Prof. Hassan HAJJAJ
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Professor, Faculty of Sciences, UMI Meknes
Laboratory of Biotechnology and Valorization of Bioresources and responsible of Cluster of Competency «*Agri-food, Safety and Security*».

TITLES, DIPLOMAS, QUALIFICATIONS

March 2005	Ability to Direct Researches' Grade (HDR), Lille 1 University.
September 2003	Diploma in Quality Management Applied to Live organisms, LYON.
February 1998	Ph.D. in Biotechnology and Industrial Microbiology, INSA Toulouse.
1993-1994	D.E.A. in Biology-Health, Bordeaux II University.

PROFESSIONAL ACTIVITIES

Since 19th December 2015 Since October 2014	Professor of Higher Education at the Faculty of Sciences of Meknes Responsible of the Research Team on « Applied Mycology ».
October 2009 - December 2015	Professor Ability at the Faculty of Sciences of Meknes, Moulay Ismail University.
October 2005 - September 2009	Assistant Professor at the Faculty of Nador, Mohamed 1st University of Oujda.
01/11/03 to 30/03/05	Temporarily Attached to Education and Research at the University Institute of Technology of Lille 1.
March 1999 to February 2002	Researcher at the Center of Research Nestlé at Lausanne in Switzerland. Title: Selection and characterization of active molecules with hypo-cholesterolemic properties from molds and superior fungi.

TEACHING ACTIVITIES AT THE UNIVERSITY

01/9/2023 to present	Coordinator of the bachelor in "Cellular Biology and Physiology" at theFaculty of Science, University Moulay Ismail, Meknes.
03/9/2019 to present	Coordinator of the specialized master "Food Sciences and bioproducts" at the Faculty of Science, University Moulay Ismail, Meknes.
01/12/2010 to present	Metabolic and thorough biochemistry course (Bachelor's degree in Life Sciences) at the Faculty of Sciences of Meknes, Moulay Ismail University.
01/10/2010 to01/11/2014	Course on Agri-food chains and food technology for students in Professional License (Food Science and Quality Control) and Specialized Master in "Food Science and Bio-products" at the Faculty of Sciences of Meknes, Moulay Ismail University.
16/03 to 15/04/2009 01/03 to 30/04/2010	**Invited Professor** at National School of Agronomy of Toulouse for teaching a course on Fermentation and Enzymatic Processes for Agro-Industry.
01/04 to 30/04/2010	Green chemistry and the valorization of agro-resources for students in master of chemistry

05/10/2005 to 01/11/2010	Structural and Metabolic biochemistry course. Course on biological techniques (Bachelor's degree in Life Sciences) at the Faculty of Nador of Mohamed 1st University of Oujda.
01/11/06 to 01/10/2007	Coordinator of two modules on food chains in D.E.S.S. agricultural management at the Faculty of Sciences of Moulay Ismail University, Meknes. Coordinator of a module on food quality management in specialized Master of Agribusiness at the Faculty of Sciences of Mohamed 1st University, Oujda.
01/11/03 to 30/03/2005	Course on Agri-food chains and quality system (DUT and Bachelor's degree in quality management) at the University Institute of Technology Lille 1.

ADMINISTRATIVES ACTIVITIES AND PROJETS MANAGEMENT

Administrative activities and expertise

01/11/03 to 30/03/05	Course on Agri-food chains and quality system (DUT and license in quality management) at the University Institute of Technology Lille 1.
Since January 2016	Coordinator of the thematic project "Agribusiness and Food Safety" of the Belgian-Moroccan Institutional Cooperation Project (CUI) (2017-2022).
Since February 2014	Member of the Steering Committee of the Doctoral College in Plant and Agri-Food Biotechnology of the University Agency of La Francophonie.
Since March 2014	Coordinator of the Moroccan Network on Molds and Mycotoxins (R3M).
Since 2012	Coordinator of a specialized Master's degree program in partnership with the Agro-Paris Tech School in "Food Sciences and Bio-Products" at the Faculty of Sciences of Meknes.
2010/2011	Coordinator of a professional degree program "Food Science and Quality Control" at the Faculty of Sciences of Meknes.
20010/2011	Head of Mission to the Presidency for the development of engineering courses.
2011/2014 & 2015/2018	Member of the Governing Board of the Faculty of Sciences of Meknes. Member of the research committee at the level of the presidency to define the lines of research. Member of the Commission and Research and Cooperation of the Faculty of Sciences Meknes. Member of the Research Commission of the Department of Biology at the Faculty of Sciences Meknes. Responsible for the equipment project for an Agribusiness Hall at the University of Oujda.
2006-2009	Member of the School Council of the Faculty of Nador.

