



Curriculum Vitae

Personal information **Fabrizio Chiodo**

Work experience

October 2008-March 2013 PhD student

CIC biomaGUNE (Spain).

Development of glycan-based anti-microbial vaccines (nanosystems).

December 2013-October 2014 Postdoctoral Researcher

Leiden University Medical Center (Netherlands).

Development of glycan-based anti-worms vaccines and diagnostics.

January 2014-November 2017 NWO VENI Fellow, Independent
Postdoctoral Researcher

Leiden Institute of Chemistry and Leiden University Medical
(Netherlands).

Study bacterial carbohydrates in modulating innate immune responses in
the context of
conjugate-vaccines

November 2018-September 2020 Senior Researcher

Amsterdam Infection and Immunity Institute (Netherlands).

Study bacterial carbohydrates in modulating innate immune responses in
the context of
conjugate-vaccines and cancer. Study glycan-based host-pathogens
interactions to design new vaccines or therapeutic approaches.

October 2020- Present Research Assistant Professor

Italian National Research Council (CNR) (Italy).

Study bacterial carbohydrates in modulating innate immune responses in
the context of
conjugate-vaccines and cancer. Study glycan-based host-pathogens
interactions to design new vaccines or therapeutic approaches.

March 2016- Present Invited Lecturer

Havana University (Cuba).

Teaching "Carbohydrates as vaccines and immune modulators"

Education and training

September 2003-September 2008 Master degree

University of Palermo (Italy)

Pharmaceutical Sciences

October 2008-March 2013 PhD in Applied Chemistry
CIC biomaGUNE/University of Basque Country (Spain)
Development of glycan-based anti-microbial vaccines (nanosystems)

