ANNUAL REPORT 2022

SCHOOL OF PHARMACEUTICAL SCIENCES (ISPSO)

INTRODUCTION FROM THE PRESIDENCY

La révision du rapport annuel de l'Institut des sciences pharmaceutiques de la Suisse occidentale (ISPSO) est toujours l'occasion de faire le point sur les réalisations de l'année précédente. En 2022, la nouvelle présidence a été élue pour poursuivre les efforts visant à maintenir et à développer l'excellence de l'école en matière d'enseignement, de recherche et d'administration. Avec le recul de la pandémie et de ses effets, nous avons pu à nouveau nous engager dans l'enseignement en face à face, bien que l'inscription aux cours en ligne ait également été maintenue.

L'École a été très active dans la formation des pharmaciennes et pharmaciens qui, une fois diplômé-es, sont entré-es sur le marché du travail en quête de diplômé-es qualifié-es. En effet, en 2022, plus de la moitié des diplômé-es ayant réussi l'examen fédéral suisse sont issus de notre institution. Nos activités de recherche, en termes de nombre de projets financés par le Fonds national suisse et des organisations comparables, ont atteint un niveau record, et nos activités de diffusion des résultats de nos recherches se sont également intensifiées. Depuis l'année dernière, nos activités sont suivies par un conseil consultatif scientifique (CCS) composé d'experts internationaux. Une réunion avec le CCS en 2022 nous a non seulement donné l'occasion de nous livrer à une réflexion et à une analyse, mais elle nous a également permis de formuler des suggestions extrêmement précieuses. Celles-ci sont maintenant mises en œuvre dans notre stratégie pour l'avenir.

La présidence s'engage à fournir un environnement de travail adéquat pour permettre à tous les collaborateurs de participer aux progrès de l'ISPSO. Les membres de l'école s'engagent à apporter une contribution significative à la société en formant d'excellents diplômés et en produisant des découvertes scientifiques pour améliorer les soins de santé.

The revision of the Annual Report of the School of Pharmaceutical Sciences (ISPSO) is always the moment to revise what was achieved within the year before. In 2022 the new presidency was elected to continue the efforts to maintain and further develop the ISPSO's excellence in teaching, research, and administration. With the pandemic and its effects receding, we could again engage in face-to-face teaching, although online lecture registration was also maintained.

ISPSO was very active in the training of pharmacists, who after graduation entered the job market in need of qualified graduates. In fact, in 2022, more than half of the graduates passing the Swiss federal exam came from our institution. Our research activities in terms of number of projects funded by the Swiss National Foundation and comparable organisations was at an all-time high, and our activities with respect to dissemination of the results of our research picked up as well. As of last year, our activities are being followed by a Scientific Advisory Board (SAB) of international experts. A meeting with the SAB in 2022 did not only give us the opportunity for self-reflection and analysis, but also yielded highly valuable suggestions. These are now being implemented into our strategy going forward.

The presidency is dedicated to providing a suitable working environment to allow all collaborators to participate in the progress in the of ISPSO. The members are commited to provide meaningful contribution to society in the form of educating the excellent graduates and delivering scientific discoveries to improve health care.

Table of Contents

DIRECTION AND ADMINISTRATION

BOARD MEMBERS

Prof Jean-Luc Veuthey, President *(until 14.07.2022)*
Prof Eric Allémann, Vice President *(until 14.07.2022)*
Prof Chantal Csajka, Vice President *(until 14.07.2022)*

Prof Gerrit Borchard, President *((from 15.07.2022)*
Prof Patrycja Nowak-Sliwinska, Vice President *(from 15.07.2022)*
Prof Serge Rudaz, Vice President *(from 15.07.2022)*

ADMINISTRATION

Mrs Françoise Védy, Administrator, 100%
Mrs Danielle Coosemans, Administrative Assistant, 60%
Mrs Sylvia Passaquay Rion, Administrative Assistant, 60%

STUDENTS SECRETARIES

Mrs Elena Onate, Administrative Assistant, 90%
Mrs Elisa Masson, Secretary, 60%
Mrs Fiona Sanmartin 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, DevOps IT, 50%
Mr Loris Franco, System Administrator, 100%
Mr Yann Manet, System Administrator, 100%
Mr Xavier Melich, Helpdesk Support, 80% *(†09.06.2022)*

DOCTORAL PROGRAM

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

ABBREVIATIONS

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

RESEARCH UNITS

ANALYTICAL SCIENCES

Prof Jean-Luc VEUTHEY, PO
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 Jules DESMEULES, PO *(until 30.09.2022)*
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, PA *(until 31.05.2022),* PAS *(since 01.06.2022)*

PHARMACEUTICAL BIOCHEMISTRY / MOLECULAR THERAPEUTICS DELIVERY GROUP

Prof Leonardo SCAPOZZA, PO
Prof Yogeshvar KALIA, PAS *(until 31.01.2022)*, PO *(from 01.02.2022)*

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, PTI *(until 28.02.2022),* PAS *(since 01.03.2022)*
Dre Anne-Laure BLANC, CE
Mrs Imane IRAQI, CE
Dr Erik PAUS, CE

DATA ANAYTICS LAB

Prof Stéphane GUERRIER, PAST

SCHOOL OF PHARMACEUTICAL SCIENCES
COMMITTEE SITUATION ON JANUARY 1st, 2022

TEACHING COMMITTEE – President: Prof Muriel CUENDET

REGULATIONS AND EQUIVALENCE COMMITTEE – President: Prof Serge RUDAZ

GRADES, EXAMINATIONS AND DEROGATIONS COMMITTEE – President: Prof Jean-Luc VEUTHEY (until August 2022) - Dr Elisabeth RIVARA-MINTEN

CONTINUING EDUCATION AND PUBLIC COURSES COMMITTEE – President: Prof Gerrit BORCHARD (until August 2022) - 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: Prof Carole BOURQUIN (until August 2022) - Mrs Françoise VÉDY

IT COMMITTEE – President: Prof Francesco Luigi GERVASIO

SECURITY AND PREMISES COMMITTEE – President: Prof Jean-Luc VEUTHEY

SCIENTIFIC COMMITTEE – Presidents: Prof Francesco Luigi GERVASIO and Prof Leonardo SCAPOZZA (until August 2022) – Prof Francesco Luigi GERVASIO

GLOBAL PHARMACY COMMITTEE – President: Prof Pascal BONNABRY

SHARED INSTRUMENTATION COMMITTEE – President: Prof Eric ALLÉMANN

PRACTICAL WORK COMMITTEE – President: Dr Florence DELIE (until August 2022) - Dr Emerson FERREIRA QUEIROZ

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

VISIBILITY AND COMMUNICATION COMMITTEE – Prof Gerrit BORCHARD and Prof Patrycja NOWAK-SLIWINSKA (until August 2022) – Prof Patrycja NOWAK-SLIWINSKA

VOLUNTEER TEACHERS GROUP – Prof. Patrycja NOWAK-SLIWINSKA

CMU LIBRARY INSTANCE – Responsible: Prof Serge RUDAZ

GROUPE EXAMENS FEDERAUX – Responsible: Prof Chantal CSAJKA

Commenté [FV1]: A traduire: volunteer teachers?

Commenté [LP2R1]: Ok traduit

Commenté [GB3R1]: No, better: Honorary professor

STAFF

PROFESSORS

Eric ALLÉMANN, 100%
Tudor ARVINTE, 10%
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%
Jules DESMEULES, 20 % (paid by Faculty of Medicine) *(until 30.09.2022)*
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)
Leonardo SCAPOZZA, 100%
Marie-Paule SCHNEIDER, 50% *(until 28.02.2022)* (+Pharma24), 75% *(since 01.03.2022)* (+Pharma24)
Jean-Luc VEUTHEY, 100%
Jean-Luc WOLFENDER, 100%
Frédéric ZENHAUSERN, 20% (non-salaried)

SENIOR LECTURERS

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

INVITED PROFESSORS AND RESEARCHERS

Leslie GUNATILAKA *(01.10-31.10.2022)*
Isa KUPKE-LAMBRECHTS *(01.08-30.09.2022)*
Anaïs PANNEQUIN *(01.01-31.12.2022)*
Gilmar THIM *(01.11.2021-31.01.2022)*

LECTURERS

Jérôme BERGER, 20% (+Unisanté)
Martin BERNHARDT, 20%
Julien BOCCARD, 100%
Noura BAWAB, 20%
Anne-Laure BLANC, 20%
Christel BRUGGMANN, 10%
Chin Bin EAP, 10% (+UNIL)
Pascal FURRER, 100%
Imane IRAQI, 40%
Erik PAUS, 40%
Karl PERRON, 40% (+60% BIVEG)
Nancy PERROTTET RIES, 10%
Christian KOLLER, 5%
Elisabeth RIVARA-MINTEN, 40%
Philippe LAURENT, 12.5%

PRIVAT DOCENTS

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

SENIOR RESEARCH ASSOCIATES

Sylvian CRETTON, 100% *(until 31.07.2022)*
Olivier DORCHIES, 100%
Victor GONZALEZ RUIZ, 100%
Thomas GURRY, 50 %
Beatrice KAUFMANN, 60 % (+15% Faculty)
Maria LAPTEVA, 80%
Laurence NEFF, 70% *(since 01.05.2022)*
Louis-Félix NOTHIAS, 100% *(since 01.07.2022)*
Sébastien TARDY, 100%
Gaëlle VACHER, 80%
Magali ZEISSER-LABOUEBE, 80%

SENIOR RESEARCH AND TEACHING ASSISTANTS

Valentina D'ATRI, 100%
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Isabel MEISTER, 90%
David PEJOSKI, 100%
Aurélien POMMIER, 100%, 90% *(since 01.11.2022)*
Viola PUDDINU, 100%
Valério RIZZI, 85% *(since 01.09.2022)*
Elena TOBOLKINA, 100%
Julie VERIEPE, 100% *(since 01.08.2022)*

POSTDOCTORAL SCHOLARS

Aya AHMED SEBAK, 85% *(since 01.04.2022)*
Simone AURELI, 85% *(since 01.03.2022)*
Margot BOUJUT, 100%
Thomas BOUVAREL, 100%
Theo BRILLATZ, 80% *(since 01.07.2022)*
Joël BRUNNER, 80% *(01.06-31.07.2022)*
Evelina CARDOSO, 40%
Aditya DARADE, 100% *(since 01.11.2022)*
Miguel DE FIGUEIREDO, 100%
Riccardo DEIDDA, 100%
Isabel FERNANDEZ COIRA, 100%
Thorben FROHLKING, 85% *(since 01.10.2022)*
Ioannis GALDADAS, 85%
Dorothea GOBBO, 50%
Si GOU, 85%, 90% *(since 01.04.2022)*
Dina HANY
Ladislav HOVAN, 85%
Sébastien JENNI, 90%
Nasreddine KANFAR, 100%
Rémy MARCELLIN-GROS, 85%
Franck MARQUET, 100% *(since 01.05.2022)*
Solène MASLOH, 100% *(since 01.07.2022)*
Hugo MORIN, 80% *(since 01.06.2022)*
Marija PETROVIC, 80% *(since 01.10.2022)*
Emanuel PINTO DE SOUSA, 100% *(since 01.12.2022)*
Carlos RODRIGUEZ NOGALEZ, 100%
Laurence SCHUMACHER, 100%
Sandrine VON GRUNIGEN, 85% *(since 01.08.2022)*

RESEARCH AND TEACHING ASSISTANTS

Kenza ABOUIR
Joanna ACHKHANIAN
Souad ADRIOUACH
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
Joël BRUNNER
Benjamin BUGNON
Carlotta CECCHINI
Aude COUMAU
Claire COUMAU
Meryem DALOUADI
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Filippo DONATI
Eloïse DUCREY
Bastiaan DUIVELSHOF
Eloïse DUPUYCHAFFRAY
Lamyae EL MORABIT
Radhia EL PHIL
Mathilde ESCAITH
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Sabrina FERRE
Angelica FERRO
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Laure GARNIER
Frédéric GASPAR
Arnaud GAUDRY
Emre GEZER
Sergey GIREL
Paula GONZALEZ FERNANDEZ
Laura Gisela GONZALEZ IGLESIAS
Ghali GUEDIRA
Paola HAEMMERLI
Anton HANKE
Dina HANY
Emilie HAUSMANN
Margaux HERITIER
Sébastien HEVIN
Robin HUBER
Laura IACOBUCCI
Bilal JABER

Mégane JERMINI
Maurice KARRENBROCK
Rami KHALIL
Martin KIENING
Olivier Auguste KIRCHHOFFER
Nassima KOLIAI
Marko KRSTIC
Honorine LARDEUX
Camille LENOIR
Ferdinand LE BLOC'H
Oliwia MAJCHRZAK
Gaëlle MAGLIOCCO
Julianne MAURIN
Tamara MELNIK
Stéphanie MENA
Valentin MIEVILLE
Luca MORICI
Hugo MORIN
Amarande MURISIER
Ivan PANCHENKO
Sara PANNILUNGHI
Allegra PELETTA
Léonie PELLISSIER
Yuan James PETERMANN
Marija PETROVIC
Laeticia PINTO
Hélène POINOT
Alexandre PORCELLO
Luis QUIROS GUERRERO
Mandimbinomena Adèle RAKOTONIRINA
Alcidia RAMOS BARROS
George RAMZY
Noémie RATSIMALAHELO
Rafael RINCON
Benjamin ROSSIER
Adriano RUTZ
Ece SAHI ILHAN
Phedra Firdaws SAHRAOUI
Suzanne Sherihan SAHRAOUI
Sara SANSALONI PASTOR
Cindy SCHELKER
Ozlem SEVIK
Christian SKALAFOURIS
Joanna SOBOCINSKA
Weronika SPALENIAK
Sofia SPATARO
Camille STAMPFLI
Oriane STRASSEL
Camille SUESS
Erga SYAFITRI
Jérémie TACHET
Betul TASKOPARAN
Laetitia TERNON
Maxime TUFEU
Gioele VISCONTI
Rudolf VON ROHR
Tatjana VUJIC
Leqi WANG
Xiaoxiao WANG

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

Martijn BEMELMANS
Mirko BONELLI
Angélique BOURQUI
Maëlis BRITO
Anne CAYRON
Perrine COURLET (C. Csajka ISPSO / L. Décosterd UNIL)
Rys EVANS
Sreemanjari KANDHASAMY
Ewa KOWOLIK
Dominykas LUKAUSKIS
Solène MASLOH (Artois University (France) / Geneva University)
Maria QUILES DEL REY
Rakesh RAMJIAWAN
Anne RAVIX

RESEARCH ASSISTANTS (ARE)

Camelia BAKHTYARI
Raphael BAUDIN
Ilona BEATRIX
Amanda Marisol BURETTI
Samuel CHAVES GONCALVES
Antoine HOSTETTLER
Celestin JACOT-DESCOMBES

Marc JAMAIN
Alexandra MARCLAY
Catia MONTEIRO
Valeria Katherine MOSTO GRUBER
Narmine REMIZA
Pierre REPITON
Emma THOMASSON

INTERNSHIP STUDENTS / VISITING SCHOLARS

Luca BALTAZAR CALAPEZ *(01.08-20.09.2022)*
Jiri BEJCEK *(15.08-09.09.2022)*
Nathareen CHAIWANGRACH *(22.08.2022-31.03.2023)*
Kelyan CSAJKA *(03.01-12.01.2022)*
Agathe COEUR *(07.06-19.08.2022)*
Gigly DEL'HAYE *(07.07-26.08.2022)*
Ludivine DE NARDIN *(03.01-10.06.2022)*
Nurbanu DEMIRTÜRK *(01.11.2022-30.04.2023)*
Lorenza DESTRO *(01.10.2022-31.03.2023)*
Gian Marco ELISA *(01.04-30.06.2022)*
Clément FONTAO *(16.05-01.07.2022)*
Izadora FURLANI *(01.03.2022-28.02.2023)*
Martina GHEZZI *(16.05-17.11.2022)*
Maxime GUIBERT (*10.01-10.07.2022)*
Justyna GORSKA *(25.04-25.06.2022)*
Aya HALMI *(18.07-18.08.2022)*
Julia JACYNA *(17.10-16.12.2022)*
Nefise KILIC *(10.01-18.02.2022)*
Alexandre Le LOARER *(05.09-30.09.2022)*
Zsofia NEMETH *(13.06-19.08.2022)*
Lucie NOVAKOVA *(11.07-31.08.2022)*

ADMINISTRATIVE STAFF

Nathalie CHIAVAROLI, 50%
Danielle COOSEMANS, 60%
Marilyn FREIRE BARJA ZLASSI, 80%
Nathalie GOFFIN, 80% *(until 31.03.2022)*
Elisa MASSON, 60%
Annabelle MONOD, 50% *(since 01.05.2022)*
Elena ONATE, 90%
Sylvia PASSAQUAY-RION, 60%
Miroslava REBETEZ-GRALEWICZ, 80%
Fiona SANMARTIN GONZALEZ, Secretary, 90%
Natalie SCHREGLE, 80%
Françoise VÉDY, 100%
Florence VON OW, 90% (25% progdoc + 70% Research unit secretary +5% secretary CAS)
Anne-Françoise WITTA, 50%

IT STAFF

Christophe FRANCEY, 50%
Loris FRANCO, 100%
Yann MANET, 100%
Xavier MELICH, 80% *(†09.06.2022)*

TECHNICAL STAFF

Montserrat ALVAREZ, 100%
Frédéric BORLAT, 100%
Nathalie BOULENS, 60%
Carole DUPRAZ, 35%
Christophe FRANCEY, 100% (incl. 50% DevOps IT)
Sarah GARDI, 100%
Aurélie GOUILLER, 90%
Tayeb JBILOU, 80%
Justine LANGHAM, 100% *(since 01.04.2022)*
Laurence MARCOURT, 100%
Aristea MASSARAS, 100%
Xavier MELICH, 100% (incl. 80% IT Helpdesk support) *(†09.06.2022)*
Jessica ORTELLI, 90%
Marco PERDIGAO, 100%
Olivier PETERMANN, 80%
Barbara PINHEIRO, 40% *(until 28.02.2022)*
Colette SAUTY, 25%
Cédric SCHELLING, 100%
Isis SENONER, 65% *(since 01.0302022)*, 40% *(since 01.10.2022)*
Emmanuelle SUBLET, 70%, 80% *(01.10.2022-31.12.2022)*

BUDGET

SALARY AND OPERATIONAL BUDGETS (CHF)	2022	2021	2020	2019	2018
Staff salary (incl. social charges)	12 269 103	12 252 781	12 054 874	11 851 759	11 969 356
Operational budget	1 184 052	1 168 166	1 149 166	1 143 666	1 133 916
Total	**13 453 155**	**13 420 947**	**13 204 040**	**12 995 425**	**13 103 272**

INVESTMENT BUDGET (CHF)	2022	2021	2020	2019	2018
Faculty investment	308 134	292 653	287 577	246 855	248 218
Section investment	290 979	290 979	290 979	290 979	290 979
Total	**599 113**	**583 632**	**578 556**	**537 834**	**539 197**

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

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

EXTERNAL FUNDS (CHF)	2018
Total	**4 391 261**

TOTAL BUDGET (CHF)	2022	2021	2020	2019 (*)	2018
Total	**22 269 654**	**21 828 853**	**21 397 261**	**20 229 027**	**18 033 730**

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

BUDGET 2022	FTE
Scientific personnel	2.60
Technicians	2.00
Laboratory and Technical Assistants	11.70
Technical and Lab Aides	0.60
Total technical personnel	***16.90***
Administration heads, Departments heads, Adm Clercks	2.00
Secretaries, Accountants, Library help	7.52
Tottal administrative personnel	***9.52***
TOTAL Technical and Administrative personnel ('PAT')	***26.42***
Full Professors	9.00
Associate Professors	2.84
Adjunct Professors	0.55
Subtotal Faculty	**12.39**
Lecturers, Academic Advisors (‘Chargés d’Ens., Cons. Etudes’)	4.40
Senior Lecturers (‘MER, Chefs de Clinique scient.’)	4.49
Senior Lecturers (‘Chargés de cours’)	0.81
(Senior) Research Associates (‘Collab. Scientifiques I et II’)	2.30
Subtotal Intermediate corps	**12.00**
Total Faculty	***24.39***
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’)	***65.41***

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

STAFF SCHOOL OF PHARMACEUTICAL SCIENCES	2022	2021	2020	2019	2018
Total	217	239	249	254	242

2022 AT A GLANCE

2022 TOTAL BUDGET (CHF)	22 269 654

TOTAL STUDENTS	2022	2021	2020	2019	2018
Bachelor Unige (Genève)	344	367	337	352	339
Bachelor Unil (Lausanne)	78	66	58	67	63
Bachelor Unine (Neuchâtel)	36	39	32	19	23
Master	155	209	182	170	152
Master in biomedical sciences (*)	27	28	13	--	--
Master of advanced studies	20	24	24	20	20
Total	**660**	**733**	**646**	**628**	**597**

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

TOTAL Ph.D STUDENTS AND POSTDOCTORAL FELLOWS	2022	2021	2020	2019	2018
Ph.D. students	117	102	113	111	100
Postdoctoral fellows	28	18	20	23	26
MA	9	9	9	7	8
Total	**154**	**129**	**142**	**141**	**134**

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

2022 KEY EVENTS

In 2022, 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. ISPSO has established a scientific advisory board (SAB) of experts of international reputation. In a first meeting, the SAB adviced us on the quality and focus of our research activities, underlining the need to establish "centers of excellence" by strengthening existing areas rather than dispensing activities (too) broadly. It was further regarded to be important for ISPSO's further development to recruit junior staff, also from internal personnel, to renew the faculty in the coming years which will see the retirement of several principal investigators (PIs). Regarding teaching, the SAB views the current situation of a high load of teaching hours to still increasing student numbers to be unsustainable. Increasing teaching efficiency by introduction of advanced teaching methods (e.g., flipped classroom) as well as the implication of volunteer faculty practitioners should therefore be considered to ease the teaching overload of the faculty members.

In view of ISPSO's development, the workload has increased considerably in recent years. The current situation is characterized by a high absenteeism rate, health risks for employees and a tense working environment. In the light of the above context, an operational analysis was envisaged with the aim of identifying any needs or difficulties within ISPSO. This step was taken in response to a request from the former presidency of the School and the Human Resources Department of the University of Geneva. To ensure greater objectivity, the mandate for this study was entrusted to an external organization, Vicario Consulting SA, Geneva. Results of the analysis will be presented to all collaborators of the School during 2023. It will be the task of the current presidency to translate outcomes from the study into measures to improve the overall situation for the members of the School.

In addition, several projects were engaged in to enhance the embedding of ISPSO in national and international networks. Among these are the preparation of a network in Digital Pharmacy with the University of Lausanne's Center of Research and Innovation in Pharmaceutical Sciences (CRISP) and the campus Energypolis in the canton of Valais. It also includes our activities in ULLA, a consortium of 10 European Schools of Pharmaceutical Sciences of excellence and the International Conference of Deans of French-speaking Faculties of Pharmacy (Cidpharmef).

In 2022, the School also had the privilege to suggest the candidate for an honorary doctorate for the Faculty of Sciences. Our choice fell on Prof. Katalyn Karikó for her contributions to the use of mRNA technology for the development of Sars-CoV-2 vaccines. The honorary doctorate was presented to Prof. Karikó during the *dies academicus* of the University of Geneva. We are looking forward to engaging in scientific interaction with "our" honorary faculty member in the future.

ANALYTICAL SCIENCES

Professor Serge RUDAZ
Professor Jean-Luc VEUTHEY
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. 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

2022 at a glance

- Publications with impact factor: 29
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 2
- Congresses / conferences organisation: 1
- Posters presentations: 8
- Oral presentations: 35
- Invited oral presentations: 17

- Number of projects at FNRS and assimilated (Research funds): 11
- Service agreements and related activities: 1
- Ph.D. Theses presented in 2022: 2
- Awards and distinctions: 5
- Public outreach activities: 1

Research funds

Confidential Project
Industry
Development of innovative analytical strategies for therapeutic peptides, oligonucleotides and radionuclide conjugates
Main applicant: Davy Guillarme
Total funding of the project: EUR 180'000.- (CHF 195'840.-)
Total duration of the project: 3 years
Allocation 2022: EUR 30'000.- (CHF 29'076.-)
Starting date: 01.08.2021

Confidential Project
Industry
Analytical characterization of bispecific and trispecific antibodies
Main applicant: Davy Guillarme
Total funding of the project: CHF 92'538.-
Total duration of the project: 3 years
Allocation 2022: CHF 0.-
Starting date: 01.10.2021

Genentech
Industry
Development of innovative methods for functional testing of mAbs based on the use of affinity chromatography columns
Main applicant: Davy Guillarme
Total funding of the project: USD 20'000.- (CHF 19'458.-)
Total duration of the project: 1 years
Allocation 2022: USD 10'000.- (CHF10'158.-)
Starting date: 01.08.2021

Merck Sharp & Dohme Corp.
Industry
Exacting modifier additive and decompression cooling effects in analytical and preparative SFC using infrared thermal imaging and other techniques
Main applicant: Davy Guillarme
Total funding of the project: USD 50'000.- (CHF 47'970.-)
Total duration of the project: 2 years
Allocation 2022: USD 25'000.- (CHF 23'297,50.-)
Starting date: 01.06.2020

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 2022: CHF 201'160.-
Starting date: 01.02.2022

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: CHF 17'000.-
Total duration of the project: 2 years
Allocation 2022: CHF 0.-
Starting date: 01.10.2020

Confidential Project
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: EUR 165'470.- (CHF 183'110.-)
Total duration of the project: 2 years
Allocation 2022: CHF 0.-
Starting date: 01.05.2021

Confidential Project
Industry
Development of innovative liquid chromatography methods for the characterization of gene therapy products
Main applicant: Davy Guillarme
Total funding of the project: EUR 183'810.- (CHF 204'120.-)
Total duration of the project: 2 years
Allocation 2022: EUR 91'904.- (CHF 91'970.-)
Starting date: 01.05.2021

OMICS4TOOL
Institutional
Main applicants: Serge Rudaz, Julien Boccard
Total funding of the project: EUR 16'640.- (CHF 16'896.-)
Total duration of the project: 4 years
Allocation 2022: EUR 11'648.- (CHF 11'623.-)
Starting date: 01.06.2022

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: 2 years
Allocation 2022: CHF 210'000.-
Starting date: 01.01.2021

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 2022: CHF 100'000.-
Starting date: 01.04.2021

Total amount for all research funds for 2022: CHF 677'284.50.-

Service agreements and related activities

Waters-Fekete
Industry
Main applicant: Jean-Luc Veuthey
Total funding of the project: CHF 24'750.-
Total duration of the project: 3 years
Allocation 2022: CHF 12'375.-
Starting date: 01.04.2021

Total amount (for all service agreements and related activities) for 2022: CHF 12'375.-.

