

ANNUAL REPORT 2023

SCHOOL OF PHARMACEUTICAL SCIENCES (ISPSO)



INTRODUCTION FROM THE PRESIDENCY

En 2023, la présidence de l'ISPSO, avec l'ensemble du corps professoral et les commissions de la Section, a poursuivi ses efforts pour créer un environnement de travail sain, propre à inspirer la créativité et la coopération. Les résultats de l'enquête Vicario sur les conditions de travail au sein de l'ISPSO ont été discutés et traduits en mesures concrètes. Le budget et l'affectation du personnel ont été rationalisés afin d'assurer un traitement équitable de toutes les unités d'ISPSO. Avec l'aide des ressources humaines de l'université, les défis ont été abordés et résolus.

S'appuyant sur ces forces, l'ISPSO a également été très visible pour nos partenaires extérieurs tels que le consortium ULLA de dix écoles européennes d'excellence en sciences pharmaceutiques, le CIDPHARMEF, un réseau mondial d'écoles de pharmacie francophones, et d'autres encore.

Comme présenté dans ce rapport, ces efforts de recherche ont été financés par des organismes tels que le Fonds national suisse de la recherche scientifique (FNS) et par des partenariats public-privé, et ont donné lieu à un grand nombre de publications, de présentations et à plusieurs brevets. Ils ont également donné lieu à plusieurs distinctions et prix pour nos collègues.

Nous nous considérons comme l'institution académique leader en sciences pharmaceutiques et en pharmacie en Suisse et continuons à mener des recherches et des formations de pointe qui ont un impact mondial.

In 2023, the presidency of ISPSO together with the faculty and committees of the Section, continued its efforts to create a working environment suitable to inspire creativity, cooperation and a healthy work environment. The results of the Vicario survey on the work conditions within ISPSO were discussed and translated into concrete measures. Budget and personnel allocation have been streamlined to assure a fair treatment of all units of ISPSO. With the assistance of the university's human resources challenges were addressed and resolved.

Building on these strengths, ISPSO was also very much visible to our outside partners such as the ULLA consortium of ten European Schools of Pharmaceutical Sciences of excellence, CIDPHARMEF, a global network of French-speaking Schools of Pharmacy and others.

As presented in this report, these efforts in research were funded by organisations such as the Swiss National Science Foundation (SNSF) and through public-private partnerships, and resulted in a large number of publications, presentations and several patents. They were also met with several distinctions and awards for our colleagues.

We regard ourselves as the leading academic institution for pharmaceutical sciences and pharmacy in Switzerland and continue conducting cutting-edge research and training that has a worldwide impact.

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DIRECTION AND ADMINISTRATION

BOARD MEMBERS

Prof Gerrit Borchard, President
Prof Patrycja Nowak-Sliwinska, Vice President
Prof Serge Rudaz, Vice President

ADMINISTRATION

Mrs Françoise Védy, Administrator, 100%
Mrs Danielle Coosemans, Administrative Assistant, 60%
Mrs Sylvia Passaquay Rion, Administrative Assistant, 60%
Mrs Laetitia Pascalín, Secretary, 45%

STUDENTS SECRETARIES

Mrs Elena Onate, Administrative Assistant, 90%
Mrs Elisa Masson, Secretary, 60%
Mr André Ramos Arada, 100% (01.04.2023-31.07.2023)
Mrs Noémie Rodriguez, Secretary, 50%, (01.09.2023-31.12.2023)
Mrs Fiona Sanmartín Gonzalez, Secretary, 90%

ACADEMIC ADVISORS

Dr Elisabeth Rivara-Minten, Academic Advisor, 40%
Dr Gaëlle Vacher, Academic Advisor Biomedical Sciences, 10%

IT STAFF

Mr Christophe Francey, Technician informatic support assistant 3, 100%
Mr Loris Franco, System Administrator, 100%
Mr Yann Manet, System Administrator, 100%

DOCTORAL PROGRAM

Dr Béatrice Kaufmann, Coordinator, 15%
Mrs Florence Von Ow, Secretary, 25%

ABBREVIATIONS

<i>PO</i>	<i>Full Professor</i>
<i>PAS</i>	<i>Associate Professor</i>
<i>PAST</i>	<i>Assistant Professor</i>
<i>PTI</i>	<i>Adjunct Professor</i>
<i>PI</i>	<i>Visiting Professor</i>
<i>PD</i>	<i>Privat-Docent</i>
<i>MER / CC</i>	<i>Senior Lecturer</i>
<i>CE</i>	<i>Lecturer</i>
<i>CS</i>	<i>Research Associate and Senior Research Associate</i>
<i>MA</i>	<i>Senior Research and Teaching Assistant</i>
<i>POSTDOC</i>	<i>Postdoctoral Scholar</i>
<i>ASS</i>	<i>Research and Teaching Assistant</i>

RESEARCH UNITS

ANALYTICAL SCIENCES

Prof Jean-Luc VEUTHEY, PO (*until 31.07.2023*)
Prof Serge RUDAZ, PO
Dr Davy GUILLARME, CC, MER
Dr Julien BOCCARD, CE

BIOMOLECULAR AND PHARMACEUTICAL MODELLING

Prof Francesco Luigi GERVASIO, PO

BIOPHARMACY

Prof Gerrit BORCHARD, PO
Dr Olivier JORDAN, MER

CLINICAL PHARMACOLOGY AND TOXICOLOGY

Prof Caroline SAMER, PAS

CLINICAL PHARMACY SCIENCES

Prof Chantal CSAJKA, PO
Dre Noura BAWAB, SCE

COMMUNITY PHARMACY PRACTICE

Dr Jérôme BERGER, CE
Dr Philippe LAURENT, CC
Dr Martin BERNHARDT, CC

HOSPITAL PHARMACY (HUG / CHUV)

Prof Pascal BONNABRY, PAS
Prof Farshid SADEGHIPOUR, PTI
Dre Christel BRUGGMANN, SCE
Dre Nancy PERROTTET RIES, SCE

IMMUNOPHARMACOLOGY OF CANCER

Prof Carole BOURQUIN, PO

MOLECULAR PHARMACOLOGY

Prof Patrycja NOWAK-SLIWINSKA, PAS

PHARMACEUTICAL BIOCHEMISTRY

Prof Leonardo SCAPOZZA, PO

MOLECULAR THERAPEUTICS DELIVERY GROUP

Prof Yogeshvar KALIA, PO

PHARMACEUTICAL TECHNOLOGY

Prof Eric ALLÉMANN, PO
Prof Norbert LANGE, PAS
Dre Florence DELIE-SALMON, MER

PHARMACOGNOSY

Prof Muriel CUENDET, PAS

PHYTOCHEMISTRY & BIOACTIVE NATURAL PRODUCTS

Prof Jean-Luc WOLFENDER, PO
Dr Emerson FERREIRA-QUEIROZ, MER

MEDICATION ADHERENCE AND INTERPROFESSIONALITY

Prof Marie-Paule SCHNEIDER, PAS
Dre Anne-Laure BLANC, CE
Mrs Imane IRAQI, CE
Dr Erik PAUS, CE

DATA ANALYTICS LAB

Prof Stéphane GUERRIER, PAST

SCHOOL OF PHARMACEUTICAL SCIENCES COMMITTEE SITUATION ON JANUARY 1st, 2023

TEACHING COMMITTEE – President: Prof Muriel CUENDET

REGULATIONS AND EQUIVALENCE COMMITTEE – President: Prof Serge RUDAZ

GRADES, EXAMINATIONS AND DEROGATIONS COMMITTEE – President: Dr Elisabeth RIVARA-MINTEN

CONTINUING EDUCATION AND PUBLIC COURSES COMMITTEE – President: Prof Marie Paule SCHNEIDER VOIROL

EXTERNAL DOCTORAL STUDENTS AND TRAINEES ADMISSION COMMITTEE – President: Prof Gerrit BORCHARD

DOCTORAL PROGRAMME COMMITTEE – President: Prof Yogeshvar KALIA

SECONDARY EDUCATION COMMITTEE – President: Mrs Elena ONATE

BUDGET COMMITTEE – President: Mrs Françoise VÉDY

IT COMMITTEE – President: Prof Francesco Luigi GERVASIO

SECURITY AND PREMISES COMMITTEE – President: Prof Jean-Luc VEUTHEY (until 31.07.2023) / Prof Eric ALLÉMANN

SCIENTIFIC COMMITTEE – Presidents: Prof Francesco Luigi GERVASIO

GLOBAL PHARMACY COMMITTEE – President: Prof Pascal BONNABRY

SHARED INSTRUMENTATION COMMITTEE – President: Prof Eric ALLÉMANN

PRACTICAL WORK COMMITTEE – President: Dr Emerson FERREIRA QUEIROZ

BIOMEDICAL SCIENCES TEACHING COMMITTEE – Presidents: Prof Pierre COSSON (Medicine) and Prof Leonardo SCAPOZZA

VISIBILITY AND COMMUNICATION COMMITTEE – Prof Patrycja NOWAK-SLIWINSKA

VISITING PROFESSORS ('PROFESSEUR-ES BÉNÉVOLES') GROUP – Prof. Patrycja NOWAK-SLIWINSKA

CMU LIBRARY INSTANCE – Responsible: Prof Serge RUDAZ

GROUPE EXAMENS FEDERAUX – Responsible: Prof Chantal CSAJKA

STAFF



PROFESSORS

Eric ALLÉMANN, 100%
Tudor ARVINTE, 10% (*until 31.07.2023*)
Pascal BONNABRY, 15% (+HUG)
Gerrit BORCHARD, 100%
Carole BOURQUIN, 80% (+20% Faculty of Medicine, but 100% paid by the Section)
Chantal CSAJKA, 50% (+UNIL)
Muriel CUENDET, 100%
Francesco Luigi GERVASIO, 100%
Stéphane GUERRIER, 50% (+ 50% GSEM)
Yogeshvar KALIA, 100%
Norbert LANGE, 100%
Patrycja NOWAK-SLIWINSKA, 100%
Serge RUDAZ, 100%
Farshid SADEGHIPOUR, 15% (+CHUV)
Caroline SAMER, 10 % (paid by Faculty of Medicine)
Leonardo SCAPOZZA, 100%
Marie-Paule SCHNEIDER, 75% (+Pharma24)
Jean-Luc VEUTHEY, 100% (*until 31.07.2023*)
Jean-Luc WOLFENDER, 100%
Frédéric ZENHAUSERN, 20% (non-numerated)

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Emerson FERREIRA QUEIROZ, 100%
Davy GUILLARME, 100%
Olivier JORDAN, 100%
Philippe LAURENT, 12.5%
Alain MERKLI, 5%
Emmanuel VARELIO, 50% (+50% Faculty of Sciences)

INVITED PROFESSORS AND RESEARCHERS

Davide BRAMBILLA (*01.10.2023-31.03.2023*)
Raquel PEREZ ROBLES (*10.01.2023-10.04.2023*)
Eakachai PROMPETCHARA (*09.01.2023-08.02.2023*)
Adina TURCU STIOLICA (*01.03.2023-31.03.2023*)

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Anne-Laure BLANC, 20%
Christel BRUGGMANN, 10%
Chin Bin EAP, 10% (+UNIL)
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Karl PERRON, 40% (+60% BIVEG)
Nancy PERROTTET RIES, 10%
Christian KOLLER, 5%
Elisabeth RIVARA-MINTEN, 40%
Philippe LAURENT, 12.5%

PRIVAT DOCENTS

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Youssef DAALI (+20% Faculty of Medicine)
Sandrine FLEURY SOUVERAIN
Marco PRUNOTTO
Pierre VOIROL
Nicolas WIDMER

SENIOR RESEARCH ASSOCIATES

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Victor GONZALEZ RUIZ, 100% (*until 31.03.2023*)
Thomas GURRY, 50 %
Hesham HAMED, 30% (*since 01.04.2023*)
Beatrice KAUFMANN, 60 % (+15% Faculty)
Maria LAPTEVA, 80% (*until 31.01.2023*)
Laurence NEFF, 20%
Louis-Félix NOTHIAS, 100% (*until 30.06.2023*)
Davis PEJOSKI, 100%, 30% (*since 01.03.2023*)
Sébastien TARDY, 100%
Gaëlle VACHER, 80%
Magali ZEISSER-LABOUEBE, 80%

SENIOR RESEARCH AND TEACHING ASSISTANTS

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Viorica PATRULEA, 50% (*since 01.02.2023*)
Aurélien POMMIER, 90% (*until 30.10.2023*)
Valério RIZZI, 85%
Elena TOBOLKINA, 100%
Julie VERIEPE, 100%

POSTDOCTORAL SCHOLARS

Mireia ANDREU CARBO, 100% (*since 01.10.2023*)
Simone AURELI, 85%
Carole BANDIERA, 80% (*until 30.09.2023*)
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Margot BOJJUT, 100%
Theo BRILLATZ, 80%
Evelina CARDOSO, 40% (*until 28.02.2023*)
Aditya DARADE, 100% (*until 28.02.2023*)
Miguel DE FIGUEIREDO, 100% (*until 30.04.2023*)
Bastiaan DUIVELSHOF, 100% (*until 31.07.2023*)
Jonathan FARO BARROS, 100%
Sabrina FERRE, 100% (*until 31.03.2023*)
Thorben FROHLKING, 85%
Ioannis GALDADAS, 85%
Mathieu GALMICHE, 100% (*since 01.04.2023*)
Dorothea GOBBO, 60% (*until 30.04.2023*)
Si GOU, 100%
Sébastien JENNI, 90% (*until 31.03.2023*)
Nasreddine KANFAR, 100% (*until 30.04.2023*)
Martin KIENING, 90% (*until 28.02.2023*)
Rémy MARCELLIN-GROS, 85%
Franck MARQUET, 100% (*until 31.10.2023*)
Solène MASLOH, 100% (*until 30.06.2023*)
Hugo MORIN, 80%
Inès NIKOLIC, 100%
Allegra PELETTA, 50% (*until 30.09.2023*)
Marija PETROVIC, 60% (*until 30.09.2023*)
Nicola PIASENTIN, 85% (*since 01.11.2023*)
Emanuel PINTO DE SOUSA, 100%
Alexandre PORCELLO, 50%
Luis QUIROS GUERRERO, 100% (*since 01.07.2023*)
Adèle RAKOTONIRINA, 90% (*July 2023*)
George RAMZY, 100% (*until 30.09.2023*)
Carlos RODRIGUEZ NOGALEZ, 100% (*until 31.10.2023*)
Laurence SCHUMACHER, 100%
Sarah SERHAL, 95% (*since 01.06.2023*)
Sandrine VON GRUNIGEN, 85%

RESEARCH AND TEACHING ASSISTANTS

Kenza ABOUIR
Joanna ACHKHANIAN
Mégane AEBISCHER
Carole BANDIERA
Cintia BAPTISTA MARQUES
Ana Beatriz BASTOS SOARES DOS SANTOS
William BELLO
Yahia BENNANI
Léa BODEN SOHL DOST
Bart BOERSMA
Alberto BORSATTO
Alexandre BORY
Benjamin BUGNON
Carlotta CECCHINI
Aude COUMAU
Claire COUMAU
Meryem DALOUADI
Yassine DHIF
Filippo DONATI
Eloïse DUCREY
Bastiaan DUIVELSHOF
Eloïse DUPUYCHAFFRAY
Radhia EL PHIL
Jonathan FARO BARROS
Pedro FEBRER MARTINEZ
Sabrina FERRE
Angelica FERRO
Raphaël FESER
Mathis FIAULT
Paul GARIN
Alexandra GARNIER
Arnaud GAUDRY
Emre GEZER
Sergey GIREL
Paula GONZALEZ FERNANDEZ
Jakub GUBALA
Ghali GUEDIRA
Paola HAEMMERLI
Anton HANKE
Emilie HAUSMANN
Margaux HERITIER
Sébastien HEVIN
Robin HUBER
Laura IACOBUCCI
Bilal JABER
Mégane JERMINI

Maurice KARRENBROCK
Martin KIENING
Olivier Auguste KIRCHHOFFER
Soufiene KRIFA
Marko KRSTIC
Karen LANDINO
Honorine LARDEUX
Ferdinand LE BLOC'H
Oliwia MAJCHRZAK
Stéphanie MENA
Yasmina MERZOUK
Valentin MIEVILLE
Luca MORICI
Nathalie NGUYEN
Ivan PANCHENKO
Sara PANNILUNGHI
Allegra PELETTA
Laeticia PINTO
Hélène POINOT
Pragallabh PURWAR
Luis QUIROS GUERRERO
Mandimbinomena Adèle RAKOTONIRINA
Alcidia RAMOS BARROS
George RAMZY
Noémie RATSIMALAHELO
Rafael RINCON
Benjamin ROSSIER
Ece SAHI ILHAN
Phedra Firdaws SAHRAOUI
Suzanne Sherihan SAHRAOUI
Cindy SCHELKER
Ozlem SEVIK
Joanna SOBOCINSKA
Weronika SPALENIAK
Sofia SPATARO
Camille STAMPFLI
Oriane STRASSEL
Camille SUESS
Erga SYAFITRI
Maxime TUFEU
Gianluca ULIVI
Gioele VISCONTI
Tess VOUILLAMOZ
Leqi WANG
Xiaoxiao WANG

JOINTLY SUPERVISED PHD STUDENTS AND JOINTLY SUPERVISED PHD STUDENTS FROM ANOTHER UNIVERSITY

Martijn BEMELMANS
Maëlis BRITO
Anne CAYRON
Lorenza DESTRO
Dominykas LUKAUSKIS
Estelle MARET

RESEARCH ASSISTANTS (ARE)

Daniel Augusto ALVES CANTO
Ilona BEATRIX
Meryem BENLALAH
Sheryl CUENAT
Rafaela FERREIRA FARIA
Charlotte GROMETTO
Célestin JACOT DESCOMBES
Marc JAMAIN
Christine KLEIN
Ines NERODENKOVA
David OHAYON
Alena SCHUEMANN
Emman THOMASSON
Océane Cindy TRANCHANT

INTERNSHIP STUDENTS / VISITING SCHOLARS

Nahide Zeren ARDA (01.04.2023-31.03.2024)
Valentine ARDOINO (22.02.2023-26.05.2023)
Mia BALIS (01.05.2023-02.06.2023)
Francesco BELLINA (01.04.2023-30.09.2023)
Yasmine BEN ABDALLAH (07.08.2023-18.08.2023)
Nathan BONTE (25.09.2023-24.07.2024)
Nathareen CHAIWANGRACH (22.08.2022-31.03.2023)
Nurbanu DEMİRTÜRK (01.11.2022-30.04.2023)
Lorenza DESTRO (01.10.2022-31.03.2023)
Pauline DESVIGNES (27.03.2023-15.08.2023)
Clément FONTAO (01.01.2023-17.02.2023)
Izadora FURLANI (01.03.2022-28.02.2023)
Annamaria HALECKOVA (01.02.2023-31.07.2023)
Sara IANKOV TOQUET (22.05.2023-18.08.2023)
Eda IMERI (07.08.2023-18.08.2023)
Alessia PAILLARD (27.11.2023-28.11.2023)
Tobias LANGER (16.01.2023-27.01.2023)
Amanda LICEA (24.05.2023-31.05.2023)
Francisca LOPEZ (01.06.2023-31.07.2023)
Anouar MEJAÏT (11.09.2023-20.10.2023)
Marine MORVAN (23.01.2023-24.02.2023)
Ana Francisca PINHEIRO LOPES (19.06.2023-17.07.2023)
Jonas John RICHARD (07.08.2023-25.08.2023)
Laura SOLE (01.03.2023-31.08.2023)
Aruna WALDBURGER (07.08.2023-25.08.2023)

ADMINISTRATIVE STAFF

Nathalie CHIAVAROLI, 50%
Danielle COOSEMANS, 60%
Lilla EREDICS, 80% (*since 01.06.2023*)
Cécile GIROD-BURNAND, 20% (*since 01.11.2023*)
Marilyn FREIRE BARJA ZLASSI, 80%
Elisa MASSON, 60%
Angeles MARTINEZ-CASTRO, 20%, (*since 01.11.2023*)
Annabelle MONOD, 50% (*until 31.03.2023*)
Elena ONATE, 90%
Laetitia PASCALIN, 45% (*since 01.05.2023*)
Sylvia PASSAQUAY-RION, 60%
André Ramos Arada, 100% (*01.04-31.07.2023*)
Miroslawa REBETEZ-GRALEWICZ, 80%
Noémie RODRIGUEZ, 50% (*01.09-31.12.2023*)
Fiona SANMARTIN GONZALEZ, 90%
Natalie SCHREGLE, 80%
Françoise VÉDY, 100%
Florence VON OW, 90% (25% progdoc + 70% Research unit secretary +5% secretary CAS)
Anne-Françoise WITTA, 50%, 80% (*since 01.04.2023*)

IT STAFF

Christophe FRANCEY, 100%
Loris FRANCO, 100%
Yann MANET, 100%

TECHNICAL STAFF

Montserrat ALVAREZ, 100% (*until 30.09.2023*)
Frédéric BORLAT, 100%
Nathalie BOULENS, 60%
Mathias BUFF, 60% (*since 01.11.2023*)
Sylvie CHLIATE-MAZZOLENI, 50% (*01.07-31.12.2023*)
Carole DUPRAZ, 35%
Sarah GARDI, 100%
Aurélie GOUILLER, 90%
Tayeb JBILOU, 80%
Justine LANGHAM, 100% (*until 31.03.2023*)
Fersan NUHIJI, 50% (*since 01.05.2023*)
Laurence MARCOURT, 100%
Aristea MASSARAS, 100% (*until 31.05.2023*)
Jessica ORTELLI, 90%
Marco PERDIGAO, 100%
Olivier PETERMANN, 90%
Colette SAUTY, 25%
Cédric SCHELLING, 100%
Isis SENONER, 40% (*until 31.12.2023*)
Luca SIMULA, 100% (*since 15.09.2023*)
Emmanuelle SUBLET, 70%

BUDGET

SALARY AND OPERATIONAL BUDGETS (CHF)	2023	2022	2021	2020	2019
Staff salary (incl. social charges)	12 679 037	12 269 103	12 252 781	12 054 874	11 851 759
Operational budget	1 180 416	1 184 052	1 168 166	1 149 166	1 143 666
Total	13 859 453	13 453 155	13 420 947	13 204 040	12 995 425

INVESTMENT BUDGET (CHF)	2023	2022	2021	2020	2019
Faculty investment	298 890	308 134	292 653	287 577	246 855
Section investment	290 979	290 979	290 979	290 979	290 979
Total	589 869	599 113	583 632	578 556	537 834

EXTERNAL FUNDS (CHF)	2023 (**)	2022	2021	2020	2019 (*)
Research funds (SNSF and others)	7 960 465	6 909 748	7 040 856	6 724 496	5 535 149
Service agreements and related activities	1 014 920	1 307 638	783 419	890 169	1 160 619
Total	8 975 385	8 217 386	7 824 275	7 614 665	6 695 768

(*) Modification in 2020 of the funds calculation rules for J. Desmeules in order to take into account his activity rate (20%) in the Section

(**) C. Samer: activity rate 10% in the Section

TOTAL BUDGET (CHF)	2023 (**)	2022	2021	2020	2019 (*)
Total	23 424 708	22 269 654	21 828 854	21 397 261	20 229 027

(*) Modification in 2020 of the funds calculation rules for J. Desmeules in order to take into account his activity rate (20%) in the Section

(**) C. Samer: activity rate 10% in the Section

BUDGET 2023	FTE
Scientific personnel	2.52
Technicians	3.00
Laboratory and Technical Assistants	10.70
Technical and Lab Aides	0.60
Total technical personnel	16.82
Administration heads, Departments heads, Adm Clerks	1.00
Secretaries, Accountants, Library help	8.86
Total administrative personnel	9.86
TOTAL Technical and Administrative personnel ('PAT')	26.68
Full Professors	9.00
Associate Professors	3.86
Adjunct Professors	0.00
Subtotal Faculty	12.86
Lecturers, Academic Advisors ('Chargés d'Ens., Cons. Etudes')	4.40
Senior Lecturers ('MER, Chefs de Clinique scient.')	3.95
Senior Lecturers ('Chargés de cours')	0.81
(Senior) Research Associates ('Collab. Scientifiques I et II')	2.30
Subtotal Intermediate corps	11.46
Total Faculty	24.32
Research and Teaching Fellows	4.20
PhD students, Post-doctoral fellows	35.82
PhD student ('Tax' Rectorate) (2022-2024) (*)	1.00
Subtotal Research and Teaching Fellows, PhD students, Post-docs	41.02
TOTAL Teaching personnel ('PENS')	65.34

(*) + 0.7 EPT PhD student on Faculty of Science budget (2022-2024)

STAFF SCHOOL OF PHARMACEUTICAL SCIENCES	2023	2022	2021	2020	2019
Total	255	217	239	249	254

2023 AT A GLANCE

2023 TOTAL BUDGET (CHF)	23 424 708
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TOTAL STUDENTS	2023	2022	2021	2020	2019
Bachelor Unige (Genève)	345	344	367	337	352
Bachelor Unil (Lausanne)	70	78	66	58	67
Bachelor Unine (Neuchâtel)	31	36	39	32	19
Master	155	155	209	182	170
Master in biomedical sciences (*)	26	27	28	13	--
Master of advanced studies	20	20	24	24	20
Total	647	660	733	646	628

(*) The Master in biomedical sciences was launched in 2020

TOTAL Ph.D STUDENTS AND POSTDOCTORAL FELLOWS	2023	2022	2021	2020	2019
Ph.D. students	97	117	102	113	111
Postdoctoral fellows	37	28	18	20	23
MA	10	9	9	9	7
Total	144	154	129	142	141

SCIENTIFIC ACTIVITIES	2023	2022	2021	2020	2019
Publications with impact factor	230	235	260	251	212
Publications without impact factor	38	24	30	45	91
Patents	5	6	2	9	6
Books and chapters	7	13	5	7	8
Congresses / conferences organisation	50	30	32	21	40
Poster presentations	173	212	127	58	179
Oral presentations	82	108	82	42	134
Invited oral presentations	135	102	98	77	177
Number of projects at FNRS and assimilated (Research funds)	103	92	85	85	79
Service agreements and related activities	34	24	35	23	38
Ph.D. theses presented	27	29	19	22	18
Awards and distinctions	37	34	22	23	31
Public outreach activities	82	79	20	45	48

2023 KEY EVENTS

In 2023, ISPSO proceeded along the lines of the planification report 2023 - 2026, which was established in 2021. Priorities mentioned in the plan are the emergence of interdisciplinary areas; preparing for faculty retirements; strengthening existing and developing new areas of research; promoting the Section's identity and fostering equal opportunity. With the nomination of Prof. Valérie Gabelica, an expert in the field of mass spectrometry (MS) we reinforced our capabilities in the area of pharmaceutical analytical sciences. Prof. Caroline Samer, professor at the Faculty of Medicine at Geneva University and an expert in personalising drug therapy, was also nominated to reinforce our activities. In addition, two of our faculty, Profs Muriel Cuendet and Caroline Samer, were selected for the H.I.T. program ('High Potential University Leaders Identity & Skills Training Program - Inclusive Leadership in Academia'), which is a national training program reserved for Switzerland's top female professors aspiring to take up leadership positions.

Our efforts in research have resulted in a large number of scientific publications, and a record number in invited presentations of our research at scientific conferences and seminars. This, and several projects enhanced the embedding ISPSO in national and international networks and increase its visibility. Among these are our activities in ULLA, a consortium of 10 European Schools of Pharmaceutical Sciences of excellence that provides our graduate students and faculty with the opportunity of scientific exchange and cooperation in European projects. We also continued to contribute to the work on interprofessionality in the framework of the International Conference of French-speaking Faculties of Pharmacy (Cidpharmef). last but certainly not least, we further developed our project Pharmascope/Pharmamobile, which is in part funded by SNSF. With this effort we inform high school students on pharmaceutical sciences from drug discovery to delivery to the patient using advanced teaching methods in the French-speaking cantons of Switzerland.

In 2023, the School also had the privilege to select Prof. Benjamin Cravatt of Scripps Research Institute (San Diego, USA) as candidate for the Prix Mondial Nessim-Habif 2023. Prof. Cravatt was also invited and accepted to join our Scientific Advisory Committee, which will meet in 2025 again. We are looking forward to engaging in discussions and hear Prof. Cravatt's advice on the further strategic development of ISPSO.

ANALYTICAL SCIENCES

Professor Serge RUDAZ

Professor Jean-Luc VEUTHEY (*until 31.07.2023*)

Doctor Julien BOCCARD

Doctor Davy GUILLARME

General description of the Unit

The group focuses its activities on separation techniques, mainly liquid chromatography (LC), capillary electrophoresis (CE) and supercritical fluid chromatography (SFC) coupled with various detectors, including mass spectrometry (MS) for the analysis and bioanalysis of pharmaceutical substances. New chromatographic supports and sample preparation approaches are evaluated and original strategies to gain selectivity and/or sensitivity of the analytical process are developed. Reduction of the total analysis time is also studied. Special focus is given to the analytical characterization of biopharmaceutical products, including monoclonal antibodies and related compounds, as well as oligonucleotides.

The research of this group also aims at the development of new strategies for targeted and untargeted metabolomic analyses with a focus on the analysis of low molecular weight compounds in biological matrices. Since 2010, the group is also investigating original approaches dedicated to the analysis of data produced by MS couplings, including CE. The use of chemometric tools for developing analytical methods, determining optimized or robust conditions, as well as for analysing data with pattern recognition techniques are applied in many projects within the School of Pharmaceutical Sciences and numerous external academic and/or industrial collaborations. Aspects of dimensionality reduction and multi-block analysis are addressed through collaborative projects in the fields of toxicology, biology, biochemistry, and pharmacology.

Specific research fields

- Liquid chromatography (LC)
- Capillary electrophoresis (CE)
- Supercritical fluid chromatography (SFC)
- Hyphenation to mass spectrometry (MS)
- Sample preparation
- Analytical Method Validation
- Chemometrics
- Metabolomics
- Toxicology
- Oligonucleotides
- Monoclonal antibodies

2023 at a glance

- Publications with impact factor: 24
- Publications without impact factor: 1
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation : 6
- Posters presentations: 20
- Oral presentations: 7

- Invited oral presentations: 24
- Number of projects at FNRS and assimilated (Research funds): 12
- Service agreements and related activities: 1
- Ph.D. Theses presented in 2023: 3
- Awards and distinctions: 5
- Public outreach activities: 0

Research funds

Bayer

Industry

Development of innovative analytical strategies for therapeutic peptides, oligonucleotides and radionuclide conjugates

Main applicant: Davy Guillaume

Total funding of the project: € 180'000.- (CHF 195'840.-)

Total duration of the project: 3 years

Allocation 2023: CHF 32'622 + CHF 29'013 = CHF 61'635.-

Starting date: 01.08.2021

Ferring-BISPE

Industry

Analytical characterization of bispecific and trispecific antibodies

Main applicant: Davy Guillaume

Total funding of the project: CHF 92'538.-

Total duration of the project: 3 years

Allocation 2023: CHF 47'165.-

Starting date: 01.05.2021

Genentech mRNA

Industry

Separation of impurities in large therapeutic RNA molecules at the nucleotide level

Main applicant: Davy Guillaume

Total funding of the project: US 20'000.- (CHF 18'110.-)

Total duration of the project: 1 years

Allocation 2023: US 20'000.- (CHF 18'110.-)

Starting date: 01.06.2023

ME12223 (SNSF)

Institutional

Mindfulness-Based Intervention to reduce stress and improve prosocial skills for health-care students: a translational RCT integrating clinical, neuroimaging and biomedical outcomes.

