

Cancer Research in Switzerland

A close-up photograph of a plant with vibrant green leaves and reddish-brown stems against a teal background. The leaves are elongated and have a slightly serrated edge. The stems are thick and woody, with some small, curled tendrils. The overall composition is a vertical shot, with the plant filling most of the frame.

A publication of the Swiss Cancer Research foundation,
the Swiss Cancer League and the cantonal cancer leagues
on their funded research projects

Imprint

© Swiss Cancer Research foundation (SCR) and Swiss Cancer League (SCL)
All rights reserved by the Research, Innovation & Development department,
including the right to reproduce this publication or portions in any form.

Publisher and information:

Swiss Cancer League
Effingerstrasse 40
P.O. Box 8219
CH-3001 Bern
Tel. +41 (0)31 389 91 16
scientific-office@swisscancer.ch
www.swisscancer.ch/research

Article number: 04 1034 02 4121

Publication date: November 2017

English edition: 300 Ex.

German edition: 4200 Ex.

French edition: 1200 Ex.

Responsible:

Rolf Marti, PhD
Head of Research, Innovation & Development department,
Swiss Cancer League

Project management and editing:

Ori Schipper, PhD
Communication officer for Research, Innovation & Development
department, Swiss Cancer League

English translation: Ellen Russon, East Sandwich,
Massachusetts, USA, www.ellenrusson.com

Images: Sonja Maria Schobinger

Design: atelierrichner.ch

Print: Ast & Fischer AG, Wabern

This edition of the report as well as all previous editions can be
downloaded as PDF files at www.swisscancer.ch/researchreport

Sonja Maria Schobinger (*1970 in Richterswil) lives in Basel. From the
beginning of her artistic career, she has worked with the representation of
plants and landscapes.

Her sensitive eye for the inconspicuous and the hidden, and her curiosity
and passion for discovery – characteristics shared by many researchers –
lead her to create images of worlds never seen before and of dream landscapes.
Her fascinating works radiate a meditative calm that is also palpable in her
photographs in this report.

schobinger.net

Cancer Research in Switzerland

Edition 2017

Table of contents

4 Editorial

Thomas Cerny and Jakob R. Passweg

8 Progress thanks to research

Rolf Marti

18 Partner organizations and committees

20 The board of the Swiss Cancer Research foundation

21 The board of the Swiss Cancer League

22 The Scientific Committee

26 Prizes for outstanding achievements in cancer research and the fight against cancer

Ori Schipper

32 Implementation of the National Strategy Against Cancer

Health services research: the right amount of medical care at the right time

Thomas Rosemann

37 Health Services Research in Oncology and Cancer Care funding programme:

A look back at the first call for proposals

Peggy Janich

41 "The balance is positive"

Rolf Marti and Peter Brauchli

45 Switzerland has a national cancer registry

Franziska Lenz

48 Research funding by the cantonal and regional cancer leagues

Cancer research at the Biotechnology Institute Thurgau

Daniel F. Legler

50 List of funded research projects

56 Basic research

59 Circulating tumour cells and liquid biopsy

Nicola Aceto

63 Selected results

65 List of approved research projects

68 Clinical research

71 Unearthing treasure through reinvestigating old drugs?

Drug repurposing for oncology

Christoph Driessen

75 Selected results

77 List of approved research projects

80 Psychosocial research

83 Psychosocial needs of survivors of childhood cancer

Gisela Michel

87 Selected results

88 List of approved research projects

90 Epidemiologic research

93 Breast cancer in young women: rare but on the rise

Elisabetta Rapiti and Christine Bouchardy

97 Selected results

98 List of approved research projects

Classical clinical cancer research focuses on improving treatment options, with the aim to be able to successfully treat or even cure as many patients as possible. The Swiss Cancer League and the Swiss Cancer Research foundation has funded, funds, and will also continue to fund research projects in this area.

But beyond treatment, which is becoming more and more effective, also other questions are moving into the foreground: Are patients with cancer receiving the treatment that they and their family want, and is it being provided correctly? Are there regional differences in the utilization of medical services? And how should society get the steadily rising costs under control?

Questions of this kind go beyond the scope of many conventional research projects. They are the subject of health services research, a field of research which became established in the last 20 years mainly in English-speaking countries but was neglected in Switzerland for a long time. For this reason, the National Strategy Against Cancer made the promotion of health services research one of its 15 priority goals.

The Swiss Cancer Research foundation has taken on this project and announced a programme for strengthening health services research in oncology: For a period of five years, funding amounting to a total support of 1 million francs a year will be granted to research projects that investigate, for example, how the costs and benefits of medical services are to be evaluated – and how accessible these services are for patients with cancer in Switzerland.



Thomas Cerny



Jakob R. Passweg

Health services research is interested in the effectiveness of therapies in everyday practice and looks out for possible concrete improvements. Similarly, we hope for research results from the funding programme that show how all patients with cancer in Switzerland can access high-quality medical services. If the results, moreover, contribute towards steady improvement of patient safety, then we will have made a good deal of progress on the way to an efficient and just organization of the health care system in the area of oncology.

A handwritten signature in cursive script that reads "Thomas Cerny".

Prof. Thomas Cerny, MD

President of the Swiss Cancer Research foundation

A handwritten signature in cursive script that reads "Jakob R. Passweg".

Prof. Jakob R. Passweg, MD

President of the Swiss Cancer League





Progress thanks to research

8

In 2016, 178 research proposals were submitted to the Swiss Cancer Research foundation and the Swiss Cancer League. After careful review, the 74 best and most promising research projects could be funded. Together with funding provided by the cantonal and regional cancer leagues, a total of 25.3 million francs were given to non-commercial cancer research: We hope that this will result in further foundations for future advances in treatment, and we thank all of the charitable donors for their trust and support.

Cancer is probably as old as the human race. That is what fossils found last year in a cave in South Africa suggest: The approximately 1.7 million-year-old bones of an early human relative are deformed with bone tumours. But for the longest time, people did not know what to do about the disease. For instance, in the oldest description of cancer, the ancient Egyptian scholar Imhotep wrote over 4000 years ago that there was no way to treat "swellings on the breast, large, spreading and hard".

This hopelessness began to change somewhat only when surgeons learned to use anaesthesia and anti-septics in the 19th century. The ability to control the pain and keep germs out of wounds made it possible for daring surgeons to cut tumours out of the body. One of the pioneers was William Halsted, who first operated on patients with breast cancer in 1882 in New York. In the attempt to eradicate cancer and its roots, Halsted took a radical approach and removed not only the whole breast but also the muscles below the breast and the adjacent lymph nodes.

After the operation, many patients could no longer move their arm and endured chronic pain. But 40 % of Halsted's patients survived for five years after the surgery, which in his day was twice the number of survivors in patients who received no treatment, as Halsted noted in the scientific description of his technique. Not only did Halsted's successors refine his methods over time but also treatment results slowly but surely began to improve.

Steady improvement of treatment options

In 1895 Conrad Röntgen discovered a new kind of rays. Only four years later, Swedish physicians used the newly discovered X-rays to treat patients with skin cancer successfully for the first time. This paved the way for a new branch of cancer treatment, called radio-oncology. Everywhere, radiation clinics opened their doors. It was discovered only later that the energy-rich rays can themselves cause cancer.

Chemotherapy, the third main pillar in cancer treatment today, emerged only after the Second World War. The foundations were laid by pathologist Sydney Farber, who out of pure desperation began to treat children with acute leukaemia (which was deadly) with a cell toxin. Ten out of 16 children treated in this way "showed ... evidences of improvement of important nature of three months' duration at the time of this report", as Farber and his co-authors wrote in an article in the *New England Journal of Medicine* in 1948. The tireless efforts of numerous researchers led in many small steps (and at least as many missteps) to steady improvement of the treatment options. Today, 70 years later, statistics show that more than four out of five children can be saved from death.

Key asset in the fight against cancer

Encouraged by the successes of treatment – which starting in the 1960s increasingly included also surgery, radiation, and several cell toxins in combination – U.S. President Richard Nixon signed the National Cancer Act of 1971, representing the U.S. commitment to what Nixon described as the "war on cancer". Since then, the monies that flow into cancer research as well as the profits realized through the sale of cancer drugs have multiplied. The survival prospects of many people with cancer have also decidedly improved over time. However, more than 40 years later, humankind has fought many important battles against cancer but have not yet won the "war on cancer".

Whether there can be an absolute victory at all, or whether humankind must perhaps get used to the idea that cancer, at least as a symptom of old age, belongs to our biology to a certain extent – and perhaps can be kept in check as a chronic disease – is still an open question. Nevertheless, research is the best asset that we have in the fight against cancer. And each research success – even if considered on its own it may not seem to be very important – justifiably nurtures hope that we will continue to make important advances in the treatment of and fight against cancer.