Additional information

Publications

46. Wang Z, Gimeno A, Lete MG, Overkleeft HS, van der Marel GA, Chiodo F, Jimenez-Barbero J, Codee JDC. Synthetic Zwitterionic Streptococcus pneumoniae Type 1 Oligosaccharides Carrying Labile O-Acetyl Esters. 2022, *Angew Chem Int Ed Engl.* 2, 62:e202211940.
45. Mukherjee R, Somovilla VJ, Chiodo F, Bruijns S, Pieters RJ, Garssen J, van Kooyk Y, Kraneveld AD, van Bergenhenegouwen J. Human Milk Oligosaccharide 2'-Fucosyllactose Inhibits Ligand Binding to C-Type Lectin DC-SIGN but Not to Langerin. 2022, *International Journal of Molecular Sciences*, 23, 14744
44. R. Ochoa-Azze; [...] F. Chiodo; A. Calcagno; V. Ghisetti; M. Rodriguez-Acosta; E. Noa-Romero; J. Enriquez-Puertas; D. Ortega-Leon; I. Valdivia-Alvarez; A. Delahanty Fernandez; A. Palenzuela-Diaz; L. Rodriguez-Noda; R. Gonzalez-Mugica; Y. Valdes-Balbin; D. Garcia-Rivera; V. Verez-Bencomo. An open-label phase IIa and double-blind, randomised, placebo-controlled phase IIb seamless clinical trial of FINLAY-FR-1A vaccine confirmed its safety and immunogenicity in COVID-19 convalescents, 2022, *The Lancet Respiratory Medicine*, 10, 785-795.
43. N. Hribernik, F. Chiodo, R.J. Pieters, A. Bernardi. Rhamnose-based glycomimetic for recruitment of endogenous anti-rhamnose antibodies. 2022, *Tetrahedron Letters*, 99, 153843.
42. Santana-Mederos, D., Perez-Nicado, R., Climent, Y., Rodriguez, L., Ramirez, B.S., Perez-Rodriguez, S., Rodriguez, M., Labrada, C., Hernandez, T., Diaz, M., Orosa, I., Ramirez, U., Oliva, R., Garrido, R., Cardoso, F., Landys, M., [...], Ojito, E., Chiodo, F., Fernandez, S., Garcia-Rivera, D., Fang, C., Chen, G.-W., Rivera, D.G., Valdes-Balbin, Y., Garcia-Rivera, D., Verez Bencomo, V. A COVID-19 vaccine candidate composed of the SARS-CoV-2 RBD dimer and *Neisseria meningitidis* outer membrane vesicles, 2022, *RSC Chemical Biology*, 3, 242-249.
41. Glycan array evaluation of synthetic epitopes between the capsular polysaccharides from *Streptococcus pneumoniae* 19F and 19A. L. Morelli, L. Lay, D. Santana-Mederos, Y. Valdes-Balbin, V. Verez-Bencomo, A. van Diepen, C. Hokke, F. Chiodo*, F. Compostella. 2021, *ACS Chemical Biology*, 7, 757-767. *Corresponding author
40. Molecular aspects concerning the use of SARS-CoV-2 Receptor Binding Domain as target for preventive vaccines. Y. Valdes-Balbin, D. Santana-Mederos, F. Paquet, S. Fernandez, Y. Climent, F. Chiodo, L. Rodriguez, B. Sanchez-Ramirez, K. Leon, T. Hernandez, L. Castellanos-Serra, R. Garrido, G-W. Chen, D. Garcia-Rivera, D. Rivera, V. Verez-Bencomo. 2021, *ACS Central Science*, 7, 757-767.
39. Synthesis and antibody binding studies of schistosoma-derived oligo- α -(1-2)-l-fucosides. M. Harvey, F. Chiodo, W. Noest, C. Hokke, G. van der Marel, J. D.C. Codee. 2021, *Molecules*, 26, 2246.
38. SARS-CoV-2 RBD-Tetanus toxoid conjugate vaccine induces a strong neutralizing immunity in preclinical studies. Y. Valdes-Balbin, D. Santana-Mederos, L. Quintero, S. Fernandez, L. Rodriguez, B. Sanchez-Ramirez, R. Perez, [...], F. Chiodo, F. Paquet, G. Chen, D. G. Rivera, D. Garcia-Rivera, V. Verez-Bencomo. 2021, *ACS Chemical Biology*, 16, 1223-1233.
37. Human C-Type Lectins, MGL, DC-SIGN and Langerin, Their Interactions With Endogenous and Exogenous Ligand Patterns. F. Chiodo, A. de Haas, S. J van Vliet, Y. van Kooyk. *Comprehensive Glycoscience*, 2nd edition, Elsevier 2021.