Projects management

2022-2027	- Coordinator of the thematic project "**Agribusiness and Food Safety**" of the Institutional University Cooperation Program (CUI) phase II between the Moulay Ismail University and the Flemish Universities in Belgium.
2022-2025	- PRIMA project partner DREAM "Diversified orchards for resilient and sustainable Mediterranean farming system".
2022-2024	- Partner of the Toubkal Project: "MIXED SOLAR/ELECTRIC DRYING COUPLED WITH IA DIC OF ANRTCOT, CHERRY AND FIG" was selected under number: ToubkaV22/139 - Campus France: 47292XK.
2021-2023	- FOSC project partner Cross-Border Climate Vulnerabilities and Remote Impacts of Food Systems of the EU, Turkey and Africa: Trade, Climate Risk and Adaptation (CREATE)

2017-2022 2020-2022	- Coordinator of the thematic project "**Agribusiness and Food Safety**" of the Institutional University Cooperation Program (CUI) phase 1 between the Moulay Ismail University and the Flemish Universities in Belgium.
2019-2020	- Co-Coordinator of the "South Initiative" research project between Mohamed Ben Abdellah University, Fez, Moulay Ismail University, Meknes and Ghent University in Belgium 2020-2022.
2017-2020	- Partner of the Covid 19 Project: "BIOACTIVE NANOPARTICLES AND TARGETED ANTIVIRAL PHYTOTHERAPY (CORONAVIRUS COVID19)".
2017-2019	- Member of the project of the "Intra-Africa Academic Mobility Scheme / Internationalization of evaluation systems, master programs and doctoral research within African universities through academic mobility Belgium" (MOUNAF) program between Belgium and the UMI.
2015-2016	- Co-Coordinator of the Fez-Meknes Regional Development Project (PDR) "Valorization of the Aromatic and Medicinal Plants (PAM) sector for social and sustainable development of the Boulemane and Ifrane regions".
2013-2016	- Coordinator of the Franco-Moroccan Cooperation Project **AP-ES2015-10** on the "Pedagogic Engineering Development and Exploration of the Paths for the Creation of a Specialized Master in" Agri-Food Sciences "with a double degree" with the School of AgroPariTech. - Partner of the research project of Moulay Ismail Meknes University on "food safety and antifungal means of fight" (PU / 2013/6).
2012-2014	- Coordinator of project AP-ES2012-19 of Franco-Moroccan Cooperation on the creation of a master's degree with the Agro Paris-Tech School in Paris.
2011-2012	- Partner of the Moroccan-Spanish Inter-University Cooperation Integrated Project (Université Moulay Ismail and University of Sevilla). **AI/048437/11** : « Aspectos docentes y de investigacion sobre nuevas tecnologias enzimaticas no contaminantes de aplicacion en los procesos industriales ».
2010-2011	- Partner of the Moroccan-Spanish Inter-University Cooperation Integrated Action Project (Moulay Ismail University and University of Sevilla) **C/030996/10** : « Sensibilizacion en el uso de nuevas technologias enzymaticas no contaminantes en los procesos industriales ».

ACTIVITIES AND RESEARCH THEMES

- Food safety (cereals, fresh grapes, dried fruits, etc.) and strategy to fight against the formation of mycotoxins (aflatoxins, ochratoxins, patulin, citrinin, DON, etc., ...) at the Faculty of Sciences of Meknes.
- Extraction and exploitation of by-products of tomato, oranges and apples (lycopene, pectin, etc.) from companies in the Meknes region for industrial applications.
- Control of drying processes and use of plant extracts to improve the quality and preservation of dried fruits.
- Valorization of dry pomace of grapes for agribusiness applications.
- Study and research of isolated fungal strains of cereals and vines with lignolytic, cellulolytic and phosphatase activities.
- Valorization and stabilization of press wines for balanced blends.
- Probiotics and lactic acid bacteria as well as the optimization of the production of bioactive peptides in collaboration with the microbiology team at the IUT Lille.
- Selection and characterization of active molecules with hypo-cholesterolemic and hypo-lipidemic properties from fungi and fungi above Nestlé in Lausanne, Switzerland.
- Characterization of the polyketide biosynthesis pathway in a filamentous fungus, *Monascus ruber* at INSA Toulouse.