Four central areas of research

The Swiss Cancer Research foundation (SCR), the Swiss Cancer League (SCL), and the cantonal cancer leagues (CCL) support research projects across the entire broad range of cancer research, grouped in four central research areas: basic, clinical, psychosocial, and epidemiologic cancer research. Basic research studies how cancer cells develop, proliferate, and spread in the body. Clinical research works with cancer cells and tumour tissue, to identify new biomarkers or targets, for instance. Clinical research also conducts clinical trials with patients to establish new, improved treatments or to optimize existing treatments. Psychosocial research studies the mental and social effects of cancer. It aims to improve the quality of life of persons with cancer and their families. Epidemiologic research examines, for example, the rates of cancers in the population and the factors that have an effect on cancer risk, such as smoking, lack of exercise, or unfavourable environmental factors. The SCR, SCL, and CCL also fund research projects in nursing sciences, prevention, public health, and health services research.

More than 25 million francs for over 180 different research projects

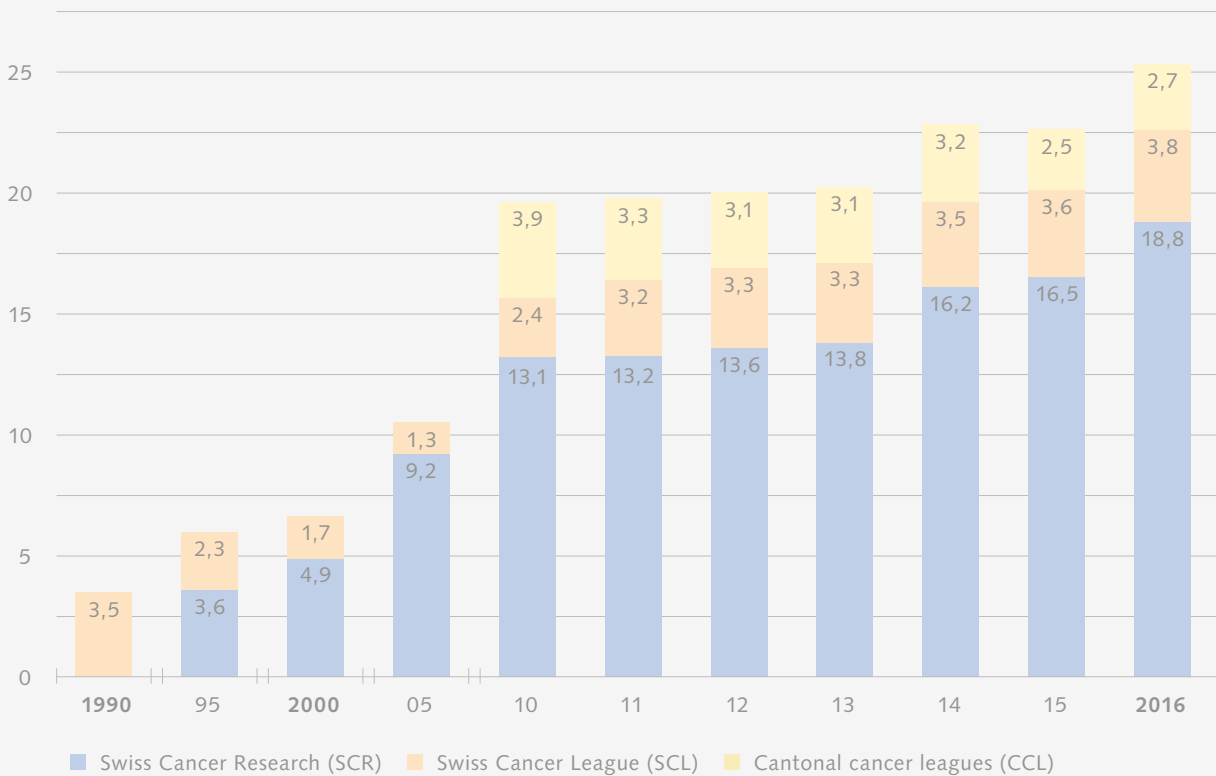
In 2016 the SCR, SCL, and CCL provided a total of 25.3 million francs for 189 diverse research projects (Figure 1; Table 1). Just under three quarters of all funds granted came from the SCR; the SCL contributed 15% and the CCL 11%.

The distribution of the funds from the two partner organizations SCR and SCL to research institutions in Switzerland shows that researchers at the university hospitals and universities in Zurich, Lausanne, Bern, Geneva, and Basel were the most successful with their submission of research proposals (Table 2). With grants ranging between 4.2 million francs (Zurich) and 2.2 million francs (Basel), these research facilities received significant percentages of the total funding granted. As centres of innovative cancer research in Switzerland, the clusters of academic research institu-

Figure 1
Cancer research funding by SCR, SCL, and CCL since the founding of SCR in 1990

Research funding by the CCL has been recorded centrally and published only since 2009.

Amount in million CHF



tions in Zurich and in Lausanne stand out, which in this highly competitive funding context each received approximately one fifth of the total funding.

In line with their funding strategy, the SCR and the SCL supported mainly independent research projects. In 2016 a total of 178 research proposals were submitted. Of these, after careful review, the 74 best and most promising research projects could be funded with 18.7 million francs in total (Table 3). Compared to the previous year, there was somewhat less competition for the limited funding available: In 2016 fewer grant applications were submitted, but more research projects were funded than in 2015. Of the 178 grant applications submitted, the Scientific Committee rated 102 research projects as solid and promising and recommended them for funding. Compared with 2015, when the Scientific Committee recommended 103 of 191 projects for funding, a higher percentage of

high-quality research proposals were submitted in 2016. However, only 74 of the 102 projects recommended for support could be funded; for a further 28 high-quality research projects, unfortunately, there was not enough funding available.

Table 1
Research funding by SCR, SCL, and CCL in overview

Number of grants approved and amount granted in 2016 (all funding areas)

Total SCR, SCL, and CCL	Independent research projects	Bursaries	Research organizations	Programmes, organizations, and conferences	Total
Number of grants approved	121	7	7	54	189
Amount granted in kCHF	21 479	626	2 300	942	25 347
Proportion of total funding in %	85	2	9	4	100
SCR					
Number of grants approved	63	4	6	27	100
Amount granted in kCHF	15 704	501	2 100	543	18 848
Proportion of total funding in %	83	3	11	3	100
SCL					
Number of grants approved	11	3	1	27	42
Amount granted in kCHF	3 042	125	200	399	3 766
Proportion of total funding in %	81	3	5	11	100
CCL					
Number of grants approved	47	-	-	-	47
Amount granted in kCHF	2 733	-	-	-	2 733

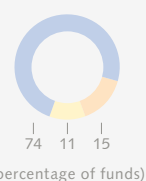


Table 2

Distribution of cancer research funding by SCR and SCL to the research institutions in 2016

Research institutions	Number of projects	Amount in kCHF	Proportion in %
PSI Villigen	2	522	2.4
SAKK/IBCSG/SPOG/SCCR	10	2 479	11.4
University/Inselspital Bern	20	2 915	13.5
FMI Basel	0	0	0
University/University Hospital Basel	12	2 197	10.1
IELSG Bellinzona	2	613	2.8
Hospital San Giovanni Bellinzona	1	256	1.2
IOSI Bellinzona	5	553	2.6
IRB Bellinzona	1	245	1.1
University of Geneva/HUG	10	2 355	10.9
EPF Lausanne	4	1 000	4.6
University/CHUV Lausanne	15	2 933	13.5
University of Lucerne	1	199	0.9
Kantonsspital St. Gallen	3	489	2.3
NICER Zurich	2	400	1.8
ETH Zurich	1	250	1.2
University/University Hospital Zurich	19	4 266	19.7
Total	108	21 672	100

Abbreviations

CHUV	Centre Hospitalier Universitaire Vaudois
EPF	Ecole Polytechnique Fédérale
ETH	Eidgenössische Technische Hochschule
FMI	Friedrich-Miescher-Institut
HUG	Hôpitaux Universitaires de Genève
IBCSG	International Breast Cancer Study Group
IELSG	International Extranodal Lymphoma Study Group
IOSI	Istituto Oncologico della Svizzera Italiana
IRB	Institute for Research in Biomedicine
NICER	National Institute for Cancer Epidemiology and Registration
PSI	Paul Scherrer Institut
SAKK	Swiss Group for Clinical Cancer Research
SCCR	Swiss Childhood Cancer Registry
SPOG	Swiss Paediatric Oncology Group

Table 3

Distribution of funds by SCR and SCL and success rates within the amount granted to independent research projects

	2015		2016	
	Grant applications	Amount in kCHF	Grant applications	Amount in kCHF
All projects				
Received/applied for	191	56 960	178	52 740
Recommended	103		102	
Approved	56	15 730	74	18 746
Success rate	29%	28%	42%	36%