36. M. Anderlueh, F. Berti, A. Bzducha-Wrobel, F. Chiodo, C. Colombo, F. Compostella, K. Durlík, X. Ferhati, R. Holmdahl, D. Jovanovic, W. Kaca, L. Lay, M. Marinovic-Cincovic, M. Marradi, M. Ozil, L. Polito, J.J. Reina-Martin, C.A. Reis, R. Sackstein, A. Silipo, U. Svajger, O. Vanek, F. Yamamoto, B. Richichi, S.J. van Vliet. Recent advances on smart glycoconjugate vaccines in infections and cancer. 2021, *The FEBS Journal*. 10.1111/febs.15909.
35. Analysis of Synthetic Monodisperse Polysaccharides by Wide Mass Range Ultrahigh-Resolution MALDI Mass Spectrometry. S. Nicolardi, A. A. Joseph, Q. Zhu, Z. Shen, A. Pardo-Vargas, F. Chiodo, A. Molinaro, A. Silipo, Y.EM van der Burgt, B. Yu, P.H. Seeberger, M. Wührer. 2021, *Analytical Chemistry*, 93, 4666-4675.
34. Emerging glyco-based strategies to steer immune responses. M. Anderlueh, F. Berti, A. Bzducha-Wrobel, F. Chiodo, C. Colombo, F. Compostella, K. Durlík, X. Ferhati, R. Holmdahl, D. Jovanovic, W. Kaca, L. Lay, M. Marinovic-Cincovic, M. Marradi, M. Ozil, L. Polito, J. Juan Reina-Martin, C. A Reis, R. Sackstein, A. Silipo, U. Svajger, O. Vanek, F. Yamamoto, B. Richichi, S. J van Vliet. 2021, *The FEBS Journal*, 288, 4746-4772.
33. G. Biagiotti, E. Puric, I. Urbancic, A. Kriselj, M. Weiss, J. Mravljak, C. Gellini, L. Lay, F. Chiodo, M. Anderlueh, S. Cicchi, B. Richichi. Combining cross-coupling reaction and Knoevenagel condensation in the synthesis of glyco-BODIPY probes for DC-SIGN super-resolution bioimaging. 2021, *Bioorganic Chemistry* 109, 104730.
32. W. Doelman, MHS Marqvorsen, F. Chiodo, SCM Bruijns, GA van der Marel, Y. van Kooyk, SI van Kasteren, C. Araman. Synthesis of asparagine derivatives harboring a Lewis X type DC-SIGN ligand and evaluation of their impact on immunomodulation in multiple sclerosis. 2021, *Chemistry* 27, 2742.
31. N. Reintjens, E. Tondini, AR de Jong, NJ Meeuwenoord, F. Chiodo, E. Peterse, HS Overkleeft, DV Filippov, GA van der Marel, F. Ossendorp, JDC Codee. 2020, *Journal of Medicinal Chemistry*, 63, 20, 11691-11706.
30. P. Garcia-Vello, I. Speciale, F. Chiodo, A. Molinaro, C. De Castro. Carbohydrate-based adjuvants. 2020, *Drug Discovery Today: Technologies*, Elsevier.
29. Q. Zhu, Z. Shen, F. Chiodo, S. Nicolardi, A. Molinaro, A. Silipo, B. Yu. Chemical synthesis of glycans up to a 128-mer relevant to the O-antigen of *Bacteroides vulgatus*. 2020, *Nature Communications*, 11, 4142 (Selected by the Editors as particularly important in the area of organic chemistry and chemical biology)
28. F. Di Lorenzo, M. Pither, M. Martufi, I. Scarinci, J. Guzman Caldentey, E. Lakomic, W. Jachymek, S. Bruijns, S. Martin-Santamaria, JS Frick, Y. Van Kooyk, F. Chiodo, A. Silipo, ML Bernardini, A. Molinaro. Pairing *Bacteroides vulgatus* mpk endotoxin unique structure with its equally unique immunological behavior. 2020, *ACS Central Science*, <https://doi.org/10.1021/acscentsci.0c00791>
27. F. Chiodo*, S. Bruijns, E. Rodriguez, E. Li, A. Molinaro, A. Silipo, F. Di Lorenzo, D. Garcia-Rivera, Y. Valdes-Balbin, V. Verez-Bencomo, Y. van Kooyk. Novel ACE2-Independent Carbohydrate-Binding of SARS-CoV-2 Spike Protein to Host Lectins and Lung Microbiota. 2020, *bioRxiv* 2020.05.13.092478 *Corresponding author
26. Forgione RE, Di Carluccio C, Guzman-Caldentey J, Gaglione R, Battista F, Chiodo F, Manabe Y, Arciello A, Del Vecchio P, Fukase K, Molinaro A, Martin-Santamaria S, Crocker PR, Marchetti R, Silipo A. Unveiling Molecular Recognition of Sialoglycans by Human Siglec-10. 2020, *iScience*, 23, 6, 101231.
25. S. Duinkerken, E. Li, F. van Haften, T. de Gruijil, F. Chiodo, S. Schetters, Y. van Kooyk. Chemically engineered glycan-modified cancer vaccines to mobilize skin dendritic cells. 2019, *Current Opinion in Chemical Biology*, 53, 167-172.