Main applicants: Camille Nemitz-Piguet, Serge Rudaz, Françoise Jermann

Total funding of the project: CHF 630'000.-

Total duration of the project: 4 years

Allocation 2023: CHF 188'873.-

Starting date: 01.02.2022

OMICS4TOOL

Institutional

Main applicants: Serge Rudaz, Julien Boccard

Total funding of the project: € 16'640.- (CHF 16'896.-)

Total duration of the project: 4 years

Allocation 2023: 0.-

Starting date: 01.06.2022

OMICS-RUSSIA

Institutional

Development and application of extended steroid profiling to clinical practice: a metabolomics approach

Main applicant: Serge Rudaz

Total funding of the project: 13'600.-

Total duration of the project: 2 years

Allocation 2023: 0.-

Starting date: 01.10.2020

ROCHE-AAVs

Industry

Development of innovative liquid chromatography methods for the characterization of gene therapy products

Main applicant: Davy Guillarme

Total funding of the project: € 183'810.- (CHF 202'000.-)

Total duration of the project: 2 years

Allocation 2023: 0.-

Starting date: 01.05.2021

ROCHE-BISPE

Industry

Improvement of chromatographic and LC-MS-based characterization of diverse complex protein formats for research and early development

Main applicant: Davy Guillarme

Total funding of the project: € 165'470.- (CHF 183'110.-)

Total duration of the project: 2 years

Allocation 2023: CHF 82'329.-

Starting date: 01.05.2021

ROCHE-SEC-AAV

Industry

Improving the analytical methods for AAVs characterization

Main applicant: Davy Guillarme

Total funding of the project: CHF 53'341.20.-

Total duration of the project: 1 year

Allocation 2023: CHF 13'335.30.-

Starting date: 01.10.2023

SCAHT4-GL-21-01

Institutional

Bioanalytical and metabolomic readouts for toxicology

Main applicant: Serge Rudaz

Total funding of the project: CHF 420'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 210'000.-

Starting date: 01.01.2021

SCAHT RV-AV 23-02

Institutional

Pathways of toxicity – mapping the underlying cell metabolism to support toxicant mixture effect investigations

Main applicant: Serge Rudaz

Total funding of the project: CHF 120'000.-

Total duration of the project: 2 years

Allocation 2023: CHF 50'000.-

Starting date: 01.01.2023

Steroid Pass

Industry

Biostatistic analysis of Athletes: toward a Blood Steroid Passport

Main applicant: Serge Rudaz

Total funding of the project: CHF 200'000.-

Total duration of the project: 2 years

Allocation 2023: 0.-

Starting date: 01.04.2021

Total amount for all research funds for 2023: CHF 671'447.30.-

Service agreements and related activities

Waters-Fekete

Industry

Main applicant: Jean-Luc Veuthey

Total funding of the project: CHF 39'298.-

Total duration of the project: 3 years

Allocation 2023: CHF 12'029.-

Starting date: 01.04.2021

Total amount (for all service agreements and related activities) for 2023: CHF 12'029.-

Scientific publications (with impact factor)

- Aebischer, M. K.; Bouvarel, T.; Barrozo, E.; Kochardt, D.; Elger, C.; Haindl, M.; Ruppert, R.; Guillaume, D.; D'Atri, V., Boosting the Separation of Adeno-Associated Virus Capsid Proteins by Liquid Chromatography and Capillary Electrophoresis Approaches. *Int J Mol Sci* 2023, 24 (10), 8503. 5.6
- Bello, W.; Pezzatti, J.; Berger-Gryllaki, M.; Rudaz, S.; Sadeghipour, F., Development of a generic approach for monitoring leachable compounds in hospital pharmacy-prepared prefilled plastic packaging by ultrahigh-performance liquid chromatography coupled to high-resolution mass spectrometry with postcolumn infusion. *J Pharm Biomed Anal* 2023, 236, 115640. 3.4
- Bouvarel, T.; Bremeyer, N.; Gao, M.; Holkenjans, W.; Hetzel, T.; Pell, R.; D'Atri, V.; Guillaume, D., Tackling Issues Observed during the Development of a Liquid Chromatography Method for Small Molecule Quantification in Antibody-Chelator Conjugate. *Molecules* 2023, 28 (6) 2626. 4.6
- Butre, C. I.; D'Atri, V.; Diemer, H.; Colas, O.; Wagner, E.; Beck, A.; Cianferani, S.; Guillaume, D.; Delobel, A., Interlaboratory Evaluation of a User-Friendly Benchtop Mass Spectrometer for Multiple-Attribute Monitoring Studies of a Monoclonal Antibody. *Molecules* 2023, 28 (6) 2855. 4.6
- Chapel, S.; Rouviere, F.; Guillaume, D.; Heinisch, S., Reversed HILIC Gradient: A Powerful Strategy for On-Line Comprehensive 2D-LC. *Molecules* 2023, 28 (9) 3907. 4.6
- De Figueiredo, M.; Rudaz, S.; Boccard, J., A unified strategy to rebalance multifactorial designs with unequal group sizes: application to analysis of variance multiblock orthogonal partial least squares. *Anal Chim Acta* 2023, 1263, 341284. 6.2
- De Figueiredo, M.; Saugy, J.; Saugy, M.; Faiss, R.; Salamin, O.; Nicoli, R.; Kuuranne, T.; Rudaz, S.; Botre, F.; Boccard, J., A new multimodal paradigm for biomarkers longitudinal monitoring: a clinical application to women steroid profiles in urine and blood. *Anal Chim Acta* 2023, 1267, 341389. 6.2
- Douez, E.; D'Atri, V.; Guillaume, D.; Antier, D.; Guerriaud, M.; Beck, A.; Watier, H.; Foucault-Fruchard, L., Why is there no biosimilar of Erbitux®? *J Pharm Biomed Anal* 2023, 234, 115544. 3.4
- Duivelshof, B. L.; Bouvarel, T.; Pirner, S.; Larraillet, V.; Knaupp, A.; Koll, H.; D'Atri, V.; Guillaume, D., Enhancing Selectivity of Protein Biopharmaceuticals in Ion Exchange Chromatography through Addition of Organic Modifiers. *Int J Mol Sci* 2023, 24 (23) 16623. 5.6
- Fekete, S.; Aebischer, M. K.; Imiolek, M.; Graf, T.; Ruppert, R.; Lauber, M.; D'Atri, V.; Guillaume, D., Chromatographic strategies for the analytical characterization of adeno-associated virus vector-based gene therapy products. *Trends Anal Chem* 2023, 164, 117088. 13.1
- Fekete, S.; Guillaume, D., Ultra-short columns for the chromatographic analysis of large molecules. *J Chromatogr A* 2023, 1706, 464285. Girel, S.; Guillaume, D.; Fekete, S.; Rudaz, S.; Gonzalez-Ruiz, V., Investigation of several 4.1 chromatographic approaches for untargeted profiling of central carbon metabolism. *J Chromatogr A* 2023, 1697, 463994. 4.1
- Guillaume, D.; Rouviere, F.; Heinisch, S., Theoretical and practical comparison of RPLC and RPLC x RPLC: how to consider dilution effects and sensitivity in addition to separation power? *Anal Bioanal Chem* 2023, 415 (13), 2357. 4.3
- Jager, M. C.; Patt, M.; Gonzalez-Ruiz, V.; Boccard, J.; Wey, T.; Winter, D. V.; Rudaz, S.; Odermatt, A., Extended steroid profiling in H295R cells provides deeper insight into 4.1

chemical-induced disturbances of steroidogenesis: Exemplified by prochloraz and anabolic steroids. <i>Mol Cell Endocrinol</i> 2023, 570, 111929.	
Lardeux, H.; Fekete, S.; Lauber, M.; D'Atri, V.; Guillaume, D., High-Throughput Chromatographic Separation of Oligonucleotides: A Proof of Concept Using Ultra-Short Columns. <i>Anal Chem</i> 2023, 95 (27), 10448.	7.4
Lardeux, H.; Guillaume, D.; D'Atri, V., Comprehensive evaluation of zwitterionic hydrophilic liquid chromatography stationary phases for oligonucleotide characterization. <i>J Chromatogr A</i> 2023, 1690, 463785.	4.1
Lardeux, H.; Guillaume, D.; Imiolek, M.; Fekete, S.; Lauber, M. A., Pressure-Enhanced Liquid Chromatography as a Suitable Approach to Improve Selectivity for Large Molecule Separations. <i>LCGC N.A.</i> 2023, 41, 28.	0.48
Olesti, E.; Boccard, J.; Rahban, R.; Girel, S.; Moskaleva, N. E.; Zufferey, F.; Rossier, M. F.; Nef, S.; Rudaz, S.; Gonzalez-Ruiz, V., Low-polarity untargeted metabolomic profiling as a tool to gain insight into seminal fluid. <i>Metabolomics</i> 2023, 19 (6), 53.	3.06
Pamies, D.; Vujic, T.; Schvartz, D.; Boccard, J.; Repond, C.; Nunes, C.; Rudaz, S.; Sanchez, J. C.; Gonzalez-Ruiz, V.; Zurich, M. G., Digoxin Induces Human Astrocyte Reaction In Vitro. <i>Mol Neurobiol</i> 2023, 60 (1), 84.	5.1
Perez-Robles, R.; Fekete, S.; Navas, N.; Guillaume, D., Practical study on the impact of injection conditions in gradient elution mode for the analysis of therapeutic proteins when using very short columns. <i>J Chromatogr A</i> 2023, 1709, 464359.	4.1
Shestakova, K. M.; Moskaleva, N. E.; Boldin, A. A.; Rezvanov, P. M.; Shestopalov, A. V.; Rumyantsev, S. A.; Zlatnik, E. Y.; Novikova, I. A.; Sagakyants, A. B.; Timofeeva, S. V.; Simonov, Y.; Baskhanova, S. N.; Tobolkina, E.; Rudaz, S.; Appolonova, S. A., Targeted metabolomic profiling as a tool for diagnostics of patients with non-small-cell lung cancer. <i>Sci Rep</i> 2023, 13 (1), 11072.	4.6
Tobolkina, E.; Pamies, D.; Zurich, M.-G.; Rudaz, S.; González-Ruiz, V., Bringing CE-MS into the regulatory toxicology toolbox: Application to neuroinflammation screening. <i>Microchem J</i> 2023, 193.	4.8
Visconti, G.; Boccard, J.; Feinberg, M.; Rudaz, S., From fundamentals in calibration to modern methodologies: A tutorial for small molecules quantification in liquid chromatography-mass spectrometry bioanalysis. <i>Anal Chim Acta</i> 2023, 1240, 340711.	6.2
Visconti, G.; de Figueiredo, M.; Salamin, O.; Boccard, J.; Vuilleumier, N.; Nicoli, R.; Kuuranne, T.; Rudaz, S., Straightforward quantification of endogenous steroids with liquid chromatography-tandem mass spectrometry: Comparing calibration approaches. <i>J Chromatogr B</i> 2023, 1226, 123778.	3.0
Visconti, G.; de Figueiredo, M.; Strassel, O.; Boccard, J.; Vuilleumier, N.; Jaques, D.; Ponte, B.; Rudaz, S., Multitargeted Internal Calibration for the Quantification of Chronic Kidney Disease-Related Endogenous Metabolites Using Liquid Chromatography-Mass Spectrometry. <i>Anal Chem</i> 2023, 95 (36), 13546.	7.4

Scientific publications (without impact factor)

Boccard, J.; Rudaz, S., Why do we need to go beyond overall biological variability assessment in metabolomics? Front Anal Sci 2023, 3.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 6
- Posters presentations: 20
- Oral presentations: 7
- Invited oral presentations: 24

Ph.D. Theses presented in 2023

Bastiaan Duivelshof

Development of Novel Chromatographic Techniques Hyphenated to Mass Spectrometry for the Analysis of Therapeutic Proteins

Jean-Luc Veuthey et Davy Guillaume

Sabrina Ferre

CE-MS in Metabolomics

Serge Rudaz et Jean-Charles Sanchez

Gioele Visconti

Development of Multi-Targeted Quantification Strategies for Clinical Metabolomics using Liquid Chromatography–Mass Spectrometry

Serge Rudaz et Nicolas Vuilleumier

Awards and distinction

Aebischer M., **Prix du Club Jeunes de l'AFSEP de la meilleure communication orale**, 3ème Ecole Thématique du Club Jeunes de l'AFSEP, Vichy (France), June 2nd, 2023.

Duivelshof, B.L.; Guillaume, D.; Veuthey, J.L., **Best presentation award, 1st prize**, “Using protein-specific retention behavior to improve the characterization of therapeutic antibodies”, CHanalysis2023, Beatenberg, March 2023.

Guillaume, D., **Elected among the 100 most influential people in analytical sciences – ranking #7 in the category “leaders and advocates”**, reported in the analytical scientist, 2023.

Meister I.; Girel, S; Furlani I.; Homan C.; Jermann F.; Boccard J.; Piguet C.; Rudaz S., **2023 Best Poster Award**, “Metabolomic and lipidomic approaches in mindfulness-based intervention for health-care students”, Swiss Metabolomic Society, Annual meeting 2023, Zürich, 15 September 2023.

Rudaz S., **2023-2026 Invited Professor**, College of Pharmacy, Jinan University, Guangzhou (China).

Visconti G.; de Figueiredo M.; Strassel O.; Vuilleumier N.; Jaques D.; Ponte B.; Rudaz S., **Best Poster Award**, “Fast in-sample multiplexed quantification of endogenous metabolites associated with chronic kidney disease using liquid chromatography–mass spectrometry”, RDPA23, Novara (Italy), 6-9 September 2023.

BIOMOLECULAR AND PHARMACEUTICAL MODELLING

Professor Francesco Luigi GERVASIO

General description of Unit

The Biomolecular & Pharmaceutical Modelling Group (FAMOB), led by Prof. Francesco Luigi Gervasio, focusses on the development of methods for drug discovery and biomolecular simulations with emphasis on enhanced sampling simulation methods and free energy calculations. The group significantly contributed to the development of methods for overcoming the timescale problem of molecular simulations (metadynamics, parallel-tempering metadynamics, path collective variables, OneOPES) which are widely used across different fields ranging from drug discovery and biophysics to nanotechnology. The group has also developed algorithms to sample hidden (cryptic) drug binding pockets in 'undruggable' proteins, such as SWISH. The research group applies these methods to develop new drugs and to study a multitude of complex biophysical phenomena, including protein dynamics and folding, ligand binding, allostery, activation mechanisms in GPCRs and protein kinases, the formation of cryptic binding sites and the modes of action of cancer-causing mutations. The simulations conducted by the group have guided the design of allosteric inhibitors some of which are now in pre-clinical development. The group has a number of successful collaborations with pharmaceutical companies (such as J&J, UCB and AstraZeneca).

Specific research fields

- Understanding the regulation of proteins by allosteric mechanisms and post-translational modification.
- Developing methods to compute accurate absolute ligand binding free energies and kinetics.
- Understanding cryptic binding sites and predicting their location on pharmaceutical targets.
- Understanding the activation mechanisms of drug targets such as kinases and GPCRs.
- Combining experiments and simulations to model the dynamics of biomacromolecules.
- Combining modelling and simulations to clarify the mode of action of drug-like molecules.
- Quantifying the effects of genetic mutations on protein structure and function.
- Multi-scale simulation approach to engineer nanocarriers.

2023 at a glance

- Publications with impact factor: 7
- Publications without impact factor: 5
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 1
- Posters presentations: 13
- Oral presentations: 8
- Invited oral presentations: 6
- Number of projects at FNRS and assimilated (Research funds): 6
- Service agreements and related activities: 1
- Ph.D. Theses presented in 2023: 1
- Awards and distinctions: 2
- Public outreach activities: 1

Research funds

FNSF

MITOpore

Main applicant : Prof. Enrica Bordignon, co-applicants: Prof. Francesco Luigi Gervasio, Prof. Raunser, Stefan

Total funding of the project: CHF 2'378'056.-

Total duration of the project: 4 years

Allocation 2023: CHF 161'918.-

Starting date: 01.12.2023

FNSF

Understanding and Modelling Cryptic Binding Pockets for Biology and Drug Discovery

Main applicant :Prof. Francesco Luigi Gervasio

Total funding of the project: CHF 679'870.-

Total duration of the project: 4 years

Allocation 2023: CHF 211'770.-

Starting date: 01.03.2022

FNSF BRIDGE

ABCD Antibodies: Recombinant antibodies for research

Main applicant: Prof. Pierre Cosson, Prof. Francesco Luigi Gervasio (co-applicant)

Total funding of the project: CHF 446'224.- (CHF 200'112.-)

Total duration of the project: 2 years

Allocation 2023: CHF 94'000.-

Starting date: 01.05.2022

H2020-EU MC ITN

ALLOstery in Drug Discovery

Main applicant: Prof Zoe Cournia

Total funding of the project: EUR 3'669'354.-

Total duration of the project: 4 years

Allocation 2023: CHF 47'000.-

Starting date: 01.09.2021

CSCS Swiss National Supercomputing Centre Production Project

Understanding the effect of pressure and lipids on the conformational equilibria of B1AR (s1169)

Main applicant: Prof. Francesco Luigi Gervasio

Total funding of the project: CHF 180'000.- (450'000 node hours)

Total duration of the project: 1 year

Allocation 2023: CHF 135'000.-

Starting date: 01.10.2022

CSCS Swiss National Supercomputing Centre Production Project

Understanding the mechanistic basis of Wnt signalling on class F GPCRs (s1228)

Main applicant: Prof. Francesco Luigi Gervasio

Total funding of the project: CHF 160'000.- (400'000 node hours)

Total duration of the project: 1 year

Allocation 2023: CHF 120'000.-

Starting date: 01.04.2023

Total amount for all research funds for 2023: CHF 769'688.-

Scientific publications (with impact factor)

- Juyoux, P.; Galdadas, I.; Gobbo, D. von Velsen, J.; Pelosse, M.; Tully, M.; Vadas, O.; Gervasio, F. L.; Pellegrini, E.; Bowler, M. W. Architecture of the MKK6-p38 α complex defines the basis of MAPK specificity and activation. Science 2023, 381, 1217–1225 doi: 10.1126/science.add785 63.832
- Radoux-Mergault, A.; Oberhauser, L.; Aureli, S.; Gervasio, F.L.; Stoeber, M. Subcellular location defines GPCR signal transduction. Sci Adv 2023, 9, eadf6059 doi: 10.1126/sciadv.adf6059 14.136
- Qi, C.; Acosta-Gutierrez, S. Lavriha, P.; Othman, A.; Lopez-Pigozzi, D.; Bayraktar, E.; Schuster, D.; Picotti, P.; Zamboni, N.; Bortolozzi, M.; Gervasio, F. L.; Korkhov, V. M. Structure of the connexin-43 gap junction channel in a putative closed state. eLife 2023, 12, RP87616. doi:10.7554/eLife.87616 8.713
- Rizzi, V.; Aureli, S.; Ansari, N.; and Gervasio, F. L. OneOPES, a Combined Enhanced Sampling Method to Rule Them All. J. Chem. Theory Comput. 2023, 19 (17) 5731–5742 doi:10.1021/acs.jctc.3c00254 6.578
- Calderón, J. C.; Ibrahim, P.; Gobbo, D.; Gervasio, F. L.; Clark T. General Metadynamics Protocol to Simulate Activation/Deactivation of Class A GPCRs: Proof of Principle for the Serotonin Receptor J. Chem. Inf. Model. 2023, 63 (10) 3105–3117 doi:10.1021/acs.jcim.3c00208 6.162
- Calderón, J. C.; Ibrahim, P.; Gobbo, D.; Gervasio, F. L.; Clark T. Activation/Deactivation Free-Energy Profiles for the β 2-Adrenergic Receptor: Ligand Modes of Action. J. Chem. Inf. Model. 2023, 63 (20) 6332–6343 doi:10.1021/acs.jcim.3c00805 6.162
- Rizzi, V.; Aureli, S.; Ansari, N.; Gervasio, F. L. OneOPES, a Combined Enhanced Sampling Method to Rule Them All. J. Chem. Theory Comput. 2023, 19 (17) 5731–5742 doi:10.1021/acs.jctc.3c00254 6.578

Scientific publications (without impact factor)

- Karrenbrock, M.; Procacci, P.; Gervasio, F. L.; A Nonequilibrium Alchemical Method for Drug-Receptor Absolute Binding Free Energy Calculations: The Role of Restraints. ChemRxiv 2023, Doi:10.26434/chemrxiv-2023-mc1gw
- Martin-Fernandez, M.; Gervasio, F.; Rolfe, D.; Iyer, R. S.; Needham, S.; Roberts, S.; Zanetti-Domingues, L.; Davis, B.; Clarke, D.; Fruhwirth, G.; Man, R.; Galdadas, I.; Parker, P.; Drug-Resistant EGFR Lung Cancer Mutations Promote Tumor Growth by Stabilizing Interfaces in Ligand-Free Signaling-Competent EGFR Oligomers. Research Square preprint 2023, doi:10.21203/rs.3.rs-3143359/v1
- Borsatto, A.; Gianquinto, E.; Rizzi, V.; Gervasio, F. L.; SWISH-X, an Expanded Approach to Detect Cryptic Pockets in Proteins and at Protein-Protein Interfaces. bioRxiv 2023, 2023.11.03.565527, doi:10.1101/2023.11.03.565527
- Karrenbrock, M.; Rizzi, V.; Procacci, P.; Gervasio, F. L.; Addressing Sub-Optimal Poses in Non-Equilibrium Alchemical Calculations. ChemRxiv 2023, doi:10.26434/chemrxiv-2023-29682

Ding, X.; Aureli, S.; Vaithia, A.; Lavriha, P.; Schuster, D.; Khanppnavar, B.; Li, X.; Blum, T. B.; Picotti, P.; Gervasio, F. L.; Korkhov, V. M.;
Structural Basis of Connexin-36 Gap Junction Channel Inhibition.
bioRxiv, 2023, 2023.12.09.570920,
doi:10.1101/2023.12.09.570920

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1
- Posters presentations: 13
- Oral presentations: 8
- Invited oral presentations: 6

Ph.D. Theses presented in 2023

Dominykas Lukauskis
Calculating Absolute Ligand Binding Free Energies and Ranking Ligand Binding Poses Using
Metadynamics enabled Molecular Dynamics Simulations
Prof. F.L. Gervasio

Awards and distinction

Borsatto, A.; Booster 2023 prize for the best communication: CHF 10'000

Borsatto, A.; Making the invisible protein life visible using integrative biophysical approaches: Structural and dynamic characterization of hidden protein states and allosteric regulatory landscapes **Best poster prize of the CECAM workshop** 4-6 October 2023, Lugano (Switzerland)

Public outreach activities (radio, television and other media, community service)

Gervasio, F L., Coordinated press release with Grenoble on the Science paper that led to a number of articles and blogs.

BIOPHARMACY

Professor Gerrit BORCHARD
Doctor Olivier JORDAN

General description of the Unit

The Biopharmacy lab focuses on the understanding on complex drugs of biological and non-biological origin such as therapeutic proteins, nanomedicines and vaccines by using physico-chemical characterization of complex drugs, developing *in vitro* models representing tissues involved in absorption, metabolism and immune response, and by *in vivo* studies. We strive to optimize the interaction between complex drugs and biological systems in terms of an enhanced efficacy and safety. Regarding the technological part, we are engaged in the development of new formulations and vectors for complex drug application in a targeted and individualized manner. Such vectors are based on the synthesis of novel (bio) polymers functionalized with functional targeting moieties such as peptides, antibody fragments, and aptamers. From a therapeutic point of view, we are focusing on vaccination against infectious diseases and new approaches for cancer (immuno)therapy. Finally, our technical knowledge and scientific expertise allow us to be involved in discussions on complex medicines with regulatory authorities and pharmacopoeias.

Specific research fields

Characterization at the nanoscale: Another part of the research focused on the nanomedicine characterization procedures, establishing reliable protocols for quality assessment (physicochemical and *in vitro*). This part of the research was performed under the framework of the project Quality requirements for nanomedicines – Filling the gaps, supported by the Frankfurt Foundation Quality of Medicines. Research was devoted to the analysis of parenteral PEGylated and non-PEGylated nanoemulsions and lipid nanoparticles, as lipid-based nanocarriers. As project outcomes, several characterization protocols and data interpretation recommendations have been proposed.

Deciphering the protein corona on nanoparticles (NPs): The therapeutic efficacy and adverse impacts of nanoparticles are strongly dependent on their systemic circulation time, and in turn on the proteins adsorbed onto nanoparticle surface – the so called “protein corona”. Our lab investigated the *in vivo* circulation time and corona composition of specific nanoparticles possessing different surface properties. Following a thorough characterization at the nanoscale, *in vivo* and proteomics investigations revealed that long-circulating NPs adsorbed higher concentrations of specific proteins - such as alpha-2H-glycoprotein and apolipoprotein C-I, while short-circulating NPs adsorb higher amounts of hemoglobin. The proteins governing NP systemic circulation time were disclosed in an ACS Nano paper.

2023 at a glance

- Publications with impact factor: 21
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 1
- Posters presentations: 33
- Oral presentations: 3
- Invited oral presentations: 7
- Number of projects at FNRS and assimilated (Research funds): 5
- Service agreements and related activities: 4

- Ph.D. Theses presented in 2023: 2
- Awards and distinctions: 7
- Public outreach activities: 1

Research funds

FNRS IZCOZO-182947

Category: SNSF

Tailored Adjuvants for Vaccine Formulations

Main applicant: Gerrit Borchard

Total funding of the project: CHF 319'040.-

Total duration of the project: 4 years

Allocation 2023: CHF 0.-

Starting date: 01.07.2019

FNRS P5R5PM-214509

Category: SNSF

Revamping 3D-Bioprinted Skin Scaffolds for Long-Term

Cryopreservation and Lyophilisation

Main applicant: Viorica Patrulea

Total funding of the project: CHF 131'692.-

Total duration of the project: 1.5 years

Allocation 2023: CHF 131'692.-

Starting date: 01.02.2023

FNRS LAAGP0-215787

Category: SNSF

Pharmascope: an interactive pedagogical approach to drive pharmaceutical sciences closer to secondary school students

Main applicants: Gerrit Borchard, Pascal Bonnabry

Total funding of the project: CHF 197'232.-

Total duration of the project: 3 years

Allocation 2023: CHF 63'744.-

Starting date: 01.11.2023

INNOSUISSE 54334.1 IP-LS

Category: Institutional

Innovative drug delivery system to fight vessel stenosis after vascular surgery

Main applicant: Olivier Jordan

Total funding of the project: CHF 175'907.-

Total duration of the project: 1.5 years

Allocation 2023: CHF 9'358.99.-

Starting date: 01.12.2021

UNITHER DEVELOPPEMENT BORDEAUX

Category: Institutional

Main applicant: Gerrit Borchard

Total funding of the project: CHF 19'156.83.-

Total duration of the project: 3 years

Allocation 2023: CHF 7'067.32.-

Starting date: 01.07.2022

Total amount for all research funds for 2023: CHF 211'862.31.-

Service agreements and related activities

Innogap Fund

Total amount for 2023 CHF 690.-

Jordan Industrie

Total amount for 2023 CHF 44'022.16.-

Frankfurt Foundation Quality of Medicines (FFQM)

Total amount for 2023 CHF 19'538.-

NanoGVA Galenus Symposium

Total amount for 2023 CHF 12'405.29.-

Total amount (for all service agreements and related activities) for 2023: CHF 76'655.45.-

Scientific publications (with impact factor)

Nikolić, I.; Filipić, B.; Petrović, M.; Jordan, O.; Savić, S.; Borchard, G. The Landscape of Nanomedicines: An Expert Perspective. Archives of Pharmacy, 73 (2023), 390-403; 46686 doi: 10.5937/arhfarm73-46686.	0.11
Ilić, T.; Đoković, J.B.; Nikolić, I.; Mitrović, J.R.; Pantelić, I.; Savić, S.D.; Savić, M. M. Parenteral Lipid-Based Nanoparticles for CNS Disorders: Integrating Various Facets of Preclinical Evaluation towards More Effective Clinical Translation. Pharmaceutics 2023, 15 (2), 443. doi: 10.3390/pharmaceutics15020443.	6.53
Filipić, B.; Pantelić, I.; Nikolić, I.; Majhen, D.; Stojić-Vukanić, Z.; Savić, S.; Krajišnik, D. Nanoparticle-Based Adjuvants and Delivery Systems for Modern Vaccines. Vaccines 2023, 11 (7), 1172. doi: 10.3390/vaccines11071172.	7.80
Stojanović, G. M.; Milić, L.; Endro, A. A.; Simić, M.; Nikolić, I.; Savić, M.; Savić, S. Textile-based wearable device for detection of date rape drugs in drinks. Textile Research Journal 2023, 00405175231218740. doi: 10.1177/00405175231218740.	2.46
Peletta, A.; Lemoine, C.; Courant, T.; Collin, N.; Borchard, G. Meeting vaccine formulation Challenges in an emergency setting: Towards the development of accessible vaccines. Pharmacological Research, vol. 189, 2023, p. 106699 doi: 10.1016/j.phrs.2023.106699.	10.33
Schelker, C.; Nowak-Sliwinska, P.; Borchard, G. HDACIs and TKIs combinations and their liposomal delivery for cancer treatment. Journal of Controlled Release, (2023) 358:59-77. doi: 10.1016/j.jconrel.2023.04.006.	10.80
Marques, C.; Maroni, P.; Maurizi, L.; Jordan, O., Borchard, G. Understanding protein-nanoparticle interactions leading to protein corona formation: <i>in vitro</i> - <i>in vivo</i> correlation study. International Journal of Biological Macromolecules. 256 (2023) 128339. doi: 10.1016/j.ijbiomac.2023.128339.	8.20
Petrović, M.; Tankov, S.; Kiening, M.; Chakradhar, Y.; Rafael, D.; Walker, P.R.; Borchard, G.; Jordan, O. How to outsmart the cold tumor microenvironment: Design of STING ligand nanoparticles for improved cancer immunotherapy. OpenNano 12 (2023) 100157. doi: 10.1016/j.onano.2023.100157.	5.00
Petrović, M.; Borchard, G.; Jordan, O. How to outsmart the cold tumor microenvironment: Design of STING ligands nanoparticles for improved cancer immunotherapy. OpenNano 12: 100157 (2023). doi.org/10.1016/j.onano.2023.100157.	N/A

- Marquet, F.; Hagen, H.; Stanchieri, M.; Serre Beinier, V.; Grasso, G.; Danani, A.; Patrulea, V.; Borchard, G. Clickable polyethyleneimine incorporated into triblock copolymeric micelles as an efficient platform in the delivery of siRNA to NSCLC cells. *International Journal of Pharmaceutics* 2023 (649) 123632. doi: 10.1016/j.ijpharm.2023.123632. 5.80
- Sakr, O.S.; Zaitoun, M.M.A.; Amer, M.S.; Qubisi, M.; Elshafeey, A.H.; Jordan, O.; Borchard, G. Explosomes: A new modality for DEB-TACE local delivery of sorafenib. In vivo proof of sustained release. *Journal of Controlled Release* 23 (2023) 12-22. doi: 10.1016/j.jconrel.2023.10.013. 10.80
- Marques, C.; Hajipour, M.J.; Marets, C.; Oudot, A.; Safavi-Sohi, R.; Guillemin, M. Borchard, G.; Jordan, O. Saviot, L.; Maurizi, L. Identification of the Proteins Determining the Blood Circulation Time of Nanoparticles, *ACS Nano* 17 (2023) 12458–12470. doi: 10.1021/acsnano.3c02041. 18.03
- Marques, C.; Borchard, G.; Philipp, E.; Wilhelm, M.; Barton, A. Dynamic light scattering analysis for iron-carbohydrate complexes. *JoVE* 197 (2023) e63820. doi: 10.3791/63820-v. 1.42
- Melnik, T.; Kapitanova, K.; Vinet, L.; Piallat, M.L.; Jordan, O.; Delie-Salmon, F. Atorvastatin-loaded spray-dried PLGA microparticles for local prevention of intimal hyperplasia: Drug release rate optimization and activity on synthetic vascular smooth muscle cells. *Journal of drug delivery science and technology* 79:104076 (2023). doi: 10.1016/j.jddst.2022.104076. 5.06
- Brunner, J.; Borchard, G. Structure-activity relationship of a peptide permeation enhancer. *Tissue Barriers* 11 (2023) e2060692. doi: 10.1080/21688370.2022.2060692. 3.10
- Rodríguez-Nogales, C.; Meeus, J.; Thonus, G.; Corveleyn, S.; Allémann, E.; Jordan, O. Spray-dried nanocrystal-loaded polymer microparticles for long-term release local therapies: an opportunity for poorly soluble drugs. *Drug Delivery* 30 (1), 2284683. doi: 10.1080/10717544.2023.2284683. N/A
- Morici, L.; Gonzalez-Fernandez, P.; Jenni, S.; Porcello, A.; Allémann, E.; Jordan, O.; Rodríguez-Nogales, C. Nanocrystal-chitosan particles for intra-articular delivery of disease-modifying osteoarthritis drugs. *International Journal of Pharmaceutics*, 123754. doi: 10.1016/j.ijpharm.2023.123754. 5.80
- Gou, S.; Porcello, A.; Allémann, E.; Salomon, D.; Micheels, P.; Jordan, O.; Y.N., Kalia. Injectable Hyaluronan-based thermoresponsive hydrogels for dermatological applications. *Pharmaceutics* 15 (6), 1708. doi: 10.3390/pharmaceutics15061708. 6.53
- Porcello, A.; Hadjab, F.; Ajouaou, M.; Philippe, V.; Martin, R.; Abdel-Sayed, P.; Hirt-Burri, N.; Scaletta, C.; Raffoul, W.; Applegate, L.A.; Allémann, E.; Jordan, O.; Laurent, A. Ex vivo functional benchmarking of hyaluronan-based osteoarthritis viscosupplement products: comprehensive assessment of rheological, lubricative, adhesive and stability attributes. *Gels* 9 (10), 808. doi: 10.3390/gels9100808. 4.60
- Porcello, A.; Gonzalez-Fernandez, P.; Jeannerat, A.; Peneveyre, C.; Abdel-Sayed, P.; Scaletta, C.; Raffoul, W.; Hirt-Burri, N.; Applegate, L.A.; Allémann, E.; Laurent, A.; Jordan, O. Thermo-responsive hyaluronan-based hydrogels combined with allogeneic cytotherapeutics for the treatment of osteoarthritis. *Pharmaceutics* 15 (5), 1528. doi: 10.3390/pharmaceutics15051528. 6.53
- Laurent, A.; Porcello, A.; Jeannerat, A.; Peneveyre, C.; Cœur, A.; Abdel-Sayed, P.; Scaletta, C.; Michetti, M.; de Buys Roessingh, A.; Jordan, O.; Allémann, E.; Raffoul, W.; Hirt-Burri, N.; Applegate, L.A. Lyophilized progenitor tenocyte extracts: Sterilizable cytotherapeutic derivatives with antioxidant properties and hyaluronan hydrogel functionalization effects. *Antioxidants* 12 (1), 163. doi: 10.3390/antiox1201016.3. 7.67

Ph.D. Theses presented in 2023

Allegra Marialea Nicole Peletta

Formulating equitable vaccines: investigating accessible adjuvants for pandemic prone diseases
Gerrit Borchard

Cintia Baptista Marques

Protein-Nanoparticle Interactions: In Vitro-In Vivo Correlation and Implications for Corona Formation

Gerrit Borchard, Olivier Jordan

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1
- Poster presentations: 33
- Oral presentations: 3
- Invited oral presentations: 7

Awards and distinction

Marques, C.; Borchard, G.; Jordan, O. Influence of nanoparticle charge on interaction with key proteins from protein corona – an in vitro-in vivo correlation study. Nanomed Europe 2023, Liverpool, UK, June 19-22, 2023. **Best oral presentation award.**

Jordan, O.; Perron, K.; Sublet, E.; Gan, B.H.; Reymond, J.L.; Durand, M.; Borchard, G.; Patrúlea, V., Chitosan-based chemical platforms for launching antimicrobial peptides against ESKAPE pathogens. **First poster prize** at the 16th Swiss Pharma Science Day 2023 of the Swiss Academy of Pharmaceutical Sciences, 23 September 2023, Bern (Switzerland).