Basic research				
Received/applied for	95	30 217	93	28 945
Recommended	48		53	
Approved	26	8 122	35	9 986
Success rate	27%	27%	38%	34%

Clinical research				
Received/applied for	74	21 937	66	19 144
Recommended	48		41	
Approved	23	6 122	31	7 308
Success rate	31%	28%	47%	38%

Psychosocial research				
Received/applied for	9	2 107	12	2 867
Recommended	4		4	
Approved	4	624	4	438
Success rate	44%	30%	33%	15%

Epidemiologic research				
Received/applied for	13	2 699	7	1 784
Recommended	3		4	
Approved	3	862	4	1 014
Success rate	23%	32%	57%	57%

The sum of all funds requested for independent research was 52.7 million francs, of which a good third could be granted to the approved projects. Somewhat more than one half of the funding total went to research projects in basic research; almost 40% of the total went to research projects in clinical research. The remaining funds went to research projects in psychosocial and epidemiologic research. This relatively small percentage of funding for psychosocial and epidemiologic research projects is due, among other things, to the fact that only a few high-quality research proposals were submitted in these areas. The SCR and the SCL were able to fund all research projects in these areas that were recommended for funding, but once again in 2016, the two partner organizations had to make difficult decisions in the other research areas – and had to turn down 18 research projects in basic research and 10 research projects in clinical (so called translational) research, even though they were rated highly in the evaluation by the Scientific Committee.

Performance agreements for financing services

In accordance with the strategy of the two funding organizations SCR and SCL, approximately 60% of the funds is earmarked for what is called patient-centred research, research that aims to benefit patients and their families. A look at the figures for independent research alone shows that this was not achieved. However, patient-centred research is supported not only by funding independent research. The SCR and the SCL also compensate six different research organizations for performing central and indispensable services for the benefit of clinical and epidemiologic research in Switzerland.

In clinical research, these services include designing study protocols, coordinating national and international multicentre studies, and administrative tasks for the study approval process with the ethics committees and Swissmedic, the Swiss authorization authority. In the area of cancer epidemiology, the organizations supported by the SCR provide researchers with know-how and resources for collecting, managing, and analysing data in the cantonal and national cancer registries (see box).

The research organizations supported, in brief

Swiss Group for Clinical Cancer Research (SAKK)

SAKK is a decentralized academic research institute that has conducted clinical studies on cancer treatment in all larger hospitals in Switzerland since 1965. SAKK encompasses a wide network of about 20 Swiss research groups and a coordination centre in Bern. For rare cancers SAKK works together with selected collaborative groups in other countries. SAKK aims to improve existing cancer treatments, study the effectiveness and tolerability of new treatments (radiotherapy, chemotherapy, surgery), and establish new treatment standards. → www.sakk.ch

International Breast Cancer Study Group (IBCSG)

Since 1977 the IBCSG has conducted academic clinical trials with the aim to improve treatment of women with breast cancer. The IBCSG is a multicentre study group with a coordination centre located in Bern, a data management centre and a statistics centre in the United States, and a pathology reference laboratory in Italy that serves the entire organization. In Switzerland, all university clinics, numerous cantonal hospitals, and oncologists in private practices participate in IBCSG studies. → www.ibcsg.org

15

National Institute for Cancer Epidemiology and Registration (NICER)

As a national coordination centre, NICER harmonizes the work of the 14 cantonal and regional cancer registries. It compiles the cancer data collected in the cantons, assures the quality of the data, and analyses the data at the national level. These data collected in the network are utilized to determine national statistics on cancer incidence. For healthcare policy, the data enable evidence-based decision making that benefits the population as well as individual patients with cancer. → www.nicer.org

International Extranodal Lymphoma Study Group (IELSG)

The IELSG is a multicentre study group that was created in 1998 in Ascona, with a coordination and data management centre in Bellinzona. It aims to coordinate international research activities in the area of extranodal lymphomas. As these lymphomas develop in all organs in the body, different treatments are required. To test and optimize the effectiveness of treatments, more than 200 international institutes participate in this network. → www.ielsg.org

Swiss Paediatric Oncology Group (SPOG)

SPOG has been conducting clinical cancer research in paediatric oncology/haematology since 1977, with the aim to improve treatment and quality of life of children and adolescents with cancer. SPOG is a national, independent association with its headquarters in Bern. Members are all paediatric oncology departments at Swiss hospitals and the Swiss Childhood Cancer Registry. As childhood cancers are relatively rare, research in childhood cancer is possible only in the framework of international collaborations. At present, SPOG is taking part in more than 20 clinical trials in which approximately 150 young patients in Switzerland are participating. → www.spog.ch

Swiss Childhood Cancer Registry (SCCR)

The SCCR is the national cancer registry for children and adolescents in Switzerland. Since 1976 it has captured all new cases of cancer in young persons up to the age of 20. It also documents treatments and conducts longitudinal studies on health and quality of life of childhood cancer survivors. In this way it contributes towards research on the causes of childhood cancer, improvement of cancer treatment, and prevention of late effects in cancer survivors. The SCCR, which is funded from several sources, is located at the Institute of Social and Preventive Medicine at the University of Bern. → www.kinderkrebsregister.ch

Table 4
Supported research organizations

Funding by SCR, according to performance agreements in the years 2010–2016

Amount in kCHF

	2010	2011	2012	2013	2014	2015	2016
Swiss Group for Clinical Cancer Research (SAKK)	600	600	600	*900	*1050	*1100	*1150
International Breast Cancer Study Group (IBCSG)	560	560	560	500	450	400	350
National Institute for Cancer Epidemiology and Registration (NICER)	-	200	200	250	250	250	250
International Extranodal Lymphoma Study Group (IELSG)	-	-	200	200	200	250	250
Swiss Paediatric Oncology Group (SPOG)	100	100	150	150	150	150	200
Swiss Childhood Cancer Registry (SCCR)	-	50	50	75	75	100	100
Total	1 260	1 510	1 760	2 075	2 175	2 250	2 300

*of wich 200 000 CHF funded by SCL

Table 5
Research funding by the cantonal cancer leagues in overview

Number of research projects and institutions supported and amount granted

Cancer league	Number of projects and institutions supported		Amount granted in kCHF	
	2015	2016	2015	2016
Aargau	1	0	15	0
Basel	11	9	315	450
Bern	7	10	430	550
Central Switzerland	1	2	34	66
Eastern Switzerland	0	1	0	100
Freiburg	0	1	0	4
Geneva	9	9	945	785
Grisons	3	2	40	30
Schaffhausen	1	0	20	0
Ticino	2	4	175	285
Thurgau	2	1	48	10
Zurich	8	8	499	453
Total	45	47	2 521	2 733

For their expenditure, the research organizations receive compensation based on performance agreements that define in a clear and binding way the requirements with regard to reporting and evaluation and the objectives for research. In addition, there is the condition that the research organizations must secure independent and long-term financing that guarantees their continuing existence independently of contributions from the SCR. In 2016 the SCR supported the six research organizations with a total of 2.1 million francs. Another 200 000 francs were provided by the SCL (Table 4).

Research funding by the cantonal cancer leagues

Compared to the previous year, in 2016 the CCL supported two more research projects: Ten different cantonal and regional cancer leagues gave more than 2.7 million francs to 47 research projects (Table 5). The largest sum was once again given by the Geneva Cancer League, followed by the Bern, Zurich, Basel, and Ticino Cancer Leagues. The research projects and institutions supported by the CCL are listed on pages 50 to 54.



Rolf Marti, PhD

Rolf Marti has headed the Research, Innovation & Development department (formerly: Scientific Office) at the Swiss Cancer League since 2003. He is a member of the managing board of the Swiss Cancer League and director of the Swiss Cancer Research foundation office.

As a member of the core group of the National Strategy Against Cancer 2014–2017, he currently focuses his work on the fields of action "Research promotion" and "Epidemiology and monitoring".

Tel. +41 (0)31 389 91 45

rolf.marti@krebsliga.ch

www.krebsliga.ch/forschung

www.krebsforschung.ch

Partner organizations and committees

18

Swiss Cancer Research foundation (SCR)

In existence since 1990, the Swiss Cancer Research foundation, with the help of donations, provides funding for all areas of cancer research: basic, clinical, epidemiologic, and psychosocial research. A special focus is the funding of patient-centred research projects that result as far as possible in direct patient benefit. The SCR foundation board is responsible for distributing the funds to researchers. The board's funding decisions are based on the recommendations made by the Scientific Committee, which reviews the grant applications according to clearly defined criteria. The SCR also supports the development and implementation of measures to fight cancer in Switzerland – namely, the National Strategy Against Cancer 2014–2017.