Scientific publications (with impact factor)

Aebischer, M. K.; Gizardin-Fredon, H.; Lardeux, H.; Kochardt, D.; Elger, C.; Haindl, M.; Ruppert, R.; Guillarme, D.; D'Atri, V. Anion-Exchange Chromatography at the Service of Gene Therapy: Baseline Separation of Full/Empty Adeno-Associated Virus Capsids by Screening of Conditions and Step Gradient Elution Mode. Int J Mol Sci 2022, 23 (20), 12332. *5.92*

Ahmad, I. A. H.; Losacco, G. L.; Shchurik, V.; Wang, X.; Cohen, R. D.; Herron, A. N.; Aiken, S.; Fiorito, D.; Wang, H.; Reibarkh, M.; et al. Trapping-Enrichment Multi-dimensional Liquid Chromatography with On-Line Deuterated Solvent Exchange for Streamlined Structure Elucidation at the Microgram Scale. Angew Chem Int Ed Engl 2022, 61 (21), e202117655. *14.94*

Barrientos, R. C.; Losacco, G. L.; Azizi, M.; Wang, H.; Nguyen, A. N.; Shchurik, V.; Singh, A.; Richardson, D.; Mangion, I.; Guillarme, D.; et al. Automated Hydrophobic Interaction Chromatography Screening Combined with In Silico Optimization as a Framework for Non denaturing Analysis and Purification of Biopharmaceuticals. Anal Chem 2022, 94 (49), 17131-17141. *8.00*

Bouvarel, T.; Duivelshof, B. L.; Camperi, J.; Schlothauer, T.; Knaupp, A.; Stella, C.; Guillarme, D. Extending the performance of FcRn and FcgammaRIIIa affinity liquid chromatography for protein biopharmaceuticals. J Chromatogr A 2022, 1682, 463518. *4.60*

Deidda, R.; Losacco, G. L.; Schelling, C.; Regalado, E. L.; Veuthey, J. L.; Guillarme, D. Sub/supercritical fluid chromatography versus liquid chromatography for peptide analysis. J Chromatogr A 2022, 1676, 463282. *4.60*

Duivelshof, B.; Zoldhegyi, A.; Guillarme, D.; Lauber, M.; Fekete, S. Expediting the chromatographic analysis of COVID-19 antibody therapeutics with ultra-short columns, retention modeling and automated method development. J Pharm Biomed Anal 2022, 221, 115039. *3.57*

Duivelshof, B. L.; Beck, A.; Guillarme, D.; D'Atri, V. Bispecific antibody characterization by a combination of intact and site-specific/chain-specific LC/MS techniques. Talanta 2022, 236, 122836. *6.55*

Dumas, T.; Courant, F.; Almunia, C.; Boccard, J.; Rosain, D.; Duporte, G.; Armengaud, J.; Fenet, H.; Gomez, E. An integrated metabolomics and proteogenomics approach reveals molecular alterations following carbamazepine exposure in the male mussel Mytilus galloprovincialis. Chemosphere 2022, 286 (Pt 2), 131793. *8.94*

Ferre, S.; Boccard, J.; Rudaz, S.; Gonzalez-Ruiz, V. Evaluation of Prototype CE-MS Interfaces. Methods Mol Biol 2022, 2531, 1-13. *1.37*

Ferre, S.; Gonzalez-Ruiz, V.; Zangari, J.; Girel, S.; Martinou, J. C.; Sardella, R.; Rudaz, S. Separation and determination of cysteine enantiomers in plasma after derivatization with 4-fluoro-7-nitrobenzofurazan. J Pharm Biomed Anal 2022, 209, 114539. *3.57*

Figueiredo M.; Giannoukos S.; Rudaz S.; Zenobi R.; Boccard J. Efficiently handling high-dimensional data from multifactorial designs with unequal group sizes using Rebalanced ASCA (RASCA). J Chemom 2022, **e3401**, 1-15. *2.46*

Fleury-Souverain S.; Maurin J.; Guillarme D.; Rudaz S.; Bonnabry P. Development and application of a liquid chromatography coupled to mass spectrometry method for the simultaneous determination of 23 antineoplastic drugs at trace levels. J Pharm Biomed Anal 2022, 221, 115034. *3.57*

Gonzalez-Ruiz V.; Cores A.; Caja M.; Sridharan V.; Villacampa M.; Martin A.; Olives I.; Menendez J. Fluorescence Sensors Based on Hydroxycarbazole for the Determination of Neurodegeneration-Related Halide Anions. Biosensors, 2022, 12 (3),175. *5.42*

Harris A. F.; Lacombe J.; Sanchez-Ballester N. M.; Victor S.; Curran K. A. J.; Nordquist A. R.; Thomas B.; Gu J.; Veuthey J. L.; Soulairol I.; et al. Decellularized Spinach Biomaterials Support Physiologically Relevant Mechanical Cyclic Strain and Prompt a Stretch-Induced Cellular Response. ACS Appl Bio Mater 2022, 5 (12), 5682-5692. *3.25*

Lardeux H.; Goyon A.; Zhang K.; Nguyen J. M.; Lauber M. A.; Guillarme D.; D'Atri, V. The impact of low adsorption surfaces for the analysis of DNA and RNA oligonucleotides. J Chromatogr A 2022, 1677, 463324. *4.60*

Lathuiliere A.; Vernet R.; Charrier E.; Urwyler M.; Von Rohr O.; Belkouch M. C.; Saingier V.; Bouvarel T.; Guillarme D.; Engel A. et al. Immortalized human myoblast cell lines for the delivery of therapeutic proteins using encapsulated cell technology. Mol Ther Methods Clin Dev 2022, 26, 441-458. *5.84*

Manna A. C.; Leo S.; Girel S.; Gonzalez-Ruiz V.; Rudaz S.; Francois P.; Cheung A. L. Teg58, a small regulatory RNA, is involved in regulating arginine biosynthesis and biofilm formation in Staphylococcus aureus. Sci Rep, 12 (1), 14963. *4.99*

Marquet F.; D'Atri V.; Guillarme D.; Borchard G. A New Practice to Monitor the Fabrication Process of Fab-Targeting Ligands from Bevacizumab by LC-MS: Preparation and Analytical Characterization. Sci Pharm 2022, 90 (1), 5. *3.42*

Moskaleva N. E.; Shestakova K. M.; Kukharenko A. V.; Markin P. A.; Kozhevnikova M. V.; Korobkova E. O.; Brito A.; Baskhanova S. N.; Mesonzhnik N. V.; Belenkov Y. N. et al. Target Metabolome Profiling-Based Machine Learning as a Diagnostic Approach for Cardiovascular Diseases in Adults. Metabolites 2022, 12 (12), 1185. *4.75*

Murisier A.; Andrie M.; Fekete S.; Lauber M.; D'Atri V.; Iwan K.; Guillarme D. Direct coupling of size exclusion chromatography and mass spectrometry for the characterization of complex monoclonal antibody products. J Sep Sci 2022, 45 (12), 1997-2007. *3.64*

Murisier A.; D'Atri V.; Pirner S.; Larraillet V.; Fekete S.; Lauber M.; Guillarme D. Ultra-Fast Middle-Up Reversed Phase Liquid Chromatography Analysis of Complex Bispecific Antibodies Obtained in Less Than One Minute. Pharmaceutics 2022, 14 (11), 2315. *6.07*

Murisier A.; D'Atri V.; Larraillet V.; Pirner S.; Guillarme D. Boosting the Liquid Chromatography Separation of Complex Bispecific Antibody Products by Using the Multi-Isocratic Elution Mode. Separations 2022, 9 (9), 243. *3.34*

Nupur N.; Joshi S.; Guillarme D.; Rathore A. S. Analytical Similarity Assessment of Biosimilars: Global Regulatory Landscape, Recent Studies and Major Advancements in Orthogonal Platforms. Front Bioeng Biotechnol 2022, 10, 832059. *6.06*

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. Mol Neurobiol 2023, 60 (1), 84-97. *5.59*

Plachka K.; Gazarkova T.; Skop J.; Guillarme D.; Svec F.; Novakova L. Fast Optimization of Supercritical Fluid Chromatography-Mass Spectrometry Interfacing Using Prediction Equations. Anal Chem 2022, 94 (11), 4841-4849. *8.00*

Roussel J. M.; Schelling C.; Righezza M.; Veuthey J. L. Application of prediction intervals to the interpretation of the robustness study of a UHPLC method for the separation of cannabinoids. J Pharm Biomed Anal 2022, 220, 114977. *3.57*

Rudaz S.; Tobolkina E.; González-Ruiz V.C.; Meister I.; De Figueiredo M.; Guillarme D.; Boccard J. Challenges in ESI-MS-based Untargeted Metabolomics. Chimia 2022, 76 (1-2), 90-100. *1.65*

Visconti G.; Olesti E.; Gonzalez-Ruiz V.; Glauser G.; Tonoli D.; Lescuyer P.; Vuilleumier N.; Rudaz S. Internal calibration as an emerging approach for endogenous analyte quantification: Application to steroids. Talanta 2022, 240, 123149. *6.55*

Vujic T.; Schvartz D.; Furlani I. L.; Meister I.; Gonzalez-Ruiz V.; Rudaz S.; Sanchez J.C. Oxidative Stress and Extracellular Matrix Remodeling Are Signature Pathways of Extracellular Vesicles Released upon Morphine Exposure on Human Brain Microvascular Endothelial Cells. Cells 2022, 11 (23), 3926. *7.66*

Books or books chapters

Losacco G.L.; Dispas A.; Veuthey J.-L.; Guillarme D. [in] Application space for SFC in pharmaceutical drug discovery and development, [in] Practical Application of Supercritical Fluid Chromatography for Pharmaceutical Research and Development, M. Hicks, P. Ferguson (eds), Separation Science and Technology, Academic Press, 2022, 29-47.

Ferré S.; Boccard J.; Rudaz S.; González-Ruiz V. Evaluation of prototype CE-MS interfaces in Capillary Electrophoresis-Mass Spectrometry, [in] Capillary Electrophoresis-Mass Spectrometry: Methods and Protocols. Christian Neusüß and Kevin Jooß (eds.), Springer, 2022, 1-13.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1
- Posters presentations: 8
- Oral presentations: 35
- Invited oral presentations: 17

Ph.D. Theses presented in 2022

Amarande Murisier
Development of liquid chromatographic techniques and their possible hyphenation to mass spectrometry for therapeutic protein characterization
Jean-Luc Veuthey and Davy Guillarme

Tatjana Vujic
Xenobiotics-induced toxicity on human brain microvascular endothelial cells and their associated extracellular vesicles
Serge Rudaz and Jean-Charles Sanchez

Awards and distinction

Girel, S., **2022 Best Poster Award in Metabolomics**, "Advantages of absorption mode FT with full window apodization for Orbitrap-based metabolomic analysis", K. Nagornov A. Kozhinov, Y. Tsybin, S. Rudaz, 38th International Symposium on Microscale Separations and Bioanalysis (MSB 2022), Mons (Belgium), July 3-6 2022.

Guillarme, D., **Recipient of the international award of the Belgium society of pharmaceutical sciences**. Congrès DA-PBA, Mons (Belgium),11-14 September 2022.

Lardeux, H. **Prix Noelting 2021**, qui distingue tous les ans un élève pour son parcours remarquable au sein de l'Ecole Nationale Supérieure de Chimie de Mulhouse. Décerné par l'Amicale Chimie Mulhouse, Mulhouse, September 2022.

Rudaz S., **AFSEP Senior Scientific Price for his achievements and involvement in the separative sciences community**, Association francophone des sciences séparatives (AFSEP), Analytics, Nantes (France), September 2022.

Visconti, G., **Best Oral Presentation for Young Scientist,** "A novel internal calibration approach for LC-MS/MS-based monitoring of chronic kidney disease related metabolite concentrations", P. Lescuyer, N. Vuilleumier, B. Ponte, S. Rudaz, 12th DA & 32nd PBA, Mons (Belgium), 11-14 September 2022.

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

D'Atri, V.; **Rising Stars of Separation Science**: Valentina D'Atri. Magazine interview for The Column, May 2022. The Column, 2022, 18, 17–22.
https://www.chromatographyonline.com/view/rising-stars-of-separation-science-valentina-d-atri

BIOMOLECULAR AND PHARMACEUTICAL MODELLING

Professor Francesco Luigi GERVASIO

General description of the Unit

The Biomolecular & Pharmaceutical Modelling Group (FAMOB), led by Prof. Francesco Luigi Gervasio, focuses on the development of methods for biomolecular simulations and drug discovery with emphasis on enhanced sampling simulation methods and free energy calculations. The group crucially contributed to the development of methods for overcoming the timescale problem (metadynamics, parallel-tempering metadynamics, path collective variables) 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 (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, allosteric 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 several allosteric inhibitors some of which are now in pre-clinical development as anticancer drugs. The group has a fruitful line of experimental research (NMR, SPR, mutagenesis) to validate the computational predictions, as well as a number of successful collaborations with pharmaceutical companies (such as UCB, J&J and AstraZeneca).

Specific research fields

- Modelling the regulation of therapeutic proteins by allosteric mechanisms and post-translational
- modification.
- Prediction of binding thermodynamics and kinetics and its optimization to increase the efficacy and decrease the toxicity of drugs.
- Understanding cryptic binding sites and predicting their location on pharmaceutical targets.
- Computing accurate absolute ligand binding free energies.
- Multi-scale simulation approach to engineer nanocarriers.
- Understanding the activation mechanisms of drug targets such as kinases and GPCRs.
- Combining experiments and simulations to model the dynamics of biomacromolecules.
- Quantifying the effects of genetic mutations on protein structure and function.

2022 at a glance

- Publications with impact factor: 4
- Publications without impact factor: 3
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 2
- Posters presentations: 7
- Oral presentations: 2
- Invited oral presentations: 7
- Number of projects at FNRS and assimilated (Research funds): 5
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 1
- Awards and distinctions: 3
- Public outreach activities: 5

Research funds

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 2022: CHF 206'404.-
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 2022: CHF 100'056.-
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 2022: 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 2022: CHF 45'000.-
Starting date: 01.10.2022

CSCS Swiss National Supercomputing Centre Production Project
Understanding the mechanisms of activation of class A G-protein-coupled receptors by ligands with different efficacy profiles (s1107)
Main applicant: Prof. Francesco Luigi Gervasio
Total funding of the project: CHF 150'000.- (375'000 node hours)
Total duration of the project: 1 year
Allocation 2022: CHF 112'500.-
Starting date: 01.10.2021

Total amount for all research funds for 2022: CHF 510'960.-

Scientific publications (with impact factor)

Haldar, S.; Zhang, Y.; Xia, Y.; Islam, B.; Liu, S.; Gervasio F.L.; Mulholland, Z.J.; Waller Z.A.E.; Wei, D.; Haider, S.
Mechanistic Insights into the Ligand-Induced Unfolding of an RNA G-Quadruplex
J. Am. Chem. Soc**.** 144, 935–950, 2022, doi:10.1021/jacs.1c11248 *15.41*

Borsatto, A.; Akkad, O.; Galdadas, I.; Ma, S.; Damfo, S.; Haider, S.; Kozielski, F.; Estarellas, C.; Gervasio, F.L.;
Revealing druggable cryptic pockets in the Nsp-1 of SARS-CoV-2 and other β-coronaviruses by simulations and crystallography eLife, 11 2022, doi:10.7554/eLife.81167 *8.14*

Di Gaetano, S; Pirone, L.; Galdadas, I.; Traboni, S.; Iadonisi, A.; Pedone, E.; Saviano, M.; Gervasio, F.L.; Capasso, D.;
Design, Synthesis, and Anticancer Activity of a Selenium-Containing Galectin-3 and Galectin-9N Inhibitor IJMS, 23, 2581, 2022, doi:10.3390/ijms23052581 *6.62*

Lukauskis, D.; Samways, M.; Aureli, S.; Cossins, B.; Taylor, R.; Gervasio, F.L.;
Open Binding Pose Metadynamics: an effective approach for the ranking of protein-ligand binding poses J Chem Inf Mod, 62, 6209–6216, 2022, doi:/10.1021/acs.jcim.2c01142 *6.16*

Scientific publications (without impact factor)

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 reveals a closed sieve-like molecular gate bioRxiv, 03, 26.485947, 2022, doi:10.1101/2022.03.26.485947

Radoux-Mergault, A.; Oberhauser, L.; Aureli, S.; Gervasio, F.L.; Stoeber, M.;
Subcellular location defines GPCR signal transduction bioRxiv,12, 2022,
doi: 10.1101/2022.12.12.520050

Juyoux, P.; Galdadas, I.; Gobbo, D.; Tully, M.; Gervasio, F.L.; Pellegrini, E.; Bowler, W.M., Architecture of the MKK6-p38α complex defines the basis of MAPK specificity and activation bioRxiv, 07, 2022,
doi: 10.1101/2022.07.04.498667

Congresses / conferences and Symposia

- Congresses / conferences organisation: 2
- Posters presentations: 7
- Oral presentations: 2
- Invited oral presentations: 7

Ph.D. Theses presented in 2022

Rhys Evans
Developing and Applying Novel Enhanced Sampling Simulation Techniques for Drug Discovery, Design, and Delivery
Prof. F.L. Gervasio

Awards and distinction

Swiss Bioinformatics Institute (SIB) Gervasio, F.L. nominated as group leader Francesco Luigi Gervasio's group (sib.swiss)

ACS Editor's Choice award for publication by Lukauskis, D. and others in J Chem Inf Mod 2022, 62, 6209–6216

Springer Nature EUROQSAR prize for poster of Borsatto, A.

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

F.L. Gervasio. L'invité d'Epiphane. Radio Cité (radiocite.ch)
Emission L'invité d'Epiphane, November 30st, 2022, Geneve, Suisse
https://radiocite.ch/2022/11/30/linvite-depiphane-30-11-2022-professeur-francesco-luigi-gervasio/

F.L. Gervasio. Interview in the "Repubblica" https://www.repubblica.it/salute/ December 1st, 2022

F.L. Gervasio. Verso una nuova arma contro il coronavirus. Radio RSI Radiotelevisione svizzera (radio and television of the Italian Switzerland), November 24th, 2022, Lugano, Switzerland
https://www.rsi.ch/news/svizzera/Verso-una-nuova-arma-contro-il-coronavirus-15810508.html

F.L Gervasio. Découverte d'une nouvelle cible pour attaquer le coronavirus, Le Matin, November the 22nd, 2022, Switzerland
https://www.lematin.ch/story/decouverte-dune-nouvelle-cible-pour-attaquer-le-coronavirus-843437734468

F.L. Gervasio. Report COVID-19: The spike protein is no longer the only target. Science Daily November the 22nd, 2022
https://www.sciencedaily.com/releases/2022/11/221122111452.htm

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. With regard to 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.

Highlight: Dendritic polymer-based microRNA delivery systems for the treatment of hormone positive breast cancer

In 2020, 2.3 million patients were diagnosed with breast cancer (BC) globally, 684'996 of whom passed away. First-line treatment of hormone receptor-positive breast cancer is endocrine therapy to lower expression of oestrogen and progesterone supported by targeted therapy. This treatment is not curative; however, it prolongs the patient's life expectancy. Subsequently, the treatment regimen needs to be adjusted until running out of options. Hence, a novel strategy is required. Building on our expertise in the preparation and characterization of polymeric delivery systems and their interaction with nucleic-acid-based therapeutics this project is to deliver a cocktail of microRNAs to the tumor that are downregulated in BC to restore their level of expression.

Efficient miRNA delivery to the tumor is a challenge since low transfection efficiency of naked miRNAs is limiting their clinical use. Dendritic polymer-based vector delivery systems such as poly(amidoamine) (PAMAM) derivatives represent an appealing alternative to virus-based systems including ease of fabrication along established protocols, structural flexibility, and low immune response. PAMAMs are cationic dendrimers of modifiable surface functional groups that provide high efficacy in gene delivery. PAMAMs show a narrow molecular weight distribution, a high degree of molecular uniformity, and characteristic specificity in size and shape. Amine-terminated PAMAMs easily form complexes with miRNA via ionic bonds thus promoting the cellular uptake of genetic material.

A step further to enhance discrimination between healthy and malignant tissues, thus decreasing toxicity due to lowering off-target residual accumulation, the nanocarriers are decorated with hyaluronic acid (HA)-like molecules. HA is among the most prominent targets for the CD44 receptor that is over-expressed in a variety of solid tumours, including BC. For this reason, based on structure-property relationships both in terms of 2D and 3D similarities, chemical libraries were screened to identify the best candidates to be grafted on the peripheral groups of PAMAMs to enable binding to CD44. Computer-aided drug design including molecular docking was performed using SwissSimilarity resources and Maestro Schroedinger computational software.

In 2022, the project was comprised of the synthesis of the PAMAM-based nanocarriers and their physico-chemical characterization using various techniques including NMR, DLS, NTA, SEC and UHPLC, SEM and TEM.

Other ongoing projects

Further cancer nanomedicine-related research dealt with the investigation on drug combinations delivered by liposomal vectors, as well as, on a more fundamental level, with the interactions of nanoparticles with components of biological media – the so-called biomolecular corona. In addition, the Biopharmacy lab pursued research in the field of vaccines and their combination with suitable adjuvants to prevent against infections with Dengue fever and SARS-CoV-2. Several pre-clinical studies are currently ongoing in collaboration with our partners in Switzerland, Europe, and Thailand.

Finally, in the frame of a translational Innosuisse project, novel hydrogel materials are being synthesized and evaluated towards a delivery system that would mitigate the vessel graft failure after vascular surgery.

2022 at a glance

- Publications with impact factor : 16
- Publications without impact factor : 0
- Patents : 0
- Book and chapters : 2
- Congresses / conferences organisation : 7
- Posters presentations : 14
- Oral presentations : 5
- Invited oral presentations : 9
- Number of projects at FNRS and assimilated (Research funds) : 2
- Service agreements and related activities : 2
- Ph.D. Theses presented in 2022 : 4
- Awards and distinctions : 2
- Public outreach activities : 0

Research funds

FNRS
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 2022: CHF 42'210.-
Starting date: 01.07.2019

Innosuisse
Category: Institutional
Innovative drug delivery systems to fight vessel stenosis after vascular surgery
Main applicant: Olivier Jordan
Total funding of the project: CHF 398'807.-
Total duration of the project: 1.5 years
Allocation 2022: CHF 62'772.-
Starting date: 01.12.2021

Total amount for all research funds for 2022: CHF 104'982.-

Service agreements and related activities

Jordan Industrie
Total amount for 2022 CHF 26'659.65.-

Comparison of two microfluidics manufacture methods for liposomal
Total amount for 2022 CHF 1'100.-

Total amount for all research funds for 2022: CHF 27'759.65.-

Scientific publications (with impact factor)

Petrovic, M.; Porcello, A.; Tankov, S.; Majchrzak, O.B.; Kiening, M.; Laingoniaina, A.C.; Jbilou, T.; Walker, P.R.; Borchard, G.; Jordan, O. Synthesis, Formulation and Characterization of Immunotherapeutic Glycosylated Dendrimer/cGAMP Complexes for CD206 Targeted Delivery to M2 Macrophages in Cold Tumors. Pharmaceutics 14 (2022), 1883. doi: 10.3390/pharmaceutics14091883 *6.53*

Petrovic, M.; Borchard, G.; Jordan, O. Polyethylenimine/cGAMP Nanocomplexes for STING-Mediated Cancer Immunotherapy: Formulation and Characterization Using Orthogonal Techniques. Processes 2022 10(5) 882. doi: 10.3390/pr10050882 *3.35*

Patrulea, V.; Gan, B.-H.; Perron, K.; Cai, X.; Abdel-Sayed, P.; Sublet, E.; Ducret, V.; Porroche Nerhot, N.; Applegate, L. A.; Borchard, G.; Reymond, J.-L.; Jordan, O. Synergistic effects of anitimicrobial peptide dendrimer-chitosan polymer conjugates against *Pseudomonas aeruginosa.* Carbohydrate Polymers 280 (2022), 119025. doi: 10.1016/j.carbpol.2021.119025 *10.72*

Brunner, J.; Borchard, G. Structure-activity relationship of a peptide permeation enhancer. Tissue Barriers 2022. doi: 10.1080/21688370.2022.2060692 *4.12*

Brunner, J.; Schvartz, D.; Gouiller, A.; Hainard, A.; Borchard, G. Impact of peptide permeation enhancer on tight junctions opening cellular mechanisms. Biochem. Biophys. Rep. (2022) 27;32: 101375. doi: 10.1016/j.bbrep.2022.101375 *2.61*

Marquet, F.; D'Atri V.; Guillarme, D.; Borchard, G. A New Practice to Monitor the Fabrication Process of Fab-Targeting Ligands from Bevacizumab by LC-MS: Preparation and Analytical Characterization. Sci Pharm 2022, 90 (1) 5. doi: 10.3390/scipharm90010005 *3.43*

Marquet, F.; Stojceski, F.; Grasso, G.; Patrulea, V.; Danani, A.; Borchard, G. Characterization of the Interaction of Polymeric Micelles with siRNA: A Combined Experimental and Molecular Dynamics Study. Polymers 14 (2022) 44096. doi: 10.3390/polym14204409. *4.33*

Marques, C.; Maurizi, L.; Borchard, G.; Jordan, O. Characterization Challenges of Self-Assembled Polymer-SPIONs Nanoparticles: Benefits of Orthogonal Methods. Int J Mol Sci 2022, 23 (24) 16124. doi: 10.3390/ijms232416124 *6.21*

Peletta, A.; Prompetchara, E.; Tharakhet, K.; Kaewpang, P.; Buranapraditkun, S.; Yostreerat, N.; Manopwisedjaroen, S.; Thitithanyanont-, A.; Avaro, J.; Krupnik, L.; Neels, A.; Ruxrungtham, K.; Ketloy, C.; Borchard, G. Translating a Thin-Film Rehydration Method to Microfluidics for the Preparation of a SARS-CoV-2 DNA Vaccine: When Manufacturing Method Matters. Pharmaceutics 2022, 14(7), 1427. doi: 10.3390/pharmaceutics14071427 *6.53*

Barton, A.E.; Borchard, G.; Wacker, M.G.; Pastorin, G.; Saleem, I.Y.; Chaudary, S.; Elbayoumi, T.; Zhaho, Z.; Flühmann, B. A. Need for Expansion of Pharmacy Education Globally for the Growing Field of Nanomedicine. Pharmacy 10 (2022) 17. doi: 10.3390/pharmacy10010017 *0.42*

De Jong, W.H.; Geertsma, R.E.; Borchard, G. Regulatory safety evaluation of nanomedical products: key issues to refine. Drug Deli, Translat. Res. 12 (2022) 2042-2047. doi: 10.1007/s13346-022-01208-4. *5.67*

Melnik, T., Ben Ameur, S.; Kanfar, N.; Vinet, L.; Delie Salmon, F.; Jordan, O. Bioadhesive Hyaluronic Acid/Dopamine Hydrogels for Vascular Applications Prepared by Initiator-Free Crosslinking. Int J Mol Sci 2022, 23, (10), 5706. doi: 10.3390/ijms23105706 *6.21*

Melnik, T.; Porcello, A.; Saucy, F.; Delie Salmon, F.; Jordan, O. Bioadhesive Perivascular Microparticle-Gel Drug Delivery System for Intimal Hyperplasia Prevention: In Vitro Evaluation and Preliminary Biocompatibility Assessment. Gels 2022, *8*(12), 776. doi: 10.3390/gels8120776 *4.43*

Melnik, T.; Jordan, O.; Corpataux, J.-M.; Delie Salmon, F.; Saucy, F. Pharmacological prevention of intimal hyperplasia: A state-of-the-art review. Pharmacol & Ther. 235:108157 (2022). doi: 101016/j.pharmthera.2022.108157 *13.40*

Gonzalez Fernandez, P.; Rodriguez-Nogales, C.; Jordan, O.; Allémann, E. Combination of mesenchymal stem cells and bioactive molecules in hydrogels for osteoarthritis treatment Eur J Pharm Biopharm. 2022 Mar; 172:41-52. doi: 10.1016/j.ejpb.2022.01.003 *5.59*

Porcello, A.; Gonzalez Fernandez, P.; Jordan, O.; Allémann, E. Nanoforming Hyaluronan-Based Thermoresponsive Hydrogels: Optimized and Tunable Functionality in Osteoarthritis Management. Pharmaceutics (2022), *14*(3), 659. doi:10.3390/pharmaceutics14030659 *6.53*

Books or books chapters

Porcello, A.; Laurent, A.; Hirt-Burri, N.; Abdel-Sayed, P.; Roessing, A.; Raffoul, W.; Allémann, E.; Jordan, O.; Applegate, L.A. Hyaluronan-Based Hydrogels as Functional Vectors for Standardised Therapeutics in Tissue Engineering and Regeneraive Medicine. In Nanopharmaceuticals in regenerative medicine, MadhyasthaH and Chauhan DN Eds, CRC Press, 2022. doi: 10.1201/9781003153504-8.

