	Local investigator.	Euro 54,740
• EMBO	Young Investigator Programme	Principal Investigator.	Euro 75,000
• MIUR	FIRB 2005	Local investigator.	Euro 118,100
• EMBO	Workshop funding 2006	Main Chair	Euro 30,000
• Fidelity Foundation	Donation from private foundation	Principal Investigator.	Euro 50,000
• MIUR	PRIN 2006	National coordinator.	Euro 49,700
• EC Commission	Project EURAMY	Local Investigator.	Euro 110,000
• MIUR	PRIN 2008	National coordinator.	Euro 41,160
• Regione Toscana	bando 2010	Local Investigator.	Euro 60.000
• AriSLA Foundation	Bando 2011	Principal Investigator.	Euro 60,000
• Joint Project	Florence-Cambridge	Local Investigator	Euro 150,000
• Regione Toscana	FAS-Salute 2015 - Proj. SUPREMAL	Local Investigator.	Euro 60,000
• EC Commission	2016. Project N2B Patch	Subcontractor	Euro 40,000
• Fondazione CRF	Bando 2016	Principal Investigator	Euro 23,000
• AriSLA Foundation	Bando 2017	Principal Investigator	Euro 93,000
• Fondaz. CRF/Unifi	2018 Bando Malattie Neurodegen.	Principal Investigator	Euro 100,000
• Regione Toscana	Bando Salute 2018 - Proj. PRAMA	Local Investigator	Euro 200,000
• MIUR	PRIN 2020	National coordinator	Euro 131.000
• ENTERIN	Liberal Donation from Mrs Hackel	Local Investigator	Euro 176.000
• MIUR	PNRR PE8	Local Investigator	Euro 350.000