Contact

Swiss Cancer Research
Effingerstrasse 40
P. O. Box 7021
CH-3001 Bern
Tel. +41 (0)31 389 91 16
info@krebsforschung.ch
www.krebsforschung.ch

Swiss Cancer League (SCL)

The Swiss Cancer League (SCL) works towards a world where fewer persons get cancer, fewer persons suffer the consequences and die of cancer, more persons are cured of cancer, and persons with cancer and their families receive care and support in all phases of cancer and in dying. The Cancer League brings together the national umbrella organization headquartered in Bern and 19 cantonal and regional cancer leagues. The SCL supports the cantonal cancer leagues through knowledge transfer, provision of services, developments, and coordination at the national level. It provides information on risk factors and early detection measures and runs national cancer prevention programmes. It offers specific continuing education courses for a variety of occupational groups and funds cancer research.

Contact

Swiss Cancer League
Effingerstrasse 40
P. O. Box 8219
CH-3001 Bern
Tel. +41 (0)31 389 91 00
info@krebsliga.ch
www.krebsliga.ch

Cantonal cancer leagues (CCL)

The 19 cantonal and regional cancer leagues provide persons with cancer and their family members with individual advice from experts on treatment and financial and organizational questions. The CCL staff often advise persons over a longer time period and support them in difficult situations. They provide information on legal and insurance issues and help with the reorganization of the clients' social and financial situation. The CCL also provide contacts to other support institutions, such as home care organizations. If persons with cancer experience financial difficulties as a result of their illness, they can apply for support payments. The CCL organize group meetings and courses where persons with cancer can talk about their fears and experiences and learn ways to deal with their illness. Some cancer leagues offer specialized psycho-oncology support for children of adults with cancer. And in some cantons there are outpatient oncology care services that support persons with cancer at home.

The CCL are at work in Switzerland and in Liechtenstein. The CCL do not all offer the same services. The type and extent of services depends heavily on the financial and human resources of the individual cancer league as well as on the services made available by other providers.

Cantonal and regional cancer leagues in the German-speaking part of Switzerland and in Liechtenstein

- Aargau Cancer League
- Basel Cancer League
- Bern Cancer League
- Central Switzerland Cancer League
- Eastern Switzerland Cancer League
- Grisons Cancer League
- Liechtenstein Cancer League
- Schaffhausen Cancer League
- Solothurn Cancer League
- Thurgau Cancer League
- Zug Cancer League
- Zurich Cancer League

Cantonal cancer leagues in the French-speaking part of Switzerland and in Ticino

- Fribourg Cancer League
- Geneva Cancer League
- Jura Cancer League
- Neuchâtel Cancer League
- Ticino Cancer League
- Valais Cancer League
- Vaud Cancer League

The board of the Swiss Cancer Research foundation

The board is the highest body of the Swiss Cancer Research foundation (SCR). It monitors adherence to the foundation goals and manages the foundation's assets. The board of the SCR meets two to four times a year. It decides – based on the recommendations of the Scientific Committee – on the granting of funds to researchers.

20 The members of the SCR foundation board serve on a voluntary basis. The members are:



President
Prof. Thomas Cerny, MD
Cantonal Hospital St. Gallen
Member of the board since 2009



Prof. Daniel E. Speiser, MD
University of Lausanne
Basic research representative
Member of the board since 2015



Vice president
Prof. Richard Herrmann, MD
Basel University Hospital
Clinical cancer research representative
Member of the board since 2009



up to December 2016
Erika Forster-Vannini
Former member of the Swiss Council
of States
St. Gallen
Member of the board since 2012



Prof. Matthias Egger, MD
University of Bern
Epidemiologic cancer research
representative
Member of the board since 2009



up to December 2016
Eduard Holdener, MD
Therwil
Member of the board since 2009



Prof. Nicolas von der Weid, MD
University Children's Hospital Basel
(UKBB)
Paediatric cancer research
representative
Member of the board since 2009



Silvio Inderbitzin, PhD
St. Niklausen
Member of the board since
December 2016



Prof. Martin F. Fey, MD
Inselspital Bern
Member of the board since 2015



Treasurer
Gallus Mayer
Banking specialist
St. Gallen
Member of the board since 2006

The board of the Swiss Cancer League

The highest body of the Swiss Cancer League (SCL) is the delegates' assembly, to which the representatives of the cantonal and regional cancer leagues belong. Strategic management of the SCL is the responsibility of the board. Board members represent different specialties in the fight against cancer and also the different regions of Switzerland.

21

The members of the board are:



President
Prof. Jakob R. Passweg, MD
Head physician of Haematology Clinic
Basel University Hospital
Member of the board since 2007



Hans Neuenschwander, MD
Head physician of Palliative Care
Regional Hospital of Lugano
Member of the board since 2010



Vice president
PD Gilbert Bernard Zulian, MD
Head physician of Palliative Medicine
Hôpital de Bellerive
Geneva University Hospital
Member of the board since 2009



Markus Notter, MD
Radio-Oncology
Lindenhof Hospital, Bern
Member of the board since 2013



Prof. Thomas Cerny, MD
Head physician of Oncology/
Haematology
Cantonal Hospital St. Gallen
Member of the board since 1998



up to September 2016
Corinne Ullmann
Manager
Schaffhausen Cancer League
Member of the board since 2013



Prof. Daniel Betticher, MD
Head physician of Oncology
HFR Fribourg, Cantonal Hospital
Member of the board since 2006



Christoph Kurze
Managing director
Grisons Cancer League
Member of the board since
September 2016



Lucienne Bigler-Perrotin
Manager
Geneva Cancer League
Member of the board since 2009



Brigitta Wössmer, PhD
Head psychologist of Psychosomatics
Basel University Hospital
Member of the board since 2011



Treasurer
Gallus Mayer
Banking specialist
St. Gallen
Member of the board since 2006



Karin Zimmermann, PhD
Registered nurse / scientific staff
member
Inselspital Bern
Member of the board since 2014

The Scientific Committee

22



Members of the Scientific Committee in 2016 (from left to right): Kurt Fritzsche, Jürg Schwaller, Simone Benhamou, Emanuele Zucca, Maria Blettner, Silke Gillissen, Jörg Beyer, Pedro Romero, Rolf Marti (head of Research, Innovation & Development department of the Swiss Cancer League), Nancy Hynes (president), Aurel Perren, Curzio Rüegg, Beat Schäfer, Tatiana Petrova, Joerg Huelsken, Martin Pruschy, Hans-Uwe Simon, Peggy Janich (scientific collaborator at SCL). Not pictured: Primo Schär, Friedrich Stiefel.

Criteria for high-quality cancer research

The quality of research grant applications is evaluated according to the following criteria:

- Cancer relevance: Is the proposed research project expected to contribute important new observations or knowledge on the causes, prevention, or treatment of cancer?
- Originality or socioeconomic significance: Is the proposed research project original, innovative (basic research projects), or of socioeconomic importance (clinical or epidemiologic projects)?
- Choice of methodology: Have the most appropriate methods for realization of the project been chosen?
- Feasibility: Is the project feasible in terms of finances, human resources, and organization?
- Track record: What are the applicant's (or the project group's) previous research achievements?

The Scientific Committee reviews research grant applications according to clear criteria (see box, "Criteria for high-quality cancer research"). In the evaluation of research grant applications, the main criterion is always whether a research project can generate important new findings that will contribute towards improving the prevention or treatment of cancer. The Scientific Committee also rates the originality and feasibility of the research projects – and recommends only the best projects for funding approval. It attaches particular importance to patient-centred research.

The 18 members of the Scientific Committee are recognized experts with outstanding performance and achievements. Together they cover all areas relevant to cancer research.

The members of the Scientific Committee represent the following disciplines:

- Basic research: 6 members (including the president)
- Clinical cancer research: 8 members
- Epidemiology: 2 members
- Psychosocial cancer research: 2 members

Each research grant application is reviewed carefully by several experts. In addition to two members of the Scientific Committee, also international reviewers evaluate the quality of the grant application (see box, "The research grant application review process"). At two meetings of the Scientific Committee per year, the grant applications are discussed in depth and ranked on a list. Based on the ranking list the boards of the SCR and SCL decide which projects will be approved for funding. Unfortunately, as the financial means are limited, not all high-quality grant applications can be funded. Funding goes exclusively to industry-independent research projects.

Operational support for the Scientific Committee's important tasks and responsibility is provided by the Research, Innovation & Development department of the SCL. It organizes the calls for and the peer review of research grant applications, makes the grant payments in annual increments, and receives the interim and final research reports.

The research grant application review process

The grant application is submitted online.



The grant application is sent to two members of the Scientific Committee for review.



The two Scientific Committee members recommend external reviewers.



The Research, Innovation & Development department of the SCL asks the external reviewers to review the grant application.