24. Y. Manabe, R. Marchetti, Y. Takakura, M. Nagasaki, W. Nihei, T. Takebe, K. Tanaka, K. Kabayama, F. Chiodo, S. Hanashima, Y. Kamada, E. Miyoshi, H. P. Dulal, Y. Yamaguchi, Y. Adachi, N. Ohno, H. Tanaka, A. Silipo, K. Fukase, A. Molinaro. The core fucose on an IgG antibody is an endogenous ligand of Dectin-1. 2019, *Angewandte Chemie International Edition*, 58, 18697-18702.
23. X. Wang, H. Chen, F. Chiodo*, B. Tefsen. Detection of human IgM and IgG antibodies by means of galactofuranose-coated and rhamnose-coated gold nanoparticles. 2019, *Matters* (ISSN:2297-8240), doi: 10.19185/matters.201908000004. *Corresponding author
22. Q. Zhang, A. Gimeno, D. Santana, Z. Wang, Y. Valdes-Balbin, L. Rodriguez-Noda, T. Hansen, L. Kong, M. Shen, H. Overkleef, V. Verez-Bencomo, G. van der Marel, J. Jimenez-Barbero, F. Chiodo, J. Codee. Synthetic, zwitterionic Sp1-oligosaccharides adopt a helical structure crucial for antibody interaction. 2019, *ACS Central Science*, 5, 1407-1416.
21. R. Gracia, M. Marradi, G. Salerno, R. Perez-Nicado, A. Perez-San Vicente, D. Dupin, J. Rodriguez, I. Loinaz, F. Chiodo*, C. Nativi. Biocompatible single-chain polymer nanoparticles loaded with an antigen mimetic enhance specific innate immune response. 2018, *ACS Macro Letters*, 7, 196-200. *Corresponding author.
20. N. Climent, I. Garcia, M. Marradi, F. Chiodo, L. Miralles, M. J. Maleno, J. M. Gatell, F. Garcia, S. Penades, M. Plana. Loading Dendritic Cells with Gold Nanoparticles (GNPs) Bearing HIV-Peptides and Mannosides Enhance HIV-Specific T Cell Responses. 2018, *Nanomedicine: Nanotechnology, Biology, and Medicine*, 14, 339-351.
19. S. Nicolardi, Y. van der Burgt, M. Wuhrer, J. Codee. C. H. Hokke, F. Chiodo*. Structural characterization of bio-functionalized gold nanoparticles by ultrahigh resolution mass spectrometry. 2017, *ACS Nano*, 11, 8257-8264. *Corresponding author.
18. G. Gentil, N. Ho, F. Chiodo, N. Meeuwenoord, F. Ossendorp, H. Overkleef, G. van der Marel, D. Filippov. Synthesis and evaluation of fluorescent Pam3Cys peptide conjugates. 2016, *Bioorganic & Medicinal Chemistry Letters*, 26, 3641-3645.
17. F. Chiodo, *Carbohydrate and Immunology on the Way to Modern Glycoscience. What can we learn from the past?* 2015, *Glycopedia E-Chapter*, collaboration with S. Perez.
16. M. Marradi, F. Chiodo, I. Garcia, S. Penades. *Glyconanotechnology and Disease: Gold Nanoparticles Coated with Glycosides as Multivalent Systems for Potential Applications in Diagnostics and Therapy*, Chapter-5, 89-131. 2015, *Carbohydrates in Drug Design and Discovery*, Edited by J. Jimenez-Barbero. RSC eBook Collection.
15. F. Chiodo*, M. Marradi. Gold nanoparticles as carriers for synthetic glycoconjugate vaccines. 2015, *Methods in Molecular Biology*, 1331, 159-171. *Corresponding author
14. F. Chiodo, P. M. Enriquez-Navas, J. Angulo, M. Marradi, S. Penades. Assembling different antennas of the gp120 high mannose-type glycans on gold nanoparticles provides superior binding to the anti-HIV antibody 2G12 than the individual antennas. 2015, *Carbohydrate Research*, 405, 102-09.
13. D. Arosio, F. Chiodo*, J. J. Reina, M. Marelli, S. Penades, Y van Kooyk, J. J. Garcia-Vallejo, A. Bernardi. Effective targeting of DC-SIGN by -fucosyl-amide functionalized gold nanoparticles. 2014, *Bioconjugate Chemistry*, 25, 2244-2251. *Corresponding author.
12. F. Chiodo*, M. Marradi, J. Calvo, E. Yuste, S. Penades. Glycosystems in nanotechnology: Gold glyconanoparticles as carrier for anti-HIV prodrugs. 2014, *Beilstein Journal of Organic Chemistry*, 10, 1339-1346. *Corresponding author.
11. R. Murray, Y. Qiu, F. Chiodo, M. Marradi, S. Penades, S. E. Moya. A Quantitative Study of Intracellular Dynamics of Fluorescently Labelled Gold Nanoparticles via Fluorescence Correlation Spectroscopy. 2014, *Small*, 10, 2602-2610.
10. F. Chiodo*, M. Marradi, J. Park, A. F. J. Ram, S. Penades, I. van Die, B. Tefsen. Galactofuranose-Coated Gold Nanoparticles Elicit a Pro-inflammatory Response in Human Monocyte-Derived Dendritic Cells and Are Recognized by DC-SIGN. 2014, *ACS Chemical Biology*, 9, 383-389. Highlighted on a Special ACS issue on Bioconjugates for Chemical Biology, June 2016. *Corresponding author
9. F. Chiodo*, M. Marradi, B. Tefsen, H. Snippe, I. van Die, S. Penades. High Sensitive Detection of Carbohydrate Binding Proteins on an ELISA-Solid Phase Assay based on Multivalent Glyconanoparticles. 2013, *PLoS ONE*, 8, e73027. *Corresponding author.
8. H. Kalay, M. Ambrosini, F. Chiodo, Y. van Kooyk, J. J. Garcia-Vallejo. Enhanced glycan nanoprofiling by weak anion exchange preparative chromatography, mild acid desialylation, and nanoliquid chromatography-mass spectrometry with nano fluorescence detection. 2013, *Electrophoresis*, 34, 2350-2356.
7. M. Marradi, F. Chiodo, I. Garcia, S. Penades. Glyconanoparticles as multifunctional and multimodal carbohydrate systems. 2013, *Chemical Society Reviews*, 42, 4728-4745.
6. J. J. Garcia-Vallejo, M. Ambrosini, A. Overbeek, H. van Riel, K. Bloem, W. W. J. Unger, F. Chiodo, J. G. Bolscher, K. Nazmi, H. Kalay, Y. van Kooyk. Multivalent glycopeptide dendrimers for the targeted delivery of antigens to dendritic cells. 2013, *Molecular Immunology*, 53, 387-397.
5. P. M. Enriquez-Navas*, F. Chiodo*, M. Marradi, J. Angulo, S. Penades. STD NMR Study of the Interaction between Antibody 2G12 and Synthetic Oligomannosides That Mimic Selected Branches of gp120 Glycans. 2012, *ChemBioChem*, 13, 1357-1365. *Authors contributed equally to this work.
4. P. Di Gianvincenzo, F. Chiodo, M. Marradi, S. Penades. Gold manno-Glyconanoparticles for Intervening in HIV gp120 Carbohydrate-Mediated Processes. 2012, *Methods in Enzymology*, 509, 21-40.
3. D. Safari, M. Marradi, F. Chiodo, H. A. Th. Dekker, Y. Shan, R. Adamo, S. Oscarson, G. Rijkers, M. Lahmann, J. P. Kamerling, H. Snippe, S. Penades. Gold nanoparticles as carriers for a synthetic *S. pneumoniae* type 14 conjugate vaccine. 2012, *Nanomedicine UK*, 7, 5, 651-662.
2. M. Marradi, P. Di Gianvincenzo, P. M. Enriquez-Navas, O. M. Martinez-Avila, F. Chiodo, E. Yuste, J. Angulo, S. Penades. 2011, Gold Nanoparticles Coated with High Mannose-Type Oligosaccharides Bind the HIV-1 Broadly Neutralizing Antibody 2G12 and Inhibit its Interaction with the Viral Envelope Glycoprotein gp120 and with the Virus. 2011, *Journal of Molecular Biology*, 410, 5, 798-810.
1. M. Marradi, F. Chiodo, I. Garcia, S. Penades. Glycoliposomes and metallic glyconanoparticles in glycoscience, chapter 10. 2011, *Synthesis and biological applications of glycoconjugates*, Edited by O. Renaudet; Co-Edited by N. Spinelli, Bentham eBooks, ISBN: 978-1-60805-277-6.