OTHER ACTIVITIES

- Referred in several journals of microbiology and industrial process (JSRS, PRBI, JFST, AJMR, JABST, IJMR).
- National Expert-Evaluator affiliated with the CNRST since 2019.
- Expert-Evaluator affiliated with Mohamed VI University, Benguerir.
- Activities (Consulting and expertise) for several Moroccan agribusiness companies and valorization of agricultural residues.

SCIENTIFIC PUBLICATIONS

Production scientifique :

1/ H. Hajjaj, A. Klaebe, MO. Loret, T. Tzedakis, G. Goma and PJ. Blanc. (1997). Production and identification of N-glucosylrubropunctamine and N-glucosylmonascorubra-mine from *Monascus ruber*, and occurrence of EDA complex in the red pigments. ***Appl. Environ. Microbiol***. 63:2671-2678.

2/ H Hajjaj, PJ. Blanc, G. Goma and J. François. (1998). Sampling techniques and comparative extraction procedures for quantitative determination of intra- and extracellular metabolites in filamentous fungi. ***FEMS Microbiol. Lett.*** 164:195-200.

3/ Hajjaj H, J Le Bars, G Goma, PJ Blanc. Positive and negative strategies of fungal biotechnology: case of the productionof the pigment of *Monascus*. ***Revue de Médecine Vétérinaire***, 1998, 149: 521-52.

4/ Hajjaj H, A. Klaebe, MO. Loret, G. Goma, PJ. Blanc and J. Francois (1999). The biosynthetic pathway of citrinin in the filamentous fungi *Monascus ruber* as revealed by ^{13}C-NMR. ***Appl. Environ. Microbiol***. 65:311-314.

5/ Hajjaj H, PJ. Blanc, E. Groussac, G. Goma, JL. Uribelarrea, and P. Loubiere. (1999). Improvement of red pigment/citrinin production ratio as a function of environmental conditions by *Monascus ruber*. ***Biotechnol. Bioeng***. 64:497-501.

6/ Hajjaj H, PJ. Blanc, E. Groussac, G. Goma, JL. Uribelarrea, and P. Loubiere. (2000). Kinetic analysis of red pigment and citrinin production by *Monascus ruber* as a function of organic acids accumulation. ***Enz. Microbial. Technol***. 27:619-625.

7/ Hajjaj H, A. Klaebe, E. Barbier, G. Goma, PJ. Blanc and J. François. *(2000). Medium-chain* fatty acids affect citrinin production in the filamentous fungus *Monascus ruber*. ***Appl. Environ. Microbiol***. 66:1120-1125

8/ Van den Broek P, A. Pittet, and H. Hajjaj. (2001). Aflatoxin genes and the aflatoxinogenic potential of Koji molds. ***Appl. Biotechnol. Microbiol***. 57:192-199.

9/ Hajjaj. H, P. Niederberger, and P. Duboc. (2001). Lovastatin biosynthesis by *Aspergillus terreus* in a chemically defined medium. ***Appl. Environ. Microbiol***. 67:2596-2602.

10/ Berger H, D. Rein, E. Kratky, I. Monnard, H Hajjaj, I. Meirim, C. Piguet-Welsch, J. Hauser, K. Mace and P. Niederberger. (2004). Cholesterol-lowering properties of *Ganoderma lucidum in vitro*, *ex vivo*, and in hamsters and minipigs***. Lipids Health Dis***. 3:1-12.

11/ Hajjaj H, I. Zbinden, LB. Fay, C. Mace, P. van den Broek, P. Niederberger and P. Duboc. (2005). Cholesterol biosynthesis inhibition downstream of dihydrolanosterol by *Aspergillus oryzae* strains. ***FEMS Microbiol. Lett***. 242:155-159.

12/ Hajjaj H, C. Mace, M. Roberts, P. Niederberger and LB. Fay. (2005). Effect of 26-Oxygenosterols from *Ganoderma lucidum* and their activity as cholesterol synthesis inhibitors. ***Appl. Environ. Microbiol***. 71(7):3653-8.