The grant application is reviewed. Four to six reviews are obtained for each grant application, two of which are by Scientific Committee members.



The grant application and the reviews are discussed in detail at the biannual meeting of the Scientific Committee.



After the meeting, the Research, Innovation & Development department writes up detailed minutes and creates a ranking list of all grant applications discussed, following the Scientific Committee's recommendations.



The ranking list is forwarded to the boards of the SCR and SCL. The boards make the final funding decision.



The grant applicant is informed of the decision by the Research, Innovation & Development department. Reviewer comments are fed back to the applicant anonymously.

The members are:

24



President

Prof. Nancy Hynes, PhD
Friedrich Miescher Institute for
Biomedical Research (FMI)
Basel
Member since 2015

Basic research



Prof. Joerg Huelsken, PhD
Swiss Institute for Experimental Cancer
Research (ISREC)
Swiss Federal Institute of Technology
Lausanne (EPFL)
Lausanne
Member since 2016



Prof. Tatiana Petrova, PhD
Department of Fundamental Oncology
University of Lausanne
Epalinges
Member since 2016



Prof. Pedro Romero, MD
Ludwig Institute for Cancer Research
University of Lausanne
Epalinges
Member since 2015



Prof. Primo Schär, PhD
Department of Biomedicine
University of Basel
Basel
Member since 2010



Prof. Jürg Schwaller, MD
Department of Biomedicine
University Hospital Basel
Basel
Member since 2013

Clinical research



Prof. Jörg Beyer, MD
Department of Oncology
University of Zurich
Zurich
Member since 2015



Prof. Emanuele Zucca, MD
Oncology Institute of Southern
Switzerland (IOSI)
Ospedale San Giovanni
Bellinzona
Member since 2013



Prof. Silke Gillessen, MD
Department of Oncology/Haematology
Cantonal Hospital St. Gallen
St. Gallen
Member since 2013

Psychosocial research



Prof. Aurel Perren, MD
Institute of Pathology
University of Bern
Bern
Member since 2016



Prof. Kurt Fritzsche, MD
Department of Psychosomatic
Medicine and Psychotherapy
Freiburg University Hospital
Freiburg im Breisgau, Germany
Member since 2009



Prof. Martin Pruschy, PhD
Department of Radiation Oncology
University Hospital Zurich
Zurich
Member since 2010



Prof. Friedrich Stiefel, MD
Liaison Psychiatry Service
Lausanne University Hospital (CHUV)
Lausanne
Member since 2007



Prof. Curzio Rüegg, MD
Department of Medicine
University of Fribourg
Fribourg
Member since 2013



Prof. Simone Benhamou, PhD
French National Institute of Health and
Medical Research (INSERM)
Paris, France
Member since 2011



Prof. Beat W. Schäfer, PhD
Department of Oncology
Children's Hospital Zurich
Zurich
Member since 2012



Prof. Maria Blettner, PhD
Institute of Medical Biostatistics
Epidemiology and Informatics (IMBEI)
Johannes Gutenberg University Mainz
Mainz, Germany
Member since 2010



Prof. Hans-Uwe Simon, MD
Institute of Pharmacology
University of Bern
Bern
Member since 2008

Epidemiologic research

Prizes for outstanding achievements in cancer research and the fight against cancer

26

In 2016, the Robert Wenner Prize was awarded to Mikael Pittet, a Swiss biologist working in Boston, for his seminal work in the field of tumour immunotherapy. The Swiss Cancer League awarded the Cancer Prize to physician Walter Felix Jungi for his valuable support in the difficult area of complementary and alternative medicine methods used by cancer patients. And finally, two research projects in Switzerland and two in Belgium were the successful recipients of the Swiss Bridge Award, which to mark the 20-year anniversary of the Swiss Bridge foundation was one million francs in total, or double the total support in other years.

Mikael Pittet was awarded the Robert Wenner Prize of 100 000 francs for young researchers in oncology from the Swiss Cancer League. The articles and findings of this Swiss biologist working in Boston fuel the hope that cancer immunotherapies will one day be effective also with patients that immunotherapy today cannot yet help.

Immunotherapy, or treatment that uses the person's own immune system to attack cancer cells, is a promising ray of hope in today's fight against cancer. For example, since the advent in clinical practice of a new class of cancer treatment drugs called immune checkpoint inhibitors, in 2011, formerly dire prognoses have improved dramatically for many patients with advanced skin cancer or lung cancer.



Mikael Pittet receives the Robert Wenner Prize 2016.

Make resistant tumours more susceptible to treatment

In approximately 20% of patients, the treatment lasting a few months not only shrinks tumours but also results in immune control of cancer for several years. However, for the majority of patients, immune checkpoint inhibitors fail. This is where the recently published articles and findings by Pittet's research lab at Massachusetts General Hospital Center for Systems Biology in Boston come into play: Through experiments in mouse tumour cells, Pittet and his team identified a way to make resistant tumours susceptible to immunotherapy.

New class of immune cells

Pittet also caused a great deal of excitement with his article in *Science* reporting the discovery of a new type of immune cells that can intercept a tumour's signals in the lymph nodes and in this way prevent progression of the disease. The task now is to develop treatment strategies that boost and support this class of immune cells, says Pittet.

For his outstanding research and groundbreaking findings, the 41-year-old biologist from Lausanne was awarded the Robert Wenner Prize of 100 000 francs from the Swiss Cancer League. The award ceremony was held in a worthy setting for the event in the Empire Room at the restaurant "zum Äusseren Stand" in Bern.

Robert Wenner Prize

Thanks to the bequest of Robert Wenner, a Basel gynaecologist who died in 1979, the Swiss Cancer League awards the Robert Wenner Prize of 100 000 francs to recognize outstanding research work by young researchers under the age of 45. The prize is given to research work conducted in Switzerland and from the entire range of cancer research. The first Robert Wenner Prize was awarded in 1983.

The Scientific Committee is responsible for evaluation of the candidates and selection of the prize winner. The prize winners receive 100 000 francs, with 80 000 francs earmarked for an ongoing research project and 20 000 francs as discretionary funds.

→ www.krebsliga.ch/rwp

The Cancer Prize 2016 was awarded to Walter Felix Jungi, MD, for his valuable support and tireless efforts in the complex and controversial field of complementary and alternative medicine methods used by cancer patients.

Research is sparse

The number of cancer patients in Switzerland that utilize complementary medicine methods has only been approximated. According to estimates, one in two or one in three patients uses complementary or alternative medicine methods. Many of these patients report improved quality of life, when they add a complementary medicine method such as injections of mistletoe extract to their chemotherapy. However, as there have been few clinical studies in this area, the effectiveness of most complementary methods has not been scientifically established.

Providing orientation in this confusion

However, that does not stop proponents of these methods from making grandiose and unsecured promises of cures. As the long-standing president of the Swiss Study Group for Complementary and Alternative Methods in Cancer (Schweizerische Studien-gruppe für Komplementäre und Alternative Methoden bei Krebs or SKAK), Walter Felix Jungi significantly helped the Swiss Cancer League to find some orienta-

tion in the confusion. For instance, the SKAK analysed the studies available on the efficacy and tolerability of miracle drugs such as Galavit and, based on their findings, advised caution. Although Walter Felix Jungi is retired, he remains a competent point of contact for the Swiss Cancer League for all questions regarding complementary and alternative medicine. In gratitude, the League awarded Jungi the Cancer Prize 2016.

The Cancer Prize

With the Cancer Prize the Swiss Cancer League recognizes persons who have made outstanding contributions to cancer research or committed efforts to promote research activities in service of prevention, early detection, and treatment of cancer. The prize also serves as recognition for services to the Swiss Cancer League and its goals. The 10 000-franc prize is usually awarded each year.
→ www.krebsliga.ch/krebspreis



Prize winner Walter Felix Jungi, MD, gives his thank-you speech.

Marking the occasion of its 20th anniversary, the Swiss Bridge Foundation doubled the award sum of the Swiss Bridge Award in 2016 to one million francs. The call for 2016 invited research proposals on rare cancers. These are cancers that affect fewer than six out of 100 000 persons and that are often not only insufficiently researched but also difficult to treat.

A total of 226 researchers applied for the Swiss Bridge Award with their own research proposals. A thirteen-member jury consisting of renowned experts implemented a two-step evaluation procedure and in their final decision selected two research projects from Belgium and two projects from Switzerland. For the realization of their research projects, Jan Cools, Pieter Van Vlierberghe, Christian Mosimann, and Sara Meyer each received 250 000 francs.

Analysis of disease-relevant processes

Both projects from Belgium focus on acute lymphoblastic leukaemia from T-cells, called T-ALL, a rare form of leukaemia. There has been significant progress made in T-ALL treatment over the last 50 years. Today, approximately eight out of ten people, most of whom are young patients, can be successfully treated.