Schneider, M.; Bakowsky, U.; Borchard, G.; Germershaus, O.; Patrick J. Sinko (Ed.), Martin Physikalische Pharmazie 7th Edition, Wissenschaftliche Verlagsgesellschaft Stuttgart, Germany (2022).

Ph.D. Theses presented in 2022

Joël Brunner
Untravelling the Modulation of Tight Junctions: Molecular Mechanismes and Permeation Enhancements
Gerrit Borchard

Marija Petrovic
Design of STING Ligand Nanoparticles for Improved Cold Cancer Immunotherapy
Gerrit Borchard, Olivier Jordan

Alexandre Porcello
Hyaluronan-Based Hydrogel Formulations for Therapeutic Applications
Eric Alléman, Olivier Jordan

Tamara Melnik
Controlled drug delivery for perivascular application and intimal hyperplasia prevention
Florence Delie, Olivier Jordan

Congresses / conferences and Symposia

- Congresses / conferences organisation: 7
- Posters presentations: 14
- Oral presentations: 5
- Invited oral presentations: 9

Awards and distinction

Journal Award: Pharmaceutics “Editor’s Choice” award for the paper by Patrulea V, Borchard G, Jordan O. An Update on Antimicrobial Peptides (AMPs) and Their Delivery Strategies for Wound Infections. Pharmaceutics. 2020 Sep 2;12(9):840. doi: 10.3390/pharmaceutics12090840.

Nomination by Swissmedic of G. Borchard as Chair of the newly established working party on mRNA vaccines at the European Directorate for the Quality of Medicine (EDQM) and the European Pharmacopoeia (Ph. Eur.).

CLINICAL PHARMACOLOGY AND TOXICOLOGY

Professor Jules DESMEULES
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 Veuthey;
Prof. Jean-Luc Wolfender;
Prof. Emerson Queiroz.

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

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.

2022 at a glance

- Publications with impact factor: 35
- Publications without impact factor: 6
- Patents: 3
- Book and chapters: 1
- Congresses / conferences organisation: 3
- Posters presentations: 8
- Oral presentations: 3
- 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 2022: 2
- Awards and distinctions: 5
- Public outreach activities: 19

Research funds

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.
Main Applicants: Caroline Samer, Youssef Daali
CHF 298'961.-
Total duration of the project: 4 years
Allocation 2022: CHF 64'549.-
Starting date: 01.10.2018

FNS 320030_182686
Identification of genetic determinants for central pain sensitization in fibromyalgia patients
Main Applicant: Jules Desmeules
CHF 387'000.-
Total duration of the project: 3 years
Allocation 2022: CHF 90'655.-
Starting date: 01.01.2019

Innosuisse – Swiss Innovation Agency 37848.1 IP-LS
Institutional
NDMC as a new antihyperalgesic drug
Main Applicant: Marie Besson
CHF 454'971.-
Total duration of the project: 3 years
Allocation 2022: CHF 90'954.-
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
Main Applicants: Caroline Samer, Youssef Daali
CHF 50'000.-
Total duration of the project: 3 years
Allocation 2022: CHF 50'000.-
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?
Main Applicant: Jean Terrier
CHF 50'000.-
Total duration of the project: 3-5 years
Allocation 2022: CHF 0.-
Starting date: 01.01.2020

Hôpitaux Universitaires de Genève
Projet de Recherche et Développement
Pupillométrie comme méthode de phénotypage du CYP2D6
Main Applicant: Frédérique Rodieux
CHF 50'000.-
Total duration of the project: on-going
Allocation 2022: CHF 0.-
Starting date: 08.11.2016

Total amount for all research funds for 2022: CHF 296'158.-

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 2021: CHF 55'000.-

a mis en forme : Français (Suisse)

Scientific publications (with impact factor)

Rodieux, F.; Ivanyuk, A.; Besson, M.; Desmeules, J.; Samer, C., Hydromorphone prescription for pain in children. What place in clinical practice? Fontiers in Pediatrics 2022, 10:842454. doi:10.3389. *3.56*

Magliocco, G.; Desmeules, J.; Samer, C.; Thomas, A.; Daali, Y., Evaluation of CYP1A2 activity: relationship between the endogenous urinary 6-hydroxymelatonin to melatonin ratio and paraxanthine to caffeine ratio in dried blood spots. Clin Transl Sci 2022, 15(6), 1482-91. *4.51*

Skalafouris, C.; Blanc, AL.; Grosgurin, 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 2022, Dec 14. doi:10.1007. *2.30*

Lenoir, C.; Terrier, J.; Gloor, Y.; Gosselin, P.; Daali, Y.; Combescure, C.; Desmeules, J.; Samer, C.; Reny, JL.; Rollason, V., Impact of the genotype and phenotype of CYP3A and P-gp on the apixaban and rivaroxaban exposure in a real-world setting. J Pers Med 2022, 12(4):526. doi: 10.3390. *3.50*

Daali, Y.; Rsotami-Hodjegan, A.; Samer, C., Precision medicine: impact of cytochromes P450 and transporters genetic polymorphisms, drug-drug interactions, disease on safety and efficacy of drugs. Front pharmacol 2022, 12: 834717. doi: 10.3389 *5.98*

Terrier, J.; Lenoir, C.; Samer, C., CYP450 3A4/5 Containment During SARS-CoV-2 infection. Clin Pharmacol Ther 2022, doi: 10.1002/cpt.2725. *7.05*

Roulet, L.; Bedatsova, L.; Merz, L.; Desmeules, J.; Saiah, L., Case report: confirming a diagnosis of severe olmesartan-associated enteropathy. Therapie 2022 Jun 24.doi:10.1016 *3.36*

Gloor, Y.; Matthey, A.; Sobo, K.; Mouterde, M.; Kosek, E.; Pickering, G.; Poloni, ES.; Cedraschi, C.; Ehret, G.; Desmeules, J., Uncovering a Genetic Polymorphism Located in Huntingtin Associated Protein 1 in Modulation of Central Pain Sensitization Signaling Pathways. Front Neurosci 2022 Jun 28; 16:807773 *5.15*

Perrot, S.; Eschalier, A.; Desmeules, J.; Lanteri-Minet, M.; Attal, N., Practice guidelines for the treatment of acute migraine and chronic knee osteoarthritis with paracetamol: an expert appraisal on evolution over time between scientific societies. Curr Med Res Opin 2022, Sep;38(9):1579-1585. *2.70*

Gloor, Y.; Czarnetzki, C.; Curtin, F.; Gil-Wey, B.; Tramèr M.; Desmeules, J., Genetic Susceptibility Toward Nausea and Vomiting in Surgical Patients. Front Genet 2022, Jan 31;12:816908. *4.77*

Czarnetzki, C.; Albrecht, E.; Desmeules, J.; Kern, C.; Corpataux, JB.; Gander, S.; Van Kuijk, SMJ.; Tramèr, M., Dexamethasone for the treatment of established postoperative nausea and vomiting: A randomised dose finding trial. Eur J Anaesth 2022, Jun 1;39(6):549-557. *4.18*

Achour, B.; Gosselin, P.; Terrier, J.; Gloor, Y.; Al-Majdoub, ZM.; Polasek, TM.; Daali, Y.; Rostami-Hodjegan, A.; Reny, JL., Liquid Biopsy for Patient Characterization in Cardiovascular Disease: Verification against Markers of Cytochrome P450 and P-Glycoprotein Activities. Clin Pharmacol Ther 2022, Jun;111(6):1268-1277. *7.05*

Neyshaburinezhad, N.; Ghasim, H.; Rouini, M.; Daali, Y.; Ardakani, YH., Variations in the Frequencies of Polymorphisms in the CYP450s Genes in Eight Major Ethnicities of Iran: A Review of the Human Data. J Pers Med 2022, Nov 5;12(11):1848. *3.50*

Pautex, S.; Bianchi, F.; Daali, Y.; Augsburger, M.; De Saussure, C.; Wampfler, J.; Curtin, F.; Desmeules, J.; Broers, B., Cannabinoids for behavioral symptoms in severe dementia: Safety and feasibility in a long-term pilot observational study in nineteen patients. Front Aging Neurosci 2022, Sep 29;14:957665 *5.70*

Gloor, Y.; Lloret-Linares, C.; Bosilkovska, M.; Perroud, N.; Richard-Lepouriel, H.; Aubry, JM.; Daali, Y.; Desmeules, J.; Besson, M., Drug metabolic enzyme genotype-phenotype discrepancy: High phenoconversion rate in patients treated with antidepressants. Biomed Pharmacother 2022, Aug;152:113202. *1.59*

Guinchat, V.; Ansermot, N.; Ing Lorenzini, K.; Politis, D.; Daali, Y.; Eap, CB.; Crettol, S., Opioid Use Disorder Associated with Low/Moderate Dose of Loperamide in an Intellectual Disability Patient With CYP3A and P-Glycoprotein Reduced Activity. Front Psychiatry 2022, Jun 23;13:910684. *5.43*

Mouterde, M.; Daali, Y.; Rollason, V.; Cizkova, M.; Mulugeta, A.; Al Balushi, KA.; Fakis, G.; Constantinidis, TC.; Al-Thihli, K.; Cerna, M.; Makonnen, E.; Boukouvala, S.; Al-Yahyaee, S.; Yimer, G.; Cerny, V.; Desmeules, J.; Poloni, ES., Joint Analysis of Phenotypic and Genomic Diversity Sheds Light on the Evolution of Xenobiotic Metabolism in Humans. Genome Biol Evol 2022, Dec 8;14(12): evac167. *4.06*

Kamath, A.; Srinivasamurthy, SK.; Chowta, MN.; Ullal, SD.; Daali, Y.; Chakradhara Rao, US., Role of Drug Transporters in Elucidating Inter-Individual Variability in Pediatric Chemotherapy-Related Toxicities and Response. Pharmaceuticals 2022, 15(8):990. *5.21*

Terrier, J.; Gaspar, F.; Guidi, M.; Fontana, P.; Daali, Y.; Csajka, C.; Reny, JL., Population Pharmacokinetic Models for Direct Oral Anticoagulants: A systematic Review and Clinical Appraisal Using Exposure Simulation. Clin Pharmacol Ther 2022, Aug;112(2):353-363. *7.05*

Daali, Y., Personalized Medicine: Pharmacokinetics. J Pers Med 2022, Oct 6;12(10):1660. *3.50*

Dozio, V.; Daali, Y.; Desmeules, J.; Sanchez, JC., Deep proteomics and phosphoproteomics reveal novel biological pathways perturbed by morphine, morphine-3-glucoronide and morphine-6-glucoronide in human astrocytes. J. Neurosci Res 2022, Jan;100(1):220-236. *4.43*

Béguin, MJ.; Audet, MC.; Chevalley, T.; Portela, M.; Padlina, I.; Hannouche, D.; Ing Lorenzini, K.; Meier, R.; Peter, R.; Uebelhart, B.; Rizzoli, R.; Ferrari, S.; Biver, E., Fracture Risk Following an Atypical Femoral Fracture. J Bone Miner Res 2022, Jan;37(1):87-94. *6.39*

Abouir, K.; Gosselin, P.; Guerrier, S.; Daali, Y.; Desmeules, J.; Grosgurin, O.; Reny, JL.; Samer, C.; Calmy, A.; Ing Lorenzini, K., Dexamethasone exposure in normal-weight and obese hospitalized COVID-19 patients: An observational exploratory trial. Clin Transl Sci 2022, Jul;15(7):1796-1804. *4.51*

Guinchat, V.; Ansermot, N.; Ing Lorenzini, K.; Politis, D.; Daali, Y.; Eap, CB.; Crettol, S., Case Report: Opioid Use Disorder Associated with Low/Moderate Dose of Loperamide in an Intellectual Disability Patient With CYP3A and P-Glycoprotein Reduced Activity. Front Psychiatry 2022, Jun 23; 13:910684. *5.43*

Ing Lorenzini, K.; Wainstein, L.; Spechbach, H.; Sarasin, F.; Ramlawi, M.; Desmeules, J.; Piguet, V., Opioid-related adverse drug reactions in patients visiting the emergency division of a tertiary hospital. Pharmacol Res Perspect 2022, Dec;10(6):e01033. *2.96*

Ratajczak-Enselme, M.; Mutoni, GC.; Desmeules, J.; Favet, L.; Ing Lorenzini, K., Relapses of Immune Thrombocytopenia after the second and booster doses of BNT 162b2 Vaccine. Acta Haematol 2022, Nov 3. doi: 10.1159. *3.06*

Abouir, K.; Calmy, A.; Ing Lorenzini, K., Dexamethasone and Number of Days Alive Without Life Support in Adults with COVID-19 and Severe Hypoxemia. JAMA Netw Open 2022, Feb 15;327(7):682-683. *13.36*

Perles, T.; Perez, N.; Wuarin, R.; Jacquier, P.; Rollason, V.; Serratrice, J.; Coen, M., The unusual presentation of an unusual complication: Tropical corticosteroids-induced binasal heteronymous hemianopia. Therapie 2022, 77(6):739-743. *3.36*

Antonio, JA.; Rollason, V.; Musumeci, S.; Finckh, A.; Lazarou, I.; Laffite, E.; Nendaz, M.; Serratrice, J.; Coen, M., Mazzotti reaction: Ivermectin-associated polyarthritis after delayed scabies treatment. Case report and review of the literature. Therapie 2022;77(5):612-616. *3.36*

Lenoir, C.; Niederer, A.; Rollason, V.; Desmeules, J.; Daali, Y.; Samer, C., Prediction of cytochromes P450 3A and 2C19 modulation by both inflammation and drug interactions using physiologically based pharmacokinetics.CPT-Pharmacomet Syst 2022; 11(1):30-43. *3.36*

Syrowatka, A.; Song, W.; Amato, MG.; Foer, D.; Edrees, H.; Co, Z.; Kuznetsova, M.; Dulgarian, S.; Seger, DL.; Simona, A.; Brain, PA.; Purcell Jackson, G.; Rhee, K.; Bates, DW., Key use cases for artificial intelligence to reduce the frequency of adverse drug events: a scoping review. Lancet Digit Health 2022, Feb;4(2):e137-e148. *36.61*

Edrees, H.; Song, W.; Syrowatka, A.; Simona, A.; Amato, MG.; Bates, DW., Intelligent Telehealth in Pharmacovigilance: A Future Perspective. Drug Saf 2022, May;45(5):449-458. *5.22*

Terrier, J.; Relecom, A.; Borgeaud, S.; Bridel, C.; Seebach, J.; Assal, F.; Reny, JL.; Serratrice, J., A bilateral aseptic pyogenic ventriculitis following a course of pembrolizumab, an anti-PD-1 immune checkpoint inhibitor treatment for metastatic small cell lung cancer. Therapie 2022, May 11. *3.36*

Costanza, A.; Vasileios, C.; Ambrosetti, J.; Shah, S.; Amerio, A.; Aguglia, A.; Serafini, G.; Piguet, V.; Luthy, C.; Cedraschi, C.; Bondolfi, G.; Berardelli, I., Demoralization in suicide: A systematic review. J Psychosom Res 2022, Jun;157:110788. *4.62*

Corso, M.; Cancelliere, C.; Mior, S.; Salmi, LR.; Cedraschi, C.; Nordin, M.; Sci, DM.; Taylor-Vaisey, A.; Côté, P., Are Nonpharmacologic Interventions Delivered Through Synchronous Telehealth as Effective and Safe as In-Person Interventions for the Management of Patients with Nonacutre Musculoskeletal Conditions? A Systematic Rapid Review. Arch Phys Med Rehabil 2022, Jan;103(1):145-154. *4.06*

Scientific publications (without impact factor)

Siebert, JN.; Gosetto, L.; Sauvage, M.; Bloudeau, L.; Suppan, L.; Rodieux, F.; Haddad, K.; Hugon, F.; Gervaix, A.; Lovis, C.; Combescure, C.; Manzano, S.; Ehrler, F.; PedAMINES Trial Group; PedAMINES Prehospital Group, Usability Testing and Technology Acceptance of an mHealth App at the Point of Care During Simulated Pediatric In- and Out-of-Hospital Cardiopulmonary Resuscitations: Study Nested Within 2 Multicenter Randomized Controlled Trials. JMIR Hum Factors 2022, Mar 1;9(1).

Coumeau, C.; Gaspar, F.; Terrier, J.; Csajka, C., Anticoagulants oraux directs : sécurité de la prescription en pratique gériatrique. La gazette médicale 2022, 5 sept, vol. 11.

Ing Lorenzini, K.; Wainstein, L.; Curtin, F.; Trombert, V.; Zekry, D.; Gold, G.; Piguet, V.; Desmeules, J., Adverse Drug Reactions Due to Opioid Use in Oldest-Old Patients Visiting the Emergency Unit of the Geneva Geriatric Hospital. J Frailty Aging 2022, 11(3):329-334.

Galani, V.; Besson, M.; Le Hénaff, C.; Chytas, V.; Prada, P., Quand la discontinuation des psychotropes s'impose : manifestations cliniques et approche thérapeutique. Rev Med Suisse 2022, 18, 276-81.

Besson, M., Douleur et trouble du sommeil. Douleur analg 2022, 35-63.

Chytas, V.; Costanza, A.; Mazzola, V.; Luthy, C.; Galani, V.; Bondolfi, G.; Cedraschi, C., Possible Contribution of Meaning in Life in Patients with Chronic Pain and Suicidal Ideation: Observational Study. JMIR Form Res 2022, Jun 13;6(6): e35194.

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-desmethylclobazam 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 precision et individualisation thérapeutique chez le sujet âgé [In] Cardiogériatrie clinique à l'usage du praticien, RMS Edition, Médecine et Hygiène, 2023, 279-300.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 3
- Posters presentations: 8
- Oral presentations : 3
- Invited oral presentations : 12

Ph.D. Theses presented in 2022

Lenoir Camille
Personalised medicine: a phenotypic perspective on drug safety through clinical trials in hospitalised patients.
Desmeules, J.; Samer, C.; Rollason, V.

Magliocco Gaelle
Cytochrome P450 Activity Assessment: Toward Validation of Endogenous Metrics and Discovery of New Biomarkers Using Untargeted Metabolomics.
Desmeules, J.; Daali, Y.; Thomas, A.

Awards and distinction

Rodieux, F., Augmenter la sécurité de la prescription médicamenteuse chez l'enfant et développer la médecine de précision chez l'enfant, **Subside Tremplin**, Université de Genève, June 2022.

Lenoir, C., Impact of acute inflammation on cytochromes P450 activity measured with dried blood spot. **Best IUPHAR research poster**, May 2022.

Lenoir, C. Impact of acute inflammation on cytochromes P450 activity measured with dried blood spot. **Presidential trainee award of the American Society for Clinical Pharmacology and Therapeutics**, March 2020.

Abouir, K., Dexamethasone use in normal weight and obese hospitalized COVID-19 patients: An observational pharmacokinetic study. **2nd Best IUPHAR research poster**, online, May 2022.

Magliocco, G., Cytochrome P450 Activity Assessment: Toward Validation of Endogenous Metrics and Discovery of New Biomarkers Using Untargeted Metabolomics. **SSPTC Best PhD Thesis**, June 2022.

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

C. Samer. Des tests pour personnaliser les traitements médicamenteux. Pulsations, September 2022, Geneva (Switzerland).

C. Samer. Un test génétique pour réduire les effets médicamenteux indésirables. La Tribune de Genève, September 2022, Geneva (Switzerland).

C. Samer. Les 125 ans de l'aspirine. Podcast Micro sciences, October 2022, Geneva (Switzerland).

C. Samer. L'automédication, avec précaution. Pulsations, October 2022, Geneva (Switzerland).

B. Broers, M. Besson. Indications, efficacité et risques : le point sur le CBD. Pulsations, October 2022, Geneva (Switzerland).

M. Besson. Stress et médicaments. Haute Ecole de Musique, February 25th, 2022, Geneva (Switzerland).

F. Rodieux. Syndrome de Reye : cause, symptômes, c'est quoi ? Journal des femmes, December 2022, France.

F. Rodieux. Mon enfant tousse. Puis-je lui donner un médicament contenant de la codéine ? Tribune de Genève, November 2022, Geneva (Switzerland).

M. Hofmann. Une étude sur les causes de la dépression provoque la polémique. AFP, August 11th, 2022, Paris (France).
M. Hofmann. Une étude remet en cause le rôle de la sérotonine dans la dépression, vifs débats dans le milieu psychiatrique. L'Obs, August 11th, 2022, France.

M. Hofmann. Une étude sur les causes de la dépression provoque la polémique. Lematin.ch, August 11th, 2022.

M. Hofmann. Une étude sur les causes de la dépression provoque la polémique. 20min.ch, August 11th, 2022.

M. Hofmann. Dépression : l'étude qui doute de la sérotonine critiquée. Liberation.fr, August 11th, 2022.

M. Hofmann. Serotonin is bliss ? New study debates molecule's link to depression. Dailysabah.com, August 12th, 2022.

M. Hofmann. Study concluding no proven link between lack of serotonin and depression sparks debate. Jordantimes.com, August 13th, 2022.

M. Hofmann. Depression study stirs fierce debate Researchers cast doubt on chemical link, leading to questions about value of antidepressants. Bangkokpost.com, August 11th, 2022.

M. Hofmann. Study on serotonin and depression sparks fierce debate. Malaymail.com, August 12th, 2022.

M. Hofmann. Study on serotonin and depression sparks fierce debate. Medicalxpress.com, August 11th, 2022.

M. Hofmann. Une étude sur la dépression crée la polémique. Journaldemontreal.com, August 11th, 2022.

CLINICAL PHARMACY SCIENCES

Professor Chantal CSAJKA
Doctor Monia GUIDI

General description of the Unit

The mission of the clinical pharmacy science group is to promote post-approval drug optimisation revolving around three main axes. The first research focus is therapeutic individualisation by the comprehension of the demographic, physiopathologic, environmental or genetic determinants influencing therapeutic response or toxicity. The second axe comprises research on security and efficacy of drugs, in particular in vulnerable population (paediatrics, geriatrics, oncology), and the third research focus is the development of tools and guidelines allowing for therapeutic optimisation. The methods used are based on quantitative and qualitative techniques, including modelling and simulations and biostatistics. The overall goal of the research is to increase the knowledge on the pharmacokinetics and pharmacokinetic-pharmacodynamic relationships of commercialized drugs at particular risk and to improve drugs' safety and efficacy to optimize their use in clinical practice.

Specific research fields

The following achievements have taken place in 2022.

- **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 hemorrages in a population of geriatric inpatients using data mining is ongoing. Innovative methods of structured data analyses and natural language processing are being developed to identify hemorrages associated with antithrombotic use on data retrieved from electronic medical information systems of three university hospitals (CHUV; HUG; UZH). In addition, several studies in collaboration with the Hospital in Baden on the prediction of anticholinergic burden and its association with delirium and mortality in a at-risk population of hospitalized patients have been finalized and published. In collaboration with the Family Medicine of the University of Fribourg and funded by the Leenards Foundation within the Santeinegra program, a protocol for a pragmatic clinical trial aiming at evaluating the efficacy of a medicinal herb in the treatment of acute bronchitis has been finalized and the clinical study will start early 2023. This study will also evaluate whether complementary medicine can be integrated within conventional care and whether it could be an interesting alternative to the often inappropriate use of antibiotics in this indication. An ancillary project to assess the quality of herbal products sold on the market and trough internet has been started with the Phytochemistry group of the School of Pharmaceutical Sciences, University of Geneva.