13/ Hajjaj H, JM François, G Goma, and PJ. Blanc. (2012). Effect of amino acids on red pigments and citrinin productionin *Monascus ruber.* ***J. Food Sci.*** 77(3):156-9.

14/ Mansouri A, M Hafidi, H Mazouz, R Zouhair, M El Karbane, H Hajjaj. (2014). Mycoflora and Patulin-producing strains of cereals in North-Western Morocco*.* ***SAJEB***. 4(5):276-282.

15/ H Hajjaj, G Goma, and J M. François. (2015). C/N ratio and cultivation mode effects on citrinin and red pigment production from *Monascus ruber.* ***International Journal of Food Science & Technology***. 50: 1731-1736.

16/ M Benaziz, S Ebnaich, F Aissaoui, H Douieb and H Hajjaj. (2015). Behavior of Moroccan red press wine after the clarification process. ***International Journal of Advanced Research***. 3(5): 218-225.

17/ M Benaziz, H Douieb and H Hajjaj. (2015). Influence of microoxygenation, chips and oak barrels breeding in the phenolic composition and sensory quality of the press wine. ***International Journal of Advanced Research.*** 3(7): 799- 806.

18/ S Rharmitt, M Hafidi, H Hajjaj, F Scordino, D Giosa, L Giuffrè, D Barreca, G Criseo, O Romeo. (2016). Molecular characterization of patulin producing and non-producing *Penicillium* species in apples from morocco. ***International Journal of Food Microbiology***. 18(217):137-40.

19/ M Ben aziz, H Nait Mbark, H. Douieb, H. Hajjaj. (2016). Influence of enological treatments on dissolved oxygen content of Moroccan red wine***. International Journal of Advanced Research.*** 4(3):156-160.

20/ M Ben aziz, Mouls L, H Fulcrand H, Douieb H, Hajjaj H. (2017). Phenolic compounds astringency and bitterness of Morrocan red press wines: Influence of fining agents and micro-oxygenation treatments. ***Food Science and Technology***. 78:143-150.

21/ M Ben aziz, Mouls L, Fulcrand H and Hajjaj H. Microoxygenation and fining agent treatments; impact on colour of

Morrocan red press wine. ***Journal of Food Chemistry & Nanotechnology*** 3(1):38-43 (2017).

22/ A Mansouri, El karbane M, Ben aziz M, Nait M'bark H, Hafidi M and Hajjaj H. (2017). Effect of carbon, nitrogen and physico-chemical factors on patulin production in *Penicillium expansum.* ***SAJEB***. 7(2).

23/ H Ziyat, Naciri Bennani M, Hajjaj H, Mekdad S, Qabaqous O. (2018). Synthesis and characterization of crude hydrotalcite Mg-Al-CO_3: study of thymol adsorption. ***Research on Chemical*** Intermediates. 44 (7): 4163–4177.

24/ M Ben Aziz, Garcia, F Mouls, L Fulcrand, H Hajjaj. (2019). Proanthocyanidins and anthocyanins contents, chromaticand antioxidant properties of red grape pomaces from morocco. ***Journal of Food Measurement and Characterization.*** 13(3):2051–2061.

25/ H Nait M'Barek, M Ben Aziz, A Mansouri and H Hajjaj. (2019). Isolation, screening and identification of ligno-cellulolytic fungi from northern central Morocco. ***Biotechnologie, Agronomie, Société et Environnement (BASE)***. 23(4):207-217.

26/ A Gomaa, H Nait M'Barek, H Hajjaj, T Glez. (2019). Molecular Cloning and Expression of *Candida Antarctica* lipaseB in *Corynebacterium* genus. ***Microbiology and Biotechnology Letters***. 47(4), 546–554.

27/ H Nait M'Barek, and H Hajjaj. (2020). Cellulolytic fungi from central Morocco: comparative analysis of enzyme activities, in silico prediction of physico-chemical properties and molecular docking. ***Research Journal of Biotechnology.*** 15 (5). 50-6.

28/ H Ziyat, M Naciri Bennani, H Hajjaj, O Qabaqous, S Arhzaf, S Mekdad and Safae Allaoui. (2020). Adsorption of the thymol onto natural clays of Morocco: kinetic and isotherm studies. ***Journal of Chemistry***. 2020:1-10. DOI: org/10.1155/2020/4926809.