However, still 20% of leukaemia cases in children, as well as many older patients, have bleak prospects. Jan Cools and his research team at the University of Leuven aim to identify new treatment approaches through an in-depth analysis of the various disease-relevant processes within degenerated T-cells.

The team led by Pieter Van Vlierberghe at Ghent University is interested first and foremost in epigenetic processes that play a role in the formation and development of blood cancer cells. The researchers have recently shown that the survival of leukaemia cells can be prevented by targeting a protein known as LSD1 with an active substance. This protein affects the packaging density of the genetic material in the cell



Awarding of the Swiss Bridge Award (from left to right): Jakob Passweg (president of the Swiss Cancer League), Gordon McVie (president of the jury), Jan Cools, Christian Mosimann, Sara Meyer, Pieter Van Vlierberghe, Thomas Hoepli (director of the Swiss Bridge Foundation).

nucleus and thus which genes are transcribed. With his new project, Van Vlierberghe builds upon previous results and explores the therapeutic potential of LSD1 inhibitors.

Similarities between human beings and zebrafish

In Switzerland, the research project submitted by Christian Mosimann and his group at the University of Zurich made it to the top. This team of researchers is examining the molecular mechanisms that guide the formation of chordomas. These are rare and slow-growing tumours that develop from the vestiges of the notochord, the embryonic predecessor of the spinal column. Mosimann's team has found that the chordomas of zebrafish are quite similar to those of human beings in many aspects – and they want to use this animal model in a new research project to decode the disease incidence and to identify possible therapeutic targets.

Last but not least, the research project submitted by Sara Meyer and her team at the University Hospital Basel was also one of the winners of the Swiss Bridge Award. These researchers are tracking the processes to distinguish myeloproliferative neoplasms. These are rare, chronic diseases of the haematopoietic system that can degenerate into acute myeloid leukaemia. In previous work, Meyer and her team found that the diseased cells exhibit redundant signalling pathways, which unfortunately lead to the frequently observed treatment failures. In the research project, Meyer and the members of her group are investigating whether a treatment that simultaneously interrupts two complementary signalling pathways may be more effective.

Swiss Bridge Award

The Swiss Bridge Foundation was founded in 1997 at the initiative of Thomas Hoepli, foundation board member, with the support of the Swiss Cancer League. The aim of the foundation is to financially support high-quality cancer research projects in Switzerland and other countries with the help of charitable donors and foundations. Since its founding, the Swiss Bridge Foundation has awarded more than 25 million francs for research work in Belgium, Brazil, England, France, Germany, Israel, Italy, Norway, Spain, Sweden, and Switzerland.

→ www.krebsliga.ch/forschung/auszeichnungen/swiss-bridge-award



Ori Schipper, PhD

Ori Schipper graduated in plant molecular biology and followed a postgraduate course in science journalism.

Since December 2014 he is communication officer of the Research, Innovation & Development department of the Swiss Cancer League and the Swiss Cancer Research foundation.

Tel. +41 (0)31 389 93 31

ori.schipper@krebssliga.ch

www.krebssliga.ch/forschung

www.krebsforschung.ch



Implementation of the National Strategy

Against Cancer

Health services research: the right amount of medical care at the right time

32

Medicine: a success story

The field of medicine in the last century is a great success story. Thanks to enormous medical advances, life expectancy increased dramatically: in Switzerland, for example, from 59 years for women and 53.4 years for men in 1900 to 84.9 and 80.7 years for women and men, respectively, in 2015¹. This increase in life expectancy over about 100 years was at first due mainly to vaccinations and the successful treatment of acute illnesses. Since the second half of the 20th century, it has been due mainly to new therapies for chronic diseases, especially cardiovascular diseases and cancer.

However, the fact that today fewer and fewer people die of infections, traumas, heart attacks, and strokes at a young age also leads to more and more people living long enough to have chronic, degenerative, or malignant diseases. And often it is not just one disease: With increasing age, multi-morbid patients are now more the rule than the exception.

On the side of medical health care, the enormous advances have led to strong sub-specialization and fragmentation in diagnosis and treatment. This makes coordination between the different specialties and professions crucially important today.

Need for and current state of health services research in Switzerland

Switzerland is one of the world's leaders in basic and clinical research. Each year, almost one billion francs of public funding are available for the two research areas². Moreover, Switzerland is a very wealthy country with a very well-financed health care system, which – after the United States – is the second most expensive system in the world. Nevertheless, demographic developments, which are associated with the trends mentioned above regarding chronic diseases and health care needs, increasingly represent an economic challenge for the Swiss system. New diagnostics and therapies alone cannot provide an answer; on the contrary, with each new diagnostic or therapeutic option, the complexity grows. In view of these circumstances, there is a growing awareness also in Switzerland that the focus must no longer be on what new diagnostics and therapies are being used but rather how they should be used in the most efficient way. Precisely that is the focus of health care research.

Definition of health services research

Several different definitions of health services research exist. The most comprehensive is the definition from the Agency for Healthcare Research and Quality (AHRQ), a US federal agency:

“Health services research examines how people get access to health care, how much care costs and what happens to patients as a result of this care. The main goals of health services research are to: identify the most effective way to organize, manage, finance, and deliver high-quality care; reduce medical errors; and improve patient safety.”³

This definition already makes it clear that health services, or health care, research is focussed on outcomes. For this reason, ‘outcome research’ has recently become established as a synonym for health services research. It focuses on patient-relevant outcomes. In contrast to clinical studies, this branch of research examines medical care under real conditions with unselected patients and considering economic aspects.

Promoting health services research in Switzerland

Through the Swiss Academy of Medical Sciences (SAMS), a programme supported by a private foundation was launched in 2012 that provided health services research with funding of one million francs a year. In 2016, the Swiss National Science Foundation started a National Research Programme, NRP 74 “Smarter Health Care”, with 20 million francs total funding for the projects. As questions concerning the delivery and coordination of health care services arise in all clinical areas, it is especially welcome that the Swiss Cancer League supports this branch of research, particularly because the programme supported by the SAMS excluded projects on oncological questions.

SAMS programme: research questions and results

Under the programme supported by the SAMS, 344 research proposals were submitted and 46 of them approved for funding. The research topics ranged across almost all fields of medicine, and the applicants were physicians but also nurses and other non-physician professionals. Relatively frequently, the topic addressed was the appropriateness of medical services. Although the issue of basic access to the health care system in Switzerland is not (yet) as urgent as it is in many other countries, there is inadequate provision at times for also large patient groups: Projects under the SAMS programme found, for example, that a minority of people with hypertension show adequate control of blood pressure and that many people with diabetes do not adhere to diabetes care guidelines recommending regular follow-up measurements and consultations⁴⁻⁶. Here there are ‘evidence performance gaps’ between everyday clinical practice (performance) and the existing medical evidence, which in this case represent inadequate provision. In addition, there are numerous examples of inappropriate provision, such as when antibiotics are prescribed for common colds and flu-like infections or uncomplicated urinary tract infections, or when proton pump inhibitors are prescribed as stomach ulcer prophylaxis for far longer than the indicated period of time.

But in addition to inadequate provision or inappropriate provision, increasingly there is – also here in Switzerland – overprovision of health services, which is essentially driven by misplaced financial incentives. For

instance, the number of joint surgeries is increasing much more sharply than can be explained epidemiologically by aging of the population. This holds also for lucrative elective cardiac catheterization. High regional variances in the frequency of such procedures that cannot be explained based on epidemiological data are usually an indication of overprovision. There are hospitals in Switzerland, for example, where up to 70% of elective cardiac catheterization procedures show no pathological findings⁷. A large part of these patients could have been spared the procedure by means of an adequate, non-invasive preliminary examination, as data from the United States show, where appropriate use criteria for the procedure were introduced and the number of non-indicated procedures could therefore be considerably reduced⁸.

Health services research provides solutions

A frequent misunderstanding is that health services research is only descriptive, only points up ills and grievances in the system, and does not offer any solutions. An example research project at our institute shows the constructive contribution that health services research can make. The project aimed to improve diabetes care in Swiss primary care. The Chronic Care Model held to be the gold standard of care for chronic illness served here as a model. A central element of the model is a team approach, meaning the inclusion of non-physician professionals. We first investigated the attitudes of GPs, practice nurses, and patients concerning possible increased involvement of practice nurses in patient care. This was an exploratory, hypothesis-generating study,

so we chose a qualitative method. The results showed that patients are considerably more open to the idea than expected. Practice nurses themselves were open to the idea of being more involved in patient care but were also sceptical in view of lack of medical knowledge⁹.

In several meta-analyses, we then investigated how good the evidence actually is for the team approach. We discovered that many studies had methodological shortcomings, but the few studies with good methodology found a tendency for the approach to have positive effects on many variables, including even effects on hospitalization and mortality^{10,11}.