Patrúlea, V., **Scientist achieving the #NextGreatImpossible Prize 2023** nominated by Merck KGaA.

Patrúlea, V., **Invited Researcher** at the Tokyo University of Science, Japan.

Patrúlea, V., **Subside Tremplin Award 2023** from University of Geneva, Equality and Diversity Service.

Nikolić, N., became a member of the NANO Working party at the European Directorate for the Quality of Medicines and Healthcare (EDQM).

Nikolić, I.; Borchard, G. have been collaborating as guest editors of the special issue of the Pharmaceutics journal, entitled Quality Requirements for Nanomedicines: From Early Development to the Market.

Public outreach activities (radio, television and other media, community service)

Nikolić, I. - December 2023 guest of the podcast where she was talking about nanomaterials in everyday life and about nanomedicines. The podcast was published online January 18th, 2023: <https://rss.com/podcasts/otebi/1294108/>.

CLINICAL PHARMACOLOGY AND TOXICOLOGY

Professor Caroline SAMER

General description of the Unit

FATOX Unit aims at personalizing and securing drug therapies (personalized or precision medicine approach) by measuring gene-environment-disease interactions at the pharmacokinetic level (drug interactions, in-vitro / in-vivo / in-silico prediction) and exploiting advances of various -omics technologies, including pharmacogenomics. We study in particular the variation of drug responses by evaluating drug transport and enzymes involved in the metabolism of xenobiotics such as cytochromes P450.

Specific research fields

a) **Development and optimization of tools and models for pharmacological and toxicological applications:** in vitro models for assessing drug metabolism and transport (hepatic microsomes, 3D cell models), physiology-based pharmacokinetic prediction and simulation models (PBPK) of drug-genetic-disease interactions, in-vivo tools for the characterization of metabolism and drug transport (phenotyping cocktail).

b) **Research of "omic" biomarkers of sensitivity and exposure to xenobiotics.** The therapeutic substances studied (Phase I and IV clinical trials) are in particular opioid analgesics and paracetamol as well as thienopyridines antiaggregants and oncology treatments, as well as evaluating the role of genomics in the assessment of adverse drug reactions,

c) **Computerized decision support and prescription security tools**, as well as the contribution of linguistic data analysis (AI) with the help of data science specialists.

We promote translational research by strengthening synergies between basic science and clinical medicine. We have active collaborations with many research groups and clinical services (e.g., the faculty center for translational research in biomarkers, oncopediatrics, internal medicine, hemostasis, anesthesia, medical information sciences) and at the interfaculty level with ISPSO, as well as national and international collaborations.

In more detail, our collaborations with ISPSO are the following:

Prof. Carole Bourquin;
Prof. Patrycja Nowak;
Prof. Serge Rudaz;
Prof. Jean-Luc Wolfender,
Prof. Emerson Queiroz.

Other collaborations are underway with different groups at the HUG and the Faculty of Medicine:
Prof. P. Fontana and Prof. J.L. Reny's Geneva Platelet group;
Dr Markus Kosel's psychiatric group;
Prof. Christian Lovis's group;
Prof. Marc Ansari's oncopediatric group;
Prof. Olivier Michielin's group;
Dr Fadi Haidar (nephrology);
Dr Benjamin Assouline (ICU).

National and International collaborations:

Prof. Aurelien Thomas' group (Lausanne University, CURML); Swiss Center for Applied Human Toxicology; Pr Brahim Achour Certara (Simcyp) and the University of Manchester UK, and Rhode Island University USA.

2023 at a glance

- Publications with impact factor: 34
- Publications without impact factor: 1
- Patents: 3
- Book and chapters: 2
- Congresses / conferences organisation: 2
- Posters presentations: 12
- Oral presentations: 5
- Invited oral presentations: 12
- Number of projects at FNRS and assimilated (Research funds): 6
- Service agreements and related activities: 2
- Ph.D. Theses presented in 2023: 0
- Awards and distinctions: 2
- Public outreach activities: 5

Research funds

FNS 32003B_215662 / 1

Division biologie et médecine

Metabolomic approaches for the discovery of new biomarkers of cytochrome P450 activity

Daali Youssef, Samer Caroline, Thomas Aurélien

CHF 720'000.-

Total duration of the project: 4 years

Allocation 2023: CHF 213'371.-

Starting date: 01.04.2023

FNS 320030_182361

Encouragement de projets en biologie et médecine, division III

Impact of CYP2D6 Genetic Polymorphisms on the vulnerability to Drug-Drug Interactions with tramadol: a gene-environment interaction study.

Samer Caroline & Daali Youssef

CHF 298'961.-

Total duration of the project: 4 years

Allocation 2023: CHF 64'549.-

Starting date: 01.02.2019

Innosuisse – Swiss Innovation Agency 37848.1 IP-LS

Institutional

NDMC as a new antihyperalgesic drug

Besson Marie

CHF 454'971.-

Total duration of the project: 3 years

Allocation 2023: CHF 140'530.90.-

Starting date: 01.09.2019

Hôpitaux Universitaires de Genève
Projet de Recherche et Développement 16-2022-I
Impact du polymorphisme génétique sur les interactions médicamenteuses impliquant le cytochrome P450 (CYP) 2C19 : Risque de phénoconversion chez les individus sains dont le génotype du CYP2C19 suggère un statut de métaboliseur rapide, normal et intermédiaire
Samer Caroline & Daali Youssef
CHF 50'000.-
Total duration of the project: 3 years
Allocation 2023: CHF 20'000.-
Starting date: 13.06.2022

Hôpitaux Universitaires de Genève
Projet de Recherche et Développement
Thrombotic risk in patients with nephrotic syndrome: will better pathophysiological insight improve current predictive tools?
Jean Terrier
CHF 50'000.-
Total duration of the project: 3-5 years
Allocation 2023: CHF 23'321.81.-
Starting date: 01.01.2020

Hôpitaux Universitaires de Genève
Fondation privée des HUG
Projet Patient-Processus
Drug prescription in adults with intellectual disability: current practice and impact of the Tool to improve prescription in intellectual disability (TOP-ID).
Marie Besson
CHF 200'000.-
Allocation 2023: CHF 50'000.-
Starting date: 01.03.2023

Total amount for all research funds for 2023: CHF 511'772.71.-

Service agreements and related activities

Center of Research & Expertise in antidoping sciences (REDs) & Prof. Youssef Daali, laboratoire de pharmacologie et toxicologie cliniques: CHF 35'000.-

SCAHT for the coordination MAS TOX & Prof. Caroline Samer: CHF 20'000.-

Total amount (for all service agreements and related activities) for 2023: CHF 55'000.-

Scientific publications (with impact factor)

- Ahmadi, R.; Honarvar, M.; Ghavami, M.; Daali, Y. 3.449
Optimization of Lutein Extraction from Pistachio Waste Using
Experimental Design and Ultrasonic Method. *Waste Biomass Valori* 2023.
- Beckmann, TS. ; Samer, C. ; Wozniak, H.; Savoldelli, G.; Suppan, L. 4.00
Local anesthetics' risks perception: A web-based survey. *Heliyon*.
2023 Dec 13;10(1) 2024 Jan 15.
- Busse, JW.; Casassus, R.; Carrasco-Labra, A.; Durham, J.; Mock, D.; Zakrzewska, JM.; 107.7
Palmer, C.; Samer, C.; Coen, M.; Guevremont, B.; Hoppe, T.; Guyatt, GH.; Crandon, HN.;
Yao, L.; Sadeghirad, B.; Vandvik, PO.; Siemieniuk, RAC.; Lytvyn, I.; Hunskaar, BS.; Agoritsas,
T. Management of chronic pain associated with temporomandibular disorders: a clinical
practice guideline. *BMJ* 2023, Dec 15: 383.
- Abouir, K.; Samer, C.; Landry, R.; Varesio, E.; Daali, Y. Stereoselective separation of 3.0
omeprazole and 5-hydroxy-omeprazole using dried plasma spots and a heart-cutting
2D-LC approach for accurate CYP2C19 phenotyping. *J Chromatogr B Analyt Technol*
Biomed Life Sci 2023, Epub Dec 9.
- Ghasim, H.; Rouini, M.; Safari, S.; Larti, F.; Khoshayand, M.; Gholami, K.; 3.4
Neyshaburinezhad, N.; Gloor, Y.; Daali, Y.; Ardakani, YH.
Impact of Obesity and Bariatric Surgery on Metabolic Enzymes and P-Glycoprotein
Activity Using the Geneva Cocktail Approach. *J Pers Med* 2023, 13.
- Fubini, PE.; Savoldelli, GL.; Beckmann, TS.; Samer, CF.; Suppan, M. 1.7
Impact of a Mobile App (LoAD Calc) on the Calculation of Maximum Safe Doses of Local
Anesthetics: Protocol for a Randomized Controlled Trial. *JMIR Research Protocols*. 2023
doi.org/10.2196/53679.
- Terrier, J.; Gaspar, F.; Gosselin, P.; Raboud, O.; Lenoir, C.; Rollason, V.; Csajka, C.; 3.5
Samer, C.; Fontana, P.; Daali, Y.; Reny, JL.; OptimAT study group, Apixaban and
rivaroxaban's physiologically based pharmacokinetic model validation in hospitalized
patients: A first step for larger use of a priori modeling approach at bed side. *CPT*
Pharmacometrics Syst Pharmacol 2023, Dec 12(12):1872-1883.
- Rodieux, F.; Storelli, F.; Curtin, F.; Manzano, S.; Gervais, A., Posfay-Barbe, K.; 4.6
Desmeules, J.; Daali, Y.; Samer, C., Evaluation of pupillometry for CYP2D6 Phenotyping
in Children Treated with Tramadol. *Pharmaceuticals (Basel)* 2023, Aug 30;16(9):1227
- Bianchi F, Pautex S, Wampfler J, Curtin F, Daali Y, Desmeules JA, Broers B: 1.4
Medical cannabinoids for painful symptoms in patients with severe dementia: a randomized,
double-blind cross-over placebo- controlled trial protocol. *Front Pain Res* 2023, 4.
- Gaspar, F.; Terrier, J.; Favre, S.; Gosselin, P.; Fontana, P.; Daali, Y.; Lenoir, C.; 3.5
Samer, C.; Rollason, V.; Reny, JL.; Csajka, C.; Guidi, M.,
Population pharmacokinetics of apixaban in a i hospitalized population from the OptimAT
study. *CPT Pharmacometrics Syst Pharmacol* 2023, Oct;12(10):1541-1552
- Simona, A.; Song, W.; Bates, D.; Samer, C., Polygenic risk scores in 3.7
pharmacogenomics: opportunities and challenges-a mini review. *Front Genet* 2023,
Jun 15;14
- Neyshaburinezhad N, Shirzad N, Rouini M, Namazi S, Khoshayand M, Esteghamati A, 3.68
Nakhjavani M, Ghasim H, Gloor Y, Daali Y, Ardakani YH: Evaluation of important human
CYP450 isoforms and P-glycoprotein phenotype changes and genotype in type 2 diabetic
patients, before and after intensifying treatment regimen using Geneva cocktail.
Basic Clin Pharmacol 2023, 132:487-499.

- El Masri, AER.; Tobler, C.; Willemijn, B.; Von Bueren, AO.; Ansari, M.; Samer, C., 5.6
Case report: Hepatotoxicity and nephrotoxicity induced by methotrexate in a paediatric patient, what is the role of precision medicine in 2023 ? Front Pharmacol 2023, May 2;14
- Rodieux, F.; Daali, Y.; Rollason, V.; Samer, C.; Ing Lorenzini, K., Practice of CYP450 5.6
genotyping and phenotyping in children in a real-life setting. Front Pharmacol 2023, Feb 27;14
- Bosmani, C.; Carboni, S.; Samer, C.; Lovis, C.; Perneger, T.; Huttner, A.; Hirschel, B., 2.7
REPRESENT: REPresentativeness of RESearch data obtained through the "General Informed ConsENT". BMC Med Ethics 2023, Feb 13;24(1):10
- Skalafouris, C.; Blanc, AL.; Grosgrin, O.; Marti, C.; Samer, C.; Lovis, C.; Bonnabry, P.; 2.4
Guignard, B., Development and retrospective evaluation of a clinical decision support system for the efficient detection of drug-related problems by clinical pharmacists. Int J Clin Pharm 2023, Apr;45(2):406-413
- Terrier, J.; Gaspar, F.; Fontana, P.; Daali, Y.; Reny, JL.; Csajka, C.; Samer, C., Erratum 5.9
to "Drug-Drug Interactions with Direct Oral Anticoagulants: Practical Recommendations for Clinicians" The American Journal of Medicine, Volume 134 (2021), Issue 8, 939-942. Am J Med 2023, Feb;136(2):216-217
- Terrier, J.; Lenoir, C.; Samer, C., CYP450 3A4/5 Containment During SARS-CoV-2 6.7
Infection. Clin Pharmacol Ther 2023, Feb;113(2):218
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Etain B, Bellivier F, et al: Phenotyping Indices of CYP450 and P-Glycoprotein in Human Volunteers and in Patients Treated with Painkillers or Psychotropic Drugs. Pharmaceutics 2023, 15.
- Souche, A.; Besson, M.; Desmeules, J.; Piguet, V.; Cedraschi, C., Therapeutic 0.19
alliance and cognitive behavioral group therapy. Rev Med Suisse 2023, Jun 21;19:1236-1239
- Ben Hassine, K.; Seydoux, C.; Khier, S.; Daali, Y.; Medinger, M.; Halter, J.; Heim, D.; 3.2
Chalandon, Y.; Schanz, U.; Nair, G.; Cantoni, N.; Passweg, JR.; Satyanarayana Uppugunduri, CR.; Ansari, M., Pharmacokinetic Modeling and Simulation with Pharmacogenetic Insights Support the Relevance of Therapeutic Drug Monitoring for Myeloablative Busulfan Dosing in Adult HSCT. Transplant Cell Ther 2023, Dec 9:S2666-6367
- Ghasim, H.; Rouini, M.; Safari, S.; Larti, F.; Khoshayand, M.; Gholami, K.; 3.4
Neyshaburinezhad, N.; Gloor, Y.; Daali, Y.; Ardakani, YH., Impact of Obesity and Bariatric Surgery on Metabolic Enzymes and P-Glycoprotein Activity Using the Geneva Cocktail Approach. J Pers Med 2023, Jun 25;13(7):1042
- Bianchi, F.; Pautex, S.; Wampfler, J.; Curtin, F.; Daali, Y.; Desmeules, J.; Broers, B., 1.4
Medical cannabinoids for painful symptoms in patients with severe dementia: a randomized, double-blind cross-over placebo-controlled trial protocol. Front Pain Res 2023, May 24;4:1108832
- Darnaud, L.; Delage, C.; Daali, Y.; Trouvin, AP.; Perrot, S.; Khoudour N.; Merise, N.; 5.4
Labat, L.; Etain, B.; Bellivier, F.; Lloret-Linares, C.; Bloch, V.; Curis, E.; Declèves, X., Phenotyping Indices of CYP450 and P-Glycoprotein in Human Volunteers and in Patients Treated with Painkillers of Psychotropic Drugs. Pharmaceutics 2023, Mar 18;15(3):979

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Esteghamati, Al; Nakhjavani, M.; Ghasim, H.; Gloor, Y.; Daali, Y.; Ardakani, YH.,
Evaluation of important human CYP450 isoforms and P-glycoprotein phenotype changes
and genotype in type 2 diabetic patients, before and after intensifying treatment regimen
using Geneva cocktail. Basic Clin Pharmacol Toxicol 2023, Jun;132(6):487-499 3.1
- Belgodère, L.; Pougheon Bertrand, D.; Jaulent, MC.; Rabeharisoa, V.; Janssens, W.;
Rollason, V.; Barbot, J.; Vernant, JP.; Oualikene Gonin, W.; Maison, P.; Ankri, J.;
Scientific Advisory Board of the ANSM, Patient and public involvement in the benefit-risk
assessment and decision concerning health products: position of the Scientific Advisory
Board of the French National Agency for Medicines and Health Products Safety (ANSM).
BMJ Glob Health 2023, May;8(5) 8.1
- Oualikene-Gonin, W.; Sautou, V.; Ezan, E.; Bastos, H.; Bellissant, E.; Belgodère, L.;
Maison, P.; Ankri, J.; Rollason, V., Regulatory assessment of nano-enabled health
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Exposure in Early Pregnancy: A comparative ENTIS Cohort Study. J Clin Psychopharmacol
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- Song, W.; Simona, A.; Zhang, P.; Bates, DW.; Uman, RD., Stimulant Drugs and
Stimulant Use Disorder. Anesthesiol Clin 2024, Mar;42(1):103-115 0.49
- Terrier, J.; Mach, A.; Fontana, P.; Bonhomme, F.; Casini, A., Clinicians' adherence
to guidelines for the preoperative management of direct oral anticoagulants in a tertiary
hospital : a retrospective study. BMC Anesthesiol 2023, Sep 15 ;23(1) :314 2.2
- Da Rocha Rodrigues, G.; Anex, A.; Boegli, M.; Bollondi Pauly, C.; Curtin, F.; Luthy, C.;
Desmeules, J.; Cedraschi, C., Is massage a legitimate part of nursing care? A qualitative
study. PLoS One 2023, Feb 27;18(2) 3.7
- El Biali, M.; Auvity, S.; Cisternino, S.; Smirnova, M.; Hacker, M.; Zeitlinger, M.;
Mairinger, S.; Tournier, N.; Bauer, M.; Langer, O., Dissimilar Effect of P-Glycoprotein
and Breast Cancer Resistance Protein Inhibition on the Distribution of Erlotinib to the
Retina and Brain in Humans and Mice. Mol Pharm 2023, Nov 6;20(11):5877-5887 5.36
- Breuil, L.; El Biali, M.; Vodovar, D.; Marie, S.; Auvity, S.; Bauer, M.; Goutal, S.;
Rodrigo, S.; Langer, O.; Tournier, N., Parametric Imaging of P-Glycoprotein Function
at the Blood-Brain Barrier Using $K_{E,brain}$ -maps Generated from [^{11}C] Metoclopramide PET
Data in Rats, Nonhuman Primates and Humans. Mol Imaging Biol 2023, Dec;25(6):1135-1141 3.1

Scientific publications (without impact factor)

- Sheka, M.; Coattrency, Y.; Ing Lorenzini, K.; Nendaz, M., A severe case of rhabdomyolysis
after Moderna mRNA anti-COVID-19 vaccine with a literature review. Clin Case Rep 2023, May 16;11(5)

Patents

Evans, RM.; Downes, M.; Liddle, C.; Samer, C.; The Salk Institute for Biological studies and The University of Sidney, Use of vitamin D receptor agonists and precursors to treat fibrosis, Patent number 12/266513

Evans, RM.; Downes, M.; Liddle, C.; Subramaniam, N.; Samer, C.; The Salk Institute for Biological studies and The University of Sydney, Use of Vitamine D receptor agonists, ligands, and precursors to treat pancreatic fibrosis, Patent number 20110014126.

Desmeules, J.; Zeilhofer, HU.; Besson, M.; Daali, Y.; Matthey, A., Use of N-desmethyloclobazam in the treatment of chronic pain disorders and related method 2016, Patent number PCT/IB2016/051158.

Books or books chapters

El Biali, M.; Samer, C., Médecine de précision et individualisation thérapeutique chez le sujet âgé [In] Cardiogériatrie clinique à l'usage du praticien, RMS Edition, Médecine & Hygiène, 2023, 279-300.

Besson, M.; Aubry, J.-M. ; Berney, P.; Chytas, V.; Curtis, L., Psychotropes d'usage courant, RMS Edition, Médecine & Hygiène, 2023, 1-276.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 2
- Posters presentations: 12
- Oral presentations: 5
- Invited oral presentations: 12

Ph.D. Theses presented in 2023

None

Awards and distinction

2023 SSCPT Young Scientist Award (Camille Lenoir, PhD)

Top 3 Best Poster at the Swiss Internal Medicine Congress 2023 – 1000 CHF (Ali El Masri)

Public outreach activities (radio, television and other media, community service)

Journée mondiale de pharmacologie, May 4th, 2023, HUG, Geneva (Switzerland)

Groupe de travail ateliers Pharmascope « développement » et « administration », ISPOS, UNIGE, Geneva (Switzerland)

Terrier J, Vers une personnalisation des anticoagulants oraux directs? Pulsation Magazine Mars 2023.

Samer C, Toxicité du finastéride, A Bon Entendeur (ABE), RTS. Novembre 2023.

Besson M, Médicaments psychotropes et prise de poids: la piste génétique, Le Temps 21 juin 2023

CLINICAL PHARMACY SCIENCES

Professor Chantal CSAJKA

General description of the Unit

The research of the clinical pharmacy science group is focused on post-approval drug optimisation. The overall goal is to increase the knowledge on the pharmacokinetics and pharmacodynamic relationships of commercialized drugs and to improve drugs' safety and efficacy in clinical practice.

The first research axe is the therapeutic individualisation of drugs to optimize dosage regimens for at risk drugs or in at risk populations (paediatrics, geriatrics, oncology) for whom few data are available. We develop clinical trials to assess the contribution of demographic, physiopathologic, environmental or genetic determinants influencing drug concentrations and therefore drugs' therapeutic response or toxicity. The second axe comprises research programs focusing on reducing drug toxicity, which comprise innovative methodologies for the detection of adverse drug events in hospitalized patients. The third research focus is to translate the results of our research into clinical-decision tools and guidelines for the clinic. The methods used are based on quantitative and qualitative techniques, including modelling and simulations and biostatistics.

Specific research fields

The following achievements have taken place in 2023 :

- **Drug security and efficacy.** The SNF-funded Swiss Monitoring of Adverse Drug Events (SWISSMADE study) aiming at elaborating an automatic tool for the detection of haemorrhages in a population of geriatric inpatients treated by antithrombotics using structured data mining and natural language processing provided first promising results. The process of rule-based algorithms associated with a free-text based pipeline applied on routinely collected clinical data from the electronic medical records enable the detection of severe and clinically significant haemorrhages. When validated, our pipeline will be further integrated in hospital risk management programs to improve quality of care. In collaboration with the Family Medicine of the University of Fribourg and funded by the Leenaards Foundation within the Santeinegra program, a pragmatic clinical trial aiming at evaluating the efficacy of a medicinal herb in the treatment of acute bronchitis is ongoing. This study shows that complementary medicine can be integrated within conventional care. Whether it could be an interesting alternative to the often-inappropriate use of antibiotics in this indication will be evaluated. In collaboration with the phytochemistry group of the School of Pharmaceutical Sciences, University of Geneva, an ancillary project to assess the quality of herbal products sold on the Swiss market and through internet has shown suboptimal quality of many drugs, which raises concerns.
- **Drug individualisation.** Several projects on the population pharmacokinetic, pharmacokinetic-pharmacodynamic or pharmacokinetic-adherence characterisation of oncologic (tyrosine kinase inhibitors) and antibiotics have been fulfilled. Through a collaboration with the SWISSPEDDOSE project, we could demonstrate by simulation the equivalence of a simplified dosing regimen of amoxicilline in the treatment of Lyme disease in children, which has been integrated in the Swiss Harmonized dosing regimen recommendations in pediatry. As part of an ongoing project with the HUG, several population pharmacokinetic and physiologically-based analyses of anticoagulants and antiplatelet drugs based on real-conditions of use have been finalized. They have demonstrated possible improvement for the security of use of these at-risk drugs and new strategies for dosage individualization.

- **Tools for drug optimisation in clinical practice.** Funded by the SNF (Spirit), a project on the development of a clinical decision support system for an anti-tuberculosis medical drug in Tanzania is ongoing in collaboration with the School of Engineering and Management Vaud and the Kibong'Oto Infections Diseases Hospital in Tanzania. A development of a computer-based aid for drug dosage individualization of rifampicin has been made in parallel to the development of a Bayesian clinical decision support system to optimize rifampicin dosage regimen (www.tucuxi.ch) An electronic tool for drug-drug interaction for health care professionals involving antithrombotics is currently being developed as part of the SwissMADE project.

2023 at a glance

- Publications with impact factor: 15
- Publications without impact factor: 1
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 0
- Posters presentations: 5
- Oral presentations: 6
- Invited oral presentations: 2
- Number of projects at FNRS and assimilated (Research funds): 2
- Service agreements and related activities: 1
- Ph.D. Theses presented in 2023: 0
- Awards and distinctions: 1
- Public outreach activities: 0

Research funds

Swiss National Science Foundation

Category: SNSF

SPIRIT TuberXpert project: *Clinical Decision support System for anti-tuberculosis medical drugs*

Main applicant CRISP: Dr Monia Guidi

Total funding of the project: CHF 174'958.-

Total duration of the project: 3 years

Allocation 2023: CHF 56'306.-

Starting date: 01.09.2022

Fondation Leenaards

Category: Foundation

Projet: Prise en charge de la bronchite aiguë – étude clinique randomisée portant sur un mélange d'herbes chinoises (projet ancillaire). P-Y. Rodondi, C. Csajka

Main applicant CRISP: Chantal Csajka

Total funding of the project: CHF 149'240.-

Total duration of the project: 1 year

Allocation 2023: CHF 149'240.-

Starting date: 01.06.2023

Total amount for all research funds for 2023: CHF 205'546.-

Service agreements and related activities

OM Pharma Suisse SA

Total amount for 2023: CHF 19'800.-

Total amount (for all service agreements and related activities) for 2023: CHF 19'800.-

Scientific publications (with impact factor)

- Schulthess-Lisibach AE, Gallucci G, Benelli V, Kälin R, Schulthess S, Cattaneo M, Beeler PE, Csajka C., Lutters M. Predicting delirium in older non-intensive care unit inpatients: development and validation of the DELirium risk Tool (DELIKT). *Int J Clin Pharm.* 2023; 45(5):1118-1127. 2.4
- Abler D, Courlet P, Dietz M, Gatta R, Girard P, Munafò A, Wicky A, Jreige M, Guidi M, Latifyan S, De Micheli R, Csajka C, Prior JO, Michielin O, Terranova N, Cuendet MA. Semiautomated Pipeline to Quantify Tumor Evolution From Real-World Position Emission Tomography/Computed Tomography Imaging. *JCO Clin Cancer Inform.* 2023 May;7:e2200126. 4.2
- Bandiera C., Cardoso E., Locatelli I., Digkila A., Zaman K., Diciolla A., Cristina V., Stravodimou A., Lopez V.A., Dolcan A., Sarivalasis A., Bouchaab H., Liapi A., Orcurto A., Dotta-Celio J., Peters S., Decosterd L.A., Widmer N., Wagner A.D., Csajka C., Schneider M.-P. An interprofessional medication adherence program to optimize adherence to oral anticancer therapies: a randomized-controlled trial Abstracts of the 26th Annual Meeting of ESPACOMP, the International Society for Medication Adherence, Berlin, Germany, 17-19 November 2022 *Int J Clin Pharm.* 2023;45(1):250-280. 2.4
- Frisoni G.B , Altomare D , Ribaldi F , Villain N , Brayne C , Mukadam N, Abramowicz NM et al. Dementia prevention in memory clinics: recommendations from the European task force for brain health services. *Lancet Reg Health Eur.* 2023; 26:100576. 20.9
- Briki M, André P, Thoma Y, Widmer N, Wagner AD, Decosterd LA, Buclin T, Guidi M#, Carrara S. Precision Oncology by Point-of-Care Therapeutic Drug Monitoring and Dosage Adjustment of Conventional Cytotoxic Chemotherapies: A Perspective. *Pharmaceutics.* 2023;15(4):1283. 5.4
- Gaspar F, Terrier J, Favre S, Gosselin P, Fontana P, Daali Y, Lenoir C, Samer CF, Rollason V, Reny JL, Csajka C, Guidi M., Population pharmacokinetics of apixaban in a real-life hospitalized population from the OptimAT study. *CPT Pharmacometrics Syst Pharmacol.* 2023;12:1541-1552. 3.5
- Cardoso E*, Guidi M*, Nauwelaerts N, Nordeng H, Teil M, Allegaert K, Smits A, Gandia P, Edginton A, Ito S, Annaert P, Panchaud A. Safety of medicines during breastfeeding - from case report to modeling: a contribution from the ConcePTION project. *Expert Opin Drug Metab Toxicol.* 2023;19(5):269-283. 4.3
- Thouelle P, Delfrassé M, Andre P, Buclin T, Decosterd LA, Fedeli C, Ustero P, Calmy A, Guidi M#; Swiss HIV Cohort Study. Population pharmacokinetic analysis of lopinavir in HIV negative individuals exposed to SARS-CoV-2: a COPEP (COronavirus Post-Exposure Prophylaxis) sub-study. *BMC Pharmacol Toxicol.* 2023; ;24(1):47. 2.9
- Monfort A, Cardoso E, Eap CB, Fischer Fumeaux CJ, Graz MB, Morisod Harari M, Weisskopf E, Gandia P, Allegaert K, Nordeng H, Hascoët JM, Claris O, Epiney M, Csajka C, Guidi M, Ferreira E, Panchaud A. Infant exposure to Fluvoxamine through placenta and human milk: a case series - A contribution from the ConcePTION project. *Front Psychiatry.* 2023;14:1167870. 4.7
- Thouelle P, Alves Saldanha S, Desfontaine V, Kusejko K, Courlet P, Andre P, Cavassini M, Decosterd LA, Buclin T, Guidi M#; Swiss HIV Cohort Study. Population pharmacokinetic modelling to characterize the effect of chronic kidney disease on tenofovir exposure after tenofovir alafenamide administration. *J Antimicrob Chemother.* 2023;78(6):1433-1443. 5.2
- Cardoso E, Monfort A, Ferreira E, Nordeng H, Winterfeld U, Allegaert K, Gandia P, Guidi M, Panchaud A. Maternal drugs and breastfeeding: Risk assessment from pharmacokinetics to safety evidence - A contribution from the ConcePTION project. *Therapie.* 2023;78(2):149156. 2.6

- Goutelle S, Guidi M, Gotta V, Csajka C, Buclin T, Widmer N. From Personalized to Precision Medicine in Oncology: A Model-Based Dosing Approach to Optimize Achievement of Imatinib Target Exposure. *Pharmaceutics*. 2023;15(4):1081. 5.4
- Bandiera C, Locatelli I, Courlet P, Cardoso E, Zaman K, Stravodimou A, Dolcan A, Sarivalasis A, Zurcher JP, Aedo-Lopez V, Dotta-Celio J, Peters S, Guidi M, Wagner AD, Csajka C, Schneider MP. Adherence to the CDK 4/6 Inhibitor Palbociclib and Omission of Dose Management Supported by Pharmacometric Modelling as Part of the OpTAT Study. *Cancers (Basel)*. 2023;15(1):316. 5.2
- Courlet P, Abler D, Guidi M, Girard P, Amato F, Vietti Violi N, Dietz M, Guignard N, Wicky A, Latifyan S, De Micheli R, Jreige M, Dromain C, Csajka C, Prior JO, Venkatakrishnan K, Michielin O, Cuendet MA, Terranova N. Modeling tumor size dynamics based on real-world electronic health records and image data in advanced melanoma patients receiving immunotherapy. *CPT Pharmacometrics Syst Pharmacol*. 2023;12(8):1170-1181. 3.5
- Terrier J, Gaspar F, Gosselin P, Raboud O, Lenoir C, Rollason V, Csajka C, Samer C, Fontana P, Daali Y, Reny JL. Apixaban and rivaroxaban's physiologically based pharmacokinetic model validation in hospitalized patients: A first step for larger use of a priori modeling approach at bed side; OptimAT study group. *CPT Pharmacometrics Syst Pharmacol*. 2023; 12(12): 1872-1883. 3.5

Scientific publications (without impact factor)

Di Paolo E, Mitropoulou G, Csajka C. Modulateurs de la protéine CFTR pour traiter la mucoviscidose.
La Gazette Médicale 2023 12(6) : 20-22.