- **Drug individualisation**. Several projects on the population pharmacokinetic, pharmacokinetic-pharmacodynamic or pharmacokinetic-adherence characterisation of oncologic (tyrosine kinase inhibitors, busulfan), antibiotic and antiretroviral drugs have been fulfilled in collaboration with research groups from the School of Pharmaceutical Sciences, the CHUV and Lyon for optimized dosing strategies of at-risk drugs with direct implication in clinical practice. A new research focus has been initiated on the pharmacogenetic aspects on drug efficacy and safety. A randomized controlled study conducted in community pharmacies assessing the efficiency and the feasibility of pharmacogenetic testing on escitalpram therapeutic failure will be initiated in 2023. 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 or are ongoing. 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

has been started in collaboration with the School of Engineering and Management Vaud and the Kibong'Oto Intections Diseases Hospital in Tanzania. The project will start with the characterization of rifampicine disposition in Tanzanian patients with tuberculosis, the development of a computer-based aid for drug dosage individualization and the validation of the support system to achieve efficacy targets versus standard practice. In addition, the collaborative project with the HEIG-VD aiming at developing a software (www.tucuxi.ch) for Bayesian dosage adjustment is still ongoing. Several new drugs (antibiotics in a pediatric population) have been implemented in the software. An electronic tool for drug-drug interaction for health care professionals involving antithrombotics is currently being developed as part of the SwissMADE project.

2022 at a glance

- Publications with impact factor: 17
- Publications without impact factor: 2
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 0
- Posters presentations: 9
- Oral presentations: 4
- Invited oral presentations: 0
- Number of projects at FNRS and assimilated (Research funds): 3
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 1
- Awards and distinctions: 1
- Public outreach activities: 0

Research funds

FNRS
Automated detection of adverse drug events from older inpatients' electronic medical records using structured data mining and natural language processing
Main applicant: Chantal Csajka
Total funding of the project: CHF 602'560.-
Total duration of the project: 5 years
Allocation 2022: CHF 0.-
Starting date: 01.09.2017

FNRS
Projet SPIRIT TuberXpert: Clinical Decision Support System for anti-tuberculosis medical drugs
Main applicant: Prof Yann Thomas, Institut REDS/HEIG-VD, Dre Monia Guidi, Prof Stellah Mpagama (KIDH)
Total funding of the project: CHF 499'670.-
Total duration of the project: 3 years
Allocation 2022: CHF 0.-
Starting date : 01.11.2022

Fondation Leenards
Prise en charge de la bronchite aiguë – étude clinique randomisée portant sur un mélange d'herbes chinoises.
Main applicant: Pierre-Yves Rodondi, Chantal Csajka (co-PI)
Total funding of the project: CHF 200'000.-
Total duration of the project: 3 years
Allocation 2022: CHF 0.-
Starting date: 01.01.2021
Total amount for all research funds for 2022: CHF 0.-

Scientific publications (with impact factor)

Lisibach A.; Gallucci G.; Benelli V.; Kälin R.; Schulthess S.; Beeler P E.; Csajka C.; Lutters M. Evaluation of the association of anticholinergic burden and delirium in older hospitalised patients – A cohort study comparing 19 anticholinergic burden scales. Br J Clin Pharmacol. 2022; 88(11): 4915–4927. *3.72*

Lisibach A.; Gallucci G.; Beeler P E.; Csajka C.; Lutters M. High anticholinergic burden at admission associated with in-hospital mortality in older patients: A comparison of 19 different anticholinergic burden scales. Basic Clin Pharmacol Toxicol. 2022; 130(2): 288–300. *3.68*

Farhat A.; Al-Hajje A.; Lang P-O.; Csajka C. Impact of Pharmaceutical Interventions with STOPP/START and PIM-Check in Older Hospitalized Patients: A Randomized Controlled Trial. Drugs Aging. 2022; 39(11): 899–910. *4.27*

Bandiera B.; Pasquier J.; Locatelli I.; Niquille A.; Wuerzner G.; Dotta-Celio J.; Hachfeld A.; Wandeler G.; Wagner A D.; Csajka C.; Zanchi A.; Cavassini M.; Schneider M P. Medication Adherence Evaluated Through Electronic Monitors During the 2020 COVID-19 Pandemic Lockdown in Switzerland: A Longitudinal Analysis. Patient Prefer Adherence. 2022; 16: 2313–2320. *2.31*

Bandiera C.; Skrabal Ross X.; Cardoso E.; Wagner D.; Csajka C.; Olver I.; Patterson P.; Suppiah V.; Gunn KM.; Schneider M. Interventions to support adherence to oral anticancer therapies: research challenges, lessons learned, and strategies to overcome them from Australia and Switzerland. Support Care Cancer. 2022 May;30(5):3655-3659. *3.36*

Goutelle S.; Thoma Y.; Buffet R.; Philippe M.; Buclin T.; Guidi M and Csajka C. Implementation and Cross-Validation of a Pharmacokinetic Model for Precision Dosing of Busulfan in Hematopoietic Stem Cell Transplanted Children. Pharmaceutics 2022; 14 (10): 2107. *6.52*

Goutelle S.; Woillard JB.; Buclin T.; Bourguignon L.; Yamada W.; Csajka C.; Neely M.; Guidi M. Parametric and Nonparametric Methods in Population Pharmacokinetics: Experts' Discussion on Use, Strengths, and Limitations. J Clin Pharmacol. 2022;62(2):158-170. *2.86*

Rodier T.; Puszkiel A.; Cardoso E.; Balakirouchenane D.; Narjoz C.; Arrondeau J.; Fallet V.; Khoudour N.; Guidi M.; Vidal M.; Declèves X.; Csajka C.; Alexandre J.; Cadranel J.; Fabre E.; Wislez M.; Goldwasser F. and Blanchet B. Exposure-Response Analysis of Osimertinib in Patients with Advanced Non-Small-Cell Lung Cancer. Pharmaceutics. 2022; 14(9): 1844. *6.52*

Thoueille P.; Alves Saldanha S.; Schaller F.; Munting A.; Cavassini M.; Braun D.; Günthard HF.; Kusejko K.; Surial B.; Furrer H.; Rauch A.; Ustero P.; Calmy A.; Stoeckle M.; Battegay M.; Marzolini C.; Andre P.; Guidi M.; Buclin T.; Decosterd LA. On behalf of the Swiss HIV Cohort Study. Real-Life Therapeutic Concentration Monitoring of Long-Acting Cabotegravir and Rilpivirine: Preliminary Results of an Ongoing Prospective Observational Study in Switzerland. Pharmaceutics. 2022; 14(8):1588. *6.52*

Courlet P.; Cardoso E.; Bandiera C.; Stravodimou A.; Zurcher J-P.; Chtioui H.; Locatelli I.; Decosterd LA.; Darnaud L.; Blanchet B.; Alexandre J.; Wagner AD.; Zaman K.; Schneider MP.; Guidi M*.; Csajka C*. Population Pharmacokinetics of Palbociclib and Its Correlation with Clinical Efficacy and Safety in Patients with Advanced Breast Cancer. Pharmaceutics. 2022; 14(7):1317. *6.52*

Terrier J*. ; Gaspar F*. ; Guidi M. ; Fontana P. ; Daali Y. ; Csajka C. ; Reny JL. Population Pharmacokinetic Models for Direct Oral Anticoagulants: A Systematic Review and Clinical Appraisal Using Exposure Simulation. Clin Pharmacol Ther. 2022; 112(2):353-363. *7.05*

a mis en forme : Français (Suisse)

Levionnois OL.; Barbarossa A.; Bardhi A.; Siegenthaler J.; Forss Pleyers T.; Guidi M.; Spadavecchia C.; Raillard M.; Enantiospecific pharmacokinetics of intravenous dexmedetomidine in beagles. J Vet Pharmacol Ther. 2022 Jul;45(4):366-372. *1.57*

Dao K.; Fuchs A.; André P.; Giannoni E.; Decosterd LA.; Marchetti O.; Asner SA.; Pfister M.; Widmer N.; Buclin T.; Csajka C.; Guidi M. Dosing strategies of imipenem in neonates based on pharmacometric modelling and simulation. J Antimicrob Chemother. 2022 Feb 2;77(2):457-465. *5.76*

Courlet P.; Buclin T.; Biollaz J.; Mazzoni I.; Rabin O.; Guidi M. Model-based meta-analysis of salbutamol pharmacokinetics and practical implications for doping control. CPT Pharmacometrics Syst Pharmacol. 2022 Apr; 11(4):469-481. *4.05*

Guidi M.; Csajka C.; Buclin T. Parametric Approaches in Population Pharmacokinetics. J Clin Pharmacol. 2022 Feb;62(2):125-141. *2.86*

Gaspar F.; Lutters M.; Beeler PE.; Lang PO.; Burnand B.; Rinaldi F.; Lovis C.; Csajka C. Le Pogam MA; SwissMADE study. Automatic Detection of Adverse Drug Events in Geriatric Care: Study Proposal. JMIR Res Protoc. 2022 Nov 15;11(11):e40456 *1.85*

Schmulenson E.; Bovet C.; Theurillat R.; Decosterd LA.; Largiadèr CR.; Prost JC.; Csajka C.; Bärtschi D.; Guckenberger M.; von Moos R.; Bastian S.; Joerger M.; Jaehde U. Population pharmacokinetic analyses of regorafenib and capecitabine in patients with locally advanced rectal cancer (SAKK 41/16 RECAP). Br J Clin Pharmacol. 2022 Dec;88(12):5336-5347. *3.72*

Scientific publications (without impact factor)

Coumau C, Gaspar F, Terrier J, Csajka C. Anticoagulants oraux directs : Sécurité de la prescription en pratique gériatrique. Gazette Médicale. 2022 ; 11(5) : 6-8

Csajka C, Lisibach A, Lutters M. Prévention de la iatrogénie par mesure de la charge anticholinergique. Gazette Médicale. 2022 ; 11(3) :10-12

Congresses / conferences and Symposia

- Congresses / conferences organisation: 0
- Posters presentations: 9
- Oral presentations: 4
- Invited oral presentations: 0

Ph.D. Theses presented in 2022

Frédéric Gaspar
Computer-based strategies to improve safety and risk management of antithrombotic therapies in hospitalized patients
Prof. Chantal Csajka, thesis Director

Awards and distinction

Bandiera C.; Cardoso E.; Locatelli I.; Digklia A.; Zaman K.; Diciolla A.; Cristina V.; Stravodimou A.; Aedo-Lopez V.; Dolcan A.; Sarivalasis A.; Bouchaab H.; Liapi A.; Orcurto A.; Dotta-Celio J.; Peters S.; Decosterd L.; Widmer N.; Wagner D.; Csajka C.; Schneider1 MP. A pharmacist-led interprofessional medication adherence program improved adherence to oral anticancer therapie. Congrès ESPACOMP Medication Adherence and patient safety 16-19 November 2022 Berlin. Best poster prize.

COMMUNITY PHARMACY PRACTICE

Doctor Jérôme BERGER

General description of the Unit

The Community Pharmacy of Unisanté hosts the Community Pharmacy Lab and 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 focus on understanding the determinants, development, implementation and clinical, humanistic, economic evaluation of pharmacy services around the topic "smarter medication in primary care and public health".

Specific research fields

Smarter medication in primary care and public health

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 for "smarter medication in primary care and public health":

- chronic care management programs,
- optimization of drug therapy,
- interprofessional care models
- technological innovations (e-Health)
- professional developments, methodological expertise and developments.

2022 at a glance

- Publications with impact factor: 11
- Publications without impact factor: 7
- Patents: 0
- Book and chapters :0
- Congresses / conferences organisation: 1
- Posters presentations: 8
- Oral presentations: 2
- Invited oral presentations: 6
- Number of projects at FNRS and assimilated (Research funds): 6
- Service agreements and related activities: 10
- Ph.D. Theses presented in 2022: 0
- Awards and distinctions: 0
- Public outreach activities: 33

Research funds

Institutional

Promotion Santé Suisse
Prise en charge de patient-e-s sous antalgiques addictifs (DépendAntalgie)
Main applicant: Jérôme Berger
Total funding of the project; CHF 574'390.-
Total duration of the project: 4 years
Allocation 2022: 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: Jérôme Berger, Farshid Sadeghipour
Total funding of the project; CHF 105'000.-
Total duration of the project: 1 year
Allocation 2022: CHF 0.-
Starting date: 01.01.2023

Swiss National Science Foundation / NRP74 Emerging HealthCare Leaders Joint Proposal Grant
Mysteries in Home Care Collaborations - MyHoCC project
Main applicant: Damien Cateau
Total funding of the project; CHF 10'000.-
Total duration of the project: 1 year
Allocation 2022: CHF 10'000.-
Starting date: 01.12.2022

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 applicants: Jérôme Berger, Anne Niquille Charrière
Total funding of the project: CHF 180'000.-
Total duration of the project: 1 year
Allocation 2022: CHF 180'000.-
Starting date: 01.01.2022

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD
MEDICATION REVIEW IN NURSING HOMES
Main applicants: Anne Niquille Charrière
Allocation 2022: CHF 41'250.-
Starting date: 01.01.2022

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD & Société Vaudoise de Pharmacie
"Médicaments à jour?"
Main applicant: Jérôme Berger
Total funding of the project; CHF 138'107.30.-
Total duration of the project: 3 years
Allocation 2022: CHF 14'423.20.-
Starting date: 01.01.2022

Total amount for all research funds for 2022: CHF 345'673.20.-

Service agreements and related activities

CANTONAL OFFICE OF PUBLIC HEALTH – VAUD
MENTORAT FPH
Main applicants: Jérôme Berger
Allocation 2022: CHF 135'300.-
Starting date: 01.01.2022

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: Jérôme Berger and C. Bremond
Allocation 2022: CHF 36'698.80.-
Starting date: 01.01.2022

Commenté [LP4]: Claude Bremond?

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 2021)
Main applicant: Jérôme Berger
Total amount 2022: CHF 109'875.-

CP3
Service agreement
Total amount 2022: CHF 12'517.-

PHA11
Service agreement
Total amount 2022: CHF 15'000.-

SUS4
Service agreement
Total amount 2022: CHF 2'907.90.-

SEM21
Service agreement
Total amount 2022: CHF 36'698.80.-

SV3
Service agreement
Total amount 2022: CHF 3'465.60.-

U3
Service agreement
Total amount 2022: CHF 18'686.25.-

DIV
Service agreement
Total amount 2022: CHF 2'481.60.-

Total amount (for all service agreements and related activities) for 2022: CHF 373'630.95.-

Scientific publications (with impact factor)

Nicolet A.; Perraudin C.; Wagner J.; Gilles I.; Krucien N.; Pytremann-Bridevaux I.; Marti J., Patient and Public Preference for Coordinated Care in Switzerland: Development of a Discrete Choice Experiment. Patient 2022 Jul; 15(4):485-496. *3.535*

Nicolet A.; Assouline D.; Le Pogam M-A.; Perraudin C.; Bagnoud C.; Wagner J.; Marti J.; Peytremann-Bridevaux I. Exploring Patient Multimorbidity and Complexity Using Health Insurance Claims Data: A Cluster Analysis Approach. JMIR Med Inform 2022 Apr 4; 10(4): e34274 *3.228*

Nicolet A.; Peytremann-Bridevaux I.; Bagnoud C.; Perraudin C.; Wagner J.; Marti J. Continuity of care and multimorbidity in the 50+ Swiss population: An analysis of claims data. SSM Popul Health 2022 Mar 9; 17:10106 *4.086*

Roux B.; Rakheja B.; Siroirs C.; Niquille A.; Pétein C.; Ouellet N.; Spinewine A.; Sibille F-X.; Laroche M-L. Attitudes and beliefs of older adults and caregivers towards deprescribing in French-speaking countries: a multicenter cross-sectional study. European Journal of Clinical Pharmacology 78, 1633–1646 (2022) *3.064*

Bandiera C.; Lam L.; Locatelli I.; Dotta-Celio J.; Duarte D.; Wuerzner G.; Pruijm M.; Zanchi A.; Schneider M-P. Understanding reasons and factors for participation and non-participation to a medication adherence program for patients. Diabetology & Metabolic Syndrome (2022) 14:140 *5.395*

Bandiera C.; Pasquier J.; Locatelli I.; Niquille A.; Wuerzner G.; Dotta-Celio J.; Hachfeld A.; Wandeler G.; Wagner A-D.; Csajka C.; Zanchi A.; Cavassini M.; Schneider M-P. Medication Adherence Evaluated Through Electronic Monitors During the 2020 COVID-19 Pandemic Lockdown in Switzerland: A Longitudinal Analysis. Patient Preference and Adherence 2022:16 2313–2320 *2.314*

Suttels V.; Van Singer M.; Clack L-C.; Plüss-Suard C.; Niquille A.; Mueller Y.; Boillat Blanco N. Factors Influencing the Implementation of Antimicrobial Stewardship in Primary Care: A Narrative Review. Antibiotics 2022, 12, 30 *5.222*

Amador-Fernández N.; Benrimoj S-I.; Olry de Labry Lima A.; García-Cárdenas V.; Gastelurrutia M-A.; Berger J.; Baixaul-Fernández V-J.; Climent-Catalá M-T.; Colomer-Molina V.; Martínez-Martínez F. Strengthening patient's triage in community pharmacies: A cluster randomised controlled trial to evaluate the clinical impact of a minorailment service. Plos One. 2022 October 25 *3.752*

Bourdin A.; Dotta-Celio J.; Niquille A.; Berger J. Response to the first wave of the COVID-19 pandemic in the community pharmacy of a University Center for Primary Care and Public Health. Research in Social abd Administrative Pharmacy 18 (2022) 2706-2710. *3.348*

Nicolet A.; Al-Gobari M.; Perraudin C.; Wagner J.; Peytremann-Bidevaux I.; Marti J. Association between continuity of care (COC), healthcare use and costs: what can we learn from claims data? A rapid review. BMC Health Serv Res. 2022 May 16; 22(1):658 *0.551*

Bawab N.; Moullin J.; Jotterand S.; Rossier C.; Schneider M-P.; Perraudin C. Effectiveness of an InterprofessionalProgram (Siscare) for Supporting Patients With Type 2 Diabete. Diabetes Spectr 2023;36(1):41-51 *9.043*

Scientific publications (without impact factor)

Cateau D.; Niquille A. Bilan d'un projet de déprescription en EMS. La gazette médicale, 2022 January.

Amador-Fernández N.; Escaith M.; Niquille A.; Perraudin C.; Gouveia A.; Berger J. Evaluation of an enhanced service for medication review in Swiss community pharmacies "Médicaments à Jour?": study protocol. Farmacéuticos Comunitarios, 2022 June 15.

Niquille A.; Cateau D. Déprescrire en établissement médico-social. Primary and Hospital Care, 2022;22(9):273–275

Niquille A.; Cateau D. Deprescribing in Alters und Pflegeheimen. Primary and Hospital Care, 2022;22(9):273–275

Quintana-Barcena P.; Sinner C.; Berger J. Domiciliary medication review (ReMeDo): development, reliability and accepty of a tool for community pharmacists. International Journal of Pharmacy Practice, 2022, Vol 30, 129–135

Nicollier L.; Du Pasquier S.; Berger J.; Gouveia A. Prescription des opioïdes en médecine générale pour les douleurs chroniques non cancéreuses. Rev Med Suisse 2022 ; 18 : 1761-6

Bongard A.; Strub B.; Berger J. Gouveia A. Optimiser l'adhésion médicamenteuse en ambulatoire. Interconnexion entre patients, infirmiers à domicile, pharmaciens et médecins. Rev Med Suisse 2022 ; 18 : 2090-5

Clinical practice guidelines

Kälin V.; Berger J. Mavenclad® (cladribine) : Risque d'atteintes hépatiques graves et nouvelles recommandations sur le contrôle de la fonction hépatique. Imed 2022, 2.

Kälin V.; Berger J. Hydrochlorothiazide : Risque de toxicité respiratoire. Imed 2022, 7.

Kälin V.; Berger J. Métronidazole oral (Flagyl® et génériques) : Troubles psychiatriques et idées suicidaires. Imed 2022, 7.

Kälin V.; Berger J. Prégabaline (Lyrica® et génériques) : risque accru de malformations congénitales majeures chez les enfants exposés pendant la grossesse ? Imed 2022, 7.

Kälin V.; Berger J. Topiramate (Topamax® et génériques) : risque de troubles neurodéveloppementaux chez les enfants exposés pendant la grossesse. Imed 2022, 7.

Brodard Z.; Kälin V.; Carli D.;Berger J. Rhinoconjonctivite allergique. Ipharm 2022, 1

Agostini-Ferrier S.; Kälin V.; Berger J. Comment utiliser au mieux les analgésiques de la liste B+ / Optimaler Einsatz der Analgetika der Liste B+. pharmaJournal 2022, 2, 10-14

Escaith M.; Kälin V.; Laurent P.; Berger J. Prise en charge des troubles ophtalmologiques courants à l'officine / Behandlung häufiger ophtalmologischer Beschwerden in der Apotheke. pharmaJournal 2022, 3, 4-10

Gashi-Favre A-S.; Kälin V.; Berger J. Troubles du sommeil : Quelles premières solutions peut-on apporter en officine? / Schlafprobleme : Welche Lösungen kann die Apotheke anbieten ? pharmaJournal 2022, 10, 8-14.

Schneider M-P.; Kaufmann B.; Cuendet M.; Bourquin C.; Nowak-Sliwinska P.; Berger J.; Csajka C.; Gervasio F.; Sadeghipour F.; Rudaz S.; Veuthey J-L.; Borchard G. Réforme des études : présentation du programme / Reform des Studiums : Vorstellung des neuen Programms. pharmaJournal 2022, 10, 26-30

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1
- Posters presentations: 8
- Oral presentations: 2
- Invited oral presentations: 6

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

Du Pasquier S.; Broers B. Accompagnement des patients avec un problème de dépendance. CAP Centre d'Animation des Pharmaciens, March 31st, 2022, Lausanne (Switzerland).

Barbalat M-J.; Pavon V. Quelle(s) vaccination(s) pour qui? « Refresh vaccination ». CAP Centre d'Animation des Pharmaciens, May 24th, 2022, Lausanne (Switzerland), November 14th, 2022, Fribourg (Switzerland).

Barbalat M-J.; Diana A. Comment mieux répondre à l'hésitation vaccinale ? CAP Centre d'Animation des Pharmaciens, September 2nd, 2022, Lausanne (Switzerland).

Berger J.; Héritier F. Anamnèse en soins primaires – cours d'approfondissement interprofessionnel. Partie pratique : raisonnement clinique, quelle démarche en pharmacie ? CAP Centre d'Animation des Pharmaciens, October 6th, 2022, Lausanne (Switzerland).

Berger J.; Héritier F. Anamnèse en soins primaires – cours d'approfondissement interprofessionnel. Partie pratique : système uro-génital (à l'exception de la contraception). CAP Centre d'Animation des Pharmaciens, October 6th, 2022, Lausanne (Switzerland).

Du Pasquier S.; Tzartzas K. Psychatrie : gestion des cas difficiles en officine. CAP Centre d'Animation des Pharmaciens, October 10th, 2022, Morges (Switzerland)

Brajkovic S.; Dotta-Celio J. Antiagrégants et anticoagulants – de la théorie à la pratique. CAP Centre d'Animation des Pharmaciens, October 27th, 2022, Neuchâtel (Switzerland)

Berger J.; Héritier F. Anamnèse en soins primaires – cours d'approfondissement interprofessionnel. Partie pratique : dermatologie – prise en charge de pathologies infectieuses. CAP Centre d'Animation des Pharmaciens, December 1st, 2022, Lausanne (Switzerland).

Berger J.; Héritier F. Anamnèse en soins primaires – cours d'approfondissement interprofessionnel. Partie pratique : dermatologie – prise en charge de pathologies non-infectieuses. CAP Centre d'Animation des Pharmaciens, December 1st, 2022, Lausanne (Switzerland).

Nayak J. Le patient sous traitement oncologique à l'officine – partie 1. CAP Centre d'Animation des Pharmaciens, December 6th, 2022, Lausanne (Switzerland).

Savary J. Infections sexuellement transmissibles. PharmActuel, March 15th, 2022, Fribourg Switzerland); March 17th, 2022, Martigny (Switzerland); March 22th, 2022, Lausanne (Switzerland); PharmActuel, March 24th, 2022, Online

Berger J. Vitamines et minéraux. PharmActuel, May 10th, 2022, Fribourg (Switzerland); May 19th, 2022, Sion (Switzerland); May 24th, 2022, Lausanne (Switzerland); May 31st, 2022, Online.

Kälin V. Vitamines D – Affections dermatologiques courantes et moins courantes (3ème partie).PharmActuel, June 9th, 2022, Sierre (Switzerland) ; June 21th, 2022, Lausanne (Switzerland) ; June 23th, 2022, Online ; June 28th, 2022, Bulle (Switzerland).

Escaith, M. Anticorps monoclonaux. PharmActuel, October 11th, 2022, Bulle (Switzerland); October 13th, 2022, Sion (Switzerland); October 18th, 2022, Lausanne (Switzerland); October 20th, 2022, Online.

Kälin V. Nouveautés 2021-2022. PharmActuel, November 15th, 2022, Bulle (Switzerland); November 22th, 2022, Lausanne (Switzerland); November 24th, 2022, Martigny (Switzerland); November 29th, 2022, Online.

Berger J. Liste B+ (1ère partie). ONP Ordre Neuchâtelois des Pharmaciens, June 7th, 2022, Neuchâtel (Switzerland).

Kälin V. Liste B+ (2ème partie). ONP Ordre Neuchâtelois des Pharmaciens, December 6th, 2022, Neuchâtel (Switzerland).

Berger J. Nouveautés pharmaceutiques 2021. Jeudi d'Unisanté, January 27th, Lausanne (Switzerland).

Gashi-Favre A-S.; Kälin V.; Berger J. Les classes médicamenteuses dans le diabète de type 2. Cercle de qualité Unisanté, April, 13th, 2022, Lausanne (Switzerland).