29/ H Nait M'Barek, S Arif, B Taidi and H Hajjaj. (2020). Consolidated bioethanol production from olive mill waste: wood-decay fungi from central Morocco as promising decomposition and fermentation biocatalysts. ***Biotechnology Reports***. 28:1-10. DOI:10.1016/j.btre.2020.e00541.

30/ H Ziyat, M Naciri Bennani, S Allaoui, J Houssaini, H Nait M'barek, S Arif and H Hajjaj. (2021). *In Vitro* Evaluation ofthe Antifungal Activity of Ghassoul-Based Formulations with Oregano and Thyme Essential Oils against *Penicillium sp*.***Hindawi Journal of Chemistry***. Volume 2021. doi.org/10.1155/2021/6692807.

31/ M Benaziz, L Hajji, M Jadouali, H Nait M'Bark, H Hajjaj, A Ainane, T Ainane. (2021). MYCOTOXIGENIC FUNGI OF WINE GRAPE IN MEKNES VINIYARDS (MOROCCO). ***Pharmacologyonline***. **2**:566-575.

32/ A Brahimi, M El Ouardi, A Kaouachi, A Boudboud, L Hajji, H Hajjaj and H Mazouz. (2022). Characterization of the Biochemical Potential of Moroccan Onions (Allium cepa L.). ***Hindawi International Journal of Food Science***. Volume 2022. DOI.org/10.1155/2022/2103151.

33/ N El Fihry, K El Mabrouk, M Eeckhout, H A Schols, Y Filali Zegzouti and H Hajjaj. (2022). Physicochemical and functional characterization of pectin extracted from Moroccan citrus peels. ***LWT Food Science and Technology***. Volume 162. DOI.org/10.1016/j.lwt.2022.113508.

34/ H Ziyat, M Naciri Bennani, Y Dehmani, J Houssaini, S Allaoui, R Kacimi & H Hajjaj. Adsorptive performance of a synthesized Mg-Al Hydrotalcite compound for removal of malachite green : kinetic, isotherm, thermodynamic, and mechanism study. (2022). ***International Journal of Environmental Analytical Chemistry***. DOI : 10.1080/03067319.2022.2032006. 1-19.

35/ M Shalapy, M Amira. G Darwish, H Nait Mbarek, T Gonzlez, H Hajjaj, A E Gomaa, Elsayed E. Hafez. (2022). Microbial psychology: Behavior, associative learning, and relation to antibiotic resistance. ***Journal of Applied Pharmaceutical Science***. DOI.ISSN 2231-3354.

36/ A Laaziz, Y El Hammoudi, S Qjidaa, A Hajjaji, H Hajjaj, G Haesaert, A Bouseta. (2022). Activity of essential oils from Syzygium aromaticum and Rosmarinus officinalis against growth and ochratoxin A production by Aspergillus tubingensis and Aspergillus luchuensis from Moroccan grapes. Vol. 61 No. 2 ***Phytopathol. Mediterr.***, vol. 61, no. 2, pp.299-310. DOI: https://doi.org/10.36253/phyto-12841.

37/ A Brahimi, S Landschoot, B Bekaert, L Hajji, H Hajjaj, K Audenaert, G Haesaert and H Mazouz. (2022). Exploring the genetic and phenotypicdiversity within and between onion (*Allium cepa L.*) ecotypes in Morocco. ***Journal of Genetic Engineering and Biotechnology***. DOI : 10.1186/s43141-022-00381-w.

38/ S Arif, H Nait M'Barek, S Oulghazi, K Audenaert and H Hajjaj. (2022). Lignocellulose-degrading fungi newly isolatedfrom central Morocco are potent biocatalysts for olive pomace valorization. ***Archives of Microbiology.*** (12):704. DOI:

10.1007/s00203-022-03318-6.

39/ T Bouddine, F Khallouki, H Laaroussi, M Bakour, I Guirrou, H Mazouz, H Hajjaj, and L Hajji. (2022). Organic Honey from the Middle Atlas of Morocco : Physic ochemical Parameters, Antioxidant Properties, Pollinical Spectra, and SugarsProfile**.** ***Foods*****.** 11(21). 3362. https://doi.org/10.3390/foods11213362.