To obtain an objective picture of diabetes care in Switzerland, we then chose several descriptive approaches. In a first study, we found that it is possible to use quality indicators in Switzerland that are adopted from the Quality and Outcomes Framework (SQOF) for diabetes care in England¹². This means that systematic monitoring of the quality of health care for patients with diabetes is basically feasible, but only with general practices that have electronic medical records. As this is not the case everywhere in Switzerland, we showed a health insurance company how, based on a comprehensive dataset, quality of care can be evaluated using routine data and simple quality indicators¹³⁻¹⁵.

Finally, we used all of the findings to design a cluster randomized controlled trial called CARAT. In CARAT, we examined whether blood sugar levels and cardiovascular risk profile improve, when specially trained practice nurses are involved in diabetic patient care. Both after one year and at three-year follow-up, the patients had significantly improved cardiovascular risk profiles¹⁶⁻¹⁸.

In conclusion

New diagnostic and therapeutic interventions alone will not be able to provide sufficient answers in an increasingly specialized and fragmented health care system, particularly not regarding chronic illnesses and multi-morbidity. Health services research aims to bring the right amount of medical care at the right time to the right patient.



Prof. Thomas Rosemann, MD, PhD

Thomas Rosemann was born in Oberbayern, Germany, in 1969. After completing medical studies and a dissertation at the University of Munich, he trained in internal medicine. He then completed a PhD in medical sciences at the University of Nijmegen (NL) and a habilitation at the University of

Heidelberg (D) in health services research. He has been full professor of primary care at the University of Zurich since 2008.

Tel. +41 (0)44 255 90 99

Thomas.Rosemann@usz.ch

www.versorgungsforschung.ch

www.hausarztmedizin.uzh.ch/de/team1/team/

RosemannThomas.html

References

1. Bundesamt für Statistik. 2015. Periodensterbetafeln für die Schweiz (1900–2150) nach Jahr, Geschlecht und Alter. www.bfs.admin.ch/bfs/de/home/statistiken/bevoelkerung/geburten-todesfaelle/todesfaelle-sterblichkeit-lebenserwartung.assetdetail.316298.html
2. Bundesamt für Statistik. 2015. Ausgaben für Forschung und Entwicklung. www.bfs.admin.ch/bfs/de/home/statistiken/bildung-wissenschaft/technologie/indikatorsystem/zugang-indikatoren/w-t-input/f-e-aufwendungen-bundes.html
3. AHRQ. What is AHRQ? Agency for Health care Research and Quality; 2002. Retrieved from <https://archive.ahrq.gov/about/whatis.htm>
4. Huber CA, Brandle M, Rapold R, Reich O, Rosemann T. A set of four simple performance measures reflecting adherence to guidelines predicts hospitalization: a claims-based cohort study of patients with diabetes. *Patient Prefer Adherence*. 2016;10:223-31.
5. Chmiel C, Wang M, Senn O, Del Prete V, Zoller M, Rosemann T, et al. Uncontrolled arterial hypertension in primary care—patient characteristics and associated factors. *Swiss Med Wkly*. 2012;142:w13693.
6. Brenner R, Waeber B, Allemann Y. Medical treatment of hypertension in Switzerland. The 2009 Swiss Hypertension Survey (SWISSHYPE). *Swiss Med Wkly*. 2011;141:w13169.
7. Interventional Cardiology in Switzerland – Annual Statistic Report. 2015. Swiss Working Group of Interventional Cardiology. www.ptca.ch/DOCS_PUBLIC/ptca_statistics_2015.pdf.
8. Desai NR, Bradley SM, Parzynski CS, Nallamothu BK, Chan PS, Spertus JA, et al. Appropriate Use Criteria for Coronary Revascularization and Trends in Utilization, Patient Selection, and Appropriateness of Percutaneous Coronary Intervention. *JAMA*. 2015;314:2045-53.
9. Rosemann T, Joest K, Körner T, Schaefer R, Heiderhoff M, Szecsenyi J. How can the practice nurse be more involved in the care of the chronically ill? The perspectives of GPs, patients and practice nurses. *BMC Fam Pract*. 2006;7:14.

10. Martínez-González NA, Djalali S, Tandjung R, Huber-Geismann F, Markun S, Wensing M, et al. Substitution of physicians by nurses in primary care: a systematic review and meta-analysis. *BMC Health Serv Res.* 2014;14:214.
11. Martínez-González NA, Tandjung R, Djalali S, Huber-Geismann F, Markun S, Rosemann T. Effects of physician-nurse substitution on clinical parameters: a systematic review and meta-analysis. *PLoS One.* 2014;9:e89181.
12. Djalali S, Frei A, Tandjung R, Baltensperger A, Rosemann T. Swiss quality and outcomes framework: quality indicators for diabetes management in Swiss primary care based on electronic medical records. *Gerontology.* 2014;60:263-73.
13. Huber CA, Reich O, Früh M, Rosemann T. Effects of Integrated Care on Disease-Related Hospitalisation and Healthcare Costs in Patients with Diabetes, Cardiovascular Diseases and Respiratory Illnesses: A Propensity-Matched Cohort Study in Switzerland. *Int J Integr Care.* 2016;16:11.
14. Huber CA, Rapold R, Brüngger B, Reich O, Rosemann T. One-year adherence to oral antihyperglycemic medication and risk prediction of patient outcomes for adults with diabetes mellitus: An observational study. *Medicine (Baltimore).* 2016;95:e3994.
15. Bähler C, Huber CA, Brüngger B, Reich O. Multimorbidity, health care utilization and costs in an elderly community-dwelling population: a claims data based observational study. *BMC Health Serv Res.* 2015;15:23.
16. Frei A, Chmiel C, Schläpfer H, Birnbaum B, Held U, Steurer J, et al. The Chronic CARE for diAbeTes study (CARAT): a cluster randomized controlled trial. *Cardiovasc Diabetol.* 2010;9:23.
17. Frei A, Senn O, Chmiel C, Reissner J, Held U, Rosemann T. Implementation of the chronic care model in small medical practices improves cardiovascular risk but not glycemic control. *Diabetes Care.* 2014;37:1039-47.
18. Frei A, Senn O, Huber F, Vecellio M, Steurer J, Woitzek K, et al. Congruency of diabetes care with the Chronic Care Model in different Swiss health care organisations from the patients' perspective: a cross sectional study. *Swiss Med Wkly.* 2014;144:w13992.

Health Services Research in Oncology and Cancer Care funding programme: A look back at the first call for proposals

In the context of the National Strategy Against Cancer 2014–2017, the Swiss Cancer Research foundation started the funding programme Health Services Research in Oncology and Cancer Care in 2016. The purpose of the programme is to expand and strengthen research activities throughout Switzerland in the area of health services in oncology. There was a good response to the first call for proposals 2016/17, and of the 44 research proposals submitted, the Swiss Cancer Research foundation was able to fund seven research projects.

Health services research is a research area that spans various disciplines, including medicine, epidemiology, economics, sociology, and ethics. It examines how people are supplied with health-related products and services under everyday conditions. The focus of the research is mainly on the quality, benefits, and costs of health services. The findings are meant to aid creation of fair access to services and in this way to promote the health and personal well-being of individuals and the entire population.

Considering the significance of the findings for medical progress, health services research is no less important than clinical research and basic research. But in contrast to clinical research and basic research, in

which Switzerland is already a worldwide leader, health services research is currently less well developed. When defining the projects for the action field "Promotion of research", the National Strategy Against Cancer 2014–2017 therefore focused on health services research.

The Swiss Academy of Medical Sciences (SAMS) was a pioneer in promoting health services research, when in 2012 it created a five-year funding programme to strengthen health services research. In 2015, the programme was complemented by the National Research Programme 74 "Smarter Health Care" funded by the Swiss National Science Foundation (SNSF). Building on this groundwork by the SAMS and the SNSF, the Swiss Cancer Research foundation (SCR) launched a funding programme for cancer-specific health services research in 2016 to strengthen health services research specifically in the area of oncology.

The funding programme, named Health Services Research in Oncology and Cancer Care, has a planned duration of five years and is supported financially in equal parts by the SCR and the Accentus Foundation (Marlies-Engeler-Fonds), which supports social, cultural, scientific, and other not-for-profit projects worldwide. Each year, a call for proposals is issued, and support is granted to up to four large research projects (with up to 250000 francs) and several smaller projects such as literature research or pilot studies (with up to 75000 francs). The funding total each year is approximately one million francs.