Gashi-Favre A-S.; Kälin V.; Agostini-Ferrier S.; Berger J. Les classes médicamenteuses dans le diabète de type 2. Cercle de qualité médecins assistants Unisanté, June 21st – June 30th – July 29th, 2022, Lausanne (Switzerland).

Kälin V.; Hugentobler Hampai D.; Berger J. Ophtalmologie, Sécheresse oculaire, Conjonctivite allergique. Cercle de qualité médecins assistants Unisanté, September 20th – September 26th – September 30th – October 6th, 2022, Lausanne (Switzerland).

Dotta-Celio J.; Cateau D. Collaboration PMG – Pharmacie. Cercle de qualité médecins assistants Unisanté, November 28th – December 6th – December 9th – December 22nd 2022, Lausanne (Switzerland).

Baechler T.; Berger J. Documentation de la gestion des problèmes liés aux médicaments. Résultats 2021. Colloque Chefs de clinique Unisanté, January 17th, 2022, Lausanne (Switzerland).

Barbalat M-J. Problématiques rencontrées en pharmacie humanitaire. Colloque Chefs de clinique Unisanté, March 14th, 2022, Lausanne (Switzerland).

Dotta-Celio J.; Berger, J. Collaboration Pharmacie PMG. Colloque Chefs de clinique Unisanté, April 11th 2022, Lausanne (Switzerland).

Kälin V.; Berger J. Vitamine B12 – Vitamine D. Colloque Chefs de clinique Unisanté, May 16th, 2022, Lausanne (Switzerland).

Nayak J.; Kälin V.; Berger J. Tirosint® solution – galénique et clinique dans la substitution thyroïdienne. Colloque Chefs de clinique Unisanté, June 20th, 2022, Lausanne (Switzerland).

Kälin V.; Agostini-Ferrier S.; Berger J. Anticoagulants oraux directs (ACOD). Colloque Chefs de clinique Unisanté, November 14th, 2022, Lausanne (Switzerland).

Du Pasquier S. Cannabis médical : Quelle évolution dans le cadre réglementaire? Colloque Chefs de clinique Unisanté, December 12th, 2022, Lausanne (Switzerland).

Brajkovic S. Prise en charge des blessures du sportif. Formation aux infirmières USMI, February, 2022, Lausanne (Switzerland).

Savary J. Virus de l'immunodéficience humaine (VIH). Formation aux infirmières USMI, March 31st, 2022, Lausanne (Switzerland).

Cateau D.; Brajkovic S. Les psychotropes. Formation aux infirmières USMI, November 24th, 2022, Lausanne (Switzerland).

Berger J.; Niquille A. Deprescription en gériatrie : comment faire ? MAS en pharmacie hospitalière, Séminaire « Thèmes en pharmacologie et toxicologie cliniques », June 1st, 2022, 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 pharmacoeconomics, 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 the CAS of Pharmacie Clinique (https://www.unige.ch/formcont/cours/cas-pharmacie-clinique).

Specific research fields

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

- Processes
  - 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
  - Economic evaluation of changes in therapeutic strategies in hospital
  - Risk analysis
  - Information technologies
  - Human factors, ergonomics and process efficiency
  - Organization in humanitarian, emergency and disaster situations (civil and military context)
- Persons
  - Inter-professionality
  - Innovative pedagogic approaches for knowledge transmission
  - Decision support
- Products
  - Development of hospital pharmaceutical forms, including ready-to-use products
  - Stability studies
  - Analysis of hazardous drugs
  - 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

2022 at a glance

- Publications with impact factor: 20
- Publications without impact factor: 4
- Patents: 0
- Book and chapters: 3
- Congresses / conferences organisation: 4
- Posters presentations: 63
- Oral presentations: 13
- Invited oral presentations: 13
- Number of projects at FNRS and assimilated (Research funds): 4
- Service agreements and related activities: 3
- Ph.D. Theses presented in 2022: 4
- Awards and distinctions: 8
- Public outreach activities: 0

Research funds

AstraZeneca, Bayer, Labatec, Vifor,
Amélioration des connaissances sur la maladie et les médicaments : étude chez des patients insuffisants cardiaques hospitalisés
Main applicant: Pr. Pascal Bonnabry
Total funding of the project: CHF 100'000.-
Total duration of the project: 2022-2023
Allocation 2022: CHF 50'000.-

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 9'000.-
Total duration of the project: to be determined
Allocation 2022: CHF 9'000.-

GSASA – PharmaSuisse, Projet de recherche d'ambition nationale, 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 applicant: Pr. Farshid Sadeghipour
Total duration of the project: to be determined
Allocation 2022: CHF 95'000.-

Grant Research & Development pharmaSuisse & Grant Fonds paritaire RBP IV MyCare Start.
Main applicants: Pr. Alice Panchaud & Pr. Marie-Paule Schneider Voirol
Total duration of the project: to be determined
Allocation 2022: CHF 210'000.-

Total amount for all research funds for 2022: CHF 364'000.-

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 2022: CHF 84'000.-

Fondation privée des HUG, pharmaGenève, Fondation Schmidheiny, CSL Behring, Sanofi
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 2022: CHF 320'000.-

Debiopharm; Radiopharmaceutical researches
Main applicant: Dre. Judith Delage
Total duration of the project: 2022
Allocation 2022: CHF 29'350.-

Total amount (for all service agreements and related activities) for 2022: CHF 433'350.-

Scientific publications (with impact factor)

Skalafouris C.; Blanc A-L.; Grosgurin O.; Marti C.; Samer C.; Lovis C.; Bonnabry P.; Guignard B., Development and restrospective evaluation of a clinical decision support system for the efficient detection of drug-related problems by clinical pharmacist.
International Journal of Clinical Pharmacy 2022, doi.org/10.1007/s11096-022-0150-5. *2.3*

Santos B.; Blondon K.; Van Gessel E.; Cerutti B.; Backes C.; Locher S.; Guignard B.; Bonnabry P.; Carpenter D.; Schneider M-P. Patient's perceptions of conflicting information on chronic medication: a prospective survey in Switzerland. BMC Open 2022, 3, 12:e060083. *3.6*

Schumacher, L.; Senhaji, S.; Gartner, B.; Carrez, L.; Dupuis, A.; Bonnabry, P.; Widmer, N. Full-scale simulations to improve disaster preparedness in hospital pharmacies.
BMC Health Services Research 2022, 22, 853, doi.org/10.1186/s12913-022-08230-9. *2.9*

Skalafouris C.; Reny J-L.; Stirnemann J.; Grosgurin O.; Eggimann F.; Grauser D.; Teixeira D.; Jermini M.; Bruggmann C.; Bonnabry P.; Guignard B. Development and assessment of PharmaCheck: an electronic screening tool for the prevention of twenty major adverse drug events. BMC Medical Informatics Decision Making 2022, 22, 146, doi.org/10.1186/s12911-022-01885-8. *3.4*

Fleury S.; Maurin J.; Guillarme D.; Rudaz S.; Bonnabry P., Development and application of a liquid chromatography coupled to mass spectrometry method for the simultaneous determination of 23 antineoplasic drugs at trace levels. Journal of Pharmaceutical and Biomedical Analysis 2022, 221, 115034, doi.org/10.1016/j.jpba.2022.115034. *3.5*

Krstic M.; Devaud J.-C.; Sadeghipour F.; Marti J., Current expertise, opinions, and attitude toward TNF-α antagonist biosimilars among physicians: A self-administered online survey in Western Switzerland. Healthcare 2022, 10, 2152; doi.org/10.3390/healthcare1011215. *3.5*

Krstic M.; Devaud J.-C.; Marti J.; Sadeghipour F., Exploring the Reasons Behind the Substantial Discontinuation Rate Among Patients Taking CT-P13 in a Large Tertiary Hospital in Western Switzerland: A Retrospective Cohort Study Using Routinely Collected Medical Data. Drugs - Real World Outcomes, 19.05.2022; doi.org/10.1007/s40801-022-00299-2. *1.8*

Feka A.; Di Paolo ER.; Pauchard JY.; Marigues A.; Gehri M.; Sadeghipour F. Off-label use of psychotropic drugs in a Swiss paediatric service: similar results from two different cohort studies. Swiss Medical Weekly 2022, 152, w30124 ; doi:10.4414/SMW.2022.w30124 *2.2*

Vonbach P.; Lutters M.; Waldispühl Suter B.; Voirol P.; Higi L.; Hufschmid Thurnherr E. Digitalisation of the drug prescribing process in Swiss hospitals - results of a survey. European Journal of Hospital Pharmacists 2022, doi: 10.1136/ejhpharm-2022-003491 *2.5*

Dusapin CJ.; Pantet O.; Voirol P.; Charrière M.; Thomann P.; Berger MM. Computer customization errors compromised the optimization of trace element repletion dose after major burns. Clinical Nutrition 2022, 41, 2207-10. doi: 10.1016/j.clnu.2022.08.00 *8.2*

Décaudin B.; Voirol P.; Perrottet N.; Spinewine A.; Bussières JF, Clinical pharmacy in four French-speaking university hospitals, integration and supervision of clinical pharmacists: An exploratory study. Annales pharmaceutiques françaises 2023, 81, 138-51. doi:10.1016/j.pharma.2022.08.001 *0.7*

Arévalo-Herrera M.; Gaitán X.; Larmat-Delgado M.; Alejandra Caicedo M.; Herrera SM.; Henao-Giraldo J.; Castellanos A.; Devaud J.C.; Pannatier A.; Oñate J.; Corradin G.; Herrera S. Randomized clinical trial to assess the protective efficacy of a Plasmodium vivax CS synthetic vaccine. Nature Communications 2022, 13, 1603 *14.9*

Favre G.; Gerbier E.; Maisonneuve E.; Pomar L.; Winterfeld U.; Lepigeon K.; Bloemenkamp KWM.; De Bruin O.; Eimir H.; Nordeng H.; Siiskonen SJ.; Sturkenboom MCJM.; Baud D.; Panchaud A. COVI-PREG; CONSIGN group. COVID-19 related medicine utilization study in pregnancy-theCOVI-PREG cohort. British Journal of Clinical Pharmacology 2022, doi: 10.1111/bcp.15611 *3.7*

Baumgartner R.; Winterfeld U.; Panchaud A.; Simões-Wüst AP. Queries on medication use during pregnancy: characterisation of the Swiss Teratogen Information Service database. Swiss Medical Weekly 2022, May 23;152:w30187. doi: 10.4414/smw.2022.w30187 *2.2*

a mis en forme : Allemand (Suisse)

Women during the COVID-19 Pandemic: A Cross-Sectional Study in Five European Countries. International Journal of Environmental Research and Public Health 2022, 19, 1389 *3.8*

Legardeur H.; Cuenoud A.; Panchaud A.; Grandoni F.; Mesquita Sauvage AB.; Alberio L.; Baud D.; Gavillet M. Shall we rethink the timing of epidural anesthesia in anticoagulated obstetrical patients? Americal Journal of Obstetric and Gynecology 2022, doi: 10.1016/j.ajog.2022.10.024 *8.6*

Balmpouzis Z.; Faure van Rossum A.; Baud D.; Panchaud A.; Mitropoulou G.; Mazza Stalder J.; Koutsokera A. Successful pregnancy in a cystic fibrosis patient with a severe impairment of lung function receiving Elexacaftor-Tezacaftor-Ivacaftor. Respiratory Medicine Case Reports 2022, doi: 10.1016/j.rmcr.2022.101776 *1.1*

Panchaud A.; Cleary B.; Weber-Schoendorfer C.; Shechtman S.; Cassina M.; Diav-Citrin O.; Damkier P. The risk of questioning the safety of drugs considered safe in pregnancy at the era of big data: the everlasting case of doxylamine. Journal of Clinical Epidemiology 2022, 152, 125-6. doi: 10.1016/j.jclinepi.2022.10.007 *7.4*

Ceulemans M.; Sillis L.; Foulon V.; Panchaud A.; Winterfeld U.; Pomar L.; Cleary B.; O'Shaughnessy F. ; Passier A.; Richardson JL.; Nordeng H., Comment to "Pregnancy and COVID-19, focus on vaccine and pharmacological treatment". Journal of Reproductive Immunology 2022, 152, 103639 *4.0*

Grandchamp S.; Blanc A.-L.; Neemann M.; Tagan D.; Sautebin A; Dobrinas M.; Widmer N. Pharmaceutical interventions on hospital discharge prescriptions: challenges for community pharmacists. Drugs - Real World Outcomes 2022, 9, 253–61, doi.org/10.1007/s40801-021-00288-x *1.8*

Scientific publications (without impact factor)

Dobrinas-Bonazzi M.; Grandchamp S.; Roussel M.; Blanc A.-L.; Widmer N., Austrittsrezepte: pharmazeutische Interventionen in der Offizin [Ordonnances de sortie d'hôpital: interventions du pharmacien d'officine]. pharmaJournal 2022, 3, 22-24.

Favre G.; Maisonneuve E.; Pomar L.; Winterfeld U.; Daire C.; Martinez de Tejada B.; Delecraz D.; Campelo S.; Moser M.; Todesco-Bernasconi M.; Sturm S.; Hösli I.; Monod C.; Frey Tirri B.; Kalimeris S.; Blume C.; Mathis J.; Zimmerman R.; Radan AP.; Surbek D.; Baud D.; Panchaud A. COVID-19 mRNA vaccine in pregnancy: Results of the Swiss COVI-PREG registry, an observational prospective cohort study. The Lancet Regional Health - Europe 2022, 18, 100410.

Gerbier E.; Favre G.; Tauqeer F.; Winterfeld U.; Stojanov M.; Oliver A.; Passier A.; Nordeng H.; Pomar L.; Baud D.; Panchaud A.; Meyer-Massetti C.; Ceulemans M. Self-Reported Medication Use among Pregnant and Postpartum Women during the Third Wave of the COVID-19 Pandemic: A European Multinational Cross-Sectional Study. International Journal of Environmental Research and Public Health 2022, 19, 5335.

Gerbier E.; Graber SM.; Rauch M.; Marxer CA.; Meier CR.; Baud D.; Winterfeld U.; Blozik E.; Surbek D.; Spoendlin J.; Panchaud A. Use of Prescribed Drugs to Treat Chronic Diseases during Pregnancy in Outpatient Care in Switzerland between 2014 and 2018: Descriptive Analysis of Swiss Health Care Claims Data. International Journal of Environmental Research and Public Health 2022, 19, 1456.

Books or books chapters

Carai S.; Jullien S.; MacIennan C.; Mutevelli J.; Weber M.; Di Paolo ER. Editorial group pour Drug dosages In Pocket book of primary health care for children and adolescents. Copenhagen: WHO Regional Office for Europe; 2022; Annex 4.

Maisonneuve E. ; Panchaud A., Recherche. In : 3e édition « Grossesse et allaitement : guide thérapeutique », 2022.

Gerbier A.; Panchaud A., Médicament Grossesse et allaitement. Chapitre in EGONE. Swiss society of Gynecology and Obstetrics, 2022.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 4
- Posters presentations: 63
- Oral presentations: 13
- Invited oral presentations: 13

Ph.D. Theses presented in 2022

Audrey Flornoy
Approches pédagogiques innovantes sur la sécurité d'utilisation des médicaments : création et évaluation de formations pour les professionnels de santé hospitaliers et d'une action de sensibilisation pour les patients.
Pr. Pascal Bonnabry

Thomas Rudolf von Rohr
Optimisation de la pharmacothérapie aux soins intensifs de pédiatrie et néonatologie : le rôle des recommandations de bonnes pratiques cliniques.
Pr. Pascal Bonnabry

Christian Skalafouris
Conception, évaluation et impact d'une aide à la décision informatisée destinée aux pharmaciens cliniciens.
Pr. Pascal Bonnabry

Sandrine von Grünigen
Handling cytotoxic drugs and related waste in low and middle-income countries: a toolkit to promote safe handling practices.
Pr. Antoine Geissbühler, Pr. Pascal Bonnabry
Institut de santé globale, Faculté de médecine

Awards and distinction

Skalafouris, C.; Gérard, L.; Rudolf Von Rohr, T.; Bonnabry, P.; Fonzo-Christe, C., Selection of clinical rules for the screening of high risk situations in pediatric medicine. **Best oral communication award**. Congress of the European Association of Hospital Pharmacists, 2022, Vienne (Autriche).

Garnier, A.; Hearder, C.; Dubs, C.; Bonnabry, P.; Bouchoud, L., Conception et évaluation d'un dispositif de formation ludopédagogique pour le lavage, la désinfection des mains et l'enfilage des gants stériles. **Public best oral communication award**. Congrès Sifem, 2022, Amiens.

Skalafouris, C.; Blanc, A-L.; Grosgurin, O.; Marti, C.; Samer, C.; Lovis, C.; Bonnabry, P.; Guignard, B., Développement et évaluation de règles cliniques pour une détection efficiente de problèmes relies à la pharmacothérapie via un système d'aide à la décision clinique. **Best oral communication award** Hopipharm, 2022, Lille.

Garnier, A.; Butaye, L.; Bonnabry, P.; Bouchoud, L., A "room of errors" to improve operators' knowledge in a cytotoxic production unit. **Best oral communication award.** Congrès GSASA, 2022, Lucerne.

Pellaton, C.; Humbert-Claude, M.; Borlat, M.-L.; Widmer, N.; Blanc, A.L., Cartographie de l'utilisation des médicaments anticholinergiques en établissement médico-social. **Best poster forum award**. Congrès GSASA, 2022, Lucerne.

Zdonowski, AC.; Savet, M.; Beney, J., A la recherche d'indicateurs pour l'Assistance Pharmaceutique. **Best oral communication award**, 23ème Journées franco-suisses de pharmacie hospitalière, 2022, Beaune.

Bello, W; Pezzatti, J; Rudaz, S.; Sadeghipour, F., Monitoring d'additifs plastiques potentiellement perturbateurs endocriniens par UHPLC-HRMS dans des contenants plastiques pré-remplis utilisés en milieu hospitalier. **Best oral presentation,** GERPAC 2022, Giens, France.

Monney, M.; Devaud, JC.; Sadeghipour, F, Etude interventionnelle prospective avant/après de l'implémentation de la culture Lean sur le processus de réception des marchandises et de mise en stock de l'unité de logistique du Service de pharmacie du CHUV. **Second Best oral communication award.** Congrès GSASA, 2022, Lucerne.

IMMUNOPHARMACOLOGY OF CANCER

Professor Carole BOURQUIN

General description of the 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.

2022 at a glance

- Publications with impact factor: 2
- Publications without impact factor: 1
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 3
- Posters presentations: 5
- Oral presentations: 6
- Invited oral presentations: 2
- Number of projects at FNRS and assimilated (Research funds): 8
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 1
- Awards and distinctions: 0
- Public outreach activities: 2

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 2022: 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: 4 years
Allocation 2022: CHF 166'707.-
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 2022: CHF 15'000.-
Starting date: 01.01.2021

Swiss Cancer Research Foundation
Category: Institutional
"Impact of obesity on anti-tumor response to immunotherapy."
(KFS-4535-08-2018-R)
Main applicants: Carole Bourquin, Aurélien Pommier
Total funding: CHF 368'850.-
Duration: 4 years
Allocation 2022: CHF 61'350.-
Starting date: 01.03.2019

Cell Migration
Category: Institutional
Doctoral Program SwissUniversities
Main applicant: Carole Bourquin
Total funding: CHF 24'000.-
Duration: 6 years
Allocation 2022: 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 2022: 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 2022: 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 2022: CHF 8'000.-
Starting date: 01.11.2020

Total amount for all research funds for 2022: CHF 556'100.-

Scientific publications (with impact factor)

Hocevar, S.; Puddinu, V.; Haeni, L.; Petri-Fink, A.; Wagner, J.; Alvarez, M.; Clift, MJD.; Bourquin C. PEGylated Gold Nanoparticles Target Age-Associated B Cells In Vivo.ACS Nano, (2022). 16, 11, 18119–18132 *18.0*

Boersma, B.; Möller, K.; Wehl, L.; Puddinu, V.; Huard, A.; Fauteux-Daniel, S.; Bourquin, C.; Palmer, G.; & Bein, T., Inhibition of IL-1β release from macrophages targeted with necrosulfonamide-loaded porous nanoparticles. Journal of Controlled Release, (2022). 351, 989-1002. *11.5*

Scientific publications (without impact factor)

Schneider, M.; Kaufmann, B.; Cuendet, M.; Bourquin, C., Nowak-Sliwinska, P.; Berger, J.; Csajka, C.; Gervasio, F.; Sadeghipour, F.; Rudaz, S.; Veuthey, JL.; Borchard, G., Réforme des études: présentation du programme / Reform des Studiums: Vorstellung des neuen Programms. pharmaJournal 2022, 10 :26-30

Congresses / conferences and Symposia

- Congresses / conferences organisation: 3
- Posters presentations: 5
- Oral presentations: 6
- Invited oral presentations: 2

Ph.D. Theses presented in 2022

Betül Taskoparan Yaglikci
Role of Intratumoral HMGB1 in the Antitumor Immune Response
Prof. Carole Bourquin
Dr Paul Richard Walker

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

Press release UNIGE « A new nanoparticle to act at the heart of cells", 9th November 2022.

Several articles in national and international press about the publication in *Journal of Controlled Release* « Inhibition of IL-1β release from macrophages targeted with necrosulfonamide-loaded porous nanoparticles.

MOLECULAR PHARMACOLOGY

Professor Patrycja NOWAK-SLIWINSKA

General description of the 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 mechanism
- Drug combinations to boost the activity of immune checkpoint inhibitors
- Complex *in vitro* platforms to mimic tumor microenvironment

2022 at a glance

- Publications with impact factor: 4
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 2
- Posters presentations: 14
- Oral presentations: 6
- Invited oral presentations: 4
- Number of projects at FNRS and assimilated (Research funds): 7
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 1
- Awards and distinctions: 1
- Public outreach activities: 8

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: 2 years
Allocation 2022: CHF 60'000.-
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 2022: CHF 10'000.-
Starting date: 01.10.2022

Fondation recherche suisse contre le cancer
Institutional
Targeting multipolar spindles in cancer cells with a synergistic drug combination
Main applicanta: Prof. Patrycja Nowak-Sliwinska, Prof. Patrick Meraldi
Total funding of the project: CHF 346'650.-
Total duration of the project: 3 years
Allocation 2022: CHF 57'800.-
Starting date: 01.01.2021

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 2022: CHF 163'478.-
Starting date: 01.01.2021

Ligne 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: 1 year (already reported in 2021)
Allocation 2022: CHF 0.-
Starting date: 01.06.2021

Innovation Debiopharm Academia Leman (IDEAL)
Institutional
IDEAL 102
Main applicant: Prof. Patrycja Nowak-Sliwinska
Total funding of the project: CHF 50'000.-
Total duration of the project: 6 months (already reported in 2021)
Allocation 2022: CHF 0.-
Starting date: 01.08.2021

DIP Mentorat
Title of the research project: Poste de mentore / Programme égalité UNIGE
Main applicant: Prof. Patrycja Nowak-Sliwinska
Total funding of the project: CHF 65'000.-
Total duration of the project: 2 years
Allocation 2022: CHF 40'000.-
Starting date: 15.05.2020

Total amount for all research funds for 2022: CHF 331'278.-

Scientific publications (with impact factor)

Griffioen, A.W.; Nowak-Sliwinska, P.; Programmed cell death lives, Apoptosis 2022, 27 (9-10), 619-621. *4.68*

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 cell anergy, Angiogenesis 2022. *10.66*

Ramzy, G.M.; Boschung, L.; Koessler, T.; Delucinge-Vivier, C.; Docquier, M.; McKee, T.A.; Rubbia-Brandt, L.; Nowak-Sliwinska, P.; FOLFOXIRI Resistance Induction and Characterization in Human Colorectal Cancer Cells, Cancers 2022, 14 (19), 4812. *6.64*

Van Beijnum, J.R.; Huijbers, E.J.M.; van Loon, K., Akbari; P., Roos, A.; Wong, T.J.; Jimenez, C.; Nowak-Sliwinska, P.; Griffioen, A.W.; Extracellular vimentin mimics VEGF and is a target for anti-angiogenic immunotherapy, Nature Commun 2022, 3 (1), 2842.2022. *17.69*

Congresses / conferences and Symposia

- Congresses / conferences organisation: 2
- Posters presentations: 14
- Oral presentations: 6
- Invited oral presentations: 4

Ph.D. Theses presented in 2022

Maria Quiles del Rey
The role of NCOA4 mediated ferritinophagy in iron biology
Arjan W. Griffioen and Patrycja Nowak-Sliwinska

Awards and distinctions

Eloise Ducrey, the winner of **Booster Programme,** which aims to fund international experiments and develop communication and popularisation skills, University of Geneva, Geneva (Switzerland).

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

P. Nowak-Sliwinska. Administrator of the LinkedIn of ISPSO, Faculty of Science, University of Geneva, Geneva (Switzerland).

P. Nowak-Sliwinska, G.M. Ramzy. Overcoming resistance to colon cancer treatment, UNIGE Press Release, October 27, 2022, Geneva (Switzerland).

P. Nowak-Sliwinska. Movie creation on Molecular Pharmacology Group for science dissemination, Faculty of Science, University of Geneva, Geneva (Switzerland).

P. Nowak-Sliwinska. Le Matin, Briser les résistances aux traitements du cancer du côlon, Lausanne (Switzerland).

P. Nowak-Sliwinska. 24 Heures, Soigner le cancer du côlon sans passer par la chimiothérapie, Lausanne (Switzerland).

P. Nowak-Sliwinska. 20 Minutes, Une solution pour mieux lutter contre le cancer du côlon (Switzerland).

P. Nowak-Sliwinska. Career Fair at the Institut International de Lancy, Grand-Lancy (Switzerland).

G.M. Ramzy, P. Nowak-Sliwinska. An illustration by the HEAD for your publication!, the Faculty of Science with the Haute École d'Art et Design, University of Geneva, Geneva (Switzerland).

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.
- 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 model for drug absorption in the gastrointestinal tract.
- Optimization of passive and iontophoretic drug delivery to the oral cavity for targeted local therapy.