Patents

N/A

Books or books chapters

N/A

Congresses / conferences and Symposia

- Congresses / conferences organisation: 0
- Posters presentations: 5
- Oral presentations: 6
- Invited oral presentations: 2

Ph.D. Theses presented in 2023

N/A

Awards and distinction

Gotta V. Paioni P. Csajka C, Berger C, Bielicki J. Pfister M. In silico studies to evaluate dosing intervals associated with low risk of amikacin accumulation in preterm neonates. Académie Suisse Pharmacologie pédiatrique, 2023. **Best poster prize**

Public outreach activities (radio, television and other media, community service)

N/A

COMMUNITY PHARMACY PRACTICE

Doctor Jérôme BERGER

General description of the Unit

The Community Pharmacy of Unisanté offers specific opportunities for the clinical pharmaceutical sciences in Western Switzerland and for the Faculty of Medicine in Lausanne.

Unisanté is the university centre dedicated to primary care and public health in Lausanne, which corresponds to the modern vision of health systems giving priority to interprofessional collaboration, optimisation of resources and partnering with patients considered in all their individuality. The team of the Community Pharmacy is fully involved in Unisanté's missions (www.unisante.ch).

The Community pharmacy practice research unit is currently affiliated to:

- Centre for Primary Care and Public Health (Unisanté), University of Lausanne
- Institute of Pharmaceutical Sciences of Western Switzerland (ISPSO), University of Geneva, University of Lausanne
- School of Pharmaceutical Sciences, University of Geneva
- Centre for Research and Innovation in Clinical Pharmaceutical Sciences, University of Lausanne

The Community Pharmacy is a key sector of the Department of Ambulatory Care in Unisanté. Our expertise is recognised at the regional, national and international levels for its clinical, research/development and educational activities. Our work focuses on understanding the determinants, development, implementation, and clinical, humanistic, economic evaluation of pharmacy services around the topic "Promoting and improving the responsible use of medicines in primary care".

Specific research fields

Promoting and improving the responsible use of medicines in primary care

The main research and teaching activities of the research unit are focused on development, implementation, and evaluation of person-centred and integrated community pharmacy services, in two main domains: 1) innovative pharmacy services, and 2) optimization of drug therapy.

2023 at a glance

- Publications with impact factor: 15
- Publications without impact factor: 13
- Patents: 0
- Book and chapters: 1
- Congresses / conferences organisation: 3
- Posters presentations: 1
- Oral presentations: 2
- Invited oral presentations: 2
- Number of projects at FNRS and assimilated (Research funds): 8
- Service agreements and related activities: 15

- Ph.D. Theses presented in 2023: 1
- Awards and distinctions: 1
- Public outreach activities: 38

Research funds

Institutional

PROMOTION SANTÉ SUISSE

Prise en charge de patient-e-s sous antalgiques addictifs (DépendAntalgie)

Main applicant: J. Berger

Total funding of the project: CHF 574'390.-

Total duration of the project: 4 years

Allocation 2023: CHF 100'000.-

Starting date: 01.12.2022

GSASA - PHARMASUISSE

Transition des soins entre l'hôpital et l'ambulatoire : coordination d'interventions pharmaceutiques de l'admission à l'hôpital à la 1ère consultation ambulatoire post-hospitalisation pour sécuriser la médication chez des patients à risque

Main applicants: J. Berger and F. Sadeghipour Total funding of the project: CHF 105'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 105'000.-

Starting date: 01.01.2023

FEDERAL OFFICE OF PUBLIC HEALTH (FOPH)

Sustainable implementation of high-quality Interprofessional Deprescribing services for nursing home residents in multiple cantons - The Simple-ID project

Main applicant: A. Niquille

Total funding of the project: CHF 630'022.-

Total duration of the project: 3 years

Allocation 2023: CHF 100'490.-

Starting date: 01.10.2023

FEDERAL OFFICE OF PUBLIC HEALTH (FOPH)

Digital platform for Hypertensive Patient Reported Outcomes – HYPROM

Main applicant: A. Panchaud

Co-applicant: J. Berger

Total funding of the project: CHF 327'936.-

Total duration of the project: 3 years

Allocation 2023: CHF 0.-

Starting date: 01.07.2023

FONDATION CHUARD-SCHMIDT

Changes in antibiotics prescription in nursing home residents after discontinuation of free COVID-19 testing - the FreeTest Study

Main applicant: N. Boillat

Co-applicant: A. Niquille

Total funding of the project: CHF 38'000.-

Total duration of the project: 1 year

Allocation 2023: CHF 0.-

Starting date: 01.10.2023

Industrial

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD

Développement, implémentation et évaluation scientifique du programme interprofessionnel vaudois de cercles de qualité médecins-pharmaciens-soignants des établissements médico-sociaux pour personnes âgées (EMS)

Main applicant: A. Niquille

Total funding of the project: CHF 200'000.-

Total duration of the project: 1 year

Allocation 2023: CHF 200'000.-

Starting date: 01.01.2023

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD

MEDICATION REVIEW IN NURSING HOMES

Main applicants: J. Berger and A. Niquille Charrière

Allocation 2023: CHF 40'000.-

Starting date: 01.10.2022

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD & Société Vaudoise de Pharmacie

“Médicaments à jour ?”

Main applicant: J. Berger

Total funding of the project: CHF 138'107.30.-

Total duration of the project: 3 years

Allocation 2023: CHF 50'485.-

Starting date: 01.01.2022

Total amount for all research funds for 2023: CHF 595'975.-

Service agreements and related activities

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD

MENTORAT FPH

Main applicants: J. Berger

Allocation 2023: CHF 190'000.-

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD

Organisation and animation of a Quality Circle Physicians-Pharmacists-Nurses in the nursing homes of the « Fondation Asile des Aveugles (FAA) and Nursing Home Béthanie»

Main applicants: J. Berger and C. Bremond

Allocation 2023: CHF 21'592.05

FEDERAL OFFICE OF PUBLIC HEALTH (FOPH) / Institute of pharmaceutical sciences of Western Switzerland (ISPSO), University of Geneva, University of Lausanne

Service agreement (Examen fédéral OSCE et QCM pharmacoéconomie en Pharmacie 2023)

Main applicant: J. Berger

Total amount 2023: CHF 102'450.-

CP3

Service agreement

Total amount 2023: CHF 15'830.-

H3S

Service agreement

Total amount 2023: CHF 580.-

HVS

Service agreement

Annual Report 2023

School of Pharmaceutical Sciences

Total amount 2023: CHF 600.-
IFAK DATA
Service agreement
Total amount 2023: CHF 3'940.89.-

ONP
Service agreement
Total amount 2023: CHF 2'100.-

PHA11
Service agreement
Total amount 2023: CHF 7'500.-

SUS4
Service agreement
Total amount 2023: CHF 4'200.30.-

SEM21
Service agreement
Total amount 2023: CHF 9'175.20.-

SYMS
Service agreement
Total amount 2023: CHF 20'000.-

SYAD
Service agreement
Total amount 2023: CHF 8'616.-

SV3
Service agreement
Total amount 2023: CHF 14'600.-

U3
Service agreement
Total amount 2023: CHF 76'655.-

Total amount (for all service agreements and related activities) for 2023: CHF 477'839.44.-

Scientific publications (with impact factor)

Amador-Fernandez, N.; Matthey-de-l'Endroit, J.; Berger, J. Factors Influencing the Implementation of a New Pharmacist. Prescribing Service in Community Pharmacies. Pharmacy, 2023, 11, 173 Tabea Jungo, K.; Weir, K R.; Cateau, D.; Streit, S.	2.2
Older adults' attitudes towards deprescribing and medication changes: a longitudinal sub-study of a cluster randomised controlled trial BMJ Open, 2023, November 28th	2.9
Bandiera, C.; Cardoso, E.; Locatelli, I.; Zaman, K.; Diciolla, A.; Digkila, A.; Stravodimou, A.; Cristina, V.; Aedo-Lopez, V.; Dolcan, A-M.; Sarivalasis, A.; Bouchaab, H.; Pasquier, J.; Dotta- Celio, J.; Wagner, A-D.; Csajka, C.; Schneider, M-P. CN42 A pharmacist-led interprofessional medication adherence program improved adherence to oral anticancer therapies: The OpTAT randomized controlled trial Annals of Oncology, 2023, October, 34, 1237	32.98

Amador-Fernandez, N.; Escaith, M.; Simi, E.; Quintana-Barcena, P.; Berger, J. Evaluation of an enhanced service for medication review with follow up in Swiss community pharmacies: Pre-post study protocol. Plos One, 2023, October.	3.70
Mena, S.; Moullin, J-C.; Schneider, M.; Niquille, A. Implementation of interprofessional quality circles on deprescribing in Swiss nursing homes: an observational study BMC Geriatrics 2023 23:620	4.07
Pétein, C.; Spinewine, A.; Laroche, M. L.; Niquille, A.; Henrard, S. Adaptation and validation of the revised Patients' Attitudes towards Deprescribing (rPATD) questionnaire for benzodiazepine receptor agonists. Research in Social and Administrative Pharmacy 2023, September, 19, 1278-1285	3.35
Nicolet, A.; Perraudin, C.; Krucien, N.; Wagner, J.; Peytremann-Bridevaux, I.; Marti, J. Preferences of older adults for healthcare models designed to improve care coordination: Evidence from Western Switzerland. Health Policy 2023 Ju; 132	3.26
Bawab, N.; Moullin, J.; Jotterand, S.; Rossier, C.; Schneider, M. P.; Perraudin, C. Building Interprofessional Collaborative Practices Through a Support Program for Patients With Type 2 Diabetes in Primary Care. J Contin Educ Health Prof 2023 Apr 1;43(2):77-86	2.19
Amador-Fernández, N.; Baechler, T.; Quintana-Bárcena, P.; Berger, J. Documentation of drug related problems and their management in community pharmacy: data evolution over six years. Research in Social & Administrative Pharmacy 2023	3.35
Amador-Fernández, N.; Benrimoj, S. I.; Garcia-Cardenas, V.; Gastelurrutia, M. Á.; Graham, E. L.; Palomo-Llinares, R.; & Martínez-Martínez, F. Identification of high-risk patients for referral through machine learning assisting the decision making to manage minor ailments in community pharmacies. Frontiers in Pharmacology. 2023 Jul 11; 14	5.6
Amador-Fernández, N.; Jenkinson, S. P.; Berger, J. Vision and practice of self-care for community pharmacy in Switzerland. Exploratory Research in Clinical and Social Pharmacy 2023 Mar; 9, 100253	3.9
Berger, J. Quelques outils pour mettre en œuvre la déprescription. Actualités Pharmaceutiques 2023 Mar; 62(624), 23-25	0.1
Michiels, Y.; Berger, J. Le rôle du pharmacien d'officine dans la déprescription. Actualités Pharmaceutiques 2023 Mar; 62(624), 30-33.	0.1
Belon, J. P.; Niquille, A.; Michiels, Y. Polypharmacie et patient âgé. Actualités Pharmaceutiques 2023 Mar; 62(624), 20-22	0.1
Michiels, Y. Adapter le traitement à la situation clinique, un objectif de santé publique Actualités Pharmaceutiques 2023, Mar; 62 (624), 19	0.1

Scientific publications (without impact factor)

Ruiz-Lozano, F.; Crespo-Sánchez, F. E.; Amador-Fernández, N. Factores y estrategias en la implantación del Servicio de Indicación Farmacéutica en farmacia comunitaria. *Farm Comunitarios*. 2023 Jul 12;15(3):25-30

Expert report

Simic, G.; Macé, F.; Baechler, T.; Niquille, A. Assistance pharmaceutique dans les établissements médico-sociaux du Canton de Vaud - Rapport d'activités 2023, 2023, December.

Allon, N.; Eggli, Y.; Niquille Charrière, A.; Marti, J. Utilisation de médicaments potentiellement inappropriés dans la population gériatrique du Valais et comparaison intercantonale, 2023, November.

Clinical practice guidelines

Dubuis, C-L; Kälin, V; Agostini Ferrier, S; Berger, J. Bon usage des dermocorticoïdes à l'officine *pharmaJournal* 2023, 12, 4-8

Amador-Fernández, N; Baechler, T ; Quintana-Barcena, P; Berger, J. Problèmes liés aux médicaments: Documentation et prise en charge en officine depuis 6 ans / Arzneimittelbezogene Probleme: Dokumentation und Betreuung in der Apotheke: Entwicklung über sechs Jahre. *pharmaJournal*, 2023, 11, 23-27

Collomb, L; Kälin, V; Agostini Ferrier, S; Berger, J. Vitamine D: Quelles recommandations en cas de carence? / Vitamin D: Welche Empfehlungen gelten bei einem Mangel? *pharmaJournal*, 2023, 10, 4-10

Matthey-de-l'Endroit, J ; Amador-Fernández, N.; Berger, J. Quels sont les barrières et les facilitateurs pour l'implémentation de la liste B+ ? / Was sind die Hürden und die förderlichen Faktoren für die Implementierung der Konsultation in der Apotheke? *pharmaJournal*, 2023, 8, 16-18

Collomb, L; Kälin, V; Agostini Ferrier, S; Berger, J. La carence en fer: Conseils e suivi en officine / Eisenmangel: Beratung und Unterstützung in der Apotheke. *pharmaJournal*, 2023, 3, 8-13

Berger, J. Pharmacie d'Unisanté : De la défiance à l'évidence / Pharmacie d'Unisanté : Skepsis weicht der Realität. *pharmaJournal* 2023, 2, 31-33.

Kälin, V; Botnaru, I; Berger, J. La carence en fer: Conseils e suivi en officine / Eisenmangel: Beratung und Unterstützung in der Apotheke. *pharmaJournal*, 2023, 2, 18-19.

Perraudin, C; De Lise, M; Berger, J. Retours sur le Covid-19 et opportunités pour les pharmacies. *pharmaJournal*, 2023, 2, 20-21

Kälin, V; Botnaru, I; Berger, J. Trop peu de médicaments de la "Liste B+" sont cliniquement pertinents ! / Zu wenig Medikamente der "Liste B+" sind klinisch relevant! *pharmaJournal*, 2023, 2, 18-19

Dubuis, C-L; Agostini-Ferrier, S; Kälin, V; Berger, J. Hygiène et soins des mains: Gardons les bons réflexes! / Handhygiene und -pflege: Nicht nachlassen! *pharmaJournal*, 2023, 1, 4-7

Books or books chapters

Perraudin, C.; Niquille, A.; Berger, J., Economic evidence for pharmacist-led medicines use review and medicines reconciliation. *Encyclopedia of Evidence in Pharmaceutical Public Health and Health Services Research in Pharmacy*, April 14th, 2023.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 4
- Posters presentations: 1
- Oral presentations: 2
- Invited oral presentations: 2

Ph.D. Theses presented in 2023

Stephanie Mena

Évaluation de l'implémentation de prestations pharmaceutiques visant l'optimisation de la pharmacothérapie de résidents en établissements médico-sociaux

Marie-Paule Schneider et Anne Niquille

Awards and distinction

Amador-Fernández, N.

Barriers and facilitators to implement a service to pharmacists prescribing in Switzerland Award for the best oral communication. PCNE, 08-11 February 2023, Hillerod (Denmark).

Public outreach activities (radio, television and other media, community service)

Radio, television and other media

Berger, J. On peut souvent faire tout aussi bien ou même mieux avec moins de médicaments. Uniscope, December 6th, 2023.

Berger, J. À l'adolescence, il peut y avoir un rejet du système de santé, de la médication. 24 Heures, November 10th, 2023.

Berger, J. Comment soigner un rhume ? Avec de la patience. Le Matin Dimanche, October 29th, 2023.

Berger, J. Pharmacie d'Unisanté : de la défiance à l'évidence. pharmaJournal, October 27th, 2023.

Mazouri S. ; Pirolt S. ; Niquille A., Les médicaments de trop ! Revue médicale Suisse, podcast En consultation, October 19th, 2023.

Public outreach activities -community service: continuous education for health professionals

Kälin V. ; Brajkovic, S. Dermatologie

Formation continue infirmière.er.s USMI, December 7th, 2023, Lausanne (Switzerland)

Troxler, S. ; Baechler, T. Ophtalmologie : sécheresse oculaire et larmes artificielles

Cercle de qualité médecins-pharmaciens-soignants, EMS Bethanie, December 6th, 2023, Lausanne (Switzerland).

Troxler, S. ; Baechler, T. Problèmes courants en dermatologie chez le sujet âgé

Cercle de qualité médecins-pharmaciens-soignants, EMS Bethanie, December 6th, 2023, Lausanne (Switzerland).

Kälin, V. ; Agostini-Ferrier, S.; Berger, J. Antalgiques de palier 3

Cercle de qualité médecins assistants Unisanté, November 24th – November 27th – December 7th, 2023, Lausanne (Switzerland).

Heritier, F. ; Berger, J. Anamnèse en soins primaires – Cours d'approfondissement interprofessionnel - Système uro-génital CAP Centre d'Animation des Pharmaciens, November 23rd, 2023, Lausanne (Switzerland).

Dotta-Celio, J. ; Brajkovic, S. ; Prise en charge des patients.e.s diabétiques en Officine CAP Centre d'Animation des Pharmaciens, November 9th, 2023, San Antonino (Switzerland).

Dotta-Celio, J. ; Brajkovic, S. Prise en charge des patients.e.s diabétiques en officine CAP Centre d'Animation des Pharmaciens, October 30th, Lausanne (Switzerland).

Escaith, M. ; Kälin, V. ; Berger, J. Pathologies ophtalmiques. Suivi ophtalmique dans les pathologies chroniques. Ordre Neuchâtelois des Pharmaciens, October 19th, 2023, Neuchâtel (Switzerland).

Heritier, F. ; Berger, J. Anamnèse en soins primaires – Cours d'approfondissement interprofessionnel Partie pratique : Dermatologie – Pathologies non infectieuses. CAP Centre d'Animation des Pharmaciens, September 28th, 2023, Neuchâtel (Switzerland).

Heritier, F. ; Berger, J. Anamnèse en soins primaires – Cours d'approfondissement interprofessionnel Partie pratique : Dermatologie – Pathologies infectieuses. CAP Centre d'Animation des Pharmaciens, September 28th, 2023, Lausanne (Switzerland).

Barbalat, M-J. ; Diana, A. Comment mieux répondre à l'hésitation vaccinale ? CAP Centre d'Animation des Pharmaciens, September 25th, 2023, Lausanne (Switzerland).

Dubuis, C-L. ; Kälin, V. ; Agostini-Ferrier, S. Antidépresseurs. Cercle de qualité médecins assistants Unisanté, September 25th – October 17th – October 27th, 2023, Lausanne (Switzerland).

Savary, J. Traitements du VIH : mise à jour. CAP Centre d'Animation des Pharmaciens, congrès pharmaMONTANA, September 23rd, 2023, Lens (Switzerland).

Barbalat, M-J. ; Pavon, V. Ce qu'il faut savoir sur les vaccins, refresh vaccination. CAP Centre d'Animation des Pharmaciens, congrès pharmaMONTANA, September 21st, 2023, Lens (Switzerland).

Kälin, V. ; Agostini-Ferrier, S. ; Berger, J. Allergies croisées les enjeux de la prescription pour la médecine du voyage. Colloque formation CVMC, September 8th, 2023, Lausanne (Switzerland).

Dotta-Celio, J. ; Kälin, V. ; Berger, J. Antiagrégants et anticoagulants – Nouveautés et vignettes cliniques. Ordre Neuchâtelois des Pharmaciens, August 31st, 2023, Neuchâtel (Switzerland).

Troxler, S. ; Kälin, V. ; Agostini-Ferrier, S. ; Berger, J. Outils pour la déprescription médicamenteuse. Colloque Chefs de clinique Unisanté, June 12th, 2023, Lausanne (Switzerland).

Dotta-Celio, J. Antiagrégants et anticoagulants. pharmActuel, June 8th, 2023, Online ; June 15th, 2023, Sierre (Switzerland) ; June 20th, 2023, Fribourg (Switzerland); June 22nd, 2023, Lausanne (Switzerland).

Collomb, L. ; Dubuis, C-L. ; Brajkovic, S. Affections ORL Colloque formation Point Santé EPFL, June 1st, 2023, Lausanne (Switzerland).

Gouveia, A. ; Berger, J. Anamnèse en soins primaires – Fondements : partie théorique du certificat FPH - Jour 2 CAP Centre d'Animation des Pharmaciens, May 30th, 2023, Lausanne (Switzerland).

Gouveia, A. ; Berger, J. Anamnèse en soins primaires – Fondements : partie théorique du certificat FPH - Jour 1 CAP Centre d'Animation des Pharmaciens, May 23rd, 2023, Lausanne (Switzerland).

Kälin, V. ; Agostini-Ferrier, S. ; Berger, J. Ruptures d'approvisionnement en médicaments Colloque Chefs de clinique Unisanté, May 22nd, 2023, Lausanne (Switzerland).

Barbalat, M-J. ; Pavon, V. Les vaccins et les maladies transmissibles : l'essentielle en une journée. CAP Centre d'Animation des Pharmaciens, May 9th, 2023 Lausanne (Switzerland).

Nayak, J. Conseil et accompagnement en officine des personnes sous traitement hormonal d'affirmation du genre. pharmActuel, May 04th, 2023, Online; May 09th, 2023, Lausanne (Switzerland); May 23rd, 2023, Sion (Switzerland); May 30th, 2023, Fribourg (Switzerland).

Barbalat, M-J. ; Pavon, V. Quelle(s) vaccination(s) pour qui ? « Refresh vaccination ». CAP Centre d'Animation des Pharmaciens, May 2nd, 2023, Lausanne (Switzerland).

Kälin, V. ; Agostini-Ferrier, S. ; Berger, J. Polymédication. Cercle de qualité Pharmacie Unisanté, April 4th, 2023, Lausanne (Switzerland)

Savary, J. Infections sexuellement transmissibles – 2^{ème} partie. pharmActuel, March, 21st, 2023, Online; March 28th, 2023, Fribourg (Switzerland) ; April 25th, 2023, Lausanne (Switzerland); April 27th, 2023, Martigny (Switzerland).

Collomb, L.; Kälin, V.; Agostini-Ferrier, S.; Berger J. Les dispositifs d'inhalation dans la prise en charge de l'asthme et de la BPCO. Cercle de qualité médecins assistants Unisanté, March 27th – March 28th – April 13th – April 28th, 2023, Lausanne (Switzerland).

Kälin, V.; Agostini-Ferrier, S.; Berger, J. Remise simplifiée des médicaments soumis à ordonnance. Colloque Chefs de clinique Unisanté, March 13th, 2023, Lausanne (Switzerland).

Escaith, M. ; Amador-Fernández, N. ; Berger, J. «Médicaments A Jour?» - MAJ? - Formation en ligne pour les assistantes en pharmacie Société vaudoise de pharmacie, March 3rd, 2023

Kälin, V. ; Agostini-Ferrier, S.; Berger, J. Liste B+, 3^{ème} partie Ordre Neuchâtelois des Pharmaciens, February 23rd, 2023, Neuchâtel (Switzerland).

Kälin, V.; Agostini-Ferrier, S.; Berger, J. Nouveautés 2022-2023 Colloque Chefs de clinique Unisanté, February 20th, 2023, Lausanne (Switzerland).

Barbalat, M-J. ; Pavon, V. Les vaccins et les maladies transmissibles : l'essentielle en une journée. CAP Centre d'Animation des Pharmaciens, February 6th, 2023, Lausanne (Switzerland).

HOSPITAL PHARMACY

Professor Pascal BONNABRY, HUG (15%)
Professor Farshid SADEGHIPOUR, CHUV (15%)

PD Doctor Johnny BENEY, ICHV, Sion
PD Doctor Sandrine FLEURY-SOUVERAIN, HUG
PD Doctor Pierre VOIROL, CHUV
PD Doctor Nicolas WIDMER, PHEL, Rennaz

Doctor Christel BRUGGMANN, CE, HUG (10%)
Doctor Nancy PERROTET, CE, CHUV (10%)

General description of the Unit

The group is composed of two part-time professors, four privat-docent and two CE from several hospitals in the French-speaking part of Switzerland. We develop research and education activities in the different fields of hospital pharmacy (logistics and pharmacoconomics, production, quality control, clinical pharmacy). The undergraduate education is mainly focused on hospital pharmacy modules in BUSP2, BUSP3 and MUP2. A post-graduate education (MAS) in hospital pharmacy is also proposed since 1999. This three-year program is a complete specialization in hospital pharmacy, associating theoretical and practical teachings, as well as a research project. Hospital pharmacy also propose positions for PhD students. The unit is also involved in global pharmacy, mainly with the project Pharm-Ed (www.Pharm-Ed.net), in disaster pharmacy, by hosting the Specialised centre for emergency and disaster pharmacy (SEDIP, www.disaster-pharmacy.ch) and in the management of the CAS of Pharmacie Clinique (<https://www.unige.ch/formcont/cours/cas-pharmacie-clinique>) and the CAS in Medicines and Medical Devices in Emergency and Disaster (<https://www.unige.ch/formcont/en/courses/emergency-disaster>).

Specific research fields

To optimize the safety, the efficiency and the traceability of drug use in hospitals:

- Processes
 - o Optimization of clinical use of drugs
 - Securing the drug use process in high-risk care units
 - Detection, prevention, management and evaluation of drug incompatibilities
 - Therapeutic education with new technologies
 - Continuity of care
 - o Economic evaluation of changes in therapeutic strategies in hospital
 - o Risk analysis
 - o Information technologies
 - o Human factors, ergonomics and process efficiency
 - o Organization in humanitarian, emergency and disaster situations (civil and military context)
- Persons
 - o Inter-professionality
 - o Innovative pedagogic approaches for knowledge transmission
 - o Decision support
- Products
 - o Development of hospital pharmaceutical forms, including ready-to-use products
 - o Stability studies
 - o Analysis of hazardous drugs
 - o Formulation of paediatric parenteral nutrition

- Development and validation of generic separation methods for the dosage of active ingredients contained in hospital pharmaceutical formulations.
- Study of content and containers interactions in leachable and extractable events of different pharmaceutical packaging

2023 at a glance

- Publications with impact factor: 27
- Publications without impact factor: 7
- Patents: 0
- Books and chapters: 1
- Congresses / conferences organisation: 7
- Posters presentations: 29
- Oral presentations: 8
- Invited oral presentations: 15
- Number of projects at FNRS and assimilated (Research funds): 5
- Service agreements and related activities : 3
- Ph.D. Theses presented in 2023: 2
- Awards and distinctions: 4
- Public outreach activities: 0

Research funds

Iqone

Etude des barrières à l'adoption des médicaments biosimilaires

Main applicant: Pr Pascal Bonabry

Total funding of the project: CHF 50'000.-

Total duration of the project: 2023-2024

Allocation 2023: CHF 50'000.-

Vifor, Labatec, Sandoz, TevaMepha, GSK, Bichsel

Ruptures d'approvisionnement en médicaments : vers une gestion plus efficiente

Main applicant: Pr Pascal Bonabry

Total funding of the project: CHF 30'000.-

Total duration of the project: 2023

Allocation 2023: CHF 30'000.-

Accord, Sandoz, Labatec

Contamination de l'environnement de travail par les cytotoxiques : bencjmarketing inter-hôpitaux et détermination des bonnes pratiques

Main applicant: Pr Pascal Bonabry

Total funding of the project: CHF 20'000.-

Total duration of the project: 2023

Allocation 2023: CHF 20'000.-

AstraZeneca, Bayer, Labatec, Vifor,

Amélioration des connaissances sur la maladie et les médicaments : étude chez des patients insuffisants cardiaques hospitalisés

Main applicant: Pr Pascal Bonabry

Total funding of the project: CHF 65'000.-

Total duration of the project: 2022-2023

Allocation 2023: CHF 15'000.-

Octopharma, Debiopharm
Pharm-Ed: une plateforme d'enseignement de la pharmacie hospitalière pour les pays en développement
Main applicant: Pr Pascal Bonnabry
Total funding of the project: CHF 6'000.-
Total duration of the project: to be determined
Allocation 2023: CHF 6'000.-

Total amount for all research funds for 2023: CHF 121'000.-

Service agreements and related activities

Confédération Helvétique, Département fédéral de la Défense, de la Protection de la Population et des Sports (DPPS)
Service – Development – Research: Centre de pharmacie d'urgence et de catastrophe
Total amount for 2023: CHF 65'800.-

Braun, Roche, Sanofi, Viatris, GPHR
Pharmamobile – une plateforme de formation innovante autour du médicament, qui vient à la rencontre des patient.es, des professionnel.les de la santé et des étudiant.es
Main applicant: Pr Pascal Bonnabry
Total funding of the project: to be determined
Total duration of the project: to be determined
Allocation 2023: CHF 125'000.-

Debiopharm; Radiopharmaceutical researches
Main applicant: Dre. Judith Delage
Total duration of the project: 2023
Allocation 2023: CHF 29'745.-

Total amount (for all service agreements and related activities) for 2023: CHF 220'545.-

Scientific publications (with impact factor)

Garnier, A.; Dubs, C.; Hearder, C.; Bonnabry, P.; Bouchoud, L., Game-based training to improve hospital pharmacy operators' compliance with handwashing guidelines. Journal of Hospital Infection 2023, Dec 9:S0195-6701(23)00389-4; doi: 10.1016/j.jhin.2023.11.015. 6.9

Garnier, A.; Butaye, L.; Bonnabry, P.; Bouchoud, L., A room of errors simulation to improve pharmacy operators' knowledge of cytotoxic drug production. Journal of Oncology Pharmacy Practice 2023, doi: 10.1177/10781552231152145. 1.4

Garnier, A.; Bonnabry, P.; Bouchoud, L., Game-based learning as training to use a chemotherapy preparation robot. Journal of Oncology Pharmacy Practice 2023, doi: 10.1177/10781552231181056. 1.4

Garnier, A.; Dubs, C.; Hearder, C.; Bonnabry, P.; Bouchoud, L., Game-based training to promote handwashing, handrub and gloving for hospital pharmacy operators. European Journal of Hospital Pharmacy 2023, 0:1-5; doi: 10.1136/ejpharm-2022-003648. 2.3

Schumacher, L.; Tinguely Casserini, J.; Bonnabry, P.; Widmer, N., Management of the COVID-19 Health Crisis: A Survey of Swiss Health Authorities' Responses. Disaster Medicine and Public Health Preparedness 2023, 17(e406), 1-2; doi: 10.1017/dmp.2023.36. 5.5