40/ H Nait M'Barek, S ARIF and H Hajjaj. (2022). Deciphering biomarkers of the plant cell-wall recalcitrance: towards enhanced delignification and saccharification. ***Biomass Conversion and Biorefinery***. DOI : 10.1007/s13399-022-03594-8.

41/ W Werghemmi, S Abou Fayssal, H Mazouz, H Hajjaj and L Hajji. (2022). Olive and green tea leaves extract in *Pleurotus ostreatus var. florida* culture media: Effect on mycelial linear growth rate diameter and growth induction index**.** ***Environment and Natural Resources : Challenges and Solutions***. DOI :10.1088/1755-1315/1090/1/012020.

42/ Y Dehmani, S Arif, I Daou, A Ed-Dra, S El Oirdi, H Moussout, H Hajjaj, F RHAZI FILALI, S Abouarnadasse. (2023). Detoxification of olive mill wastewater by adsorption on activated clay. February 2023. ***Euro-Mediterranean Journal for Environmental Integration***. DOI :10.1007/s41207-023-00347-5.

43/ H Ziyat, M Naciri Bennani, S Arif, J Houssaini & H Hajjaj. (2023). Fungicide formulation based on *Thyme* essential oil and clay for wheat protection (2023). ***Research on Chemical Intermediates***. **49**.2769–2792.

44/ A Boudboud, M Ben Aziz, H Nait M'barek, H Hajjaj, L Hajji, B DeMeulenaer and H Mazouz. (2023). Journal of Food Chemistry & Nanotechnology. **9**(3) 113-123. Effect of Pretreatment and Process Parameters on the Chemical and Biochemical Properties of Moroccan Apricots (*Prunus armeniaca* L. Var. Canino).

45/ M Benaddou, H Hajjaj, M Diouri. (2023). Eco-Friendly Utilisation of Agricultural Coproducts – Enhancing Ruminant Feed Digestibility through Synergistic Fungal Co-Inoculation with Fusarium solani, *Fusarium oxysporum*, and *Penicillium chrysogenum*. Ecological Engineering & Environmental Technology. 24(8), 120–132.

46/ M Benaddou, H Hajjaj, M Diouri.(2023). Fungal Treatment and Wheat Straw Blend for Enhanced Animal Feed from Olive Pulp. Journal of Ecological Engineering 2023, 24(12) 187–200.

47/ A Boudboud, M Ben Aziz, H Hajjaj, L Hajji, B de Meulenaer, and H Mazouz. (2023). Impact of Pretreatment and Drying Factors on Chemical and Biochemical Attributes of Moroccan Thompson Seedless Grapes. Hindawi International Journal of Food Science. Volume 2023. 1-14. https://doi.org/10.1155/2023/4438353.

48/ N El Fihry , K El Mabrouk , M Eeckhout, H A. Schols, H Hajjaj. Physicochemical, structural, and functional characterization of pectin extracted from quince and pomegranate peel: A comparative study. 2024. International Journal of Biological Macromolecules. 256(2)- DOI: 10.1016/j.ijbiomac.2023.127957.

INTERNATIONAL PATENTS

1- **H Hajjaj**, P. van den Broek, P. Niederberger, LB. Fay, C. Mace and JR. Neeser / **WO 02/10426 A1**. 02/2002. Koji molds and use thereof for preparing cholesterol-lowering products.
2- **H Hajjaj**, C. Mace, P. Niederberger, and LB. Fay / **WO 02/060465 A1**. 08/2002. Cholesterol-lowering agent.
3- M Benaziz et **H Hajjaj** / **MA 37706 A1**. Procédé de valorisation des vins de presse. 29.07.2016 Maroc.
4- N. El Fihry et **H. Hajjaj** / 63833/ 29/12/2023. Production d'un yaourt ferme maigre sans sucre ajouté à base de pectines.

CHAPTERS AND BOOKS

Amina Bouseta, Adil Laaziz, Hassan Hajjaj and Rajae Belkhou. 2021. Mycotoxins in Foods and Feeds in Morocco: Occurrence, Sources of Contamination, Prevention / Control and Regulation. Mycotoxins in Food and Beverages: Innovations and Advances, (**Food Biology Series) Hardcover. (1): 116-161**.

SCIENTIFIC COMMUNICATIONS

Around a hundred oral and poster communications at national and international events.