2022 at a glance

- Publications with impact factor: 6
- Publications without impact factor: 0
- Patents: 1
- Book and chapters: 2
- Congresses / conferences organisation: 0
- Posters presentations: 2
- Oral presentations: 0
- Invited oral presentations: 4
- Number of projects at FNRS and assimilated (Research funds): 3
- Service agreements and related activities: 2
- Ph.D. Theses presented in 2022: 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: Yogeshvar Kalia
Total funding of the project: CHF 177’068.-
Total duration of the project: 2 years
Allocation 2022: CHF 0.- (balance paid in 2023)
Starting date: 01.06.2020

INDUSTRY 1
“Development of an ex vivo skin model to investigate the effect of hyaluronic acid filler on skin biology”
Main applicant: Yogeshvar Kalia
Total funding of the project: CHF 140’000.-.
Total duration of the project: 14 months
Allocation 2022: CHF 107’317.65.-
Starting date: 01.11.2021

INDUSTRY 2
“Preclinical evaluation of a supramolecular carrier system for intestinal absorption”
Main applicant: Yogeshvar Kalia
Total funding of the project: CHF 90’000.-.
Total duration of the project: 12 months
Allocation 2022: CHF 30’662.19.-
Starting date: 01.06.2022

INDUSTRY 3
“Understanding the delivery of RNA-based therapeutics and developing methods to improve bioavailability and efficacy.”
Main applicant: Yogeshvar Kalia
Total funding of the project: CHF 434’000.-.
Total duration of the project: 48 months
Allocation 2022: CHF 55’498.56.-
Starting date: 01.11.2022

Total amount for all research funds for 2022: CHF 193’478.40.-

Service agreements and related activities

INDUSTRY 4
“Formulation of ACB lotion for the tropical treatment of psoriasis”
Main applicant: Yogeshvar Kalia
Total funding of the project: CHF 240’000.-.
Total duration of the project: 18 months
Allocation 2022: CHF 110’383.89.-
Starting date: 01.06.2021

INDUSTRY 5
“Evaluation of the penetration and permeation of X across human skin in vitro”
Main applicant: Yogeshvar Kalia
Total funding of the project: CHF 76’484.65.-
Total duration of the project: 18 months
Allocation 2022: CHF 76’484.65.-
Starting date: 01.06.2022

Total amount (for all service agreements and related activities) for 2021: CHF 186’868.54.-

Scientific publications (with impact factor)

Alambiaga-Caravaca, A. M.; González Iglesias, L. G.; Rodilla, V.; Kalia, Y. N.; López-Castellano, A., Biodistribution of progesterone in the eye after topical ocular administration via drops or inserts. *Int J Pharm* **2022**, *630*, 122453. *6.510*

Darade, A. R.; Lapteva, M.; Hoffmann, T.; Mandler, M.; Schneeberger, A.; Kalia, Y. N., Effect of mRNA delivery modality and formulation on cutaneous mRNA distribution and eGFP expression. *Pharmaceutics* **2022**, *14 (1)*, 151. *6.525*

Gonzalez-Iglésias, L. G.; Messaoudi, S.; Kalia, Y. N., Non-invasive iontophoretic delivery of cytochrome c to the posterior segment and determination of its ocular biodistribution. *Pharmaceutics* **2022**, *14 (9)*, 1832. *6.525*

Gou, S.; Monod, M.; Salomon, D.; Kalia, Y. N., Terbinafine and amorolfine with improved cutaneous bioavailability: A novel micelle-based antifungal "tri-therapy". *Pharmaceutics* **2022**, *14 (1)*, 271. *6.525*

Gou, S.; del Río-Sancho, S.; Laubach, H.-J.; Kalia, Y. N., Erbium:YAG fractional laser ablation improves cutaneous delivery of pentoxifylline from different topical dosage forms. *Int J Pharm* **2022**, *628*, 122259. *6.510*

Kang, D.; Ge, Q.; Natabou, M. A.; Xu, W.; Liu, X.; Bao, X.; Kalia, Y. N.; Chen, Y., Bolus delivery of palonosetron through skin by tip-loaded dissolving microneedles with short-duration iontophoresis: a potential strategy to rapidly relieve emesis associated with chemotherapy. *Int J Pharm* **2022**, *628*, 122294. *6.510*

Books or books chapters

Faro Barros, J.; Sahraoui, P. F.; Kalia, Y. N.; Lapteva, M., Devices for active targeted delivery: a way to control the rate and extent of drug administration [In] Targeted Drug Delivery, Y. Bachhav, Editor, Wiley-VCH, 2022, pp. 349-387.

Gratieri, T.; Kalia, Y. N., Iontophoresis in penetration enhancement. [In] Percutaneous Absorption 5th Edition, N. Dragicevic-Curic and H. I. Maibach, Editors, CRC Press, 2022, pp. 667-686.

Patents

Published: Kalia, Y.N.; Darade, A.D., Method for preparing nanosystems. WO 2022/112527 (PCT/EP2021/083236)
Filed: Kalia, Y.N., Darade, A.D.;1 new patent application filed.
Invention disclosure: 1 submitted to UNITEC.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 0
- Posters presentations: 2
- Oral presentations: 0
- Invited oral presentations: 4

Ph.D. Theses presented in 2022

Aditya Darade
Development of new formulation strategies for targeted drug delivery of low and high molecular weight therapeutic agents (No. 190)
Prof. Yogeshvar Kalia

Laura Gisela Gonzalez Iglesias
Passive and iontophoretic administration of drugs for the local and targeted treatment of ocular diseases (No. 188)
Prof. Yogeshvar Kalia

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

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.

2022 at a glance

- Publications with impact factor: 14
- Publications without impact factor: 0
- Patents: 2
- Book and chapters: 0
- Congresses / conferences organisation: 1
- Posters presentations: 27
- Oral presentations: 10
- Invited oral presentations: 1
- Number of projects at FNRS and assimilated (Research funds): 11
- Service agreements and related activities: 1
- Ph.D. Theses presented in 2022: 2
- Awards and distinctions: 3
- Public outreach activities: 3

Research funds

SNF CRSII5_183536 Sinergia - S19485
“From medicinal plant to mechanism: Target deconvolution of phytochemicals for Trypanosoma cruzi”
Applicant: Leonardo Scapozza
Main applicant: Pascal Maeser (STPI)
Total funding of the project: CHF 293’632.- (from CHF 2'279'020.-)
Total duration of the project: 3.5 years extended 1 year
Allocation 2022: CHF 86’362.-
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: Leonardo Scapozza, Marco Prunotto
Total funding of the project: CHF 1’500’000.-
Total duration of the project: 6 years (2019 -2025)
Allocation 2022: CHF 0.-
Starting date: 01.05.2019

SNF CRSII5 -186405 SIN UB - S19590
“Deciphering and Targeting the Cancer Ubiquitylome”
Applicant: Leonardo Scapozza
Main applicant: Jean-Philippe Theurillat (IOR),
Total funding of the project: CHF 733’641.- (from CHF 2'528'452.-)
Total duration of the project: 4 years
Allocation 2022: CHF 185’409.-
Starting date: 01.06.2019

HIPPIE - S19810
“High-resolution Investigation of Personalised Post-prandial inflammation biomarkErs”
Main applicants: Leonardo Scapozza, Thomas 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 2022: CHF 31’000.-
Starting date: 01.06.2020

SWISS E!114171 G2B - S19876
“G2B Gut-To-Blood: a platform for oral systemic delivery of targeted therapies”
Main applicant: Leonardo Scapozza
Total funding of the project: CHF 263’616.-
Total duration of the project: 3 years
Allocation 2022: CHF 67’881.-
Starting date: 01.10.2020

INNO-46357.1 IP-LS - S19892
“A2AR negative allosteric modulators for cancer immunotherapy: validation of lead candidate”
Main applicant: Leonardo Scapozza
Total funding of the project: CHF 881’156.-
Total duration of the project: 18 months
Allocation 2022: CHF 176’231.20.-
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: Leonardo Scapozza
Total funding of the project: CHF 878’273.45.-
Total duration of the project: 18 months
Allocation 2022: CHF 439’137.-

Starting date: 01.09.2022

INNOGAP Round26 - S110169
“Targeting selectively the TNFR1 with small molecules antagonists”
Main applicant: Leonardo Scapozza
Total funding of the project: CHF 30’000.-
Total duration of the project: 1 year
Allocation 2022: CHF 30’000.-
Starting date: 25.02.2022

FSRMM-2020- S110129
“Evolution d’une Nanofitine-médicament pour son administration par voie orale grâce à un module de passage actif de la barrière intestinale”
Main applicants: Leonardo Scapozza, Olivier Dorchies
Total funding of the project: CHF 78’188.-
Total duration of the project: 1 year
Allocation 2022: CHF 78’188.-
Starting date: 01.01.2022

FMRDB- S110113
“Understanding FMNL1 and its function towards developing a pharmacological approach for idiopathic Membranous Nephropathy”
Main applicant: Leonardo Scapozza
Total funding of the project: CHF 61’549.-
Total duration of the project: 12 months
Allocation 2022: CHF 61’549.-
Starting date: 01.01.2022

INNOSUISSE 34335.1IP - S19615
“A diagnostic kit for personalised dietary recommendations based on the gut microbiota”
Main applicant: Thomas Gurry
Total funding of the project: CHF 254’030,40.-
Total duration of the project: 01.09.2019 to 03.05.2022 (extension COVID)
Allocation 2022: CHF 51’433.-
Starting date: 01.09.2019

Total amount for all research funds for 2022: CHF 1’207’190.20.-

Service agreements and related activities

Myota-2022 – S110257
“Analyzing microbial metabolites derived from the gut microbiome in human biological samples”
Main applicant: Leonardo Scapozza
Total funding of the project: CHF 170’222.-
Total duration of the project: 12 months
Allocation 2022: CHF 170’222.-
Starting date: 01.01.2022

Total amount (for all service agreements and related activities) for 2022: CHF 170’222.-

Scientific publications (with impact factor)

Beilstein, S.; El Phil, R.; Sahraoui, S. S.; Scapozza, L.; Kaiser, M.; Maser, P., Laboratory Selection of Trypanosomatid Pathogens for Drug Resistance. *Pharmaceuticals (Basel)* **2022,** *15* (2). *4.94*

Bhattacharya, K.; Maiti, S.; Zahoran, S.; Weidenauer, L.; Hany, D.; Wider, D.; Bernasconi, L.; Quadroni, M.; Collart, M.; Picard, D., Translational reprogramming in response to accumulating stressors ensures critical threshold levels of Hsp90 for mammalian life. *Nat Commun* **2022,** *13* (1), 6271. *17.69*

Bruschi, M.; Angeletti, A.; Kajana, X.; Moroni, G.; Sinico, R. A.; Fredi, M.; Vaglio, A.; Cavagna, L.; Pratesi, F.; Migliorini, P.; Locatelli, F.; Pazzola, G.; Pesce, G.; Bagnasco, M.; Manfredi, A.; Ramirez, G. A.; Esposito, P.; Negrini, S.; Bui, F.; Trezzi, B.; Emmi, G.; Cavazzana, I.; Binda, V.; Fenaroli, P.; Pisani, I.; Montecucco, C.; Santoro, D.; Scolari, F.; Volpi, S.; Mosca, M.; Tincani, A.; Candiano, G.; Verrina, E.; Franceschini, F.; Ravelli, A.; Prunotto, M.; Meroni, P. L.; Ghiggeri, G. M., Evidence for charge-based mimicry in anti dsDNA antibody generation. *J Autoimmun* **2022,** *132*, 102900. *14.51*

Bruschi, M.; Cavalli, A.; Moll, S.; Candiano, G.; Scapozza, L.; Patel, J. J.; Tan, J. C.; Lo, K. C.; Angeletti, A.; Ghiggeri, G. M.; Prunotto, M., Discovery of anti-Formin-like 1 protein (FMNL1) antibodies in membranous nephropathy and other glomerular diseases. *Sci Rep* **2022,** *12* (1), 13659. *4.99*

Cecchini, C.; Tardy, S.; Scapozza, L., Linkers as game-changers in PROTAC Technology: emphasizing general trends in PROTAC pharmacokinetics for their rational design. *Chimia (Aarau)* **2022,** *76* (4), 341-345. *1.03*

Gibbons, S. M.; Gurry, T.; Lampe, J. W.; Chakrabarti, A.; Dam, V.; Everard, A.; Goas, A.; Gross, G.; Kleerebezem, M.; Lane, J.; Maukonen, J.; Penna, A. L. B.; Pot, B.; Valdes, A. M.; Walton, G.; Weiss, A.; Zanzer, Y. C.; Venlet, N. V.; Miani, M., Perspective: Leveraging the Gut Microbiota to Predict Personalized Responses to Dietary, Prebiotic, and Probiotic Interventions. *Adv Nutr* **2022,** *13* (5), 1450-1461. *11.56*

Huber, R.; Koval, A.; Marcourt, L.; Heritier, M.; Schnee, S.; Michellod, E.; Scapozza, L.; Katanaev, V. L.; Wolfender, J. L.; Gindro, K.; Ferreira Queiroz, E., Chemoenzymatic Synthesis of Original Stilbene Dimers Possessing Wnt Inhibition Activity in Triple-Negative Breast Cancer Cells Using the Enzymatic Secretome of Botrytis cinerea Pers. *Front Chem* **2022,** *10*, 88129 *5.54*

Ifrid, E.; Ouertatani-Sakouhi, H.; Jauslin, T.; Kicka, S.; Chiriano, G.; Harrison, C. F.; Hilbi, H.; Scapozza, L.; Soldati, T.; Cosson, P., 5-ethyl-2'-deoxyuridine fragilizes Klebsiella pneumoniae outer wall and facilitates intracellular killing by phagocytic cells. *PLoS One* **2022,** *17* (10), e0269093. *3.75*

Mologni, L.; Orsato, A.; Zambon, A.; Tardy, S.; Bisson, W. H.; Schneider, C.; Ceccon, M.; Viltadi, M.; D'Attoma, J.; Pannilunghi, S.; Vece, V.; Gueyrard, D.; Bertho, J.; Scapozza, L.; Goekjian, P.; Gambacorti-Passerini, C., Identification of non-ATP-competitive alpha-carboline inhibitors of the anaplastic lymphoma kinase. *Eur J Med Chem* **2022,** *238*, 114488. 6.*82*

Mologni, L.; Tardy, S.; Zambon, A.; Orsato, A.; Schneider, C.; Bisson, W. H.; Ceccon, M.; Viltadi, M.; Goyard, D.; Garcia, P.; D'Attoma, J.; Pannilunghi, S.; Vece, V.; Bertho, J.; Gueyrard, D.; Goekjian, P.; Scapozza, L.; Gambacorti-Passerini, C., Discovery of Novel alpha-Carboline Inhibitors of the Anaplastic Lymphoma Kinase. *ACS Omega* **2022,** *7* (20), 17083 - 17097. *4.13*

Schmaus, A.; Rothley, M.; Schreiber, C.; Moller, S.; Rosswag, S.; Franz, S.; Garvalov, B. K.; Thiele, W.; Spataro, S.; Herskind, C.; Prunotto, M.; Anderegg, U.; Schnabelrauch, M.; Sleeman, J., Sulfated hyaluronic acid inhibits the hyaluronidase CEMIP and regulates the HA metabolism, proliferation and differentiation of fibroblasts. *Matrix Biol* **2022,** *109*, 173-191. *10.44*

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* **2022** doi: 10.1111/febs.16600. 5.62

Vafeiadou, V.; Hany, D.; Picard, D., Hyperactivation of MAPK Induces Tamoxifen Resistance in SPRED2-Deficient ERalpha-Positive Breast Cancer. *Cancers (Basel)* **2022,** *14* (4). *6.57*

Vincent, F.; Nueda, A.; Lee, J.; Schenone, M.; Prunotto, M.; Mercola, M., Phenotypic drug discovery: recent successes, lessons learned and new directions. *Nat Rev Drug Discov* **2022,** *21* (12), 899-914.
and publisher Correction: Phenotypic drug discovery: recent successes, lessons learned and new directions. *Nat Rev Drug Discov* **2022,** *21* (7), 541 *112.28*

Patents

Zeisser Labouebe, M., Masloh, S., Scapozza, L., Huet, S., Kitten, O. et al. patent on Nanofitins submitted with Affilogic, EP21306709.3

Scapozza, L., Pejoski, D., Boujut, M., Hamed, H. et al. NEW ADENOSINE 2A RECEPTOR MODULATOR & USES THEREOF, P2656EP00; New European priority founding patent application, patent submitted 03.05.2022,

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1 (Cérémonie de distribution des bourses de recherche de la fondation Suisse de recherche sur les maladies musculaires, Geneva, 8.6.2022)
- Posters presentations: 27
- Oral presentations: 10
- Invited oral presentations: 1

Ph.D. Theses presented in 2022

Solène Masloh
Nanofitin as a novel shuttle for oral delivery of biologics
Prof. Leonardo Scapozza (director for University of Geneva), Dr Magali Zeisser Labouebe (co-director), Dr Maxime Culot (director for University of Artois)

Dina Hany
Genetic and multidrug combinatorial screens unravel new mechanistic clues and optimized therapeutics for estrogen receptor α-mediated breast cancer
Prof. Didier Picard (thesis-director), Prof. Patrycja Nowak-Sliwinska (co-director), Prof. Leonardo Scapozza (co-director)

Awards and distinction in 2022

Cecchini C Scholarship holder, Keystone Symposium on Targeted Protein Degradation, November 2022, Vancouver, BC, Canada

Pejoski, David and Hesham Hamed, Adoram Therapeutics presentation, 2022 BioBuisness Week. Jury Prize best pitch and Concept

Pejoski, David and Hesham Hamed Adoram Therapeutics, spin off company of the UNIGE classed Rising Star at the SACHS associates 2022 meeting 21-22 September 2022

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

Thomas Gurry x The Gut Stuff, Instagram Live podcast, February 18th 2022

Sara Pannilunghi, UNIGE finalist at « Ma thèse en 180 secondes (MT180) », March 2022

Creation of a ADORAM Therapeutics SA, a spinoff of the UNIGE, 06.06.2022registration into the Geneva commerce register (20.06.2022)

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 2022, 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
Development of new contrast agent for MRI
Formulation of microbiota
Polymer photosensitizers projects
Cancer targeted drug delivery systems
Synthesis of biopolymers

2022 at a glance

- Publications with impact factor: 16
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 0
- Congresses / conferences organisation: 1
- Posters presentations: 12
- Oral presentations: 4
- Invited oral presentations: 2
- Number of projects at FNRS and assimilated (Research funds): 5
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 5
- Awards and distinctions: 3
- Public outreach activities: 3

Research funds

HUG-CONFIRM
Category: Institutional
Molecular markers of intracranial aneurysms wall integrity and stability
Main applicants: Brenda Kwak, Philippe Bijlenga, Eric Allémann
Total funding of the project: CHF 600'000.-
Total duration of the project: 3 years
Allocation 2022: CHF 166'000.-
Starting date: 01.11.2019

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 2022: CHF 283'040.-
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 2022: CHF 143'281.-
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: 2 years
Allocation 2022: 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 2022: CHF 50'000.-
Starting date: 01.01.2021

Total amount for all research funds for 2022: CHF 642'321.-

Service agreements and related activities

Total amount for 2022: CHF 0.-

Total amount (for all service agreements and related activities) for 2022: CHF 0.-

Scientific publications (with impact factor)

Melnik T.; Jordan O.; Corpataux J.-M.; Delie F.*; Saucy F. Pharmacological prevention of intimal hyperplasia: A state-of-the-art review, Pharmacology & Therapeutics, 2022, 235. 108157. *13.40*

Melnik T.; Ben Ameur S.; Kanfar N.; Vinet L.; Delie F.; Jordan O. Bioadhesive Hyaluronic Acid/Dopamine Hydrogels for Vascular Applications Prepared by Initiator-Free Crosslinking. Int. J. Mol. Sci. 2022, 23, 5706. *6.20*

Leutcha B.P.; Dzoyem J.P.; Jouda, Sema J.-B.; TsagueTankeu D.K..; Bitchagno V.F.; Tchegnitegni G.T.M.; Essoung B.T.; Ndjakou Lenta F.R.E..; Fogue Kouam B. S.: Delie F.; Lannang A. M. Sewald N Antimicrobial and Cytotoxic Activities of Constituents from the Fruit of Albizia lebbeck L. Benth (Fabaceae). Molecules 2022, 27, 4823. *4.92*

Ndezo Bisso B.; Tokam Kuaté C.R.; Boulens N.; Allémann E.; Delie F.; Dzoyem J.P. Antibiofilm Synergistic Activity of Streptomycin in Combination with Thymol-Loaded Poly (Lactic-co-glycolic Acid) Nanoparticles against *Klebsiella pneumoniae* Isolates. Evidence-Based Complementary and Alternative Medicine, 2022, 2022, 1936165. *2.62*

Melnik T.; Porcello A.; Saucy F.; Delie F.; Jordan O. Bioadhesive Perivascular Microparticle-Gel Drug Delivery System for Intimal Hyperplasia Prevention: In Vitro Evaluation and Preliminary Biocompatibility Assessment. Gels, 2022, 8, 776. *4.43*

Melong R.; Tamokoue Kengne P. C.; Dzoyem J. P.; Fusi A. A.; Allemann E.; Delie F.; Bochet C. G.; Beifuss U.; Kapche G.d.w.f. New cytotoxic obacunone-type limonoid and other constituents from the stem bark of *Carapa procera* DC (Meliaceae), Natural Product Research. 2022, 36(11), 2783-2790. *2.86*

Nganteng, D. N. D.; Melong, R.; Mbiekop, E. P.; Maffo, T.; Allemann, E.; Delie, F.; Wafo, P.; Tchaleu, B. N.; Dzoyem, J. P., Chemical constituents and cytotoxic activity of Ocimum gratissimum L. *S Afr J Bot* **2022,** *150*, 330-333. *3.11*

Cayron, A.; Morel, S.; Bijlenga, P.; Allemann, E.; Kwak, B., Changes in endothelial characteristics as a new strategy to identify intracranial aneurysm at risk of rupture. Cardiovasc Res 2022, 118 (Suppl 1). *13.08*

Gonzalez-Fernandez, P.; Rodriguez-Nogales, C.; Jordan, O.; Allemann, E., Combination of mesenchymal stem cells and bioactive molecules in hydrogels for osteoarthritis treatment. Eur J Pharm Biopharm 2022, 172, 41-52. *5.57*

Kiening, M.; Lange, N. Enlarging the Scope of 5-Aminolevulinic Acid-Mediated Photodiagnosis towards Breast Cancers. Int J Mol Sci 2022, 23 (23). *5.54*

Kiening, M.; Lange, N., A Recap of Heme Metabolism towards Understanding Protoporphyrin IX Selectivity in Cancer Cells. Int J Mol Sci 2022, 23 (14). *5.54*

Petrovic, M.; Porcello, A.; Tankov, S.; Majchrzak, O.; Kiening, M.; Laingoniaina, A. C.; Jbilou, T.; Walker, P. R.; Borchard, G.; Jordan, O., Synthesis, Formulation and Characterization of Immunotherapeutic Glycosylated Dendrimer/cGAMP Complexes for CD206 Targeted Delivery to M2 Macrophages in Cold Tumors. Pharmaceutics 2022, 14 (9) *6.07*

Porcello, A.; Gonzalez-Fernandez, P.; Jordan, O.; Allemann, E. Nanoforming Hyaluronan-Based Thermoresponsive Hydrogels: Optimized and Tunable Functionality in Osteoarthritis Management. Pharmaceutics 2022, 14 (3). *6.07*

Rakotonirina, A.; Galperine, T.; Allemann, E. Fecal microbiota transplantation: a review on current formulations in Clostridioides difficile infection and future outlooks. Expert Opin Biol Th 2022, 22 (7), 929-944. *4.38*

Sansaloni-Pastor, S.; Varesio, E.; Lange, N., Modulation and proteomic changes on the heme pathway following treatment with 5-aminolevulinic acid. J Photoch Photobio B 2022, 233. *4.29*

Jain M.; Bouilloux J.; Borrego I.; Cook S.; van den Bergh H.; Lange N.; Wagnieres G.; Giraud MN. Cathepsin B-Cleavable Polymeric Photosensitizer Prodrug for Selective Photodynamic Therapy: In Vitro Studies. Pharmaceuticals (Basel). 2022 Apr 30;15(5):564. *5.67*

*: co-dernier auteur

Congresses / conferences and Symposia

T. Melnik, S. Ben Ameur, O. Jordan, and F. Delie. Bioadhesive sustained-release drug delivery system for the prevention of intimal hyperplasia. 13th World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology, Rotterdam (NL) (March 28th-31st, 2022).