- Schumacher, L.; Dhif, Y.; Bonnabry, P.; Widmer, N., Managing the COVID-19 health crisis: a survey of Swiss hospital pharmacies. *BMC Health Service Research* 2023, 23:1134; doi: 10.1186/s12913-023-10105-6. 2.8
- Skalafouris, C.; Blanc, A.-L.; Groscurin, O.; Marti, C.; Samer, C.; Lovis, C.; Bonnabry, P.; Guignard, B., Development and retrospective evaluation of a clinical decision support system for the efficient detection of drug-related problems by clinical pharmacists. *International Journal of Clinical Pharmacy* 2023, 45, 406-413. 2.3
- Flornoy-Guédon, A.; Fonzo-Christe, C.; Meier, E.; Gazengel-Marchand, M.; Francois, O.; Gschwind, L.; Bonnabry, P., Development and evaluation of a blended learning training programme for pharmacy technicians' continuing education. *European Journal of Hospital Pharmacy* 2023, doi: 10.1136/ejhpharm-2022-003679. 2.5
- Robert, L.; Rousselière, C.; Beuscat, J.-B.; Gautier, S.; Delporte, L.; Lafci, G.; Gerard E.; Négrier, L.; Mary, A.; Johns, E.; Payen, A.; Ducommun, R.; Ferret, L.; Voirol, P.; Skalafouris, C.; Ade, M.; Potier, A.; Dufay, E.; Beney, J.; Frery, P.; Drouot, S.; Feutry, F.; Corny, J.; Odou, P.; Décaudin, B, Premières journées francophones des utilisateurs de système d'aide à la décision en pharmacie clinique : retour d'expériences et perspectives. *Annales Pharmaceutiques Françaises* 2023, 81, 1018-1030. 1.3
- Farhat, A.; Voidey, A.; Sommer, I.; Carrez, L.; Sadeghipour, F. Optimizing pharmaceutical management of clinical trials. *Annales Pharmaceutiques Françaises* 2023, Dec 28:S0003-4509(23)00168-2. doi: 10.1016/j.pharma.2023.12.010. 1.3
- Bello, W.; Pezzatti, J.; Berger-Gryllaki, M.; Rudaz, S.; Sadeghipour, F., Development of a generic approach for monitoring leachable compounds in hospital pharmacy-prepared prefilled plastic packaging by ultrahigh-performance liquid chromatography coupled to high-resolution mass spectrometry with postcolumn infusion. *Journal of Pharmaceutical and Biomedical Analysis* 2023, 236, 115640. doi:10.1016/j.jpba.2023.115640. 3.4
- Fournier, A.; Fallet, C.; Sadeghipour, F.; Perrottet, N., Assessing the applicability and appropriateness of ChatGPT in answering clinical pharmacy questions. *Annales Pharmaceutiques Françaises* 2023, Nov 20: S0003-4509(23)00140-2. doi: 10.1016/j.pharma.2023.11.001. 1.3
- Décaudin, B.; Voirol, P.; Perrottet, N.; Spinewine, A.; Bussièrès, J.-F., Clinical pharmacy in four French-speaking university hospitals, integration and supervision of clinical pharmacists: An exploratory study. *Annales Pharmaceutiques Françaises* 2023, Jan;81(1):138-151. doi: 10.1016/j.pharma.2022.08.001. 1.3
- André, P.; Chtioui, H.; Dao, K.; Rothuizen, L.E.; Di Paolo, E.R.; Diezi, M.; Crisinel, P.A.; Cachat, F.; Chehade, H.; Buclin, T., Estimating glomerular filtration rate from serum creatinine concentration in children with augmented renal clearance: all formulas are equivocal, but some are more equivocal than others. *Kidney International* 2023, 103:223-8. doi: 10.1016/j.kint.2022.10.015. 19.0
- Hufschmid Thurnherr, E.; Dahmke, H.; Voirol, P.; Waldspühl Suter, B.; Lutters, M.; Vonbach, P., Automation of the medication process in Swiss hospitals: results of a survey. *European Journal of Hospital Pharmacy* 2023, doi: 10.1136/ejhpharm-2023-003829. 2.5
- Mondo, I.; Hannou, S.; D'Amelio, P., Using sequential pharmacotherapy for the treatment of osteoporosis: an update of the literature. *Expert Opinion in Pharmacotherapy* 2023, Sep-Dec;24(18):2175-2186. doi: 10.1080/14656566.2023.2296543. 2.6
- Rakotonirina, A.; Galperine, T.; Audry, M.; Kroemer.; Baliff, A.; Carrez, L.; Sadeghipour, F.; Schrenzel, J.; Guery, B.; Allémann; E., Dry alginate beads for fecal microbiota transplantation: From model strains to fecal samples. *International Journal of Pharmacy* 2023, 639, 122961 <https://doi.org/10.1016/j.ijpharm.2023.122961>. 5.8

- Nordeng, H.; Wegler, C.; Lindqvist, A.; Melander, E.; Magnusson, M.; Gandia, P.; Panchaud, A.; Baranczewski, P.; Spigset, O., Transfer of cetirizine/levocetirizine into human breast milk and estimation of drug exposure to infants through breastfeeding - a human lactation study from the ConcePTION project. *Basic Clinical Pharmacology and Toxicology* 2023, Oct 9. doi: 10.1111/bcpt.13948. 3.7
- Maisonneuve, E.; de Bruin, O.; Favre, G.; Goncé, A.; Donati, S.; Engjom, H.; Hurley, E.; Al-Fadel, N.; Siiskonen, S.; Bloemenkamp, K.; Nordeng, H.; Sturkenboom, M.; Baud, D.; Panchaud, A., Evolution of National Guidelines on Medicines Used to Treat COVID-19 in Pregnancy in 2020-2022: A Scoping Review. *Journal of Clinical Medicine* 2023, 12, 4519. 4.9
- Favre, G.; Maisonneuve, E.; Pomar, L.; Daire, C.; Monod, C.; Martinez de Tejada, B.; Quibel, T.; Todesco-Bernasconi, M.; Sentilhes, L.; Blume, C.; Papadia, A.; Sturm, S.; Bassler, D.; Grawe, C.; Radan, AP.; Rossier, MC.; Mathis, J.; Capoccia-Brugger, R.; Lepigeon, K.; Gerbier, E.; Addor, MC.; Winterfeld, U.; Baud, D.; Panchaud A, COVI-PREG group. Risk of congenital malformation after first trimester mRNA COVID-19 vaccine exposure in pregnancy: the COVI-PREG prospective cohort. *Clinical Microbiology and Infection* 2023, 29, 1306-1312. 13.3
- Gerbier, E.; Favre, G.; Maisonneuve, E.; Ceulemans, M.; Winterfeld, U.; Dao, K.; Schmid, CPR.; Jenkinson, SP.; Niznik, B.; Baud, D.; Spoendlin, J.; Panchaud, A., Antidiabetic Medication Utilisation before and during Pregnancy in Switzerland between 2012 and 2019: An Administrative Claim Database from the MAMA Cohort. *Journal of Diabetes Research* 2023, May. doi: 10.1155/2023/4105993. 4.3
- Monfort, A.; Cardoso, E.; Eap, BC.; Fischer, FCJ.; Graz, MB.; Morisod, MH.; Weisskopf, E.; Gandia, P.; Allegaert, K.; Nordeng, H.; Hascoët, JM.; Claris, O.; Epiney, M.; Csajka, C.; Guidi, M.; Ferreira, E.; Panchaud, A., Infant exposure to Fluvoxamine through placenta and human milk: a case series - A contribution from the ConcePTION project. *Frontiers in Psychiatry*. 2023, 14. doi:10.3389/fpsyt.2023.1167870. 5.4
- Maisonneuve, E.; Gerbier, E.; Tauqeer, F.; Pomar, L.; Favre, G.; Winterfeld, U.; Passier, A.; Oliver, A.; Baud, D.; Panchaud, A.; Nordeng, H., Determinants of Vaccination and Willingness to Vaccinate against COVID-19 among Pregnant and Postpartum Women during the Third Wave of the Pandemic: A European Multinational Cross-Sectional Survey. *Viruses* 2023, 15, 1090. <https://doi.org/10.3390/v15051090>. 5.8
- Araya, RA.; Tauqeer, F.; Ceulemans, M.; Gerbier, E.; Maisonneuve, E.; Passier, A.; Oliver, A.; Panchaud, A.; Lupattelli, A.; Nordeng, H., Pregnancy- and Birth-Related Experiences among Postpartum Women during the Third Wave of the COVID-19 Pandemic—A Multinational European Study. *Pharmacoepidemiology* 2023, 2, 54-67. <https://doi.org/10.3390/pharma2010006>. 2.7
- Dao, K.; Shechtman, S.; Diav-Citrin, O.; George, N.; Richardson, JL.; Rollason, V.; Pistelli, A.; Eleftheriou, G.; Berlin, M.; Ekobena, P.; Rousson, V.; Addor, MC.; Baud, D.; Buclin, T.; Panchaud, A.; Winterfeld, U., Reproductive Safety of Trazodone After Maternal Exposure in Early Pregnancy: A Comparative ENTIS Cohort Study. *Journal of Clinical Psychopharmacology* 2023, 43, 12-19. doi: 10.1097/JCP.0000000000001630. 3.1
- Goutelle, S.; Guidi, M.; Gotta, V.; Csajka, C.; Buclin, T. Widmer, N., From personalized to precision medicine in oncology: A model-based dosing approach to optimize achievement of imatinib target exposure. *Pharmaceutics* 2023, 15, 1081. doi: 10.3390/pharmaceutics15041081. 5.4
- Briki, M.; André, P.; Y. Thoma, Y.; Widmer, N.; Wagner, A.D.; Decosterd, L.A.; Buclin, T.; Guidi, M.; Carrara, S., Precision oncology by point-of-care therapeutic drug monitoring and dosage adjustment of conventional cytotoxic chemotherapies: A perspective. *Pharmaceutics* 2023, 15, 1283. doi: 10.3390/pharmaceutics15041283. 5.4

Scientific publications (without impact factor)

Becocci, A.; Bochaton, N.; Fau, S.; Klee, P.; Perrenoud, L.; Fonzo-Christe, C.; Pfister, R., Continuous subcutaneous insulin infusion via an insulin pump in extremely premature neonates – a case series. Intensive Care Medicine – Paediatrics and Neonatal 2023, doi.org/10.1007/s44253-023-00004-3.

Garnier, A.; D'Acremont, F.; Collomp, R.; Bonnabry, P., Appliquer les grands principes de l'escape game à un « never event » : pourquoi ? comment ? Exemple du chlorure de potassium injectable. Risque et Qualité 2023, 20, 225-30.

Beney, J. Médicaments : séparer le bon grain de l'ivraie. Revue Médicale Suisse 2023, 19, 112-113. doi: 10.53738/REVMED.2023.19.811.112.

Zdonowski, AC. ; Jordan-von Gunten, V. ; Beney, J. ; Savet-Demichelis, M., Proposition d'indicateurs pour l'assistance pharmaceutique, Le Pharmacien Clinicien, 2023, 58, 354-362, doi.org/10.1016/j.phacli.2023.01.001.

Di Paolo, ER. ; von der Weid, N., Pénurie de médicaments pédiatriques - Retour vers le futur. Competence 2023, 5, 11.

Di Paolo, ER. ; Mitropoulou, G. ; Csajka, C., Modulateurs de la protéine CFTR pour traiter la mucoviscidose. Gazette Médicale 2023, 6, 20-22.

Di Paolo, ER.; Mitropoulou, G.; Csajka, C., Modulatoren des CFTR-proteins zur Behandlung der Mukoviszidose. Der informierte @rtz 2023, 13, 29-31.

Patents

0

Books or books chapters

Sadeghipour, F.; Crauste-Manciet, S., Premises [In] Practical Pharmaceutics: An International Guideline for the Preparation, Care and Use of Medicinal Products; Springer International Publishing, 2023, 623-639.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 7
- Posters presentations: 29
- Oral presentations: 8
- Invited oral presentations: 15

Ph.D. Theses presented in 2023

Benjamin Bugnon

Soutenir la collaboration entre patients et professionnels de santé avec un plan de médication partagé numérique : recherche-action participative sur la conception, l'implémentation et les perspectives de santé publique.

Pr Pascal Bonnabry, Pr Antoine Geissbühler

Marko Krstic

Évaluation pharmacoéconomique des changements de stratégies médicamenteuses à l'hôpital ; Pr Farshid Sadeghipour, Pr Joachim Marti (Unisanté, UNIL)

Awards and distinction

Vallet, V.; Dalex, E.; Bonnabry, P.; Fleury-Souverain, S., Evaluation de la contamination de surface par des agents anticancéreux dans des unités de soins d'oncologie et d'hématologie. **Best poster award**. 24^{èmes} Journées Franco-Suisses de Pharmacie Hospitalière, November 30 - December 1st 2023, Genève (Switzerland).

Kaestli, L.-Z.; Krifa, S.; Floriel Destezet, I.; Juillerat, A.; Aeberli, J.; De Giorgi Salamun, I.; Gschwind Tran, L.; Bernard, C.; Sallet, A.; Vincent-Suter, S.; Blondon, K.; Despond, M.; Ehrler, F.; Grauser, D.; Houeix, J.; Portela, J.; Bornet-dit-Vorgeat, H.; Bonnabry, P., Une plateforme numérique permettant au patient de visualiser ses traitements médicamenteux pendant son hospitalisation. **Best oral communication award**. 24^{èmes} Journées Franco-Suisses de Pharmacie Hospitalière, November 30 - December 1st 2023, Genève (Switzerland).

Jermini, M.; Fonzo-Christe, C.; Blondon, K.; Milaire, C.; Stirnemann, J.; Bonnabry, P.; Guignard, B., Financial impact of a pharmacist-led in-hospital adverse drug events prevention program. **Best oral communication award**. European Society of Clinical Pharmacy Symposium, October 31st – November 2nd 2023, Aberdeen (Scotland).

Hannou, S.; Nicorici, C.; Spitz, P.; Cotte, S.; Bosshard, W.; Perrottet, N.; Voirol, P.; Sadeghipour F., Opioids room of horrors – An interactive learning to improve safety of drug administration. **Best GPI Award**. Congress of the European Association of Hospital Pharmacy, March 2023, Lisbon (Po)

IMMUNOPHARMACOLOGY OF CANCER

Professor Carole BOURQUIN

General description of Unit

Our overall aim is to develop novel treatments to enhance the body's immune defences against cancer.

We aim to uncover new mechanisms leading to immune activation in cancer. Our goal is to identify novel targets to stimulate anticancer immunity and to demonstrate the impact of their pharmacological modulation. In this context, we have three main research axes focusing on innate immunity, immunometabolism and drug delivery.

Specific research fields

One focus of our research is the role of players involved in the innate immune recognition of nucleic acids, such as endosomal Toll-like receptors, HMGB1 and STING. We study the effect of the pharmacological modulation of these receptors and immune mediators. We address the following questions:

- What is the impact of these pathways on different aspects of anticancer immunity?
- Can we enhance migration of immune cells into the tumor with pharmacological modulators of these pathways?
- Can we decrease cancer-associated immunosuppression by targeting these pathways?

The second focus of our research is the implementation of drug delivery systems, such as nanoparticles, to improve the therapeutic efficacy of immune modulators in cancer. We address the following questions:

- Can we use nanoparticles as a delivery system to focus the action of Toll-like receptor 7 agonists and prevent unwanted side effects?
- What are the optimal characteristics of nanocarriers to deliver drugs that target anticancer immunity?

A third focus of our research is the impact of lipid metabolism on the anti-tumor immune response at different levels. At the systemic level, we study how a high-fat diet, obesity and steroid signalling may modify anticancer immunity and the response to immunotherapy. At the cellular level, we address the role of intratumoral lipid biosynthesis and steroid metabolism on the anti-tumor immune response. We address the following questions:

- What is the impact of gender and obesity on steroid-mediated immune modulation?
- Can we target steroid metabolism to enhance the anti-tumor immune response?

We address these scientific questions using translational approaches, starting with clinically relevant data to generate our hypotheses, which we then validate in preclinical models of cancer.

2023 at a glance

- Publications with impact factor: 3
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 1
- Posters presentations: 3
- Oral presentations: 6
- Invited oral presentations: 0
- Number of projects at FNRS and assimilated (Research funds): 9
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2023: 2
- Awards and distinctions: 1
- Public outreach activities: 7

Research funds

Swiss National Science Foundation

Category: SNSF

SPIRIT Consortium "Gasotransmitters in triple negative breast cancer"
(IZSTZ0-198887)

Main applicant and coordinator: Carole Bourquin

Total funding: CHF 498'880.-

Duration: 3 years

Allocation 2023: CHF 245'940.-

Starting date: 01.09.2021

Swiss National Science Foundation

Category: SNSF

"HMGB1 and Gasdermin D: intratumoral targets to improve the response to cancer immunotherapy"
(310030_182317/1)

Main applicant: Carole Bourquin

Total funding: CHF 700'000.-

Duration: 5 years

Allocation 2023: CHF 78'843.-

Starting date: 01.01.2019

Swiss National Science Foundation

Category: SNSF

"Synergistic targeted drug combinations for induction of sensitivity to immune checkpoint
Inhibitors".
(310030_197878)

Main applicant: Patrycja Nowak-Sliwinska

Total funding: CHF 46'000.-

Duration: 4 years

Allocation 2023: CHF 15'000.-

Starting date: 01.01.2021

Swiss National Science Foundation

Category: SNSF

R'Equip " Building the future of radiation oncology in Geneva".
(316030_221602)

Main applicant: Pelagia Tsoutsou

Total funding: CHF 418'622.-

Duration: 4 years

Allocation 2023: CHF 418'622.-

Starting date: 01.12.2023

Cell Migration

Category: Institutional

Doctoral Program SwissUniversities

Main applicant: Carole Bourquin

Total funding: CHF 24'000.-

Duration: 6 years

Allocation 2023: CHF 8'000.-

Starting date: 01.07.2018

Novartis Foundation

Category: Institutional

"Exploring the tumorigenic role of stomach microbiota in a spontaneous mouse model of gastric cancer"

Main applicant: Carole Bourquin

Total funding: CHF 60'000.-

Duration: 3 years

Allocation 2023: CHF 0.-

Starting date: 01.08.2020

Debiopharm IDEAL

Category: Institutional

"A new immunotherapeutic strategy for the treatment of Her2+ breast cancer"

Main applicant: Aurélien Pommier

Total funding: CHF 51'103.65.-

Duration: 1 year

Allocation 2023: CHF 51'103.-

Starting date: 01.07.2022

Doctoral Program Cell Migration

Category: Institutional

Doctoral Program SwissUniversities

Main applicant: Carole Bourquin

Total funding: CHF 8'000.-

Duration: annual

Allocation 2023: CHF 8'000.-

Starting date: 01.11.2020

Innogap Fusion Prot

Category: Institutional

"Fusion protein for the treatment of cancer"

Main applicants: Carole Bourquin, Aurélien Pommier, Bart Boersma

Total funding: CHF 30'000.-

Duration: 1 year

Allocation 2023: CHF 30'000.-

Starting date: 01.07.2023

Total amount for all research funds for 2023: CHF 855'508.-

Scientific publications (with impact factor)

- Poinot H.; Dupuychaffray E.; Arnoux G.; Alvarez M.; Tachet J.; Ezzar O.; Moore J.; Bejuy O.; Olesti E.; Visconti G.; Gonzalez-Ruiz V.; Rudaz S.; Tille J.-C.; Voegel C.; Nowak-Sliwinska P.; Bourquin C.; Pommier A., Activation of endogenous glucocorticoids by HSD11B1 inhibits the antitumor immune response in renal cancer. *Onc Immunology* (2023), /doi/full/10.1080/2162402X.2023.2286820 7.7
- Santos SS.; Rodrigues LOCP.; Martins. V.; Petrosino M.; Zuhra K.; Ascensão K.; Anand A.; Abdel-Kader RM.; Gad MZ.; Bourquin C.; Szabo C., Role of Cystathionine β -Synthase and 3 Mercaptopyruvate Sulfurtransferase in the Regulation of Proliferation, Migration, and Bioenergetics of Murine Breast Cancer Cells. *Antioxidants* (2023). 12:647. doi: 10.3390/antiox12030647 7.7
- Nafea H.; Youness R.; Dawoud A.; Khater N.; Manie T.; Abdel-Kader R.; Bourquin C.; Szabo, C.; Gad M, Dual targeting of H₂S synthesizing enzymes; cystathionine β -synthase and cystathionine γ -lyase by miR-939-5p effectively curbs triple negative breast cancer. *Heliyon* (2023). doi.org/10.1016/j.heliyon.2023.e21063 4.0

Scientific publications (without impact factor)

0

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1
- Posters presentations: 3
- Oral presentations: 6
- Invited oral presentations: 1

Ph.D. Theses presented in 2023

Hélène Poinot

Targeting the Glucocorticoid Pathway Improves the Outcome of Immunotherapy in a Renal Cancer Model

Prof. Carole Bourquin

Dr. Aurélien Pommier

Eloïse Dupuychaffray

Impact of obesity on anticancer immunotherapy

Prof. Carole Bourquin

Awards and distinction

Dupuychaffray E.; Poinot H.; Alvarez M.; Taskoparan B.; Vögel C.; Bourquin C.; Pommier A., Obesity improves cancer immunotherapy in a sex-dependent manner. **Best poster presentation award, 1st prize.** 18th Spring School on Immunology, 05-10 March 2023, Ettal (Germany).

Public outreach activities (radio, television and other media, community service)

Bourquin C., Femmes et filles de science et technologie, February 1, 2023, Cycle d'orientation de Drize, Geneva (Switzerland)

Bourquin C., Femmes et filles de science et technologie, February 3, 2023, Ecole du Val d'Arve, Geneva (Switzerland)

Dupuychaffray, E.; Bourquin, C.; Pommier A., My thesis in 180s: "L'obésité, pour ou contre le cancer". Competition MT180, finale Unige 2023, May 4, 2023, Geneva (Switzerland).

<https://www.unige.ch/cite/evenements/ma-these-en-180-secondes/ma-these-en-180-secondes-2023/les-candidat-es/eloise-dupuychaffray>

Poinot, H.; Bourquin, C.; Pommier A., My thesis in 180s: "Moins stresser pour mieux combattre". Competition MT180, finale Unige 2023, May 4, 2023, Geneva (Switzerland).

<https://www.unige.ch/cite/evenements/ma-these-en-180-secondes/ma-these-en-180-secondes-2023/les-candidat-es/helene-poinot>

Dupuychaffray, E.; Marcos, K.: "Et si l'obésité pouvait aider à combattre le cancer". Collaboration MT180 et Heidi.News, 2023, Geneva (Switzerland).

<https://www.heidi.news/sante/et-si-l-obesite-pouvait-aider-a-combattre-le-cancer-video>

Poinot, H.; Marcos, K.: "Et si le stress jouait un rôle face au cancer". Collaboration MT180 et Heidi.News, 2023, Geneva (Switzerland).

<https://www.heidi.news/sciences/et-si-le-stress-jouait-un-role-face-au-cancer-video>

Dupuychaffray E.; Bourquin C.; Comment l'obésité améliore-t-elle le traitement contre le cancer ?, La Faculté des Sciences en Flash Talks, November 8, 2023, Institut Florimont, Geneva (Switzerland).

MOLECULAR PHARMACOLOGY

Professor Patrycja NOWAK-SLIWINSKA

General description of Unit

Paradoxically, the growing arsenal of therapeutics, yielded by biomedical research and development, does not bring the degree of effectiveness that is necessary for the treatment of cancer. It is generally expected that the combination of drugs will bring the needed improvement of cancer therapy. Although promising personalized cancer treatment approaches are starting to find clinical utility, personalized design of optimized drug combinations (ODCs) is still in its infancy.

The overall aim of the *Molecular Pharmacology Group's* research is the discovery of ODCs for the treatment of complex diseases, mainly cancer, and at the fundamental level discovery of mechanism of action leading to design of new treatment strategies. Optimally combining drugs that are already clinically used holds the potential for rapid translation into the clinic, especially when used at low doses. We use a phenotypic statistics-based technology combined with data modelling to identify ODCs with a minimal *in vitro* experimental effort. The results are subsequently translated and validated in appropriate *in vivo* models.

The major clinical relevance of this strategy can be highlighted as follows: (i) the approach is personalized, resulting in patient-tailored individualized treatment, (ii) ODC treatment may be applicable to patients that failed conventional treatment, (iii) ODC treatment can be quickly adapted during the course of treatment addressing temporal tumor heterogeneity, when tumors get more aggressive or develop resistance. Moreover, our strategy uses fundamental research to reveal the ODC action mechanisms. The latter, in turn, may identify novel signalling pathways, unexpected mechanisms of resistance and may lead to new drug discovery alleys.

Specific research subfields

- Phenotypic multidrug combinations optimization for cancer treatment
- Cell fate and acquired drug resistance mechanisms
- Drug combinations to boost the activity of immune checkpoint inhibitors
- Complex *in vitro* platforms to mimic tumor microenvironment

2023 at a glance

- Publications with impact factor: 7
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 8
- Posters presentations: 15
- Oral presentations: 7
- Invited oral presentations: 5
- Number of projects at FNRS and assimilated (Research funds): 9
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2023: 1
- Awards and distinctions: 3
- Public outreach activities: 7

Research funds

Fondation Boninchi

Institutional

Discovery of the optimized combination of drugs for the treatment of cancer

Main applicant: Prof. Patrycja Nowak-Sliwinska

Total funding of the project: CHF 60'000.-

Total duration of the project: 1.5 years

Allocation 2023: CHF 0.-

Starting date: 01.08.2022

Fondation privée des HUG

Institutional

Projet Booster

Main applicant: Eloïse Ducrey

Total funding of the project: CHF 10'000.-

Total duration of the project: 1 year

Allocation 2023: CHF 0.-

Starting date: 01.10.2022

Fondation recherche suisse contre le cancer

Institutional

Targeting multipolar spindles in cancer cells with a synergistic drug combination

Main applicant: Prof. Patrick Meraldi co-applicant: Prof. Patrycja Nowak-Sliwinska

Total funding of the project: CHF 346'650.-

Total duration of the project: 3 years

Allocation 2023: CHF 115'600.-

Starting date: 01.01.2021

Fondation Valery

Developing new personalized treatments for colorectal cancer patients

Main applicant: Prof. Patrycja Nowak-Sliwinska and Prof. Patrick Meraldi

Total funding of the project: CHF 400'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 134'000.-

Starting date: 01.02.2023

FNRS 310030_197878

SNSF

Synergistic targeted drug combinations for induction of sensitivity to immune checkpoint inhibitors

Main applicant: Prof. Patrycja Nowak-Sliwinska

Total funding of the project: CHF 599'329.-

Total duration of the project: 4 years

Allocation 2023: CHF 137'549.-

Starting date: 01.01.2021

Ligue genevoise contre le cancer

Institutional

Cibler les fuseaux multipolaires dans les cellules cancéreuses avec une combinaison multidrogue synergique

Main applicant: Prof. Patrycja Nowak-Sliwinska

Total funding of the project: CHF 88'609.-

Total duration of the project: 2 years

Allocation 2023: CHF 0.-

Starting date: 01.06.2021

DIP Mentorat

Title of the research project: Programme égalité UNIGE

Main applicant: Prof. Patrycja Nowak-Sliwinska

Total funding of the project: CHF 65'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 40'000.-

Starting date: 15.05.2020

DIP Egalité

Title of the research project: Programme égalité UNIGE

Main applicant: Prof. Patrycja Nowak-Sliwinska

Total funding of the project: CHF 65'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 40'000.-

Starting date: 15.05.2020

SCAHT

Institutional

Pathways of toxicity – mapping the underlying cell metabolism to support toxicant mixture effect investigations.

Main applicant: Serge Rudaz

Total funding of the project: CHF 120'000.-

Total duration of the project: 2 years

Allocation 2023: CHF 50'000.-

Starting date: 01.01.2023

Total amount for all research funds for 2023: CHF 517'149.-

Scientific publications (with impact factor)

Poinot, H.; Dupuychaffray, E.; Arnoux, G.; Alvarez, M.; Tachet, J.; Ezzar, O.; Moore, J.; Bejuy, O.; Olesti, E.; Gonzalez Ruiz, V.; Rudaz, S.; Tille, J-C.; Vögel, C.; Nowak-Sliwinska, P.; Bourquin, C.; Pommier, A. Activation of endogenous glucocorticoids by HSD11B1 inhibits the antitumor immune response in renal cancer, *Oncoimmunology* 2023 Nov 30; 13(1):2286820 doi: 10.1080/2162402X.2023.2286820. eCollection 2024. 7.72

Nowak-Sliwinska, P.; Griffioen, A.W.; Rising impact of cell death research, Apoptosis, (2023) 28(11-12):1503-1504 doi: 10.1007/s10495-023-01895-5. 7.21

Mieville, V.; Griffioen, A.W.; Benamran, D.; Nowak-Sliwinska, P. Advanced *in vitro* models for renal cell carcinoma therapy design, *Biochem Biophys Acta Rev Cancer*, (2023)1878(5): 188942, doi: 10.1016/j.bbcan.2023.188942. 11.41

Ramzy, G.M.; Norkin, M.; Koessler, T.; Voirol, L.; Tihy, M.; Hany, D.; McKee, T.; Ris, F.; Buchs, N.; Docquier, M.; Toso, C.; Rubbia-Brandt, L.; Bakalli, G.; Guerrier, S.; Huelsken, J.; Nowak-Sliwinska, P. Platform combining mathematical modeling and patient-derived organoids to facilitate personalized treatment of colorectal carcinoma, *Journal of Experimental & Clinical Cancer Research*, (2023) 42:79, doi.org/10.1186/s13046-023-02650-z. 12.66

Schelker, C.; Nowak-Sliwinska, P.; Borchard, G. Liposomal delivery systems for drug combinations in cancer treatment, *Journal of Controlled Release*, (2023) 358:59-77, doi: 10.1016/j.jconrel.2023.04.006. 10.80

Hany, D.; Zoetemelk, M.; Bhattacharya, K.; Nowak-Sliwinska, P.; Picard, D. Network-informed discovery of multidrug combinations for ERα+/HER2-/PI3Kα-mutant breast cancer, *Cell Mol Life Sci*. 2023 Mar 3;80(3):80. doi: 10.1007/s00018-023-04730-x. 9.78

Nowak-Sliwinska, P.; van Beijnum, J.R.; Griffioen, J.R.; Huinen, Z.R.; Grima Sopesens, N.; Schulz, R.; Jenkins, S.V.; Dings, R.P.M.; Groenendijk, F.H.; Huijbers, E.J.M.; Thijssen, V.; Jonasch, E.; Vyth-Dreese, F.A.; Jordanova, E.S.; Bex, A.; Bernards, R.; de Gruijl, T.D.; Griffioen, A.W.; Proinflammatory activity of VEGF-targeted treatment through reversal of tumor endothelial cellanergy, *Angiogenesis*, (2023) 26(2):279-293, doi: 10.1007/s10456-022-09863-4. 10.66

Congresses / conferences and Symposia

- Congresses / conferences organisation: 8
- Posters presentations: 15
- Oral presentations: 7
- Invited oral presentations: 5

Ph.D. Theses presented in 2023

George Ramzy

Personalised drug combination platform for effective colorectal cancer treatment

Patrycja Nowak-Sliwinska

Awards and distinctions

Eurydice Marie-Michèle Leclercq received the prize (2nd prize) for the best master thesis at ISPSO! The work was executed in our lab.

Dr. Mireia Andreu Carbo received LAEMELLI prize 2023 for her PhD thesis.

Dr. Mireia Andreu Carbo received the prize for the best PhD thesis at the Faculty of Science, UNIGE.

Public outreach activities (radio, television and other media, community service)

Interview with P Nowak-Sliwinska in "19.30" news of the Radio Television Swiss.

P. Nowak-Sliwinska, G.M. Ramzy. Tumor avatars to fight colorectal cancer, UNIGE press release, April 4, 2023, Geneva (Switzerland).

P. Nowak-Sliwinska joined the Steering Committee of the Translational Research Center of Oncohaematology.

P. Nowak-Sliwinska joined the Steering and Scientific Committee of the Certificate of Advanced Studies (CAS) on Advanced Therapy Medicinal Products.

Movie creation on Molecular Pharmacology Group for science dissemination.

P. Nowak-Sliwinska, within the Equality and Diversity Commission of the Faculty of Sciences, contributed to the development of the Unconscious Biases Project.

P. Nowak-Sliwinska selected as a jury member of the 8th edition of the inter-cycle competition (12-15 years) "Les Olympes de la parole" organized by our Association, AGFDU (Association genevoise de femmes diplômées des universités).

MOLECULAR THERAPEUTICS DELIVERY GROUP

Professor Yogeshvar KALIA

General description of the Unit

The principal field of interest is drug delivery, and the group focuses on developing and investigating methods to increase molecular transport across biological barriers using chemical, formulation and technology-based enhancement techniques. Areas of interest include (i) topical and transdermal delivery of therapeutic agents by investigating the effect of molecular properties on both passive and active transport processes into and across the skin, (ii) use of formulation and technology-based methods to improve drug delivery to the eye, and (iii) development of an ex vivo model for drug absorption in the gastrointestinal tract.

Specific research fields

The research in the field of drug delivery includes:

- Development of new formulations and physical enhancement techniques to increase topical and transdermal delivery of low and high molecular weight therapeutics.
- Development and optimization of methods to understand the spatio-temporal biodistribution of drugs in the skin and other tissues.
- Development of an ex vivo model using porcine and human skin to investigate subcutaneous administration of biomacromolecules.
- Investigation into the use of formulation and technology-based methods to improve drug delivery to both the anterior and posterior segments of the eye.
- Developing a physiological ex vivo porcine intestine model to investigate drug absorption in the gastrointestinal tract.
- Optimization of passive and iontophoretic drug delivery to the oral cavity for targeted local therapy.