Projects

2021: Partner EU-ITN network Glytunes

2018: Amsterdam Infection and Immunity Institute, Individual Grant

2017, 2016 and 2015: Erasmus+ KA107 (Mobility between partner countries in the field of higher education): for

students and staff exchange Havana University/Leiden University and vice versa. Project coordinator

2016: National Natural Science Foundation of China (NSFC)/Joint Research Scheme

2016, 1st Co-applicant. Collaboration with Dr. B. Tefsen, Xi'an Jiaotong-Liverpool University, Suzhou, China.

2014: NWO (Netherlands Organization for Scientific Research) Chemische Wetenschappen (Chemical Sciences): Individual VENI grant for starting independent research.

2014: NWO-WOTRO Science for Global Development: PhD student training period from Cuba to Leiden. Project coordinator

2012: Prize for one of the best Oral Communication in the 26th International Carbohydrate Symposium (ICS 2012), Madrid, 22-27 July 2012.

2011: National Spanish grant for short-stay abroad (FPI-MICINN)

2009: Spanish PhD fellowship, Beca FPI-MICINN, BES-2009-025533

Memberships Editorial Boards Research Topic at Frontiers in Immunology: The Role of Glycans in Infectious Disease

Editorial Board Frontiers in Microbiology

Cuban State Honor Carlos J. Finlay for the Scientific Contribution in the development of different SARS-CoV-2 vaccines

2015: Extraordinary Award for PhD Thesis defended in 2013 from University of Basque Country (top 10% 2012/2013).

20 Invited Talks at different Universities and Research Institute Worldwide

Scientific Dissemination in Schools and Public Events

8 Invited talks to International Conferences

16 Oral contributions to International Conferences

Other Relevant Information 130h of teaching at different Universities

Co-director and direct supervision of 5 PhD students; Director and direct supervision of 2 BSc students and 3 MSs students; Direct supervision of 3 PhD students from personal projects/grants and collaborations. Supervision of 3 PhD students from other collaborations (Department MCBI Amsterdam).

PhD committee Member of Massey University (New Zealand), Lisbon Faculty of Medicine, and Leiden University.