- Congresses / conferences organisation: 1
- Posters presentations: 12
- Oral presentations: 4
- Invited oral presentations: 2

Ph.D. Theses presented in 2022

Souad Adriouach
Squalene-based Near-infrared Dye Nanoparticles for the Imaging and Treatment of Cancer by Phototherapy
Allémann Eric

Martin Kiening
Exploring Metabolic Alterations in Cancer for Photodynamic Purposes
Lange Norbert

Tamara Melnik
Controlled Drug Delivery Systems for Perivascular Application and Intimal Hyperplasia Prevention
Delie Florence
Jordan Olivier

Alexandre Porcella
Hyaluronan-based Hydrogels Formulations for Therapeutic Applications
Allémann Eric
Jordan Olivier

Sara Sansaloni Pastor
Photosensitizer prodrug-induced protein expression in cancer cells
Lange Norbert

a mis en forme : Français (Suisse)

a mis en forme : Français (Suisse)

Awards and distinction

Cosseron A. **Best Poster in Pharmaceutical Technology**, Glatt Group, Swiss Pharma Science Day 2022, 19 August 2022, Berne (Suisse)

Rakotonirina Mandimbinomena Adèle, **2ème prix du jury et prix du public**, ma Thèse en 180 secondes, finale UNIGE, 25 mars 2022, Genève (Suisse)

Rakotonirina Mandimbinomena Adèle, **2ème prix du jury et prix du public**, ma Thèse en 180 secondes, finale Suisse, 19 mai 2022, Genève (Suisse)

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

P. Furrer, Journée « Futur en tous genres » accueil de 41 jeunes, préparation de crèmes pour les mains

P. Furrer, Accueil 5 étudiant-es boussole, 1er mars 2022

F. Delie, Accueil 5 étudiant-es boussole, 1er mars 2022

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 and antiparasitic activity are of particular interest. In these areas, 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 focus is set on multiple myeloma and lung adenocarcinoma models. Also, most antiparasitic drugs available on the market (when available) have a limited efficacy and strong side effects. Some plant extracts and pure compounds showed good in vitro and in vivo activity. Therefore, derivatives (synthetized by collaborators) are currently being investigated to improve their physicochemical properties. The absorption and metabolism 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 identify plant extracts and natural products with antiparasitic activity
- 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

2022 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: 10
- Oral presentations: 4
- Invited oral presentations: 0
- Number of projects at FNRS and assimilated (research funds): 7
- Service agreements and related activities: 0
- PhD Theses presented in 2022: 1
- Awards and distinctions: 0
- Public outreach activities: 0

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 2022: CHF 128'378.-
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: 48 months
Allocation 2022: CHF 109'190.-
Starting date: 01.01.2020

FNS
Grant No IZSEZO_213423 / 1
Main applicant within the research unit: Muriel Cuendet
Total funding of the project: CHF 4'500.-
Total duration of the project: 1 month
Allocation 2022: CHF 4'500.-
Starting date: 01.10.2022

Institutional
INNOSUISSE – Innovation Project
Grant No 33410.1 IP-LS: Development of waltherione F-based chemical entities for Chagas disease
Main applicant within the research unit: Muriel Cuendet
Total funding of the project: CHF 271'200.-
Total duration of the project: 30 months
Allocation 2022: CHF 22'466.-
Starting date: 01.06.2019

Institutional
Leading House for the Latin American Region – Seed Money Grant
Grant No SMG1906
Main applicant within the research unit: Muriel Cuendet
Total funding of the project: CHF 10'050.-
Total duration of the project: 29 months
Allocation 2022: CHF 0.-
Starting date: 01.02.2020

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: 23 months
Allocation 2022: CHF 43'600.-
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: 12 months
Allocation 2022: CHF 58'000.-
Starting date: 01.08.2022

Total amount for all research funds for 2022: CHF 366'134.-

Service agreements and related activities

Total amount for all service agreements and related activities for 2022: CHF 0.-

Scientific publications (with impact factor)

Coira, I.F.; Rincon, R.; Cuendet, M., The multiple myeloma landscape: epigenetics and non-coding RNAs. Cancers 2022, 14, 2348. *6.75*

Wong, C.Y.; Cuendet, M.; Spaleniak, W.; Gholizadeh, H.; Marasini, N.; Ong, H.X.; Traini, D., Validation of a cell integrated next generation impactor to assess in vitro drug transport of physiologically relevant aerosolized particles. International Journal of Pharmaceutics 2022, 624, 122024. *6.51*

Sevik Kilicaslan, O.; Cretton, S.; Quiros-Guerrero, L.; Bella, M.A.; Kaiser, M.; Mäser, P.; Ndongo, J.T.; Cuendet, M., Isolation and structural elucidation of compounds from Pleiocarpa bicarpellata and their in vitro antiprotozoal activity. Molecules 2022, 27, 2200. *4.92*

Saraux, N.; Cretton, S.; Sevik Kilicaslan, O.; Occioni, C.; Ferro, A.; Quiros-Guerrero, L.; Karimou, S.; Christen, P.; Cuendet, M., Isolation and structure elucidation of compounds from Sesamum alatum and their antiproliferative activity against multiple myeloma cells. Journal of Natural Products 2022, 85, 2706-2713. *4.80*

Saraux, N.; Imeri, D.; Quiros-Guerrero, L.; Karimou, S.; Christen, P.; Cuendet, M., Phytochemical investigation of the roots of Ipomoea asarifolia and antiproliferative activity of the isolated compounds against multiple myeloma cells. Journal of Natural Products 2022, 85, 56-62. *4.80*

Ferro, A.; Cretton, S.; Venturini Polese, A. A.; Coutinho Endringer, D.; Cuendet, M., Active compounds from Inga edulis Martius seeds against multiple myeloma. Natural Product Communications 2022, 17, 1. *1.49*

Congresses / conferences and symposia

- Congress / conferences organisation: 0
- Posters presentations: 10
- Oral presentations: 4
- Invited oral presentations: 0

Ph.D. Theses presented in 2022

Micaela Faria Freitas
Anti-proliferative natural compounds and their derivatives in various *in vitro* multiple myeloma models
Prof. Muriel Cuendet

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 bioactivies 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 metabolisation 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 phytotherapeuticals
- Study of the metabolisation 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

2022 at a glance

- Publications with impact factor: 19
- Publications without impact factor: 0
- Patent: 0
- Book and chapters: 1
- Congresses / conferences organisation: 0
- Posters presentations: 5
- Oral presentations: 2
- Invited oral presentations: 13
- Number of projects at FNRS and assimilated (Research funds): 4
- Service agreements and related activities: 3

- Ph.D. Theses presented in 2022: 3
- Awards and distinctions: 0
- Public outreach activities: 1

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 2022: CHF 73'049.-
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: 48 months
Allocation 2022: CHF 736'265.- (for the whole consortium but received at UNIGE)
Starting date: 01.04.2020

Institutional
Université de la Réunion – Projet PHAR
Main applicant within the research unit: Jean-Luc Wolfender
Total funding of the project: CHF 21'936.-
Total duration of the project: 20 months
Allocation 2022: 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: 23 months
Allocation 2022: CHF 50'000.-
Starting date: 01.02.2022

Total amount for all research funds for 2022: CHF 859'314.-

Service agreements and related activities

Industry Partner, Geneva (NITM)
Total amount for 2022: CHF 0.-

Industry Partner, Geneva (ALICE)
Total amount for 2022: CHF 40'882.-

Industry Partner, France
Total amount for 2022: CHF 51'550.-
Total amount (for all service agreements and related activities) for 2022: CHF 92'432.-

Scientific publications (with impact factor)

Allard, P.-M., Gaudry, A., Quirós-Guerrero, L. M., Rutz, A., Dounoue-Kubo, M., Walker, T. W. N., Defossez, E., Long, C., Grondin, A., David, B., Wolfender, J.-L., Open and reusable annotated Mass Spectrometry Dataset of a chemodiverse collection of 1,600 plant extracts. Gigascience 2022 (12). *7.65*

Gaudry, A., Huber, F., Nothias, L.-F., Cretton, S., Kaiser, M., Wolfender, J.-L., Allard, P.-M., MEMO: Mass Spectrometry-based sample vectorization to explore chemodiverse datasets. Frontiers in Bioinformatics, 2022, 2. *5.00*

Hammerle, F., Bingger, I., Pannwitz, A, Magnutzki, A., Gstir, R., Rutz, A., Wolfender, J.-L., Peintner, U., Siewert, B., Targeted isolation of photoactive pigments from mushrooms yielded a highly potent new photosensitizer: 7,7′-Biphyscion. Scientific Reports, 2022, 12. *4.99*

Hell, T., Rutz, A., Dürr, L., Dobrzyński, M., Reinhardt, J. K., Lehner, T., Keller, M., John, A., Gupta, M., Pertz, O., Hamburger, M., Wolfender, J.-L., Garo, E., Combining activity profiling with advanced annotation to accelerate the discovery of Natural Products targeting oncogenic signaling in melanoma. Journal of Natural Products, 2022, 85, 1540–1554. *4.80*

Henry, J., Hung, A., Allard, P.-M., Taki, A., Gasser, R. B., Kaslin, J., Wlodkowic, D., Wolfender, J.-L., Urban, S., Targeted isolation of antibiotic brominated alkaloids from the marine sponge *Pseudoceratina durissima* using virtual screening and molecular networking. Marine Drugs 2022, 20 (9). *6.08*

Hoyt, C. T., Balk, M., Callahan, T. J., Domingo-Fernández, D., Haendel, M. A., Hegde, H. B., Himmelstein, D. S., Karis, K., Kunze, J., Lubiana, T., Matentzoglu, N., McMurry, J., Moxon, S., Mungall, C. J., Rutz, A., Unni, D. R., Willighagen, E., Winston, D., Gyori, B. M., Unifying the identification of biomedical entities with the bioregistry. Scientific Data, 2022, 9. *8.50*

Huber, R., Koval, A., Marcourt, L., Heritier, M., Schnee, S., Michellod, E., Scapozza, L., Katanaev, V. L., Wolfender, J. L., Gindro, K., Queiroz, E. F., Chemoenzymatic synthesis of original stilbene dimers possessing Wnt inhibition activity in triple-negative breast cancer cells using the enzymatic secretome of *Botrytis cinerea* pers. Fontiers in Chemistry 2022, 10. *5.54*

Huber, R., Marcourt, L., Koval, A., Schnee, S., Righi, D., Michellod, E., Katanaev, V. L., Wolfender, J. L., Gindro, K., Queiroz, E. F., Chemoenzymatic synthesis of complex phenylpropanoid derivatives by the *Botrytis cinerea* secretome and evaluation of their Wnt inhibition activity. Frontiers in Plant Science 2022, 12, 805610. *6.62*

Huber, R., Marcourt, L., Quiros-Guerrero, L.- M., Luscher, A., Schnee, S., Michellod, E., Ducret, V.,Kohler, T., Perron, K., Wolfender, J. L., Gindro, K., Ferreira Queiroz, E., Chiral separation of stilbene dimers generated by biotransformation for absolute configuration determination and antibacterial evaluation. Frontiers in Chemistry 2022, 10, 11. *5.54*

Kasim, N., Afzan, A., Mediani, A., Low, K. H., Ali, A. M., Mat, N., Wolfender, J. L., Ismail, N. H., Correlation of chemical profiles obtained from (1) H-NMR and LC-MS metabolomics with alpha-glucosidase inhibition activity for varietal selections of *Ficus deltoidea*. Phytochemical Analysis 2022, 33, 1235-1245. *3.02*

Lever, J., Kreuder, F., Henry, J., Hung, A., Allard, P.-M., Brkljača, R., Rix, C., Taki, A. C., Gasser, R. B., Kaslin, J., Wlodkowic, D., Wolfender, J.-L., Urban, S., Targeted isolation of antibiotic brominated alkaloids from the marine sponge *Pseudoceratina durissima* using virtual screening and molecular networking. Marine Drugs 2022, 20, 554. *6.08*

Marcourt, L., Massiot, G., The structure of hemicalide from the marine sponge hemimycale sp. European Journal of Organic Chemistry 2022, 2022 (25). *3.26*

Quiros-Guerrero, L. M., Nothias, L. F., Gaudry, A., Marcourt, L., Allard, P. M., Rutz, A., David, B., Queiroz, E. F., Wolfender, J. L., Inventa: A computational tool to discover structural novelty in natural extracts libraries. Frontiers in Molecular Biosciences 2022, 9, 1028334. *6.11*

Rutz, A., Sorokina, M., Galgonek, J., Mietchen, D., Willighagen, E., Gaudry, A., Graham, J. G., Stephan, R., Page, M., Vondrášek, J., Steinbeck, C., Pauli, G. F., Wolfender, J.-L., Bisson, J., Allard, P.-M., The LOTUS initiative for open knowledge management in natural products research. E-Life 2022, 11, e7080. *8.71*

Saldanha, L. L., Allard, P.-M., Dilarri, G., Codesido, S., González-Ruiz, V., Ferreira Queiroz, E., Ferreira, H., Wolfender, J.-L., Metabolomic- and molecular networking-based exploration of the chemical responses induced in *Citrus sinensis* leaves inoculated with Xanthomonas citri. Journal of Agricultural and Food Chemistry 2022, 70, 46, 14693–14705. *5.89*

Schnee, S., Huber, R., Marcourt, L., Michellod, E., Wolfender, J.-L., Gindro, K., Ferreira Queiroz, E., Generation of antifungal stilbenes derivatives towards grapevine downy mildew using enzymatic secretome of *Botrytis cinerea.* BIO Web of Conferences 2022, 50, 03007. *0.40*

Wainwright, C. L., Teixeira, M. M., Adelson, D. L., Buenz, E. J., David, B., Glaser, K. B., Harata-Lee, Y., Howes, M. R., Izzo, A. A., Maffia, P., Mayer, A. M., Mazars, C., Newman, D. J., Nic Lughadha, E., Pimenta, A. M., Parra, J. A., Qu, Z., Shen, H., Spedding, M., Wolfender, J. L., Future directions for the discovery of natural product-derived immunomodulating drugs: an IUPHAR positional review. Pharmacological Research 2022, 177, 106076. *10.33*

Walker, T. W. N., Alexander, J. M., Allard, P.-M., Bardgett, R. D., Capdevila, P., Coley, P. D., David, B., Defossez, E., Endara, M.-J., Ernst, M., Fernandez, C., Forrister, D. L., Gargallo-Garriga, A., Jassey, V. E. J., Neumann, S., Pellissier, L., Peñuelas, J., Peters, K., Rasmann, S., Roessner, U., Sardans, J., Schrodt, F., Schuman, M., C., Weckwerth, W., Wolfender, J.-L., van Dam, N. M., Salguero-Gómez, R., Functional Traits 2.0: The power of the metabolome for ecology. Journal of Ecology 2022, 110, 4-20. *6.38*

Wolfender, J.-L., Gaudry, A., Rutz, A., Quiros-Guerrero, L.-M., Nothias, L.-F., Ferreira Queiroz, E., Defossez, E., Allard, P.-M., Metabolomics in ecology and Bioactive Natural Products discovery: challenges and prospects for a comprehensive study of the specialised metabolome. CHIMIA, 2022, 76, 954. *1.65*

Book and chapters

Houriet, J., Wolfender, J. L., Graz, B., Selecting the most promising local treatments: retrospective treatment-outcome surveys and reverse pharmacology, Medicinal Plants as Anti-infectives Current Knowledge and New Perspectives. Chassagne, F., Ed., Academic Press: London, 2022.

Congresses / conferences and symposia

- Congresses / conferences organisation: 0
- Posters presentations: 5
- Oral presentations: 2
- Invited oral presentations: 13

Ph.D. Theses presented in 2022

Léonie Pellissier
Comprehensive study of the fungal endophyte community of the long-lived Amazonian palm *Astrocaryum sciophilum*: a model for deciphering plant-microbe interactions at chemical and bioactive levels"
Director: Prof. Jean-Luc Wolfender, co-director: Dr Katia Gindro, Agroscope

Hugo Morin
asmonate pathway initiation in the distal leaf primary vasculature after mechanical wounding in *Arabidopsis thaliana*"
Director: Prof. Jean-Luc Wolfender, co-director: Prof. Edward Farmer, UNIL

Adriano Rutz
Integrative analytical and computational strategies for qualitative and quantitative plant metabolome characterization"
Director: Prof. Jean-Luc Wolfender

Public outreachs activities:

Information grand public sur les activités et la collaboration Phytochimie et produits naturels bioactifs-Agroscope Journal : Entreprise romande, 23 septembre 2022
Les champignons et nous - Les champignons, experts es manipulation, Journaliste : Pierre Cormon

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 its contributing factors as well as assess cost-effective, interprofessional adherence-enhancing programs to implement in clinical practice and envision new models of care. Therefore, the research plan of the unit aims at achieving a comprehensive understanding of patient adherence and self-management across several chronic disease models. This research is at the interface between pharmaceutical and medical sciences.

The head of the unit is also the scientific director of pharma24 (0.25 FTE), an outpatient pharmacy located in the Geneva University Hospitals (HUG). The team consists of 13 FTE pharmacists, including two PhDs, and 10 FTE pharmacy technicians. Pharma24 is an academic outpatient pharmacy, where research on medication adherence and interprofessionality has been launched in 2019. Pharma24, as research partner, supports a steady collection of routine-based adherence and patient data. In 2022, pharma24 was responsible for developing, testing and disseminating educational material for community pharmacists to deliver the first oral SAS-CoV-2 (nirmatrelvir/ritonavir) treatment in the Canton of Geneva in collaboration with the HUG. As part of a PhD thesis, pharma24 also collected data to document this key pharmacist-physician interprofessional collaboration. Since the SAS-CoV-2 epidemic, community pharmacists and physicians confirmed that they are instrumental front-line healthcare providers for society.

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 Th. Fassier, Faculty of Medicine, head of the centre, and P. 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 in collaboration with Pr. M-C. Vanier, University of Montreal, Canada, initiated and lead the working group on interprofessional education at involving several French-speaking faculties of pharmacies in the world. 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, cost-effectiveness, patient security and to decrease the pressure of pharmaceuticals on the environment. Pr. M. Schneider and Dr. J. Berger represent the School of pharmacy in the Education Pharmaceutical Sciences Switzerland working group (*Ausbildung Pharmazeutische Wissenschaften Schweiz, APhWS*), which is currently working on the new catalogue of objectives for academic education of pharmacists as healthcare 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 evaluate medication adherence support programs in chronic diseases, such as oral oncology, diabetic kidney disease and HIV.
- To develop robust medication adherence measurement and data analysis, in particular electronic monitoring in routine care.
- To analyse the epidemiology of contradictory information on prescribed medications as perceived by chronic patients, and its impact on patient medication self-management.
- To investigate how chronic patients self-adjust their prescribed medications, and how this behaviour can be prevented in the context of a patient-professional partnership and shared decision-making throughout the patient trajectory.
- To investigate how interprofessional collaborations could support a more efficient and secure medication use, especially at the interface between the hospital and the community.

2022 at a glance

- Publications with impact factor: 11
- Publications without impact factor: 1
- Patents: 0
- Book and chapters: 1
- Congresses / conferences organisation: 2
- Posters presentations: 10
- Oral presentations: 4
- Invited oral presentations: 7
- Number of projects at FNRS and assimilated (Research funds): 4
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 0
- Awards and distinctions: 2
- Public outreach activities: 2

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 2022: CHF 75'042.-
Starting date: 01.06.2022

Commission Fédérale de la Qualité (CFQ)
Category: Institutional
Title of the research project:
Main applicant: Marie-Paule Schneider Voirol
Total funding of the project: CHF 305'811.-
Total duration of the project 4 years
Allocation 2022: CHF 0.-
Starting date: 01.11.2022

Swiss Cancer Research Foundation
Category: Institutional
Title of the research project: Optimizing targeted anti-cancer therapies: from better medication adherence to individualized treatments.
Main applicant: Marie-Paule Schneider Voirol
Total funding of the project: CHF 248'200.-
Total duration of the project 4 years
Allocation 2022: CHF 0.-
Starting date: 01.10.2018

Qualité et Recherche Santésuisse 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: 5 years
Allocation 2022: CHF 0.-
Starting date: 01.07.2017

Total amount for all research funds for 2022: CHF 75'042.-

Service agreements and related activities

Total amount (for all service agreements and related activities) for 2022: CHF 0.-

Scientific publications (with impact factor)

Schneider, MP.; Burnier, M.
Partnership between patients and interprofessional healthcare providers along the multifaceted journey to medication adherence.
British journal of clinical pharmacology. 2022. DOI: 10.1111/bcp.15325 *3.72*

Santos, B.; Blondon, K. S.; Van Gessel, E.; Cerutti, B.; Backes, C.; Locher, S.; Guignard, B.; Bonnabry, P.; Carpenter, D.; Schneider, M. P.
Patients' perceptions of conflicting information on chronic medications: a prospective survey in Switzerland.
BMJ open 2022, 12 (11), e060083. DOI:10.1136/bmjopen-2021-060083 *3.00*

Pasquier, J.; Schneider, M. P.; Locatelli, I.
Estimation of adherence to medication treatment in presence of censoring.
British journal of clinical pharmacology 2022. DOI: 10.1111/bcp.15452 *3.72*

Papus, M.; Dima, A. L.; Viprey, M.; Schott, A. M.; Schneider, M. P.; Novais, T.
Motivational interviewing to support medication adherence in adults with chronic conditions: Systematic review of randomized controlled trials.
Patient Educ Couns 2022. 105 (11). DOI: 10.1016/j.pec.2022.06.013 *2.94*

Kardas, P.; Bago, M.; Barnestein-Fonseca, P.; Garuolienė, K.; Granas, A. G.; Gregório, J.; Hadžiabdić, M. O.; Kostalova, B.; Leiva-Fernández, F.; Lewek, P.; Mala-Ladova, K.; Schneider, M. P.; van Boven, J. F. M.; Volmer, D.; Ziampara, I.; Ágh, T.
Reimbursed medication adherence enhancing interventions in 12 european countries: Current state of the art and future challenges.
Frontiers in pharmacology 2022, 13. DOI: 10.3389/fphar.2022.944829 *5.99*

Courlet, P.; Cardoso, E.; Bandiera, C.; Stravodimou, A.; Zurcher, J.-P.; Chtioui, H.; Locatelli, I.; Decosterd, L. A.; Darnaud, L.; Blanchet, B.; Alexandre, J.; Wagner, A. D.; Zaman, K.; Schneider, M. P.; Guidi, M.; Csajka, C.
Population Pharmacokinetics of Palbociclib and Its Correlation with Clinical Efficacy and Safety in Patients with Advanced Breast Cancer.
Pharmaceutics 2022, 14 (7), 1317. DOI: 10.3390/pharmaceutics14071317 *6.07*

Bawab, N.; Schneider, M.-P.; Ballabeni, P.; Locatelli, I.; Bugnon, O.; Perraudin, C.
Effectiveness of an Interprofessional Program (Siscare) for Supporting Patients With Type 2 Diabetes.
Diabetes Spectrum 2022. DOI:10.2337/ds21-0084 *1.54*

Bandiera, C.; Skrabal Ross, X.; Cardoso, E.; Wagner, D.; Csajka, C.; Olver, I.; Patterson, P.; Suppiah, V.; Gunn, K. M.; Schneider, M.
Interventions to support adherence to oral anticancer therapies: research challenges, lessons learned, and strategies to overcome them from Australia and Switzerland.
Supportive Care in Cancer 2022. DOI:10.1007/s00520-021-06710-y *3.60*

Bandiera, C.; Ribaut, J.; Dima, A. L.; Allemann, S. S.; Molesworth, K.; Kalumiya, K.; Käser, F Olson, M. S.; Burnier, M.; van Boven, J. F. M.; Szucs, T.; Albrecht, D.; Wilson, I.; De Geest, S.; Schneider, M.P.
Swiss Priority Setting on Implementing Medication Adherence Interventions as Part of the European ENABLE COST Action.
International Journal of Public Health 2022, 67. DOI:10.3389/ijph.2022.1605204 *3.89*

Bandiera, C.; Pasquier, J.; Locatelli, I.; Niquille, A.; Wuerzner, G.; Dotta-Celio, J.; Hachfeld, A.; Wandeler, G.; Wagner, A. D.; Csajka, C.; Zanchi, A.; Cavassini, M.; Schneider, M. P.
Medication Adherence Evaluated Through Electronic Monitors During the 2020 COVID-19 Pandemic Lockdown in Switzerland: A Longitudinal Analysis.
Patient preference and adherence 2022, 16, 2313-2320. *2.71*

Bandiera, C.; Lam, L.; Locatelli, I.; Dotta-Celio, J.; Duarte, D.; Wuerzner, G.; Pruijm, M.; Zanchi, A.; Schneider, M. P. Understanding reasons and factors for participation and non-participation to a medication adherence program for patients with diabetic kidney disease in Switzerland: a mixed methods study. Diabetol Metab Syndr 2022, 14 (1). DOI:10.1186/s13098-022-00898-7 *3.05*

Scientific publications (without impact factor)

Schneider, M.P.; Kaufmann, B.; Cuendet, M.; Bourquin, C.; Nowak-Sliwinska, N.; Berger, J.; Csajka, C.; Gervasio, F.; Sadeghipour, F.; Rudaz, S.; Veuthey, J-L.; Borchard, G.
Réforme des études en sciences pharmaceutiques: présentation du programme.
pharmaJournal 2022, 10, 26-30.

Books or books chapters

Schneider, M.P.; Sommer, J.; Senn, N.
Prescription médicamenteuse durable : la nécessité d'une collaboration interprofessionnelle entre médecins et pharmaciens. Chapitre 3.2.5. [In] Santé et Environnement : Vers une nouvelle approche globale, N. Senn, M. Gaille, M. del Río Carral, J. Gonzalez Holguera, Ed. Médicine et Hygiène, 2022.

Congresses / conferences and Symposia

- Congresses / conferences organisation: 2
- Posters presentations: 10
- Oral presentations: 4

Invited oral presentations: 7

Awards and distinction

Bandiera, C.; Cardoso, E.; Locatelli, I.; Digklia, A.; Zaman, K.; Diciolla, A.; Cristina, V.; Stravodimou, A.; Aedo-Lopez, V.; Dolcan, A.; Sarivalasis, A.; Bouchaab, H.; Liapi, A.; Orcurto, A.; Dotta-Celio, J.; Peters, S.; Decosterd, L.; Widmer, N.; Wagner, D.; Csajka, C.; Schneider, MP. An interprofessional medication adherence program to optimize adherence to oral anticancer therapies: a randomized-controlled trial. **Best poster award, Jean-Michel Métry prize**. International Society for Medication Adherence (ESPACOMP), 17-19 November, 2022, Berlin (Germany).

Saliez Pierret, G.; Braillard, O.; Lazzaro, D.; Schneider, M.P. Améliorer la collaboration d'équipe autour des médicaments : un projet interprofessionnel innovant. **Prix Qualité 2022**. Journée de la qualité, Hôpitaux Universitaires de Genève (HUG), 09 Décembre 2022, Genève (Suisse).