2023 at a glance

- Publications with impact factor: 6
- Publications without impact factor: 0
- Patents: 1
- Book and chapters: 2
- Congresses / conferences organisation: 1
- Posters presentations: 1
- Oral presentations: 1
- Invited oral presentations: 2
- Number of projects at FNRS and assimilated (Research funds): 6
- Service agreements and related activities: 4
- Ph.D. Theses presented in 2023: 2
- Awards and distinctions: 0
- Public outreach activities: 1

Research funds

INNO-44531.1 IP-LS

“Novel self-structuring gels for dermal filler applications”

Main applicant: Y. KALIA

Total funding of the project: CHF 177'068.-

Total duration of the project: 2 years

Allocation 2023: CHF 30'420.- (balance paid in 2023)

Starting date: 01.06.2020

62704.1 INNO-LS & INDUSTRY

“Peptide loaded biodegradable polymer films for targeted oral treatment and care”

Main applicant: Y. KALIA

Total funding of the project: CHF 15'000.-

Total duration of the project: 9 months

Allocation 2023: CHF 15'000.-

Starting date: 01.04.2023

INDUSTRY 1

“Development of an ex vivo skin model to investigate the effect of hyaluronic acid filler on skin biology”

Main applicant: Y. KALIA

Funding of the project 2021-2023: CHF 290'000.-

Total duration of the project: 29 months

Allocation 2023: CHF 153'310.96.-

Starting date: 01.11.2021

INDUSTRY 2

“Preclinical evaluation of a supramolecular carrier system for intestinal absorption”

Main applicant: Y. KALIA

Total funding of the project: CHF 90'000.-

Total duration of the project: 18 months

Allocation 2023: CHF 61'324.38.-

Starting date: 01.06.2022

INDUSTRY 3

“Understanding the delivery of RNA-based therapeutics and developing methods to improve bioavailability and efficacy.”

Main applicant: Y. KALIA

Total funding of the project: CHF 434'000.-

Total duration of the project: 48 months

Allocation 2023: CHF 110'997.12.-

Starting date: 01.11.2022

INDUSTRY 4

“Investigation of gastrointestinal permeability of Debio 0432 and identification of potential metabolizing enzymes.”

Main applicant: Y. KALIA

Total funding of the project: CHF 51'075.-

Total duration of the project: 12 months

Allocation 2023: CHF 16'156.72.-

Starting date: 01.08.2023

Total amount for all research funds for 2023: CHF 387'209.-

Service agreements and related activities

INDUSTRY 5

“Formulation of ACB lotion for the tropical treatment of psoriasis” and “Stability studies”

Main applicant: Y. KALIA

Total funding of the project: CHF 250'688.-

Total duration of the project: 24 months

Allocation 2023: CHF 104'277.58.-

Starting date: 01.06.2021

INDUSTRY 6

“Evaluation of the penetration of adapalene into porcine skin in vitro by CLSM.”

Main applicant: Y. KALIA

Total funding of the project: CHF 17'086.-

Total duration of the project: 2 months

Allocation 2023: CHF 17'086.-

Starting date: 02.02.2023

INDUSTRY 7

“Evaluation of the penetration and permeation of X across human skin in vitro”

Main applicant: Y. KALIA

Funding of the project 2022-2023: CHF 80'595.-

Funding of the project 2023-2024: CHF 19'602.-

Total duration of the project: 26 months

Allocation 2023: CHF 19'602.30.-

Starting date: 01.06.2022

INDUSTRY 8

“Topical delivery of excipients into the skin”

Main applicant: Y. KALIA

Total funding of the project: CHF 2'430.-

Total duration of the project: one week

Allocation 2023: CHF 2'430.-

Starting date: 01.07.2023

Total amount (for all service agreements and related activities) for 2023: CHF 143'396.-

Scientific publications (with impact factor)

- F. A. P. de Sá, J. F. M. Andrade, T. C. Miranda, M. Cunha-Filho, G. M. Gelfuso, M. Lapteva, Y. N. Kalia, T. Gratieri: Enhanced topical paromomycin delivery for cutaneous leishmaniasis treatment: passive and iontophoretic approaches. *Int J Pharm.* 2023; 648: 123617. <https://doi.org/10.1016/j.ijpharm.2023.123617> 5.8
- S. Gou, M. Lapteva, R. Brusini, K. Flegeau, F. Bourdon, G. Kaya, J. Faivre, Y. N. Kalia: Development of an ex vivo porcine skin model for the preclinical evaluation of subcutaneously injected biomacromolecules. *Int J Pharm.* 2023; 648: 123562. <https://doi.org/10.1016/j.ijpharm.2023.123562> 5.8
- Aditya R. Darade, Maria Lapteva, Vincent Ling, Y. N. Kalia: Polymeric micelles for cutaneous delivery of the hedgehog pathway inhibitor TAK-441: formulation development and cutaneous biodistribution in porcine and human skin. *Int J Pharm.* 2023; 644: 123349. <https://doi.org/10.1016/j.ijpharm.2023.123349>. 5.8
- S. Gou, A. Porcello, E. Allémann, D. Salomon, P. Micheels, Olivier Jordan, Y. N. Kalia: Injectable hyaluronan-based thermoresponsive hydrogels for dermatological applications. *Pharmaceutics* 2023; 15(6):1708. <https://doi.org/10.3390/pharmaceutics15061708> 5.4
- J. Quartier, M. Lapteva, Y. Boulaguiem, S. Guerrier, Y. N. Kalia: Influence of molecular structure and physicochemical properties of immunosuppressive drugs on micelle formulation characteristics and cutaneous delivery. *Pharmaceutics* 2023; 15(4): 1278. <https://doi.org/10.3390/pharmaceutics15041278> 5.4
- A. M. Alambiaga-Caravaca, L. G. González Iglesias, V. Rodilla, Y. N. Kalia, A. López-Castellano: Biodistribution of progesterone in the eye after topical ocular administration via drops or inserts. *Int J Pharm.* 2023 Jan 5; 630:122453. <https://doi.org/10.1016/j.ijpharm.2022.122453> 5.8

Patents

A. Darade and Y. N. Kalia, A1 Method for preparing nanosystems. WO 2022/112527

Books or books chapters

- A.L.M. Daneluti, A.R. Baby, Y.N. Kalia: Using nanostructured materials to increase safety and efficacy of organic UV filters, [In] P. Kesharwani and S. K. Dubey. *Nanocosmetics: Delivery Approaches, Applications and Regulatory Aspects*, CRC Press, 2023, 261–291.
- J. Faro Barros, P. F. Sahraoui, Y. N. Kalia, M. Lapteva. *Devices for active targeted delivery: a way to control the rate and extent of drug administration*. [In] Y. Bachhav (ed.), *Targeted Drug Delivery – Wiley-VCH Verlag (Germany)*, 2023, 349-387

Congresses / conferences and Symposia

Congresses / conferences organisation: 1

« 36ème Séminaire en Sciences Pharmaceutiques, Programme Doctoral en Sciences Pharmaceutiques »
Leysin, Switzerland

Posters presentations: 1

B. Rossier, Y. N. Kalia, E. Allémann: Combination of thermoresponsive terbinafine nanocrystals-loaded thermo-sensitive gels and fractional ablative laser to improve ungual drug delivery.
SFNano Annual Meeting, December 4-6, 2023, Montpellier, France.

Oral presentations: 1

W. Shatz-Binder, B. Leonard, C. Blanchette, B. Kelley, Y. Kalia: Designing a multivalent ferritin scaffold for agonism of OX40R, a member of the tumor necrosis factor receptor super family.
Pharmameets, February 9-11, 2023, Gaia, Portugal

Invited oral presentations: 2

Y. N. Kalia: Developing an ex vivo human skin platform to investigate subcutaneous administration. Global Drug Delivery Meeting, Genentech, June 6, 2023.

Y. N. Kalia: Laser-assisted drug delivery. 24 hours of Lasers and energy-based devices – Cutaneous applications, American Society for Laser Medicine and Surgery (ASLMS), 24-hour Virtual Event, February 10-11, 2023.

Ph.D. Theses presented in 2023

Jonathan FARO BARROS

« Cytochrome c Bioconjugation – Creating an Iontophoretic Shuttle for the Noninvasive Transdermal Delivery of Proteins » (No. 225)
Director: Prof. Yogeshvar Kalia

Phedra Firdaws SAHRAOUI

« Investigation into the influence of protein structure and properties on needle-free electrically-assisted transport across the skin » (No. 220)
Director: Prof. Yogeshvar Kalia

Public outreach activities (radio, television and other media, community service)

Y. N. Kalia, Member, Executive Committee of BioAlps « the Life Sciences cluster of Western Switzerland ».

PHARMACEUTICAL BIOCHEMISTRY

Professor Leonardo SCAPOZZA

General description of the Unit

The Pharmaceutical Biochemistry group (Molecular Therapeutics Discovery) research is linked to the discovery of molecular therapeutics.

The research is focused on drug discovery and understanding ligand-macromolecule interactions to develop new therapeutic strategies including new chemical entities, new targets using an interdisciplinary approach based on the combination of Biochemistry/Biophysics and Chemistry with Computational Chemistry/Molecular Modelling. Additionally, an in vivo activity in the field of rare disease has been added in order to be able to do preclinical Proof of Concept.

Specific research fields

The research in the field of pharmaceutical biochemistry/chemistry covers three main topics, namely Cancer, Neglected Diseases, Rare Diseases and Antibiotics Research.

- In Cancer Research we have two main objectives, namely the development of inhibitors of tyrosine kinase domain of oncogenic fusion proteins involved in cancerogenesis and the development of new small molecule based immunotherapeutic considering the role of inflammation in cancer.
- Within the research area of Neglected Diseases and Rare Diseases we aim at elucidating and validating new potential drug targets for developing therapeutic strategies against orphan diseases e.g. dystrophy/splicing disorders and the major parasitic diseases of the Third World e.g. Malaria, Tripanosomiasis and Leishmaniosis as well as finding potential lead compounds against such diseases.
- Within the area of Antibiotic Research, the objective is to find compounds inhibiting bacterial virulence with novel mechanisms of action as well as working on pandemic preparedness and response: Broad spectrum antiviral therapeutics for infectious diseases with epidemic potential.

Further minor activities based on molecular recognition-based approaches for improving formulation and delivery are on-going.

2023 at a glance

- Publications with impact factor: 13
- Publications without impact factor: 0
- Patents: 1
- Book and chapters: 0
- Congresses / conferences organisation: 2
- Posters presentations: 3
- Oral presentations: 0
- Invited oral presentations: 9
- Number of projects at FNRS and assimilated (Research funds): 8
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2023: 6
- Awards and distinctions: 3
- Public outreach activities: 5

Research funds

SNF CRSII5_183536 Sinergia - S19485

“From medicinal plant to mechanism: Target deconvolution of phytochemicals for Trypanosoma cruzi”

Applicant: L. SCAPOZZA

Main applicant: P. MAESER (STPI)

Total funding of the project: CHF 333'632.- (from CHF 2'279'020.-)

Total duration of the project: 3.5 years extended 1 year

Allocation 2023: CHF 40'000.-

Starting date: 01.02.2019

Fondation GELU - S19549

“Exploring the role of KIAA1199/CEMIP axis in Alport syndrome, a paediatric rare disease condition resulting in end stage renal disease”

Main applicants: L. SCAPOZZA and M. PRUNOTTO

Total funding of the project: CHF 1'500'000.-

Total duration of the project: 6 years (2019 -2025)

Payment 2019: CHF 750'000.-

Payment for project prolongation in 2021: CHF 750'000.-

Allocation 2023: CHF 0.-

Starting date: 01.05.2019

SNF CRSII5 -186405 SIN UB - S19590

“Deciphering and Targeting the Cancer Ubiquitylome”

Applicant: L. SCAPOZZA

Main applicant: J-P. THEURILLAT (IOR),

Total funding of the project: CHF 733'641.- (from CHF 2'528'452.-)

Total duration of the project: 4,5 years

Allocation 2023: CHF 186'639.-

Starting date: 01.06.2019

HIPPIE - S19810

“High-resolution Investigation of Personalised Post-prandial inflammation biomarkErs”

Main applicant: L. SCAPOZZA and T. GURRY

Total funding of the project: CHF 135'000.- (+ CHF 10'000.- en 2021 + CHF 31'000.- en 2022)

Total duration of the project: 1 year

Allocation 2023: CHF 0.-

Starting date: 01.06.2020

SWISS EI114171 G2B - S19876

“G2B Gut-To-Blood: a platform for oral systemic delivery of targeted therapies”

Main applicant: L. SCAPOZZA

Total funding of the project: CHF 263'616.-

Total duration of the project: 3 years

Allocation 2023: CHF 0.-

Starting date: 01.10.2020

INNO-46357.1 IP-LS - S19892

A2AR negative allosteric modulators for cancer immunotherapy: validation of lead candidate”

Main applicant: L. SCAPOZZA

Total funding of the project: CHF 865'807.07.-

Total duration of the project: 18 months

Allocation 2023: CHF 160'882.27.-

Starting date: 01.12.2020

INNO- 102.479 IP-LS – S110314

Adenosine 2A receptor reactivation by positive allosteric modulators as a new therapeutic venue for unmet medical need in chronic inflammation

Main applicant: L. SCAPOZZA

Total funding of the project: CHF 878'273.45.-

Total duration of the project: 18 months

Allocation 2023: CHF 263'482.-

Starting date: 01.09.2022

AFM Téléthon France - S110608

"Duchenne muscular dystrophy: Phenotyping and validation of better murine models for improving preclinical research and clinical translation – a step further"

Main applicant: O. DORCHIES

Total funding of the project: CHF 230'442.18.- (EUR 240'200)

Total duration of the project: 36 months

Allocation 2023: CHF 73'870.-

Total amount for all research funds for 2023: CHF 724'873.27.-

Scientific publications (with impact factor)

Angeletti, A.; Bruschi, M.; Kajana, X.; Spinelli, S.; Verrina, E.; Lugani, F.; Caridi, G.; Murtas, C.; Candiano, G.; Prunotto, M.; Ghiggeri, G. M. Mechanisms Limiting Renal Tissue Protection and Repair in Glomerulonephritis. *Int J Mol Sci* 2023, 24 (9). DOI: 10.3390/ijms24098318 5.6

Bagka, M.; Choi, H.; Heritier, M.; Schwaemmle, H.; Pasquer, Q. T. L.; Braun, S. M. G.; Scapozza, L.; Wu, Y.; Hoogendoorn, S. Targeted protein degradation reveals BET bromodomains as the cellular target of Hedgehog pathway inhibitor-1. *Nat Commun* 2023, 14 (1), 3893. DOI: 10.1038/s41467-023-39657-1 16.6

Casal Moura, M.; Deng, Z.; Brooks, S. R.; Tew, W.; Fervenza, F. C.; Kallenberg, C. G. M.; Langford, C. A.; Merkel, P. A.; Monach, P. A.; Seo, P.; Spiera, R. F.; St Clair, E. W.; Stone, J. H.; Prunotto, M.; Grayson, P. C.; Specks, U. Risk of relapse of ANCA-associated vasculitis among patients homozygous for the proteinase 3 gene Val119Ile polymorphism. *RMD Open* 2023, 9 (1). DOI: 10.1136/rmdopen-2022-002935 5.4

Chawla, D.; Benitez, A.; Xu, H.; Whitehill, V.; Tadesse-Bell, S.; Shapiro, A.; Ramirez, E.; Scherer, K.; Foschini, L.; Drawnel, F.; Clinch, B.; Prunotto, M.; Ukachukwu, V. Predictors of Seeking Care for Influenza-Like Illness in a Novel Digital Study. *Open Forum Infect Dis* 2023, 10 (1), ofac675. DOI: 10.1093/ofid/ofac675 4.2

Henzi, B. C.; Schmidt, S.; Nagy, S.; Rubino-Nacht, D.; Schaedelin, S.; Putananickal, N.; Stimpson, G.; North Star, C.; Amthor, H.; Childs, A. M.; Deconinck, N.; de Groot, I.; Horrocks, I.; Houwen-van Opstal, S.; Laugel, V.; Lopez Lobato, M.; Madruga Garrido, M.; Nascimento Osorio, A.; Schara-Schmidt, U.; Spinty, S.; von Moers, A.; Lawrence, F.; Hafner, P.; Dorchies, O. M.; Fischer, D. Safety and efficacy of tamoxifen in boys with Duchenne muscular dystrophy (TAMDMD): a multicentre, randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Neurol* 2023, 22 (10), 890-899. DOI: 10.1016/S1474-4422(23)00285-5 48.0

Huber, R.; Marcourt, L.; Heritier, M.; Luscher, A.; Guebey, L.; Schnee, S.; Michellod, E.; Guerrier, S.; Wolfender, J. L.; Scapozza, L.; Kohler, T.; Gindro, K.; Queiroz, E. F. Generation of potent antibacterial compounds through enzymatic and chemical modifications of the trans-delta-viniferin scaffold. *Sci Rep* 2023, 13 (1), 15986. DOI: 10.1038/s41598-023-43000-5 5.5

- Huet, S.; Zeisser Labouebe, M.; Castro, R.; Jacquot, P.; Pedrault, J.; Viollet, S.; Van Simaey, G.; Doumont, G.; Larbanoix, L.; Zindy, E.; Cunha, A. E.; Scapozza, L.; Cinier, M. Targeted Nanofitin-drug Conjugates Achieve Efficient Tumor Delivery and Therapeutic Effect in an EGFRpos Mouse Xenograft Model. *Mol Cancer Ther* 2023, 22 (11), 1343-1351. DOI: 10.1158/1535-7163.MCT-22-0805 5.7
- Masloh, S.; Culot, M.; Gosselet, F.; Chevreil, A.; Scapozza, L.; Zeisser Labouebe, M. Challenges and Opportunities in the Oral Delivery of Recombinant Biologics. *Pharmaceutics* 2023, 15 (5). DOI: 10.3390/pharmaceutics15051415 5.4
- Murtas, C.; Bruschi, M.; Spinelli, S.; Kajana, X.; Verrina, E. E.; Angeletti, A.; Caridi, G.; Candiano, G.; Feriozzi, S.; Prunotto, M.; Ghiggeri, G. M. Novel biomarkers and pathophysiology of membranous nephropathy: PLA2R and beyond. *Clin Kidney J* 2024, 17 (1), sfad228. DOI: 10.1093/ckj/sfad228 5.8
- Muscat, S.; Grasso, G.; Scapozza, L.; Danani, A. In silico investigation of cytochrome bc1 molecular inhibition mechanism against *Trypanosoma cruzi*. *PLoS Negl Trop Dis* 2023, 17 (1), e0010545. DOI: 10.1371/journal.pntd.0010545 4.8
- Spataro, S.; Guerra, C.; Cavalli, A.; Sgrignani, J.; Sleeman, J.; Poulain, L.; Boland, A.; Scapozza, L.; Moll, S.; Prunotto, M. CEMIP (HYBID, KIAA1199): structure, function and expression in health and disease. *FEBS J* 2023, 290 (16), 3946-3962. DOI: 10.1111/febs.16600 5.4
- Vono, M.; Mastelic-Gavillet, B.; Mohr, E.; Ostensson, M.; Persson, J.; Olafsdottir, T. A.; Lemeille, S.; Pejoski, D.; Hartley, O.; Christensen, D.; Andersen, P.; Didierlaurent, A. M.; Harandi, A. M.; Lambert, P. H.; Siegrist, C. A. C-type lectin receptor agonists elicit functional IL21-expressing Tfh cells and induce primary B cell responses in neonates. *Front Immunol* 2023, 14, 1155200. DOI: 10.3389/fimmu.2023.1155200 8.8
- Wasilewicz, A.; Kirchweiger, B.; Bojkova, D.; Abi Saad, M. J.; Langeder, J.; Butikofer, M.; Adelsberger, S.; Grienke, U.; Cinatl, J., Jr.; Petermann, O.; Scapozza, L.; Orts, J.; Kirchmair, J.; Rabenau, H. F.; Rollinger, J. M. Identification of Natural Products Inhibiting SARS-CoV-2 by Targeting Viral Proteases: A Combined in Silico and in Vitro Approach. *J Nat Prod* 2023, 86 (2), 264-275. DOI: 10.1021/acs.jnatprod.2c00843 5.1

Patents

L. Scapozza, A. Gouiller, M. Boujut, M. Héritier, D. Pejoski, T. De Smedt, Adenosine 2A Receptor Modulators for Use in the Treatment of Cancer, WO2023213761A1, filed November 9 ,2023.

Congresses / conferences and Symposia

36ème séminaire en sciences pharmaceutiques, August 28-31 2023, Leysin – Switzerland

SSPT Symposium 2023 - Fortschritte in der Pharmakologie, 25 January 2023, Bern - Switzerland

• Posters presentations:

Margot Boujut, Margaux Héritier, Aurélie Gouiller, Camille Süess, Alessandro Scapozza, Maxime Guibert, Hesham Hamed, Sébastien Tardy, Thibaut De Smedt, David Pejoski & Leonardo Scapozza, "Optimization of selective and potent A2AR negative allosteric modulators as immunotherapy for high adenosine cancers' treatment", EFMC International Symposium on Advances in Synthetic and Medicinal Chemistry EFMC-ASMC 2023, 3-7 September 2023, Zagreb, Croatia.

Laurence A. Neff, Leonardo Scapozza, and Olivier M. Dorchies; Imaging Of Muscle Perfusion Of Dystrophic Mice In Situ With Laser-Speckle Contrast Analysis; 20èmes Journées Annuelles de la Société Française de Myologie, November 2023, La Baule, France

David Pejoski, Camille Suess, Aurélie Gouiller, Margaux Heritier, Margot Boujut, Sébastien Tardy, Thibaut De Smedt, Laurent Galibert, Walter Reith, Markus Joerger, Christian Toso, Thibaud Koessler, Hesham Hamed, Leonardo Scapozza. A Novel Allosteric Oral Immunotherapy Small Molecule Modulates Adenosine 2A Receptor Signaling and Restores Anti-Tumor Immune Responses. ESMO Immuno-Oncology, December 2023, Geneva, Switzerland

- Invited oral presentations:

Olivier M. Dorchies, Pharmacotherapy for Duchenne muscular dystrophy: From mouse models to patients... and back, 36ème Séminaire en Sciences Pharmaceutiques, Molecular Therapeutics – From the Target to the Patient: Challenges and Perspectives, 28-31 August 2023, Leysin, Switzerland

Margaux Héritier, Elucidating HIF2 α ligand binding path for PROTAC design, 3rd SciMed PhD Conference, 13-15 March 2023, Les Diablerets, Switzerland

David Pejoski, Adoram Therapeutics update, Sachs European Life Sciences Forum, 1 March, Zurich, Switzerland

David Pejoski, Adoram Therapeutics update, SwissBiotech Day, 24 April, Basel, Switzerland

David Pejoski, Adoram Therapeutics pitch, HLG JnJ Startup Workshops, 9 May, 20 June, 5 September 27 October, Montreux, Basel, Zurich, Switzerland

David Pejoski, Adoram Therapeutics pitch, BioInnovation Day Agora, 12 May, Lausanne, Switzerland

David Pejoski, Adoram Therapeutics update, Sachs ELSF, 20 September, Basel, Switzerland

David Pejoski, Small Molecule Cancer Immunotherapy via Allosteric Modulation of the Adenosine Pathway, Next Generation Immunotherapy, 5 October, Frankfurt, Germany

David Pejoski, Small Molecule Cancer Immunotherapy via Allosteric Modulation of the Adenosine Pathway, SCCL Retreat, 13 November, Lausanne, Switzerland

Ph.D. Theses presented in 2023

Carlotta CECCHINI

“Design and Synthesis of Proteolysis Targeting Chimeras (PROTACs) to target HIF-2 α in VHL-associated Renal Cell Carcinoma (RCC)”

Director: Leonardo Scapozza

Sara PANNILUNGI

“Synthesis and Biological Evaluation of Electrophilic Fragments as Covalent Selective Blockers of TNFR1-DD”

Director: Leonardo Scapozza

Suzanne Sherihan SAHRAOUI

“A novel tool for small molecule target identification in cytosolic and organellar sub-proteomes of Trypanosoma under in vivo conditions”

Director: Leonardo Scapozza

Ghali GUEDIRA

“Unraveling the role of NADPH oxidases in Duchenne muscular dystrophy: Implications and therapeutic strategies”

Director: Leonardo Scapozza

Co-directeur: Hesham Ismail Hamed

Ece SAHI-ILHAN

“Understanding and Targeting RNA Conformational Ensemble to Develop Therapeutic Approaches for Splicing-Related Diseases: A Case Study of Hutchinson-Gilford Progeria Syndrome”

Director: Leonardo Scapozza

Sofia SPATARO

“Exploring CEMIP axis to identify new therapeutic strategies in glomerular diseases”

Director: Leonardo Scapozza

Awards and distinction

David Pejoski, 2023 BioInnovation Day, Lausanne. Adoram Therapeutics, 2nd Place for Best Startup of 31 Startups.

David Pejoski, Hesham Hamed, Leonardo Scapozza, Winners of VentureKick Round 1 startup pitching competition for Adoram Therapeutics, April 4th, Lausanne, Switzerland

David Pejoski, Awarded an additional year of Innosuisse Business Core Coaching Access, February 2023

Public outreach activities (radio, television and other media, community service)

Olivier M. Dorchies, invited seminar at NeuroMyoGene. 20 years of pharmacotherapy for Duchenne muscular dystrophy: From mouse models to patients and back, 18th December, University Claude Bernard, Lyon, France

David Pejoski, Entrepreneurship presentation and round table moderation, at SCIMED PhD Conference, 15th March, Les Diablerets, Switzerland

David Pejoski, UNIGE Science Innovation Hub - Entrepreneurship Workshop presentation, 20th April, Geneva, Switzerland

David Pejoski, Entrepreneur Lecture for BioBusiness training cohort, 13th December, Lugano, Switzerland

Magali Zeisser-Labouebe, Participation au développement et à la mise en place de l'atelier « Développement d'un médicament », Geneva, Switzerland

PHARMACEUTICAL TECHNOLOGY

Professor Eric ALLEMANN
Professor Norbert LANGE
Doctor Florence DELIE-SALMON

General description of the Unit

Research at the unit of Pharmaceutical Technology is focusing on the delivery of therapeutic agents for cancer, rheumatic, vascular applications and contrast agents for medical imaging at the right site at the right time. Eric Allémann has activities in nanomedicine, micro particles, and targeted contrast agents for medical imaging. Norbert Lange leads research in photodetection, photodynamic therapy and enzymatically activated prodrugs. Florence Delie leads research in nanomedicine and drug targeting. In 2023, various collaborations were continued with the University Hospital of Geneva, the University Hospital of Lausanne, and the Faculty of Medicine in Geneva as well as with established companies.

Specific research fields

Modified nanoparticles for active targeting
Perivascular formulation for the prevention of restenosis
Development of drug formulations for intra articular delivery
Enzymatically activated prodrugs and supramolecular constructs
Antiviral agents
Development of new contrast agent for MRI
Formulation of microbiota
Polymer photosensitizers projects
Cancer targeted drug delivery systems
Synthesis of biopolymers

2023 at a glance

- Publications with impact factor: 13
- Publications without impact factor: 2
- Patents: 0
- Book and chapters: 1
- Congresses / conferences organisation: 0
- Posters presentations: 7
- Oral presentations: 0
- Invited oral presentations: 5
- Number of projects at FNRS and assimilated (Research funds): 4
- Service agreements and related activities: 1
- Ph.D. Theses presented in 2023: 1
- Awards and distinctions: 0
- Public outreach activities: 11

Research funds

INNO 59530.1 IP-LS

Category: INNOSUISSE

Novel intradermal desensitization kit for treatment of food allergies: formulation development to achieve a scalable desensitization treatment platform

Main applicants: Jean-Christophe Caubet, Eric Allémann

Total funding of the project: CHF 566'081.-

Total duration of the project: 1,5 years

Allocation 2023: CHF 169'824.-

Starting date: 01.05.2022

FNRS – 205321 – 192350

Category: SNSF

Synthesis of biopolymers and their application for glucose carriers for osteoarthritis stem cells therapy

Main applicant: Eric Allémann

Total funding of the project: CHF 493'114.-

Total duration of the project: 4 years

Allocation 2023: CHF 142'840.-

Starting date: 01.09.2020

GALAPAGOS NV

Category: Industry

Main applicant: Eric Allémann

Total funding of the project: CHF 435'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 0.-

Starting date: 01.11.2020

NOVARTIS-ALLE

Category: Industry

Main applicant: Eric Allémann

Total funding of the project: CHF 75'000.-

Total duration of the project: 3 years

Allocation 2023: CHF 0.-

Starting date: 01.01.2021

Total amount for all research funds for 2023: CHF 312'664.-

Service agreements and related activities

LTA

Total amount for 2023: CHF 41'461.-

Total amount (for all service agreements and related activities) for 2023: CHF 41'461.-

Scientific publications (with impact factor)

- Melnik T., Kapitanova K., Vinet L., Piallat M.-L., Jordan O., Delie F., Atorvastatin-loaded spray-dried PLGA microparticles for local prevention of intimal hyperplasia: Drug release rate optimization and activity on synthetic vascular smooth muscle cells. *Journal of drug delivery science and technology*, 2023, vol. 79, p. 104076. 5.00
- Kuaté Tokam C. R., Ndezo B. B., Boulens N., Allémann E., Delie F., Dzoyem J. P., Antibiofilm Activity and Synergistic Effects of Thymol-Loaded Poly (Lactic-Co-Glycolic Acid) Nanoparticles with Amikacin against Four *Salmonella enterica* Serovars. *Canadian Journal of Infectious Diseases and Medical Microbiology*, 2023. 2.80
- Ribaux P., Wuillemin C., Petignat P., Delie F., Cohen M., NANO-SBT-PEDF delivery system: A promising approach against ovarian cancer? *Heliyon*, 2023, 9(2): e13676. 4.00
- Cayron, AF; Bejuy, O; Vargas, MI; Colin, DJ; Aoki, T; Lövblad, KO; Bijlenga, P; Kwak, BR; Allémann, E; Morel, S, Time-of-flight and black-blood MRI to study intracranial arteries in rats *Eur. Radiol. Experiment.*, 2023, 8, 1, 3. 5.67
- Rodriguez-Nogales, C; Meeus, J; Thonus, G; Corveleyn, S; Allémann, E; Jordan, O., Spray-dried nanocrystal-loaded polymer microparticles for long-term release local therapies: an opportunity for poorly soluble drugs, *Drug Delivery*, 2023, 30, 1, 2284683. 6.00
- Porcello, A; Hadjab, F; Ajouaou, M; Philippe, V; Martin, R; Abdel-Sayed, P; Hirt-Burri, N; Scaletta, C; Raffoul, W; Applegate, LA; Allémann, E; Jordan, O; Laurent, A., Ex Vivo Functional Benchmarking of Hyaluronan-Based Osteoarthritis Viscosupplement Products: Comprehensive Assessment of Rheological, Lubricative, Adhesive, and Stability Attributes, *Gels*, 2023, 9, 10, 808. 4.60
- Gou, S; Porcello, A; Allémann, E; Salomon, D; Micheels, P; Jordan, O; Kalia, YN, Injectable Hyaluronan-Based Thermoresponsive Hydrogels for Dermatological Applications, *Pharmaceutics*, 2023, 15, 6, 1708. 5.40
- Porcello, A; Gonzalez-Fernandez, P; Jeannerat, A; Peneveyre, C; Abdel-Sayed, P; Scaletta, C; Raffoul, W; Hirt-Burri, N; Applegate, LA; Allémann, E; Laurent, A; Jordan, O, Thermo-Responsive Hyaluronan-Based Hydrogels Combined with Allogeneic Cytotherapeutics for the Treatment of Osteoarthritis, *Pharmaceutics*, 2023, 15, 5, 1528. 5.40
- Rakotonirina, A; Galperine, T; Audry, M; Kroemer, M; Baliff, A (Baliff, Aurelie); Carrez, L; Sadeghipour, F; Schrenzel, J; Guery, B; Allémann, E., Dry alginate beads for fecal microbiota transplantation: From model strains to fecal samples, *Int. J. Pharm.*, 2023, 639, 122961. 5.80
- Cayron, AF; Morel, S; Allémann, E; Bijlenga, P; Kwak, BR., Imaging of intracranial aneurysms in animals: a systematic review of modalities, *Neurosurgical Review*, 2023, 46, 1, 56. 3.17
- Laurent, A; Porcello, A; Jeannerat, A; Peneveyre, C; Coeur, A; Abdel-Sayed, P; Scaletta, C; Michetti, M; Roessingh, AD; Jordan, O; Allémann, E; Raffoul, W; Hirt-Burri, N; Applegate, LA., Lyophilized Progenitor Tenocyte Extracts: Sterilizable Cytotherapeutic Derivatives with Antioxidant Properties and Hyaluronan Hydrogel Functionalization Effects, *Antioxydants*, 2023, 12, 1, 163. 7.00
- Sansaloni-Pastor, S, Lange, N., Unleashing the potential of 5-Aminolevulinic acid: Unveiling a promising target for cancer diagnosis and treatment beyond photodynamic therapy, *J. Photochem. Photobiol. B. Biol.*, 2023, 247, 112771. 5.68

Kiening, M; Lange, N., A step ahead to enhancing routine breast cancer resection: Spheroid and hen's egg chorioallantoic membrane models to assess the photodynamic diagnosis efficiency of ALA and PSI-ALA-hex, J. Photochem. Photobiol. B. Biol., 2023, 244, 112717.

5.68

Scientific publications (without impact factor)

Furrer P., Etiquetage des médicaments à formule. Ce qui a changé depuis le 1^{er} avril 2023. PharmaJournal, 2023, 4 :21-24.

Furrer P. Formulations anti-poux à l'officine. PharmaJournal, 2023, 8 : 12-15.

Patents

None

Books or books chapters

Delie F., Furrer P., Pharmacocinétique oculaire in : Médicaments et biothérapies en ophtalmologie. Elsevier Masson Publisher, F. Behar-Cohen, F. Chast Editors. SFO report, 2023.

Congresses / conferences and Symposia

- Congresses / conferences organisation :0
- Posters presentations :7
- Oral presentations :0
- Invited oral presentations :5

Ph.D. Theses presented in 2023

Rakotonirina Mandimbinomena
Development of a Novel Oral Formulation for Fecal Microbiota Transplantation
Allémann Eric

Awards and distinction

None

Public outreach activities (radio, television and other media, community service)

M. A. Rakotonirina, Communiqué de presse, UNIGE, May 9th, 2023, Geneva (Switzerland)

F. Delie, Participation à « Women in Science », organisé par le CERN, February 2023, Geneva (Switzerland)

F. Delie, Accueil étudiants boussole, Spring 2023, Geneva (Switzerland)

F. Delie, Pharmascope (mise en place, groupe de travail production), Spring-Summer 2023, Geneva (Switzerland)

P. Furrer, Journée « Futur en tous genres » accueil de jeunes gens (11-12 ans), préparation d'un hydrogel désinfectant pour les mains, November 9th, 2023, Geneva (Switzerland)

P. Furrer, Accueil 5 étudiants boussole, préparation de crèmes pour les mains, March 6th, 2023, Geneva (Switzerland)

P. Furrer, Rencontre avec les pharmaciens maîtres de stage MUP2, présentation de la nouvelle pharmacopée helvétique 12, March 6th, 2023 and September 26th, 2023, Geneva (Switzerland)

P. Furrer, Accueil de 27 étudiants de l'Ohio State University College of Pharmacy, USA, visite des laboratoires, March 13rd, 2023, Geneva, Switzerland

P. Furrer, Hôpital des nouragues (27.03.2023 au 02.04.2023), préparation de 10 kg d'hydrogel, March 17th, 2023, Geneva (Switzerland)

P. Furrer, Pharmascope, groupe de travail « Fabrication et commercialisation », 9 réunions de 45-60 min, Spring-Summer 2023, Geneva (Switzerland)

P. Furrer, Collaboration industrielle : formulation d'un bain de bouche à base d'extraits de plantes contre les mucites radio/chimio induites et les candidoses buccales, Spring 2023, Geneva (Switzerland)

PHARMACOGNOSY

Professor Muriel CUENDET

General description of the unit

The pharmacognosy research unit mainly focuses on the study of the pharmacological activity of bioactive natural products. Compounds with anticancer activity are of particular interest. For this, the development of new and better drugs remains a principal need. A panel of in vitro bioassays indicative of inhibiting major stages of carcinogenesis (initiation, promotion and progression) is used. Mechanistic studies are then pursued with the most promising compounds. A particular interest is set on multiple myeloma and lung adenocarcinoma models. Some plant extracts and pure compounds showed good in vitro and in vivo activity. Therefore, derivatives (synthesized by collaborators) are currently being investigated to improve their physicochemical properties. The absorption, metabolism and efficacy of those compounds are being evaluated in vitro and in vivo.

Specific research fields

- To identify plant extracts and natural products capable of inhibiting one or several of the major stages of carcinogenesis (initiation, promotion and progression)
- To characterize the mechanism of action of compounds that inhibit carcinogenesis by studying cellular pathways and cancer hallmarks, such as proliferation, angiogenesis, migration, and invasion
- To rationally optimize the molecules regarding their activity and selectivity

2023 at a glance

- Publications with impact factor: 6
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 0
- Poster presentations: 3
- Oral presentations: 2
- Invited oral presentations: 2
- Number of projects at FNRS and assimilated (Research funds): 4
- Service agreements and related activities: 0
- PhD Theses presented in 2023: 2
- Awards and distinctions: 0
- Public outreach activities: 2

Research funds

FNS

Grant No CRSII5_183536: From medicinal plant to mechanism: Target deconvolution of phytochemicals for *Trypanosoma cruzi*

Main applicant within the research unit: Muriel Cuendet

Total funding of the project: CHF 945'554.-

Total duration of the project: 54 months

Allocation 2023: CHF 0

Starting date: 01.02.2019

FNS

Grant No 310030-184790: HDAC6 ZnF-UBP domain inhibition in multiple myeloma

Main applicant within the research unit: Muriel Cuendet

Total funding of the project: CHF 530'880.-

Total duration of the project: 60 months

Allocation 2023: CHF 74'416.-

Starting date: 01.01.2020

Institutional

Debiopharm - IDEAL Project 103: Antiproliferative activity of withanolide derivatives

Main applicant within the research unit: Muriel Cuendet

Total funding of the project: CHF 43'600.-

Total duration of the project: 29 months

Allocation 2023: CHF 0

Starting date: 01.02.2022

Institutional

Ligue Pulmonaire Genevoise: Ligue pulmonaire

Main applicant within the research unit: Muriel Cuendet

Total funding of the project: CHF 58'000.-

Total duration of the project: 24 months

Allocation 2023: CHF 0

Starting date: 01.08.2022

Total amount for all research funds for 2023: CHF 74'416.-

Service agreements and related activities

Total amount for all service agreements and related activities for 2023: CHF 0

Scientific publications (with impact factor)

Ferro, A.; Pantazaka, E.; Athanassopoulos, C.M.; Cuendet, M., Histone deacetylase-based dual targeted inhibition in multiple myeloma. <i>Medicinal Research Reviews</i> 2023, 43, 2177-2236.	13.3
Sevik Kilicaslan, O.; Cretton, S.; Hausmann, E.; Quirós-Guerrero, L.; Karimou, S.; Kaiser, M.; Mäser, P.; Christen, P.; Cuendet, M., Antiprotozoal activity of natural products from Nigerien plants used in folk medicine. <i>Frontiers in Pharmacology</i> 2023, 14, 1190241.	5.6
Ferro, A.; Graikioti, D.; Gezer, E.; Athanassopoulos, C.M.; Cuendet, M., Entinostat-bortezomib hybrids against multiple myeloma. <i>Molecules</i> 2023, 28, 1456.	4.6
Saraux, N.; Bruna, L.; Ebrahimi, S.N.; Karimou, S.; Christen, P.; Cuendet, M., Antiproliferative activity of compounds isolated from the root bark of <i>Lannea acida</i> in multiple myeloma cell lines. <i>Phytochemistry</i> 2023, 209, 113641.	3.8
Spaleniak, W.; Cuendet, M., Resveratrol as a circadian clock modulator: mechanisms of action and therapeutic applications. <i>Molecular Biology Reports</i> 2023, 50, 6159-6170.	2.8
Vérièpe-Salerno, J.; Podavini, S.; Long, M.J.C.; Kolotuev, I.; Cuendet, M.; Thome, M., MALT-1 shortens lifespan by inhibiting autophagy in the intestine of <i>C. elegans</i> . <i>Autophagy Reports</i> 2023, 2, 2277584. *	

* The impact factor for this journal will be attributed in 2024.

Congresses / conferences and symposia

- Congress / conferences organisation: 0
- Posters presentations: 3
- Oral presentations: 2
- Invited oral presentations: 2

Ph.D. Theses presented in 2023

- Weronika Spaleniak
Preventive and therapeutic approaches against pancreatic and lung cancers
Director: Prof. Muriel Cuendet, co-director: Prof. Charna Dibner
- Ozlem Sevik
Phytochemical investigation of plants from Brazil and West Africa as well as their antiparasitic activity
Director: Prof. Muriel Cuendet

Public outreach activities (radio, television and other media, community service)

- Media interventions
Cuendet, M., Des biscuits antistress. A-t-on vraiment besoin de cookies adaptogènes ? *Blick*, September 30, 2023.
- Activities for the public
Cuendet, M., "Femmes et filles de science et technologie": presentation to children from 2 Geneva schools, January 31 and February 3, 2023.

PHYTOCHEMISTRY AND BIOACTIVE NATURAL PRODUCTS

Professor Jean-Luc WOLFENDER
Doctor Emerson FERREIRA-QUEIROZ

General description of the Unit

The main research activities of the unit are related to the development of methodologies for the rapid isolation identification and bioactivity characterisation of natural products (NPs) at the microgram scale. State-of-the-art LC-MS and LC-MS/MS as well as microNMR techniques are used for dereplication purposes or de novo identification of NPs in crude extracts from different origins (plants, fungi, and microorganisms). Microfractionation methods in 96 well plates allow bioassays to be performed on LC peak in crude extracts, quantitative estimation of the well content and further structural determination by sensitive NMR. Rational large scale isolation strategies are developed for the rapid obtention of pure NPs in the mg scale for further testing bioactivities and mode of action. The range of biological activities studied in house or in collaboration covers mainly antifungal, antiprotozoal, anti-inflammatory, and antiepileptic activities. The interest of the group is also focused on plant metabolomics, in this respect the focus is on the investigation of bioactive NPs dynamically induced in various stress situations (fungi confrontation, biotic and abiotic stresses, metabolite elicitation...). With the idea to generate original sources of bioactive NPs, other strategies including biotransformation or chemical derivatisation of crude extracts from common sources are also investigated. Finally, the analytical and metabolomics methods are also used for studying the metabolism of crude extracts in view of a better understanding of the mode of action (synergy, prodrugs) and the potential toxicity of phytopharmaceuticals or nutraceuticals.

Specific research fields

- Search for new lead compounds from natural sources
- On-line identification of natural products by LC-UV-NMR-MS (dereplication)
- Rapid microfractionation of crude extracts for chemical and bioactivity profiling
- Plant metabolomics
- Search for original bioactive stress-induced natural products of various origin
- Study of antifungal compounds from pathogen fungi in co-culture Qualitative quantitative analysis of phytotherapeutics
- Study of the metabolism of phytopreparation by metabolomics in relation with their mode of action
- Investigation of natural products involved in diseases associated with problems of ageing
- Search for new lead compounds for use against tropical parasitic diseases
- Investigation of methods for isolation of natural products using preparative chromatographic techniques
- Exploitation of microbial biotransformation for the search of new lead compounds

2023 at a glance

- Publications with impact factor: 14
- Publications without impact factor: 4
- Patent: 0
- Book and chapters: 0
- Congresses / conferences organisation: 0
- Posters presentations: 6
- Oral presentations: 3
- Invited oral presentations: 17
- Number of projects at FNRS and assimilated (Research funds): 9
- Service agreements and related activities: 2

- Ph.D. Theses presented in 2023: 3
- Awards and distinctions: 2
- Public outreach activities: 0

Research funds

FNS

Grant No 205321_182438: Improving natural products chemical biodiversity for drug discovery by fungal secretome assisted biotransformation.

Main applicant within the research unit: Emerson Ferreira Queiroz

Total funding of the project: CHF 319'161.-

Total duration of the project: 48 months

Allocation 2023: CHF 0.-

Starting date: 01.04.2019

FNS

Grant No CRSII5-189921/1: An in silico and chemo-biological approach to identify anti-infective and pro-metabolic natural products.

Main applicant within the research unit: Jean-Luc Wolfender

Total funding of the project: CHF 3'198'673.-

Total duration of the project: 60 months

Allocation 2023: CH 767'050.- (for the whole consortium but received at UNIGE)

Starting date: 01.04.2020

FNS BRIDGE

Grant No 40B2-0-211759: Identification of antimicrobial and anti-virulence lead compounds from biodiverse microorganisms through a platform integrating metabolomics and innovative bioassays.

Main applicant within the research unit: Jean-Luc Wolfender

Total funding of the project: CHF 1'263'693.-

Total duration of the project: 48 months

Allocation 2023: CHF 311'644.- (for the whole consortium but received at UNIGE)

Starting date: 01.09.2023

Institutional

Université de la Réunion – Projet PHAR

Main applicant within the research unit: Jean-Luc Wolfender

Total funding of the project: CHF 8'019.-

Total duration of the project: 20 months

Allocation 2023: CHF 0.-

Starting date: 01.07.2021

Institutional

Debiopharm - IDEAL Project 104: Enzymatically engineered antibiotics against multidrug-resistant bacteria.

Main applicant within the research unit: Emerson Ferreira Queiroz

Total funding of the project: CHF 50'000.-

Total duration of the project: 26 months

Allocation 2023: CHF 0.-

Starting date: 01.02.2022

Institutional

CHUV – ANDROGRAPHIS

Main applicant within the research unit: Emerson Ferreira Queiroz

Total funding of the project: CHF 60'000.-

Total duration of the project: 12 months

Allocation 2023: CHF 60'000.-

Starting date: 01.04.2023

Institutional

Institut Louis Malardé: Chimiodiversité et valorisation des micro-algues polynésiennes – CEWAMAP.

Main applicant within the research unit: Jean-Luc Wolfender

Total funding of the project: CHF 19'502.-

Total duration of the project: 24 months

Allocation 2023: CHF 15'601.-

Starting date: 01.09.2023

Confidential project

Industry

Development of methods for obtaining plant extracts containing bitter compounds.

Main applicant for the research unit: Jean-Luc Wolfender

Total funding of the project: CHF 284'868.-

Total duration of the project: 73 months

Allocation 2023: CHF 40'883.-

Starting date: 01.03.2017

Confidential project

Industry

Exploration de la composition en métabolites primaires et spécialisés d'orchidées et de champignons endophytes

Main applicant for the research unit: Jean-Luc Wolfender

Total funding of the project: CHF 247'786.-

Total duration of the project: 48 months

Allocation 2023: CHF 98'507.-

Starting date: 01.06.2021

Total amount for all research funds for 2023: CHF 1'293'685.-

Service agreements and related activities

Industry Partner, Vaud, (HPTLC)

Total amount for 2023: CHF 13'587.-

Divers mandats

Total amount for 2023: CHF 4'107.-

Total amount (for all service agreements and related activities) for 2023: CHF 17'694.-

Scientific publications (with impact factor)

- Alfattani, A., Queiroz, E. F., Marcourt, L., Leoni, S., Stien, D., Hofstetter, V., Gindro, K., Perron, K. and Wolfender, J. L., One-step bio-guided isolation of secondary metabolites from the endophytic fungus *Penicillium crustosum* using high-resolution semi-preparative HPLC. Combinatorial Chemistry & High Throughput Screening 2023. 1.8
- Challal, S., Skiba, A., Langlois, M., Esguerra, C. V., Wolfender, J. L., Crawford, A. D. and Skalicka-Woz, K., Natural product-derived therapies for treating drug-resistant epilepsies: from ethnopharmacology to evidence-based medicine. Journal of Ethnopharmacology 2023, 317. 5.4
- Gao, Y.-Q., Morin, H., Marcourt, L., Yang, T.-H., Wolfender, J.-L., Farmer, E. E., Chloride, glutathiones, and insect-derived elicitors introduced into the xylem trigger electrical signaling. Plant Physiology 2023. 7.4
- Hammerle, F., Quiros-Guerrero, L., Wolfender, J. L., Peintner, U., Siewert, B., Highlighting the phototherapeutic potential of fungal pigments in various fruiting body extracts with informed feature-based molecular networking. Microbial Ecology 2023, 86, 1972-1992. 3.6
- Huber, R., Marcourt, L., Héritier, M., Luscher, A., Guebey, L., Schnee, S., Michellod, E., Guerrier, S., Wolfender, J. L., Scapozza, L., Köhler, T., Gindro, K., Queiroz, E. F., Generation of potent antibacterial compounds through enzymatic and chemical modifications of the trans- δ -viniferin scaffold. Scientific Reports 2023, 13. 4.6
- Klimenko, A., Huber, R., Marcourt, L., Tabakaev, D., Koval, A., Dautov, S. S., Dautova, T. N., Wolfender, J. L., Thew, R., Khotimchenko, Y., Queiroz, E. F., Katanaev, V. L., Shallow- and deep-water Ophiura species produce a panel of chlorin compounds with potent photodynamic anticancer activities. Antioxidants (Basel) 2023, 12. 7
- Krishnan, S. R., Skiba, A., Luca, S. V., Marcourt, L., Wolfender, J. L., Skalicka-Wozniak, K., Gertsch, J., Bioactivity-guided isolation of trypanocidal coumarins and dihydro-pyranochromones from selected Apiaceae plant species. Phytochemistry 2023, 213, 113770. 3.8
- Le Loarer, A., Marcellin-Gros, R., Dufosse, L., Bignon, J., Frederich, M., Ledoux, A., Queiroz, E. F., Wolfender, J. L., Gauvin-Bialecki, A., Fouillaud, M., Prioritization of microorganisms isolated from the indian ocean sponge *Scopalina hapalia* based on metabolomic diversity and biological activity for the discovery of Natural Products. Microorganisms 2023, 11. 4.5
- Morin, H., Chételat, A., Stolz, S., Marcourt, L., Glauser, G., Wolfender, J. L., Farmer, E. E., Wound-response jasmonate dynamics in the primary vasculature. New Phytologist, 2023, 240,1484-1496. 9.4
- Pellissier, L., Gaudry, A., Vilette, S., Lecoultre, N., Rutz, A., Allard, P. M., Marcourt, L., Queiroz, E. F., Chave, J., Eparvier, V., Stien, D., Gindro, K., Wolfender, J. L., Comparative metabolomic study of fungal foliar endophytes and their long-lived host *Astrocaryum sciophilum*: a model for exploring the chemodiversity of host-microbe interactions. Frontiers in Plant Science 2023, 14. 5.6
- Rutz, A., Wolfender, J. L., Automated composition assessment of natural extracts: untargeted mass spectrometry-based metabolite profiling integrating semiquantitative detection. Journal of Agricultural and Food Chemistry 2023, 71, 18010-18023. 6.1
- Skiba, A., Koziol, E., Luca, S. V., Budzynska, B., Podlasz, P., Van Der Ent, W., Shojaeinia, E., Esguerra, C. V., Nour, M., Marcourt, L., Wolfender, J. L., Skalicka-Wozniak, K., Evaluation of the antiseizure activity of endemic plant Halfordia kendack Guillaumin and its main constituent, halfordin, on a Zebrafish pentylenetetrazole (PTZ)-induced seizure model. International Journal of Molecular Sciences 2023, 24, 3. 5.6

Walker, T. W. N., Schrod, F., Allard, P. M., Defosse, E., Jassey, V. E. J., Schuman, M. C., Alexander, J. M., Baines, O., Baldy, V., Bardgett, R. D., Capdevila, P., Coley, P. D., van Dam, N. M., David, B., Descombes, P., Endara, M. J., Fernandez, C., Forrister, D., Gargallo-Garriga, A., Glauser, G., Marr, S., Neumann, S., Pellissier, L., Peters, K., Rasmann, S., Roessner, U., Salguero-Gomez, R., Sardans, J., Weckwerth, W., Wolfender, J. L., Penuelas, J., Leaf metabolic traits reveal hidden dimensions of plant form and function. *Science Advances* 2023, 9, eadi4029.

13.6

Zwygart, A. C. A., Medaglia, C., Huber, R., Poli, R., Marcourt, L., Schnee, S., Michellod, E., Mazel-Sanchez, B., Constant, S., Huang, S., Eckerle, I., Bekliz, M., Gindro, K., Queiroz, E. F., Tapparel, C., Antiviral properties of trans- δ -viniferin derivatives against enveloped viruses. *Biomedicine & Pharmacotherapy* 2023, 163, 114825.

7.5

Scientific publications without impact factor

Burdet, F., Allard, P.-M., Nothias, L.-F., Kirchhoffer, O., Gaudry, A., Moretti, S., Engler, R., Guerrero, L. M. Q., Queiroz, E. F., Nitschke, J., Hanna, N., Wu, C., Grondin, A., David, B., Soldati, T., Wolfrum, C., Carreira, E., Wolfender, J.-L., Pagni, M., Mehl, F., Application of the RDF framework to integrate heterogeneous experimental data of a large chemo- and biodiverse collection from a research collaborative project. *ChemRxiv*, 2023.

Ferreira Queiroz, M. M., Huber, R., Marcourt, L., Guénée, L., Allard, P.-M., Rutz, A., Nothias, L.-F., Carlotta De Ruvo, C., Kissling, J., Gupta, M. P., et al., Phytochemical study of *Alzatea verticillata*, the sole species belonging to the Alzateaceae family. *Frontiers in Natural Products* 2023. *

Gaudry, A., Pagni, M., Mehl, F., Moretti, S., Quiros-Guerrero, L.-M., Rutz, A., Kaiser, M., Marcourt, L., Queiroz, E. F., Ioset, J.-R., Grondin, A., David, B., Wolfender, J.-L., Allard, P.-M., A sample-centric and knowledge-driven computational framework for natural products drug discovery. *ChemRxiv*, 2023, 1-52.

Kirchhoffer, O., Nitschke, J., Allard, P.-M., Marcourt, L., David, B., Grondin, A., Hanna, N., Queiroz, E., Soldati, T., Wolfender, J.-L., Targeted isolation of natural analogs of anti-mycobacterial hit compounds based on the metabolite profiling of a large collection of plant extracts. *Frontiers in Natural Products* 2023, 2. *

* The impact factor for this journal will be attributed in 2024.

Congresses / conferences and symposia

- Congresses / conferences organisation: 0
- Posters presentations: 6
- Oral presentations: 3
- Invited oral presentations: 17
- Workshops: 6

Ph.D. Theses presented in 2023

Arnaud Gaudry

“Development of an integrative strategy to leverage the results of the metabolomics profiling and anti-trypansomatid screening of a large plant extracts collection”.

Director: Prof. Jean-Luc Wolfender

Luis-Manuel Quiros Guerrero

“Development of a prioritization strategy to efficiently select natural extracts from large biodiverse datasets with a high structural novelty potential”.

Director: Prof. Jean-Luc Wolfender

Robin Huber

“Improving the chemical diversity of natural products for drug discovery through biotransformation by fungi”.

Director: Dr Emerson Ferreira Queiroz, co-director: Dr Katia Gindro, Agroscope

Awards and distinctions:

Ferreira Queiroz, E., The joint prize from the Phytochemical Society of Europe and the Pierre Fabre Research Institute is awarded in recognition of the significant contribution made to innovative research in the field of phytochemistry and natural product research. **PSE-Pierre Fabre Prize for 2023**. Phytochemical Society of Europe meeting on ‘Bioactive Natural Products’, 29 June 2023, Paris (France).

Rutz, A., The first Dr. Willmar-Schwabe-Young-Talent-Prize price was awarded to Adriano for his outstanding contributions dealing with establishment of a platform for data sharing on natural products and their origins call the lotus initiative (<https://lotus.nprod.net/>) that he developed during his thesis. **Dr. Willmar-Schwabe-Young-Talent-Prize for 2023**. 71st International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research (GA), 2-5 July 2023, Dublin (Ireland).

MEDICATION ADHERENCE AND INTERPROFESSIONALITY

Professor Marie Paule SCHNEIDER VOIROL

General description of the Unit

The associate professorship (0.75 FTP) in medication adherence and interprofessionality, and its research and teaching unit was launched in August 2018. Medication adherence is the core research area of the unit. Medication adherence is a key determinant of the ambulatory healthcare system. It is defined as the process by which patients take their medications as prescribed. It is characterized by three components: treatment initiation, implementation and discontinuation (Vrijens et al. 2012). As described by the World Health Organization (WHO) in 2003, around 50% of chronic patients are nonadherent to their treatment worldwide. This creates an endemic, medical and economic threat on the healthcare systems, which needs to be addressed. Research is needed to better document the issue and the contextual and human contributing factors as well as assess cost-effective, interprofessional adherence-enhancing programs for implementation in clinical practice. Therefore, the research plan of the unit aims to achieve a comprehensive understanding of factors, implementation strategies and pathway, and intervention components in preparation for new models of care through implementation science. The unit is a core member of the Swiss Implementation Science Network (IMPACT).

The head of the unit is also the scientific director of pharma24 (0.25 FTE), an outpatient pharmacy located at the exit of the Geneva University Hospitals (HUG). The team consists of 14 FTE pharmacists, including two PhDs, and 10 FTE pharmacy technicians. Pharma24 is an academic outpatient pharmacy, where research on medication adherence, pharmaceutical services and interprofessionality has been launched in 2019. Pharma24, as research partner, supports a steady collection of routine-based adherence and patient data. In 2023, pharma24 and our unit at UNIGE received a first 4-year joint grant to develop the interprofessional collaboration through digital teleconsultation between community pharmacists in Geneva and general practitioners at the Geneva University Hospitals (HUG).

In terms of teaching, the unit is in charge of the interprofessional curriculum of the School of Pharmaceutical Sciences since 2019 in close collaboration with the Interprofessional Simulation Centre (CIS) of the University of Geneva, especially with Dr Thomas Fassier, Faculty of Medicine, head of the centre, and Patricia Picchiottino, University of Applied Sciences Western Switzerland, deputy head. In 2022, based on the invitation of CIDPHARMEF, *la Conférence Internationale des Doyens des facultés de PHARMacie d'Expression Française*, Pr. Marie Schneider and Pr. Marie-Claude Vanier, University of Montreal, Canada, initiated the Working Group on Interprofessional Education, which involves many French-speaking faculties of pharmacy around the world (with webinar attendance > 90 participants). This work is supported by a grant from the *Francophone University Agency* (AUF).

Since September 2018, the medication adherence unit has been actively involved in the reform of the teaching curriculum of the school of pharmacy (Bachelor and Master levels), with a focus in harnessing the teaching of communication in health to ensure medication adherence, patient security, treatment cost-effectiveness and to decrease the pressure of pharmaceuticals on the environment. Since 2023, Pr. M. Schneider initiated the development of teaching labs in clinical pharmacy, and she is an active member of the core group of teachers implementing the change. Pr. M. Schneider with colleagues represent the School of pharmacy in the Education Pharmaceutical Sciences Switzerland working group (*Ausbildung Pharmazeutische Wissenschaften Schweiz, APhWS*), which is currently working on a new catalogue of objectives for the academic training of pharmacists as health professionals. The unit medication adherence and interprofessionality is in charge of the 20-week training course in community pharmacy for Master's students in collaboration with pharmaSuisse, the Swiss association of pharmacists.

Specific research fields

- To implement and evaluate medication adherence support programs in chronic diseases in primary care.
- To develop robust medication adherence measurement and data analysis, in particular digital monitoring in routine care.
- To investigate how long-term patients self-adjust their prescribed medications, and how this behaviour can be better supported in the context of a patient-professional partnership and shared decision-making throughout the patient journey.
- To implement and analyse the cost-benefit of teleconsultations between patients, pharmacists and physicians in primary care.
- To investigate how interprofessional collaborations could support a more efficient and secure medication use, especially at the interface between the hospital and the community.

2023 at a glance

- Publications with impact factor: 8
- Publications without impact factor: 1
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organization: 5
- Posters presentations: 5
- Oral presentations: 10
- Invited oral presentations: 12
- Number of projects at FNRS and assimilated (Research funds): 5
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2023: 1
- Awards and distinctions: 4
- Public outreach activities: 3

Research funds

SNF

Category: SNF

Title of the research project: Implementation of a new model of care for supporting adherence in people starting a new medication for a long-term condition (myCare Start project) - An implementation-effectiveness science study

Main applicant: Marie Paule Schneider Voirol

Total funding of the project: CHF 319'683.-

Total duration of the project: 4 years

Allocation 2023: CHF 76'544.-

Starting date: 01.06.2022

Commission Fédérale de la Qualité (CFQ)

Category: Institutional

Title of the research project: Implementation of a new model of integrated care for supporting adherence in people starting a new medication for a long-term condition (myCare Start project)

Main applicant: Marie Paule Schneider Voirol

Total funding of the project: CHF 305'811.-

Total duration of the project 4 years

Allocation 2023: CHF 161'445.-

Starting date: 01.11.2022

Pharmasuisse

Category: Institutional

Title of the research project: Clinical Study Agreement for the project myCare Start

Main co-applicants: Marie P. Schneider & Alice Panchaud, Université de Bern, Suisse

Total funding of the project: CHF 213'771.-

Total duration of the project: 3 years

Allocation 2023: CHF 104'748.-

Starting date: 01.09.2023

Qualité et Recherche Santé Suisse Curafutura et Pharmasuisse

Category: Institutional

Title of the research project: Medication adherence, diabetes and renal failure

Main applicant: Marie Paule Schneider Voirol

Total funding of the project: CHF 110'000.-

Total duration of the project: 7 years

Allocation 2023: CHF 0.-

Starting date: 01.07.2017

Francophone University Agency (Agence Universitaire de la Francophonie - AUF)

Category: Institutional

Title of the research project: Teaching interprofessionality (IP) in the French-speaking world and sharing teaching methods

Main co-applicants: Marie Paule Schneider Voirol & Marie-Claude Vanier, University of Montreal, Canada

Total funding of the project: CHF 9'540.-

Total duration of the project: 1 year

Allocation 2023: CHF 0.-

Starting date: 01.09.2023

Total amount for all research funds for 2023: CHF 342'737.-

Service agreements and related activities

Total amount (for all service agreements and related activities) for 2023: 0

Scientific publications (with impact factor)

Bandiera, C.; Locatelli, I.; Courlet, P.; Cardoso, E.; Zaman, K.; Stravodimou, A.; Dolcan, A.; Sarivalasis, A.; Zurcher, J-P.; Aedo-Lopez, V.; Dotta-Celio, J.; Peters, S.; Guidi, M.; Wagner, AD.; Csajka, C.; Schneider, MP.

Adherence to the CDK 4/6 Inhibitor Palbociclib and Omission of Dose Management Supported by Pharmacometric Modelling as Part of the OpTAT Study.

Cancers 2023;15(1):316. DOI: 10.3390/cancers15010316

5.20

Santos, B.; Blondon, K.S.; Sottas, M.; Carpenter, F.; Backes, C.; Van Gessel, E.; Schneider, MP.

Perceptions of conflicting information about long-term medications: a qualitative in-depth interview study of patients with chronic diseases in the Swiss ambulatory care system.

BMJ Open 2023 DOI: 10.1136/bmjopen-2022-070468.

2.90

Mena, S.; Moullin, J.C.; Schneider, MP.; Niquille, A.

Implementation of interprofessional quality circles on deprescribing in Swiss nursing homes: an observational study.

BMC Geriatr 2023 DOI: 10.1186/s12877-023-04335-w.

4.10

Bawab, N.; Moullin, J.; Jotterand, S.; Rossier, C.; Schneider, MP.; Perraudin, C.
Building Interprofessional Collaborative Practices Through a Support Program for Patients
With Type 2 Diabetes in Primary Care.
Journal of Continuing Education in the Health Professions 2023 1;43(2):77-86.
DOI: 10.1097/CEH.0000000000000466. 1.80

Novais, T.; Fortini, C.; Dima, A.L.; Schott, A.M.; Viprey, M.; Schneider, MP.
[Learning motivational interviewing to better support patient medication adherence].
Rev Med Suisse 2023 DOI: 10.53738/revmed.2023.19.823.777 0.19

Rousseau, M. ; Solh Dost, S. ; Santos, B. ; Gauthier, R. ; Cavassini, M. ; Calmy, A. ;
Schneider, M.
[HIV self-tests in community pharmacies Inventory and practice recommendations for
interprofessional collaborations]
Rev Med Suisse 2023 DOI: 10.53738/revmed.2023.19.847.2017 0.19

Jaunin-Stalder, N.; Boulet, MC.; Braillard, O.; Saliez Pierret, G.; Lazzaro, D.; Bounnaceur
Tena, S.; Schneider, MP. [The prescription: messenger between the person, the doctor's
office, the nursing and pharmacy teams] Rev Med Suisse 2023 19(829):1101-6 DOI :
10.53738/REVMED.2023.19.829.1101 0.19

Bandiera, C. ; Duarte, D. ; Dotta-Celio, J. ; Zanchi, A. ; Schneider, MP.
[Diabetic nephropathy: Interprofessional support of medication adherence]
Rev Med Suisse 2023;19(829):1085-9 DOI : 10.53738/REVMED.2023.19.829.1101 0.19

Scientific publications (without impact factor)

Ribault, J.; Bandiera, C.; Schneider, MP.; De Geest, S.
Les priorités pour améliorer l'adhésion médicamenteuse en Suisse.
pharmaJournal 2023, 12, 28-31.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 5
- Posters presentations: 5
- Oral presentations: 10
- Invited oral presentations: 12

Ph.D. Theses presented in 2023

Carole BANDIERA

An interprofessional intervention to support adherence to complex and polypharmacy treatments in
patients with solid cancer and patients with diabetic kidney disease (Thesis Nr 215)

Marie SCHNEIDER

Awards and distinction

Bandiera, C. ; Dotta-Celio, J. ; Locatelli, I. ; Nobre, D. ; Wuerzner, G. ; Pruijm, M. ; Lamine, F. ; Burnier, M. ; Zanchi, A. ; Schneider MP.

The differential impact of a 6-versus 12-month pharmacist-led interprofessional medication adherence program on medication adherence in patients with diabetic kidney disease: the randomized and controlled PANDIA-IRIS study. **3rd Prize Best oral communication**, Annual Meeting of the Swiss Society of General Internal Medicine, May 11, 2023, Basel (Switzerland).