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

M.P. Schneider. Des pilules difficiles à avaler. Magazine Générations, Février 2022

C. Bandiera. Adhésion médicamenteuse chez des patients chroniques sévèrement atteints dans leur santé: patients souffrant d'un cancer solide et patients diabétiques avec atteinte rénale ; Comment aider les patient-es à mieux gérer leurs médicaments ?
My thesis in 180 seconds, Février 2022
https://ispso.unige.ch/interprofessionality/

Code de champ modifié

DATA ANALYTICS LAB

Professor Stéphane GUERRIER

General description of the Unit

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

2022 at a glance

- Publications (with impact factor): 10
- Publications without impact factor: 0
- Patents: 0
- Book and chapters: 1
- Congresses / conferences organisation: 2
- Posters presentations: 0
- Oral presentations: 0
- Invited oral presentations: 3
- Number of projects at FNRS and assimilated (Research funds): 4
- Service agreements and related activities: 0
- Ph.D. Theses presented in 2022: 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 1'662'752.-
Total duration of the project: 4 years
Allocation 2022: CHF 474'375.15.-
Starting date: 01.01.2019
Link: https://data.snf.ch/grants/grant/176843

SNSF Professorships Extension
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 2022: CHF 0.-
Starting date: 01.01.2023
Link: https://data.snf.ch/grants/grant/211007

Innosuisse
Title: Stochastic Modelling of Inertial Sensors for Precise GNSS-based Positioning
Main applicants: Stéphane Guerrier, Jan Skaloud (EPFL), Markus Wenk (Hexagon)
Main discipline: Engineering
Total funding of the project: CHF 917'280.- (CHF 246'355.- allocated to the University of Geneva)
Total duration of the project: 2 years
Allocation 2022: CHF 46'613.03.-
Starting date: 01.09.2020

Innosuisse
Title: Multi-Sensor Adjustment of Raw LiDAR, Visual and Inertial Measurements in Kinematic Laser Scanning Devices
Main applicants: Stéphane Guerrier, Jan Skaloud (EPFL), 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 2022: CHF 0.-
Starting date: 01.09.2022

Total amount for all research funds for 2022: CHF 520'988.18.-

Service agreements and related activities

Total amount (for all service agreements and related activities) for 2022: CHF 0.-

Scientific publications (with impact factor)

Guerrier S.; Molinari R.; Victoria-Feser M.-P.; Xu H.; Robust Two-Step Wavelet-Based Inference for Time Series Models, Journal of the American Statistical Association (Theory & Methods), 117 (540), 1996-2013, 2022. *4.369*

Pfarrwaller E.; Voirol L.; Piumatti G.; Karemera M.; Sommer J.; Gerbase MW.; Guerrier S.; Baroffio A. Student's intentions to practice primary care are associated with their motives to become doctors: a longitudinal study. BMC Med Educ. 2022 Jan 11; 22(1):30. *3.263*

Kermarrec G.; Lösler M.; Guerrier S.; Schön S. The variance inflation factor to account for correlations in likelihood ratio tests: deformation analysis with terrestrial laser scanners, Journal of Geodesy, 96 (11), 1-18, 2022. *4.809*

Zhang Y.; Cucci D.A.; Molinari R.; Guerrier S. Scale-Wise Variance Minimization for Optimal Virtual Signals: An Approach for Redundant Gyroscopes, IEEE Transactions on Signal Processing, 70, 5320-5333, 2022. *4.875*

Abouir K.; Gosselin P.; Guerrier S.; Daali Y.; Desmeules J.; Grosgurin O.; Reny J.L.; Samer C.; Calmy A.; Ing Lorenzini K.R. Dexamethasone exposure in normal-weight and obese hospitalized COVID-19 patients: An observational exploratory trial, Clinical and Translational Science, 15 (7), 1796-1804, 2022. *4.516*

Miglioli C.; Bakalli G.; Orso S.; Karemera M.; Molinari R.; Guerrier S.; Mili N. Evidence of antagonistic predictive effects of miRNAs in breast cancer cohorts through data-driven networks, Scientific Reports, 12 (1), 1-16, 2022. *4.996*

Insolia L.; Molinari R.; Rogers S.R.; Williams G.R.; Chiaromonte F.; Calovi M. Honey bee colony loss linked to parasites, pesticides and extreme weather across the United States, Scientific Reports, 12(1): 1-13, 2022. *4.996*

Boulaguiem Y.; Zscheischler J.; Vignotto E.; Van der Weil K.; Engelke S. Modeling and simulating spatial extremes by combining extreme value theory with generative adversarial networks, Environmental Data Science 1, 2022. tba

Bakalli G.; Guerrier S.; Scaillet O. A Penalized Two-pass Regression to Predict Stock Returns with Time-Varying Risk Premia, Journal of Econometrics, 2023, in press. *3.363*

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, in press. *4.809*

Conference Proceedings

Minaretzis C.; Cucci D. A.; Guerrier S.; Radi A.; El-Sheimy N.; Sideris M. Robust Wavelet Variance-based Approaches for the Stochastic Modeling of Inertial Sensor Measurement Noise, Proceedings of the 2022 International Technical Meeting of The Institute of Navigation, Long Beach, California, January 2022, pp. 1444-1456.

Besta M.; Grob R.; Miglioli C.; Bernold N.; Kwasniewski G.; Gjini G.; Kanakagiri R.; Ashkboos S.; Gianinazzi L.; Dryden N.; Hoefler T. Motif Prediction with Graph Neural Networks, in Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2022.

Besta M.; Miglioli C.; Labini P.S.; Tetek J.; Iff P.; Kanakagiri R.; Ashkboos S.; Janda K.; Podstawski M.; Kwaundefinedniewski G.; Gleinig N.; Vella F.; Mutlu O.; Hoefler T. ProbGraph: High-Performance and High-Accuracy Graph Mining with Probabilistic Set Representations, in Proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis, 2022.

Book Chapters

Faul M.V.; Boulaguiem Y.; Faultlines within Sectors in Partnership Executive Boards, in Partnerships for Sustainability in Contemporary Global Governance, 231-254, Routledge, 2022.

Selected statistical software (R packages):

Maintainer and author for the R package “simts”, which provides easy-to-use tools for time series analysis.
Source code: https://github.com/SMAC-Group/simts
Website: https://smac-group.github.io/simts/index.html. Downloads: 8’000 per year.

Maintainer and author for the R package “wv”, which provides various tools to perform standard and robust wavelet variance analysis for time series.
Source code: https://github.com/SMAC-Group/wv
Website: https://smac-group.github.io/wv/. Downloads: 6’000 per year.

Maintainer and author for the R package “avar”, which provides a computationally efficient implementation of the Allan variance and of other related quantities.
Source code: https://github.com/SMAC-Group/avar
Website: https://smac-group.github.io/avar/. Downloads: 6’000 per year.

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Congresses / conferences and symposia:

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

Awards and distinction:

Cesare Miglioli, Best Paper SC award for ProbGraph: High-Performance and High-Accuracy Graph Mining with Probabilistic Set Representations at the International Conference on High Performance Computing, Networking, Storage and Analysis, 2022.

Public outreach activities:

Participation to “*Comprendre le Numérique*”, Fall 2022, Bachelor level course (open to all bachelors 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

Commenté [LP5]: Descriptions des profs?

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. It is the result of a collaboration agreement between the University of Geneva and the University of Lausanne for Pharmacy.

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 2023. 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.

2022 at a glance

The year 2022 for the CRISP was marked by great strides in the deployment of advanced therapy medicinal products (ATMPs), both in the field of research with the initiation of new projects and the submission and acceptance of competitive fundings, and in the development of postgraduate training specific to the field of ATMPs. In addition, an academic production of phages following good manufacturing practice (GMP) and validated by Swissmedic is about to be ready to treat the first patients at the CHUV.

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 2022 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 2022.

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 2022. Within this framework, structured scientific seminars (accredited by pharmasuisse in 2022 for continuing education) have been presented by each group and a first scientific 1-day conference took place in October at the CHUV on the topic of Seemless care.

Innovative Biological and Cellular Therapies

The goal for 2022 of this center of expertise was to continue the development of a structured institutional program at the University Hospital of Lausanne (CHUV) to promote new cellular and biological therapies in the clinic and improve research collaboration. An inventory of the structures, projects, mechanisms, and transversal competences available at the CHUV with a vision of future needs has been established. The results of the working groups (production, regulations and certifications, patients/clinics, pricing, pharmacovigilance, training and organization) will be presented during 2023 to the CHUV direction to define the development strategy for these new types of medicines and the means and resources required to achieve the implementation of such therapeutic strategies at the CHUV.

The development of a phage therapy care programme has been finalized with i) the setting up of a first batch of therapeutic bacteriophages according to GMP standards by the Laboratory of Bacteriophages and Phage Therapy and the Center for Cell Production (CPC) obtaining the first two authorisations for treatment by phage therapy, in collaboration with the Infectious Diseases Department and the Pneumology Department of the CHUV. This major achievement opens the door to the first treatment of *P. aeruginosa* lung infections by phage therapy at the CHUV, which is expected in Q2 2023.

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, transfusion medicine and cellular therapies as well as Master theses in these areas are now active in the program of the Master 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 been accepted by both universities and will open in November 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 NCRR Microbiome of UNIL/ETHZ (https://nccr-microbiomes.ch) are ongoing. We also obtained a SNF Grant for Scientific exchange, which helped us organizing a Phage Therapy Symposium at CHUV on September 21, 2022, entitled Phage Therapy in Humans: Overview on Current Concepts in Europe and the Middle East.

Finally, a new project submitted in October 2022 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).

Research funds

Innovative Biological and Cellular Therapies

Swiss National Science Foundation
Consortium NCCR Microbiome
Main applicant: Dr Grégory Resch
Total funding of the project; CHF 200'000.-
Total duration of the project: 2 years
Allocation 2022: CHF 91'121.-
Starting date: 01.09.2022

Swiss National Science Foundation
Phage Therapy in Humans: Overview on Current Concepts in Europe and the Middle East
Main applicant: Dr Grégory Resch
Total funding of the project; CHF 4'650.-
Total duration of the project: 3 months
Allocation 2022: CHF 4'650.-
Starting date: 01.08.2022

Total amount for all research funds for 2022: CHF 95'771.-

Service agreements and related activities

Total amount (for all service agreements and related activities) for 2022: CHF 0.-

Scientific publications of the Pole Innovative Biological and Cellular Therapies

Mitropoulou G.; Koutsokera A.; Csajka C.; Blanchon S.; Sauty A.; Brunet JF.; von Garnier C.; Resch G.; Guery B. Phage therapy for pulmonary infections: lessons from clinical experiences and key considerations. Eur Respir Rev. 2022;31(166):220121. *9.55*

Ferry T; Kolenda C.; Laurent F.; Leboucher G.; Merabischvilli M.; Djebara S.; Gustave CA.; Perpoint T.; Barrey C.; Pirnay JP.; Resch G. Personalized bacteriophage therapy to treat pandrug-resistant spinal Pseudomonas aeruginosa infection. Nat Commun. 2022;13(1):4239. *17.69*

Save J.; Que YA.; Entenza JM.; Kolenda C.; Laurent F.; Resch G. Bacteriophages Combined With Subtherapeutic Doses of Flucloxacillin Act Synergistically Against Staphylococcus aureus Experimental Infective Endocarditis. J Am Heart Assoc. 2022;11(3):e023080. doi: 10.1161/JAHA.121.023080. *6.10*

Pirnay JP.; Ferry T.; Resch G. Recent progress toward the implementation of phage therapy in Western medicine. FEMS Microbiol Rev. 2022 Jan 18;46(1):fuab040. doi: 10.1093/femsre/fuab040. *15.17*

Längst E.; Crettaz D.; Delobel J.; Renella R.; Bardyn M.; Turcatti G.; Tissot J-D.; M Prudent*. In Vitro-Transfusional Model fr Red-Blood-Cell Study: the Advantage of Lowering Hematocrit, Blood Transfus, 2022, doi: 10.2450/2022.0086-22. Online ahead of print. *5.75*

Muret C.; Crettaz D.; Martin A.; Aliotta A.; Bertaggia D.; Calderara.; Alberio L.; Prudent* M. Two novel platelet biotinylation methods and their impact on stored platelet concentrates in a blood bank environment, Transfusion 2022;62, 2324-2333. *3.33*

Yasemi M.; Prudent M.; Jolicoeur M. A Dynamic Constraint-based Modelling (DCBM) Approach With Alternative Metabolic Objective Functions Predicts The impact of Oxidative Stress, IFAC PapersOnLine, 2022; 55(20); 385-390. *0.20*

a mis en forme : Français (Suisse)

Notariale R.; Längst E.; Perrone P.; Crettaz D.; Prudent* M.; Manna* C. Effect of mercury on membrane proteins, anionic transport and cell morphology in human erythrocytes. Cell Physiol Biochem, 2022; 56:500-513. *5.50*

Lotens A.; Prudent M.; Rapaille A. Antioxidants in single methylene-blue-treated plasma units cannot be used to predict pathogen inactivation treatment success. Vox Sanguinis, 2022; 117:937-942. *2.99*

Sabri M.; El Handi K.; Valentini F.; De Stradis A.; Achbani EH.; Benkirane R.; Resch G.; Elbeaino T. Identification and Characterization of Erwinia Phage IT22: A New Bacteriophage-Based Biocontrol against Erwinia amylovora. Viruses. 2022;14(11):2455. *5.80*

Save J.; Que YA.; Entenza J.; Resch G. Subtherapeutic Doses of Vancomycin Synergize with Bacteriophages for Treatment of Experimental Methicillin-Resistant Staphylococcus aureus Infective Endocarditis. Viruses. 2022;14(8):1792. *5.80*

Depelteau JS.; Renault L.; Althof N.; Cassidy CK.; Mendonça LM.; Jensen GJ.; Resch GP.; Briegel A. UVC inactivation of pathogenic samples suitable for cryo-EM analysis. Commun Biol. 2022 Jan 11;5(1):29. 35017666. *6.50*

Prazak J.; Valente LG.; Iten M.; Federer L.; Grandgirard D.; Soto S.; Resch G.; Leib SL.; Jakob SM.; Haenggi M.; Cameron DR.; Que YA. Benefits of Aerosolized Phages for the Treatment of Pneumonia Due to Methicillin-Resistant Staphylococcus aureus: An Experimental Study in Rats. J Infect Dis. 2022 Apr 19;225(8):1452-1459. *5.60*

Fischer-Fumeaux C.; Barin J.; Prudent M.; Richard C.; Martin A.; Henriot I.; Legardeur H.; Kaech C.; May H.; Vuignier J.; Tolsa J-F. Accès au lait de donneuses en Suisse et création de la première banque de lait maternel romande au CHUV: enjeux et perspectives. Rev Med Suisse 2022; 18, 59-63. *0.10*

Mitropoulou G.; Gijs PJ.; Koutsokera A.; Sauty A.; Blanchon S.; Csajka C.; Brunet JF.; Resch G.; Guery B.; Von Garnier C. Phagothérapie pour traiter les infections respiratoires [Phage therapy for respiratory infections]. Rev Med Suisse. 2022;18(804):2150-2156. *0.10*

a mis en forme : Français (Suisse)

Congresses / conferences and Symposia

- Congresses / conferences organisation: 1
- Posters presentations: 10
- Oral presentations: 8
- Invited oral presentations: 2

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 25% of the total number of PhD students enrolled in the PSLS.

There are still a few doctoral students who are completing their thesis under the "old regime" of the Doctoral School in Pharmaceutical Sciences, but in 2021, the Pharmaceutical Sciences Doctoral Programme Commission decided that any new thesis starting from 1 March 2022 would be carried out according to the PSLS thesis stream. The last 6 PhD students still under the "old regime" will finish indeed their theses in 2022-2023.

This doctoral program, 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 program is mandatory in order to be able to defend the thesis and a minimum number of 30 ECTS credits is required before the thesis defense can take place. These measures are clearly detailed in the regulations for the Doctoral Programme in Pharmaceutical Sciences.

The program 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 program: 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 programs from the Life Sciences Doctoral School, or from other CUSO doctoral programs, as long as there is space 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 program. 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 now 20 (previously 18), in order to align with the other PSLS programs.

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.

Courses and symposia

In this year of the decline of the Covid-19 pandemic, the objective has been to gradually return to face-to-face activities, while continuing to take advantage of the acquired experience - and the related benefits - in terms of organising certain activities remotely. Indeed, holding courses via video-conferencing tools allows greater flexibility and also benefits from the teachings of distant speakers without them having to travel.
We were able to maintain 19 of the initially scheduled activities, either as face-to-face meetings (when possible), or in a remote form. All our teachers were very reactive, and a majority of the planned activities took place. This was made possible by the great responsiveness, availability and dynamism of our external teachers, whom we cannot thank enough. Also due to the particular health situation, some activities scheduled in 2022, or that had been postponed since 2021 could unfortunately not be organised, due to the very busy schedules of some external speakers working in the health field. However, some courses had also to be postponed, especially those that involved a lot of interactivity. A total of 236.5 hours could however be maintained within the 2022 PhD program (including all activities; see Tables 1-3 below for detailed information).

Extra-muros seminar

The seminar in pharmaceutical sciences took place for the second 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. One minor point that was raised was that the size of the screen for the presentations in the conference room, could be a little bigger.

The 35th seminar in pharmaceutical sciences presented a programme "Drug meets patient" focusing on various aspects of drug discovery, drug development, industrial and regulatory aspects and finally the delivery to the patient. The symposium offered a soft skill workshop on two afternoons under the title "Being able to influence yourself positively". It also gave the opportunity to network with guest speakers coming from academia and industry, and to help them improve their communication skills.

All presentations except one could be given with the speakers present, which very much enhanced the interaction and discussion between speakers and participants, which were continued during the social activities. One speaker from the WHO had to record his presentation due to time constraints, and the presentation was projected during the conference and made available to the participants. One speaker (Dr. Marco Prunotto) cancelled at the last moment (Covid-positive) and his presentation was cancelled.

The PhD students were also involved in a motivational workshop, moderated by a former Olympic athlete and her colleague ("Being able to influence yourself positively"). Topics discussed here, such as self-motivation and communication, were also reflected in scientific presentations by hospital pharmacists and one speaker from industry. The soft-skill workshop gave cause for many discussions, however, the lack of professional follow-up after the workshop was finished was seen as a disadvantage. The fact that most speakers were present for at least two days at the congress venue, and participated in social activities, gave rise to networking opportunities to participants during and after the official program. The location favoured this interaction.

The symposium was evaluated by the participants to have been perfectly organized, interdisciplinary in nature not having an emphasis on only one discipline but rather touching on different aspects of pharmaceutical sciences and practice. The atmosphere was described as friendly, the presentations as very interesting with dedicated speakers and the podium discussions at the end of every session as

engaging. Suggestions by the participants for the future seminars organization included to keep the interdisciplinary and transversal character of the symposium and organize workshops concerning ecological aspects of pharmaceutical research.

After a 2-year break due to COVID restrictions, the PhD day could take place on November 18th and welcomed around 70 attendees for a full day of presentations about very diverse subjects from drug development to patient-centered care. Pr Yogeshvar N. Kalia gave an introduction as well as a very heartwarming closing speech reminding us of how multiskilled and versatile this field is. Thirteen senior PhD students presented their work to the audience and questions and discussions took place after each talk, continuing during coffee breaks and lunch time. Prof. Leonardo Scapozza raised relevant questions after each presentation allowing presenters to share their subject further with the audience. Dr. Gregory Resch from the CHUV, Lausanne was our invited keynote speaker. He presented his work on phage therapy and its great potential to revolutionize the way we treat bacterial infections. The organizing committee composed of 7 PhD students from the Pharmacy Practice research groups, was overall very satisfied with the event and received very positive feedback throughout the day from both participants and speakers. Presentations finished at 5pm and were followed by an apéro which went on until 8pm.

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). Five PhD students chose this alternative in 2022, 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 new way of participating financially in the organization of hospital and community pharmacy courses (MAS seminars; CHF 100.- per attending PhD student) showed to be a good improvement, and the organizers could thus have CHF 1200.- available as participation to the costs of the two scheduled seminars.

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 103 participants attended these lectures including 63 PhD students.

The Doctoral Program Commission should have held a meeting on December 13th 2022, but this had unfortunately to be postponed to early 2023 for health reasons.

Table 1
List of courses organized within the PhD Program in Pharmaceutical Sciences 2022 and number of participants

Name of course 2022	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	7(52)
Pharmacie hospitalière et communautaire 2	19H012	F. Sadeghipour	18	3	5(49)
Pratique des pans d'expériences (Design of Experiments DOE)	19H022	S. Rudaz, J. Boccard	16	3	11 PhD students, 1 post-doc
Design drugs with a computer	19H053	A. Daina, V. Zoete	16	2	7
Introduction to pharmaceutical industry: History, structures and Challenges	19H017	B. Baumeister	30	5	POSTPONED TO 2023
Formulation of protein biopharmaceuticals and drug delivery	19H013	T. Arvinte	20	5	4
Drug discovery: an industrial perspective	19H063	M. Prunotto	18	3	CANCELLED
Introduction to Biostatistics: Real Life Examples in Clinical Research and Development	19H055	D. Warne	24	4	CANCELLED
Use of fluorescence spectroscopy in the study of drugs, protein and membrane	19H032	T. Arvinte	16	3	7 PhD students, 1 post-doc
Initiation aux méthodes d'analyse multivariées en sciences pharmaceutiques	19H046	S. Rudaz, J. Boccard	12	3	CANCELLED
Techniques de chromatographie préparative : isolement de produits naturels et de composés synthétiques	19H037	E. Ferreira-Queiroz	20	3	CANCELLED
Introduction to plant metabolomics	19H047	P.-M. Allard, G. Glauser, E. Defossez	12	2	0
Microscopy and imaging course	14B063P	C. Bauer	32	3	0

Library PhD Camp: from Research to Publication	19H064	A.Bellier, V. Huber	8	1	0
Drug development: regulatory aspects and clinical trials	19H009	S. Latour, A. Mc Allister, A. Naik	24	4	CANCELLED
Ethics in research	19H092	Y. Kalia, D. Sprumont	12	2	5
Biotechnology development	19H070	Various speakers from NovImmune	20	3	CANCELLED
Personal genomics & predictive genetics	19H069	D. Kraus, G. Tanackovic; T. Abbas-Terki	10	1.5	7
Aperçu de la pharmacovigilance pré et post-marketing	19H068	V. Rollason	16	1.5	CANCELLED
Suivi thérapeutique des médicaments en pratique clinique	19H059	N. Widmer	8	1.5	Postponed to 2023
Ask the Expert Session 2022	19H091	C. Bourquin	4	0.5	CANCELLED
Pharmaceutical regulatory affairs: an introduction	19H088	G.Sbihi-Bouvier, P.Humbert-Droz	20	3	12
Spectrométrie de masse + exercices	1506BCR + 1506BEX	G. Hopfgartner	20	4	0
Electrophorèse capillaire	19H016	S. Rudaz	12	2	CANCELLED
Biobusiness	19H085	P.Nowak-Sliwinska	12	2	CANCELLED
Hot topics in immunology and immunopharmacology	19H077	C. Bourquin, O. Hartley	28	1.5 credit for 5 conf. followed	CANCELLED
Immunology from A to Z Part 1: basic immunology	19H083	C. Bourquin, V. Puddinu	26	4	CANCELLED

Immunology from A to Z Part 2: advanced immunology	19H084	C. Bourquin, V. Puddinu	18	3	CANCELLED
Combination therapies for cancer and personalized medicine	19H080	P. Nowak-Sliwinska	6	1	CANCELLED
Theory into practice: creating a successful business in Life Sciences	19H072	J. Camblong	10	1.5	POSTPONED TO 2023, due to sanitary situation
Quality in pharmaceuticals	19H065	F.-X. Abellan, J. Boccadoro, A. Stroemberg	20	3	CANCELLED
Pharmaceutical project and portfolio management	19H075	A. Poulet	6	1	10
Portfolio Management and Business Development: How a Pharma Company Builds, Maintains and Integrates Its Portfolio	19H097	L. Lauciello	6	1	11
Patenting procedures in life sciences and intellectual property	19H018	K. Houchangpour D. Kraus L. Miéville, P. Weibel	24	4	Postponed to 2023
Challenges in clinical oncology	19H094	C. Bourquin P. Nowak-Sliwinska I. Labidi-Galy	12	2	CANCELLED
Validation de méthodes analytiques	19H034	S. Rudaz, J. Boccard, J.-M. Roussel	28	4	CANCELLED
Drug Discovery: DNA Encoded Libraries and Their Role	19H095	A. Satz	6	1	6
Protein Biochemistry: Data Analysis and Associated Literature Research	19H096	O. Vadas	14	2	CANCELLED
Production stérile: méthodes et environnement	19H044	F. Sadeghipour	9	1.5	CANCELLED
TOTAL	39		236		92 PhD 2 post-docs

Table 2
List of symposia organized within the PhD Program in Pharmaceutical Sciences 2022 and number of participants.

Name of course 2022	# Course no.	Course organizer	Total no. of hours	Credits	# No. of participants
PhD Day	19H020	Y. Kalia	8	1 or 2	58 PhD students (66 total)
Conférences sur sujets spécialisés		Y. Kalia	10 days (20 hrs)	1,5 for 5 conf.	63 PhD students (103 total)
35th « extra-muros » meeting, ("Drug meets Patient")	19H025	P. Nowak-Sliwinska, G. Borchard	4 days (24 hrs)	1 or 2	29 (40 total)
Industrial Postdoctoral Fellowships at Roche		Y. Kalia, M. Prunotto	2	N/A	40 (41 total)
8e Symposium annuel de recherche d'Unisanté: Tour d'horizon sur la mobilité en recherche Méthodologie, compétences transverses/transférables		Unisanté, Lausanne	4	0.5	0

Table 3
List of networking activities organized within the PhD Program in Pharmaceutical Sciences 2022 and number of participants.

Name of course 2022	Course no.	Course organizer	Total no. of hours	Credits	No. of PhD students
Boost your career! How to network at a scientific meeting	19H078	C. Bourquin	4	0.5	CANCELLED
Votre programme doctoral se présente : general information session on the PhD in pharmaceutical sciences	19H093	Y. Kalia, B. Kaufmann, F. von Ow, D. Billotte, C. Neyen	2	N/A	11
4th Forum of the PhD School of Life Sciences		PSLS	8	0.5/1	CANCELLED
L'industrie pharmaceutique se présente	19H050	Y. Kalia	6	1	CANCELLED
Career day *	19H007	Y. Kalia	7	1	CANCELLED

*the career day of the Faculté des Sciences was proposed to the PhD students, but the University of Geneva cancelled it, due to sanitary situation.

Public research funds (CUSO)

Conférence Universitaire de Suisse Occidentale (CUSO)

The CUSO announced a 2022 budget similar to the 2021 budget (i.e., without financial support for programme coordination). The programme and the budget for 2022 were submitted to the CUSO in Sep 2021 and they were duly accepted. The total budget in 2022 for the five activities (Seminar Extra-Muros, Conférences spécialisées, Cours, Symposia as well as Networking activities) was CHF 40'500.- Some activities were rescheduled in 2022, but due to our lecturers' agenda, often complicated by the sanitary situation, it was not possible to schedule them in 2022.

The COVID-19 sanitary situation did not allow us to hold all scheduled activities, and some of them, involving networking interactions had again to be postponed to 2023.

At the end, the effective costs for 2022 for all the activities were CHF 29'191.98.-

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.