Mali, R.; Bouillon, P.; Schneider, MP.; Spechbach, H.

BabelDr vs. Google Translate: Translation in a pharmacy setting. **3rd Prize Best poster young researchers**, Annual Meeting of the Swiss Society of General Internal Medicine, May 11, 2023, Basel (Switzerland).

Beatriz Santos has been awarded a Mini-Booster prize by the Private Foundation of the University Hospitals of Geneva (HUG) to support the professional careers of young researchers, June 1st, 2023.

Marie Schneider was the winner of the 2023 Steve Hudson Lecture, European Society of Clinical Pharmacy (ESCP). Her presentation was entitled "Innovative interprofessional education models – are schools of pharmacy ready?". ESCP Symposium 2023: Innovations in clinical pharmacy practice, Education and Research, Aberdeen Nov 1st, 2023 (Scotland).

Public outreach activities (radio, television and other media, community service)

Bandiera, C.

La non-adhésion aux traitements coûte 125 milliards d'euros par année à l'Europe.

Le Journal de l'UNIGE

<https://www.unige.ch/lejournale/recherche/printemps-2023/adhesion-traitement/>

Policy brief: Swiss Priority Setting on Implementing Medication Adherence Interventions – the European ENABLE COST Action - Espacomp

<https://www.espacomp.eu/2023/04/11/policy-brief-swiss-priority-setting-on-implementing-medication-adherence-interventions-the-european-enable-cost-action/>

Mazouri, S.; Schneider, MP.

Un médicament pour la vie, Podcast « En consultation », Revue Médicale Suisse, Sept 27, 2023

DATA ANALYTICS LAB

Professor Stéphane GUERRIER

General description

The Data Analytics Lab aims at contributing to the development of new methodologies for data analysis and decision-making that allow to respond to the ever-increasing data size and model complexity while achieving desirable statistical properties and performance. These fundamental developments make use of the latest advances in (applied) computer sciences, in particular machine learning. We also aim at making these developments broadly available through open-source statistical packages (e.g. the R platform) and scientific publications and/or reports in applied statistics. To ensure added-value and tangible impact of our work, we aim at confirming and expanding our interdisciplinary approach to research. Therefore, our work includes not only collaborations with established researchers in computer and mathematical sciences but also in areas such as experimental and behavioural sciences for whom data analysis has become an important and very demanding challenge, as is also the case for disciplines such as life sciences (medical and pharmaceutical), population health, engineering (signal processing, navigation), economics, management and others. We also aim at collaborating with (semi-)private institutions that face the challenges of analysing the data they collect in order to improve their products and/or services as well as their strategic decision-making.

Specific research fields

- Computational statistics and simulation methods
- Life sciences analytics
- Signal processing and time series analysis
- Machine learning
- Data analytics in engineering
- Applied statistics

2023 at a glance

- Publications (with impact factor): 13
- Publications (without impact factor): 2
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 1
- Posters presentations: 0
- Oral presentations: 11
- Invited oral presentations: 4
- Number of projects at FNRS and assimilated (Research funds): 3
- Service agreements and related activities: 0
- Ph.D. Thesis presented in 2023: 0
- Awards and distinctions: 1
- Public outreach activities: 1

Research funds

SNSF Professorships

New Challenges for Statistical Methods in Large and Complex Data Settings: Analysis of Dependent Data and Model Selection

Main applicant: Stéphane Guerrier

Main discipline: Mathematics

Total funding of the project: CHF 816'508.-

Total duration of the project: 2 years

Allocation 2023: CHF 427'685.90.-

Starting date: 01.01.2022

Link: <https://data.snf.ch/grants/grant/176843>

Innosuisse

Title: Multi-Sensor Adjustment of Raw LiDAR, Visual and Inertial Measurements in Kinematic Laser Scanning Devices

Main applicants: Stéphane Guerrier, Jan Skaloud (EPFL) and Elmar van der Zwan (Hexagon)

Main discipline: Engineering

Total funding of the project: CHF 815'265.40.- (CHF 257'690.20.- allocated to the University of Geneva)

Total duration of the project: 2 years

Allocation 2023: CHF 83'457.20.-

Starting date: 01.10.2022

SNSF Sinergia (obtained in 2023, starting in 2024)

Title: Data-driven imaging of volcanic plumbing systems

Main applicants: Stéphane Guerrier, Luca Caricchi (University of Geneva) and Chiara Montagna (Istituto Nazionale di Geofisica e Vulcanologia Sezione di Pisa, Italy)

Main discipline: Interdisciplinary

Total funding of the project: CHF 2'313'234.-

Total duration of the project: 4 years

Allocation 2023: CHF 0.-

Starting date: Fall 2024

Total amount for all research funds for 2023: CHF 511'143.10.-

Scientific publications (with impact factor)

Ramzy, G. M.; Norkin, M.; Koessler, T.; Voirol, L.; Tihy, M.; Hany, D.; McKee, T.; Ris, F.; Buchs, N.; Docquier, M.; Toso, C.; Rubbia-Brandt, L.; Bakalli, G.; Guerrier, S.; Huelsken, J.; Nowak-Sliwinska, P. Platform combining statistical modeling and patient-derived organoids to facilitate personalized treatment of colorectal carcinoma. <i>Journal of Experimental & Clinical Cancer Research</i> 2023, 42.	11.3
Bakalli, G.; Guerrier, S.; Scaillet, O. A penalized two-pass regression to predict stock returns with time-varying risk premia. <i>Journal of Econometrics</i> 2023, 237, 105375.	6.3
Cucci, D. A.; Voirol, L.; Khaghani, M.; Guerrier, S. On Performance Evaluation of Inertial Navigation Systems: The Case of Stochastic Calibration. <i>IEEE Transactions on Instrumentation and Measurement</i> 2023, 72, 1–17.	5.6
Wehrli, L.; Galdadas, I.; Voirol, L.; Smiesko, M.; Cambet, Y.; Jaquet, V.; Guerrier, S.; Gervasio, F. L.; Nef, S.; Rahban, R. The action of physiological and synthetic steroids on the calcium channel CatSper in human sperm. <i>Frontiers in Cell and Developmental Biology</i> 2023, 11.	5.5

Bakalli, G.; Cucci, D. A.; Radi, A.; El-Sheimy, N.; Molinari, R.; Scaillet, O.; Guerrier, 5.4

S.Multi Signal Approaches for Repeated Sampling Schemes in Inertial Sensor Calibration. IEEE Transactions on Signal Processing 2023, 71, 1103–1114.

Quartier, J.; Lapteva, M.; Boulaguiem, Y.; Guerrier, S.; Kalia, Y. N. Influence of Molecular Structure and Physicochemical Properties of Immunosuppressive Drugs on Micelle Formulation Characteristics and Cutaneous Delivery. *Pharmaceutics* 2023, 15. 5.4

Huber, R.; Marcourt, L.; Héritier, M.; Luscher, A.; Guebey, L.; Schnee, S.; Michellod, E.; Guerrier, S.; Wolfender, J.-L.; Scapozza, L.; Köhler, T.; Gindro, K.; Queiroz, E.F. Generation of potent antibacterial compounds through enzymatic and chemical modifications of the trans- δ -viniferin scaffold. *Scientific Reports* 2023, 13, 15986. 4.6

Cucci, D. A.; Voirol, L.; Kermarrec, G.; Montillet, J.-P.; Guerrier, S. The Generalized Method of Wavelet Moments with eXogenous inputs: a fast approach for the analysis of GNSS position time series. *Journal of Geodesy* 2023, 97, 14. 4.4

Cagliani, M.; Cantatore, F.; Valsecchi, L.; Miglioli, C.; Dumont, R.; Rinaldi, S.; Candiani, M.; Salvatore, S. Effects of flexible sacrum position at birth on maternal and neonatal outcomes. A retrospective cohort study. *International Journal of Gynecology & Obstetrics* 2023. 3.8

Guerrier, S.; Kuzmics, C.; Victoria-Feser, M.-P. Prevalence Estimation from Random Samples and Census Data with Participation Bias. *Journal of the American Statistical Association* 2023+ (accepted in 2023, in press). 3.7

Pfarrwaller, E.; Voirol, L.; Karemera, M.; Guerrier, S.; Baroffio, A. Dynamics of career intentions in a medical student cohort: a four-year longitudinal study. *BMC Medical Education* 2023, 23. 3.6

Origoni, M.; Cantatore, F.; Sopracordevole, F.; Clemente, N.; Spinillo, A.; Gardella, B.; De Vincenzo, R.; Ricci, C.; Landoni, F.; Di Meo, M. L.; Ciavattini, A.; Di Giuseppe, J.; Preti, E.; Iacobone, A. D.; Carriero, C.; Dellino, M.; Capodanno, M.; Perino, A.; Miglioli, C.; Insolia, L.; Barbero, M.; Candiani, M. Colposcopy Accuracy and Diagnostic Performance: A Quality Control and Quality Assurance Survey in Italian Tertiary-Level Teaching and Academic Institutions-The Italian Society of Colposcopy and Cervico-Vaginal Pathology (SICPCV). *Diagnostics* 2023, 13. 3.6

Boulaguiem, Y.; Quartier, J.; Lapteva, M.; Kalia, Y. N.; Victoria-Feser, M. P.; Guerrier, S.; Couturier, D. L. Finite Sample Adjustments for Average Equivalence Testing. *Statistics in Medicine* 2023+ (accepted in 2023, in press). 2.0

Scientific publications (without impact factor)

Minaretzis, C.; Luo, Y.; Guerrier, S.; El-Sheimy, N.; Sideris, M. Robust Wavelet Variance-Based Stochastic Analysis of Instantaneous Code Phase-Based Oscillator Instability. *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023)*, 2023, 3005–3019.

Insolia, L.; Perrotta, D. Tk-Merge: Computationally Efficient Robust Clustering Under General Assumptions. *Building Bridges between Soft and Statistical Methodologies for Data Science. SMPS 2022. Advances in Intelligent Systems and Computing*, vol 1433. Springer, Cham, 2023.

Congresses / conferences and Symposia:

- Congresses / conferences organization: 1
- Posters presentations: 0
- Oral presentations: 11
- Invited oral presentations: 4

Awards and distinction:

Yuming Zhang (PhD student in Statistics) received ICSDS Student Travel Award, Institute of Mathematical Statistics, 2023.

Public outreach activities (radio, television and other media, community service)

Participation to “*Comprendre le Numérique*”, Fall 2023, Bachelor level course (open to all Bachelor’s students of the University of Geneva, cours transversal), responsible for the module on statistical literacy.

Center for Research and Innovation in Clinical Pharmaceutical Sciences (CRISP)

Professor Chantal CSAJKA Director

Professor Michel PRUDENT Head of the pole of competence "Innovative Biological and Cellular Therapies"

Doctor Monia GUIDI Head of the pole of competence "Real-Life Medicines"

Doctor MER Gregory RESCH Head of the laboratory of bacteriophages and phage therapy

General description of the Unit

The Center for Research and Innovation in Clinical Pharmaceutical Sciences (CRISP) is the Lausanne entity of the Institute of Pharmaceutical Sciences of Western Switzerland.

The CRISP networks academic groups from the CHUV, Unisanté and the School of Pharmaceutical Sciences of the University of Geneva around two areas of expertise: "Real-Life Medicines" that focuses on the optimization of therapies under real-life conditions in target populations, "Innovative Biological and Cellular Therapies" that focuses on translational research of new types of cellular or biological drugs. The third center of competence in "Digital Pharmacy" that aims at developing research and education at the interface of pharmacy and technologies will be opened in 2024. The poles of competence work in synergy to improve the coherence and efficiency of research and the translation of results into care.

The vision of the CRISP is to promote training, clinical research and care related to drugs of chemical, cellular or biological origin. The missions of the poles of expertise are the following:

- To develop coordinated research to address public health challenges related to the safety, efficacy, efficiency and cost effectiveness of conventional and innovative medicines.
- To work to support the implementation of innovative therapeutic strategies and care delivery in the clinic.
- To consolidate the training of students, health professionals and scientists in the field of clinical pharmaceutical sciences, opening it to cellular and biological therapies.

2023 at a glance

The year 2023 at the Centre for Research and Innovation in Clinical Pharmaceutical Sciences (CRISP) was particularly marked by the boom in innovative biological and cellular therapies, with Swissmedic accreditation for the manufacture of therapeutic bacteriophages, opening the near future possibility of phage therapy treatment for patients suffering from difficult-to-treat bacterial infections. In addition, we have opened a post-graduate training course (CAS, Certificate of Advanced Studies) in the field of advanced therapy drugs, delivered by UNIL and UNIGE. In addition, the network created by the Advanced Therapies Competence Centre has enabled us to highlight current developments at the CHUV based on these new types of drugs, and the obstacles and facilitators that need to be discussed to improve coherence and synergies.

The individualisation of therapies in populations at higher risk of iatrogenicity, such as neonatology, paediatrics and geriatrics, was at the heart of our research. Clinical dosage recommendations have been drawn up and, combined with the development of Bayesian dosage adaptation tools, are ready to be implemented in the clinic. In addition, an innovative approach enabling automatic detection of haemorrhage in elderly patients treated in hospital with antithrombotics from the computerised patient record opens a new perspective for monitoring quality and risk management in hospitals.

Pole in Real-Life Medicines

The specific research objective of this pole is to address health challenges related to the safety, efficacy and cost effectiveness of medicines in the target population of interest and evaluate risks and benefits of medicines for at-risk populations systematically excluded from studies and for specialised medicines with high costs. The specific achievements for 2023 of the CRISP network groups that include the Clinical pharmacy sciences group (Prof C. Csajka), the Hospital pharmacy group (Prof F. Sadeghipour) and the Community pharmacy group (Dr J. Berger) are presented in each group's specific sections of the annual report 2023.

Apart from research, one of the main objectives of this pole is to promote exchanges for the sharing of expertise and the training of master and doctoral students of the different academic groups. Regular shared group meeting between the different academic groups for doctoral students and Master students have taken place, which allowed a gain of expertise for the students and the identification of expertise among the senior scientists that can be of support for their personal research work.

The "Réseau Universitaire Romand de Pharmacie Pratique" (R2P2) bringing together pharmacists from the CHUV, the HUG, Unisanté, Pharma24, the Valais Hospitals and the Riviera Chablais Hospitals to promote scientific exchanges has pursued its objectives in 2023. Within this framework, structured scientific seminars accredited by pharmauisse have been presented by each group. The annual scientific 1-day conference organized by the group of Interprofessionality and Adherence took place in October at the University of Geneva on the topic of "Implementation Studies".

Innovative Biological and Cellular Therapies

CRISP's bacteriophage laboratory (Dr G. Resch), in close collaboration with the CHUV pharmacy's cell therapy centre (Dr J.F. Brunet), has developed a process for producing therapeutic bacteriophages in accordance with Good Manufacturing Practice (GMP). This represents a major step forward in the conduct of clinical trials evaluating the benefits of phage therapy in the treatment of difficult-to-treat bacterial infections, and in their future clinical use. <https://www.chuv.ch/fr/crisp/therapies-innovantes-biologiques-et-cellulaires/laboratoire-des-bacteriophages-et-de-phagothérapie>.

An inventory of the activities, related infrastructures, opportunities and risks associated with the development of biological and cellular therapeutic approaches under development at the CHUV has been carried out by Prof. M. Prudent and all main players. The report will serve as a basis for defining the strategic development of this new type of drug and the action plan.

A UNIL/UNIGE CAS in ATMP (Advanced Therapy Medicinal Products) co-directed by Prof. L. Kandalafi and Prof. C. Csajka began in 2023, offering a unique training programme for scientists and healthcare professionals in the field of advanced biological and cellular therapies (cellular therapies in oncology and immunotherapy, transfusion medicine, phagotherapy, nanomedicine, combinatorial strategies in oncology). The CHUV is positioning itself as a centre of expertise for training in the rapidly expanding field of ATMP. <https://www.formation-continue-unil-epfl.ch/formation/atmp/>

Several projects on transfusion medicine have provided new insights in blood components characterisation. The BioCAP project (Biotin-labeled platelets for in vitro and in vivo characterization of platelet functions: Cold storage and Aging of Platelet concentrates, in collaboration with the Haemostasis and Platelet Research Laboratory of the CHUV and the CHUV pharmacy) enabled the set-up of a GMP compliant platelet labelling method, offering the possibility to study the effects of platelet concentrate preparations and storage techniques in vivo after transfusion. In vitro studies are underway on cellular changes due to storage temperature. Altogether, such research will provide clinical and laboratory data to improve or revise clinical praxis. An experimental in vitro blood transfusion model evaluating the impact of preservation of red blood cells during transfusion has also been developed, allowing for a better assessment of cellular behaviour in the presence of plasma. These projects are in collaboration with Transfusion Interrégionale CRS.

Optional courses in the field of phagotherapy and transfusion medicine as well as Master theses in these areas are now active in the program of the master's in pharmacy. A CAS in 'Biological and advanced

therapies: product manufacturing and clinical use' within the framework of the UNIL/EPFL and UNIGE post-graduate program has launched in 2023.

Research projects on bacteriophages and phage therapy for the control of *P. aeruginosa* lung infection in CF patients within the framework of the SNF NCCR Microbiome of UNIL/ETHZ (<https://nccr-microbiomes.ch>) are ongoing. Finally, a new project with the objective to detect phage lysis by photonic tools has been granted (SNF-ANR SUPPLY grant in collaboration with the EPFL and the CEA Grenoble, starting date 01/02/2023).

2023 at a glance

- Publications with impact factor: 4
- Publications without impact factor: 1
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 12
- Posters presentations: 17
- Oral presentations: 3
- Invited oral presentations: 11
- Number of projects at FNRS and assimilated (Research funds): 2
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2023: 0
- Awards and distinctions: 1
- Public outreach activities: 0

Research funds Innovative Biological and Cellular Therapies

Swiss National Science Foundation
Category: Consortium NCCR Microbiome
Main applicant: Dr Grégory Resch
Total funding of the project: CHF 200'000.-
Total duration of the project: 2 years
Allocation 2023: CHF 108'879.-
Starting date: 01.09.2022

Swiss National Science Foundation
Category : SNSF
SUPPLY: SUPERfast Photonic detection of Phage LYsis »
Main applicant: Dr Grégory Resch
Total funding of the project: CHF 687'531.-
Total duration of the project: 4 years
Allocation 2023: CHF 205'506.-
Starting date: 01.01.2023

Total amount for all research funds for 2023: CHF 314'385.-

Scientific publications of the Pole Innovative Biological and Cellular Therapies (with impact factor)

Köhler, T.; Luscher, A.; Falconnet, L.; Resch, G.; McBride, R.; Mai, QA.; Simonin, JL.; Chanson, M.; Maco, B.; Galiotto, R.; Riat, A.; Civic, N.; Docquier, M.; McCallin, S.; Chan, B.; van Delden, C. Personalized aerosolised bacteriophage treatment of a chronic lung infection due to multidrug-resistant *Pseudomonas aeruginosa*. *Nat Commun.* 2023 Jun 27;14(1):3629. doi: 10.1038/s41467-023-39370-z. Erratum in: *Nat Commun.* 2023 Jul 24;14(1):4443. 16.6

Burz, SD.; Causevic, S.; Dal Co, A.; Dmitrijeva, M.; Engel, P.; Garrido-Sanz, D.; Greub, G.; Hapfelmeier, S.; Hardt, W-D.; Hatzimanikatis, V.; Heiman, CM.; Herzog, MK-M.; Hockenberry, A.; Keel, C.; Keppler, A.; Lee, S-J.; Luneau, J.; Malfertheiner, L.; Mitri, S.; Ngyuen, B.; Oftadeh, O.; Pacheco, AR.; Peaudecerf, F.; Resch, G.; Ruscheweyh, H-J.; Sahin, A.; Sanders, IR.; Slack, E.; Sunagawa, S.; Tackmann, J.; Tecon, R.; Ugolini, GS.; Vacheron, J.; van der Meer, JR.; Vayena, E.; Vonaesch, P.; Vorholt, JA. From microbiome composition to functional engineering, one step at a time. *Microbiol Mol Biol Rev.* 2023 Dec 20;87(4): e0006323. doi: 10.1128/mmbr.00063-23. Epub 2023 Nov 10. 12.9

Mutti, M.; Moreno, DS.; Restrepo-Córdoba, M.; Visram, Z.; Resch, G.; Corsini, L. Phage activity against *Staphylococcus aureus* is impaired in plasma and synovial fluid. *Sci Rep.* 2023 Oct 24;13(1):18204. doi: 10.1038/s41598-023-45405-8. 4.6

Längst, E.; Crettaz, D.; Tissot, J-D.; Prudent, M. The Effect of the Donor's and Recipient's Sex on Red Blood Cells Evaluated Using Transfusion Simulations, *Cells*, 2023, 12, 1454, 1-14. doi: 10.3390/cells12111454 6.0

Scientific publications of the Pole Innovative Biological and Cellular Therapies (without impact factor)

Längst, E.; Crettaz, D.; Delobel, J.; Renella, R.; Bardyn, M.; Turcatti, G.; Tissot, J-D.; Prudent, M. In Vitro-Transfusional Model for Red-Blood-Cell Study: the Advantage of Lowering Hematocrit, *Blood Transfus*, 2023, 21, 277-288. doi: 10.2450/2022.0086-22

Congresses / conferences and Symposia

- Congresses / conferences organization: 12
- Posters presentations: 17
- Oral presentations: 3
- Invited oral presentations: 11

Awards and distinction

Muret C., Crettaz D., Alberio L., Prudent M. Analyses phosphoprotéomiques et fonctionnelles des plaquettes traitées par inactivation des pathogènes et conservées à froid ou à température ambiante. Oral presentation, SFTS 2023, Toulouse, France, Nov. 2023. **Price for the best oral presentation, scientist < 35 years-old**

PhD PROGRAM

Professor Yogeshvar KALIA, Director
Doctor Béatrice KAUFMANN, Coordinator
Ms Florence VON OW, Secretary

General description of the Unit

The PhD Programme in Pharmaceutical Sciences promotes a solid theoretical and practical training in all aspects of the Pharmaceutical Sciences, fosters interdisciplinary research and provides opportunities for scientific exchange via lectures, symposia and networking activities. The PhD Programme also aims to increase awareness of career opportunities outside academia for graduates from the School of Pharmaceutical Sciences.

Our doctoral programme continues to consolidate its integration into the new inter-faculty Doctoral School in Life Sciences created by the Faculty of Science and the Faculty of Medicine in June 2018 (PSLS), of which the School of Pharmaceutical Sciences is a founding member. An administrative management platform has been set up, which allows doctoral students to manage their administrative files, and also to validate the various key stages of their thesis, such as the TAC or obtaining credits. The PhD Programme in Pharmaceutical Sciences provides approximately 22% of the total number of PhD students enrolled in the PSLS (43% of the Faculty of sciences PhD students enrolled in the PSLS).

This doctoral programme, a pioneer since 2004, is in fact a special case. Indeed, there is only one pharmaceutical sciences program in French-speaking Switzerland. The doctoral studies are generally done in Geneva or Lausanne, with a few exceptions for extramural theses. For any doctoral student doing a thesis with a specialization in "pharmaceutical sciences", registration and participation in the doctoral programme is mandatory in order to be able to defend the thesis and a minimum number of 30 ECTS credits is required before the thesis defence can take place. These measures are clearly detailed in the regulations for the Doctoral Programme in Pharmaceutical Sciences.

The programme covers all aspects of pharmaceutical sciences, from basic research at the molecular level through to clinical pharmaceutical sciences and the patient. Five types of activities make up the programme: courses, specialized conferences, symposia, networking activities and extramural seminars.

The activities of our doctoral programme are primarily organised for doctoral students enrolled in the Pharmaceutical Sciences Doctoral Programme, but we accept enrolments from other doctoral programmes from the Life Sciences Doctoral School, or from other CUSO doctoral programs, as long as there are places available.

In addition to the activities proposed by the programme, we also recognize some external activities, which are also granted credits. This is especially useful for "extramural" PhD students who are sometimes far from Geneva and cannot participate in the "local" courses and events.

The credits granted vary but as a general rule, 1 credit is awarded for 6 hours of activity (internal activities) or 1 credit for 10 hours of participation (external activities). It should be noted that most of the PhD students acquire more than the minimum 30 credits indicating their active participation in the PhD programme. Despite the fact the UNIGE does not allow the award of credits twice for different formations, completion of a CAS or MAS is recognized with the award of 3 credits (in the "course" part of the credits table). The minimum number of credits to be obtained by attending courses is 20, plus 6 credits minimum awarded for the attendance to conferences or symposia, the sum of both positions (courses and conferences) must reach 30 credits minimum.

The introduction of the TAC, which takes place 12-15 months after the start of the doctorate, by the PhD Programme commission, enables an evaluation of the progress of the PhD thesis. This is organized with the objective of harmonizing levels of excellence of the PhD candidates from the different component disciplines in the School of Pharmaceutical Sciences and indeed the Doctoral School in Life Sciences. This is done with respect to: (i) efficient time-planning and organization of the thesis project, (ii) enthusiasm and ability to perform interesting projects and (iii) optimization of thesis project progression. The TAC system is valid for all PhD candidates beginning their thesis as of 15 September 2015. In 2023, 18 successful TAC were held.

Courses and symposia

In this second year following the Covid-19 pandemic, priority has been given to face-to-face activities, while continuing to take advantage of the benefits of organising certain activities remotely. Holding certain courses via videoconferencing tools provides greater flexibility and also allows participants to benefit from the teachings of distant speakers without having to travel. Many activities could unfortunately not be organised, due to the very busy schedules of some external speakers working in the health field.

A total of 256 hours could however be maintained within the 2023 PhD programme (including all activities; see Tables 1-3 below for detailed information).

Extra-muros seminar

The extramural seminar in pharmaceutical sciences took place for the third time in Leysin at the Alpine Classic Hotel. We found the location and facilities of the hotel to be ideal for the purpose of this seminar.

The objective of the 36th extramural seminar in pharmaceutical sciences was to provide an overview of recent developments in the fields of fundamental, translational and clinical pharmaceutical sciences with speakers from academia and industry; a central theme was to focus on “artificial intelligence” and its role and potential applications.

The first session of the symposium, entitled “Challenges & Pitfalls – Different Perspectives”, was intended to present the challenges and hurdles to successful drug development from the points of academia, “big pharma” and the perspective of a successful entrepreneur. In this respect, Dr. Madiha Derouazi, who is currently the CEO of Speransa Therapeutics, gave an excellent talk that was very much appreciated by the audience based on personal experiences of the “start-up” process.

The first full day was devoted to “Drug Discovery” with the morning session focusing on new experimental techniques approaches that could impact the process.

The second full day focused on “Translation” and began with a presentation on the development of pharmacotherapy for Duchenne muscular dystrophy patients. The second and third presentations focussed on physiologically based pharmacokinetic (PBPK) models. The final talk of the day highlighted the business and management related challenges and more generally speaking the point of view of medium sized pharmaceutical companies in preclinical development.

The final half day of the seminar was devoted to the clinical pharmaceutical sciences with experienced clinicians from UNIGE/HUG giving a series of presentations.

Each morning and afternoon session was chaired by a different non-professorial staff scientist, and this gave the opportunity to these colleagues to gain more visibility, and they all did an excellent job.

The evaluation from the participants noted the excellence of the speakers and the scientific interest of the topics. The overall organization and balance between the lectures and the discussion were also appreciated. Although the technical support from the venue was very good, the audiovisual equipment would benefit from an upgrade to make it more suitable for larger audiences.

Overall, the seminar was considered to be very successful.

In 2023, the PSLS reached its 5th year of existence. A special edition of the annual Forum was held in June, with the presentations given by two pharmaceutical sciences PhD Students among other lectures. More than one hundred people attended this event.

All our doctoral students (as well as all doctoral students affiliated to the PSLS) must follow and validate an awareness-raising module on ethics in scientific research, which is a prerequisite for the validation of their thesis credits. The module chosen is the "Research Integrity Training (EPIGEUM)", but equivalences are accepted for other courses, in particular our "Ethics in research" module, including the e-learning modules TRREE (TRAINING AND RESOURCES IN RESEARCH ETHICS EVALUATION). Nine PhD students chose this alternative in 2023, thus taking the opportunity to study even deeper this essential topic.

The rule of a minimum of 6 doctoral students enrolled for a CUSO-funded course to take place (valid as from 01.01.2020) was communicated to all our external speakers, and all of them were willing to postpone their course if necessary, in order to reach this quota.

The PhD students also attended the specialized seminars ("conférences spécialisées") proposed within the PhD programme; 10 seminars were given face to face by international researchers from academia and industry, for a total of 20 teaching hours. A total of 175 participants attended these lectures including 65 PhD students.

The Doctoral Program Commission should have held a meeting in December 2023, but this had unfortunately to be postponed to early 2024 for agenda issues.

Table 1

List of courses organized within the PhD Program in Pharmaceutical Sciences 2023 and number of participants

Name of course 2023	Course No.	Course Organizer	Total no. of hours	Credits	No. of PhD students (total no. of attendees)
Pharmacie hospitalière et communautaire 1	19H003	P. Bonnabry	18	3	2 (36)
Pharmacie hospitalière et communautaire 2	19H012	F. Sadeghipour	18	3	2 (36)
Pharmacie hospitalière et communautaire 3	19H015	J. Beney	18	3	0
Design drugs with a computer	19H053	A. Daina, V. Zoete	16	2	7
Use of fluorescence spectroscopy in the study of drugs, protein and membrane	19H032	T. Arvinte	16	3	0
Techniques de chromatographie préparative : isolement de produits naturels et de composés synthétiques	19H037	E. Ferreira-Queiroz	20	3	8
Graduate campus: from research to publication	19H064	A. Bellier, V. Huber (A. Levi)	8	1	0
Ethics in research	19H092	Y. Kalia, D. Sprumont	12	2	9
Biotechnology development	19H070	Various speakers from NovImmune	20	3	18
Suivi thérapeutique des médicaments en pratique clinique	19H059	N. Widmer	8	1.5	8
Pharmaceutical regulatory affairs : an introduction	19H088	G. Sbihi-Bouvier, P. Humbert-Droz	20	3	7
Quality in pharmaceuticals	19H065	F.-X. Abellan, J. Boccadoro, A. Stroemberg	20	3	10
Pharmaceutical project and portfolio management	19H075	A. Poulet	6	1	11

Portfolio Management and Business Development: How a Pharma Company Builds, Maintains and Integrates Its Portfolio	19H097	L. Lauciello	6	1	9
Patenting procedures in life sciences and intellectual property	19H018	K. Houchangpour, D. Kraus, R. Flückiger	24	4	6
TOTAL	36		230 (effective)		97 PhD

Table 2

List of symposia organized within the PhD Program in Pharmaceutical Sciences 2023 and number of participants.

Name of course 2023	# Course no.	Course organizer	Total no. of hours	Credits	# No. of participants
Conférences sur sujets spécialisés		Y. Kalia	10 days (20 hrs)	1,5 for 5 conf.	65 PhD students (175 total)
36 th « extra-muros » meeting, ("Molecular Therapeutics – From the Target to the Patient: Challenges and Perspectives")	19H025	L. Scapozza, Y. Daali, Y. Kalia	4 days (24 hrs)	1 or 2	26 (37 total)
Outline - Industrial Postdoctoral Fellowships at Roche		Y. Kalia, M. Prunotto	2	N/A	(Every 2 years)

Table 3

List of networking activities organized within the PhD Program in Pharmaceutical Sciences 2023 and number of participants.

Name of course 2023	Course no.	Course organizer	Total no. of hours	Credits	No. of PhD students
5 th Forum of the PhD School of Life Sciences		PSLS	8	0.5/1	17 from ISPSO + 65 from UNIGE + 6 post-doc + 19 Profs/others
Career day *	19H007	Y. Kalia	7	1	5

*the Life Sciences career day of UNIGE, UNIL and EPFL was proposed to the PhD students.

Public research funds (CUSO)

Conférence Universitaire de Suisse Occidentale (CUSO)

The CUSO announced a 2023 budget similar to the 2022 budget (i.e., without financial support for programme coordination). The programme and the budget for 2023 were submitted to the CUSO in Sep 2022 and they were duly accepted. The total budget in 2023 for the five activities (Seminar Extra-Muros, Conférences spécialisées, Cours, Symposia as well as Networking activities) was 40'500.- CHF. Some activities were rescheduled in 2023, but due to our lecturers' agenda, often complicated by the sanitary situation, it was not possible to schedule them in 2023.

At the end, the effective costs for 2023 for all the activities were 27'625.85.- CHF.

We would like to thank all our external lecturers for their flexibility and their willingness to find solutions to keep almost all the essential courses given remotely and hope that this sanitary emergency will continue to give place to more normal days.

We also take the opportunity in this report to thank the CUSO for the past and future financial support allowing us to offer an outstanding program to the PhD students in Pharmaceutical Sciences.