The Health Services Research in Oncology and Cancer Care funding programme issued the first call for proposals in the summer of 2016. By the submission deadline, 44 proposals had been received (for 21 small and 23 large research projects). The proposals were submitted predominantly by researchers who work at hospitals (20) and universities or universities of applied sciences (17) but also by patient organizations (3), cancer registries (2), and health insurance companies (2). Two thirds of the proposals came from Zurich (16), Geneva (8), and Bern (6). The total funding requested by the 44 proposals was 6 540 242 francs.

For evaluation of the research proposals, an 11-member scientific committee of experts in Germany and Switzerland was established; the experts covered various subject areas within health services research (Table 6). The committee was chaired by Marcel Zwahlen at the Institute of Social and Preventive Medicine (ISPM) at the University of Bern. The committee selected the research projects for funding based on a two-stage evaluation procedure: The committee members decided on an initial selection of research projects based on the project outlines submitted and then evaluated full proposals for those selected projects.

In the first evaluation stage, each project outline was examined by two members of the committee. They checked whether a project was in fact a health services research project and whether it was cancer-related. If so, they then rated the project outline based on four different criteria:

- 1) significance of the research project in terms of improving oncological health services,
- 2) scientific quality and appropriateness of the chosen research methods,
- 3) feasibility of the research project,
- 4) the applicant's previous scientific achievements.

Of the 44 research projects submitted, the committee members rated 35 as relevant health services research projects. Thematically, the projects covered the entire patient's pathway (Figure 2) and all areas of health services research, including quality, demand and utilization, economic aspects of health services provision, and use of new technologies.

At the end of the first evaluation stage, the committee invited a short list of eleven applicants (five small and six large research projects) to submit full proposals. In the second evaluation stage, the full proposals were evaluated, based on the same criteria as in the first evaluation stage, by three members of the committee and in addition by at least two national and international experts. In the end, the committee recommended seven out of eleven research projects for funding. At a board meeting on 7 April 2017, and in accordance with the committee's recommendations, the board of the Swiss Cancer Research foundation approved the first seven research projects for the funding programme with a total funding amount of 941 950 francs.

The researchers responsible for the seven approved projects plan to conduct their research in the next one to four years. In addition to research questions on

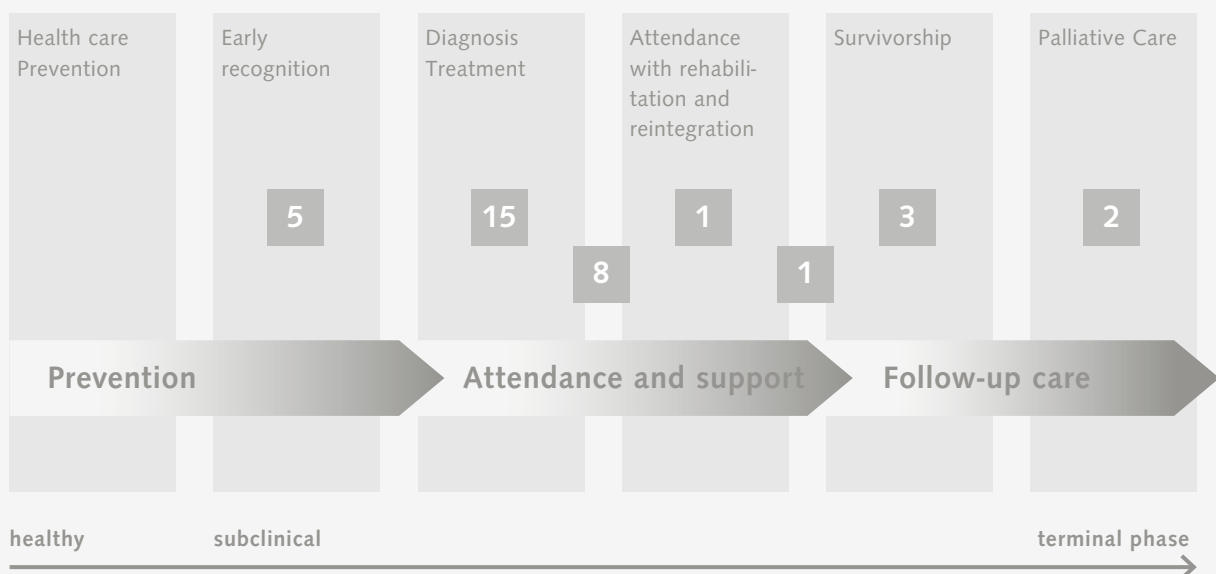
Table 6

Members of the scientific committee for the funding programme's first call for proposals

Name	University/institute/organization
Prof. Marcel Zwahlen, PhD (president)	Institute of Social and Preventive Medicine (ISPM), University of Bern
PD Eva Bergsträsser, MD	Paediatric Palliative Care, University Children's Hospital Zurich
Prof. Iren Bischofberger, PhD	Department of Health Science, Kalaidos University of Applied Sciences, Zurich
Prof. Urs Brügger, PhD	ZHAW School of Management and Law, Winterthur
Prof. Steffen Eychmüller, MD	University Center for Palliative Care, Inselspital Bern
Klazien Matter-Walstra, PhD	European Center for Pharmaceutical Medicine, University of Basel
Prof. Thomas Perneger, MD	Service qualité des soins, Hôpitaux universitaires de Genève (HUG)
Prof. Isabelle Peytremann-Bridevaux, MD	Institute of Social and Preventive Medicine (IUMSP), University of Lausanne (UNIL)
Prof. Thomas Rosemann, MD, PhD	Institute of General Practice, University Hospital Zurich
PD Thomas Ruhstaller, MD	Breast Center, St.Gallen Cantonal Hospital
Prof. Susanne Singer, MD	Institute of Medical Biometry, Epidemiology and Informatics, Johannes Gutenberg University Mainz

Figure 2

Thematic distribution of the submitted research projects over the patient's pathway, which have been classified as health services research (35 out of 44 projects).



continuity of cancer care in different regions of Switzerland and on unequal access to mammography screening programmes, the research projects will also study the quality of care for young women with breast cancer and the secure use of information technologies in the management of patient data. Other research topics being investigated in the first year of the funding programme are: improving treatment through optimization of medication use, the efficacy and safety of treatments with elderly patients following treatment guidelines, and the need for psychosocial follow-up care after cancer in childhood.

Upon completion of the first call for proposals, and based on a survey of the committee members, it was decided that the funding programme will be continued in the same form in the following years. The only change will be some modifications in the make-up of the scientific committee for better coverage of some underrepresented areas within health services research in the future.

With the establishment of the Health Services Research in Oncology and Cancer Care funding programme, project number 6.1 of the National Cancer Strategy 2014–2017, namely, “health services research”, is deemed completed. The results of the funded research projects are to be followed up on and analysed. The aim is to identify as early as possible any findings that are relevant for health policy and to communicate them to decision makers in government and the health care system.



Peggy Janich, PhD

After studying biotechnology at Brandenburg University of Technology Cottbus-Senftenberg and Technische Universität Dresden, Janich completed a PhD at the Centre for Genomic Regulation in Barcelona. She then worked as a researcher at the University of Lausanne before joining the Swiss Cancer League in February 2016.

Tel. +41 (0)31 389 93 63

peggy.janich@krebsliga.ch

www.krebsliga.ch/forschung

“The balance is positive”

The National Strategy Against Cancer divided the overarching goal of project 6.2, namely, to improve the framework conditions of clinical research in Switzerland, into two subprojects. The aim of the first subproject is to implement the Federal Act on Research involving Human Beings, which came into force in 2014, in a research-friendly manner. The second subproject aims to strengthen clinical and translational research. Here, a conversation between the two persons responsible for the subprojects, Rolf Marti and Peter Brauchli, on what has been achieved so far.

Mr. Brauchli, why did the National Strategy Against Cancer divide the goal of strengthening clinical research into two subprojects?

The Federal Act on Research involving Human Beings (Human Research Act) came into force in 2014, which was precisely the start of the implementation phase of the National Strategy Against Cancer. The Act addresses some very new and for us very important aspects, such as an authorization procedure through only one leading ethics committee and the risk-adapted approach. For one, it was important to support the authorities in implementation. For another, Switzerland invests significant public funds in basic medical research. In this area, it has reached a high level. But unfortunately, it is a known fact that many of the research results remain purely theoretical and are not made utilizable for human benefit. Translational medicine, which brings scientific findings from the laboratory to the clinic, from bench to bedside, is not sufficiently developed.

Have expectations regarding research-friendly implementation of the Human Research Act been fulfilled?

In part. The Act has made some things easier for researchers. But as it turns out, unfortunately, the ethics committees were not sufficiently prepared for the change. The attractiveness of Switzerland as a centre for research depends essentially on the reliable and appropriate implementation of the law in force. This has not been assured in the last few years. For a country like Switzerland, which is considered to be a leader in innovation, this is particularly surprising.

What is holding up the implementation?

The Human Research Act ascribes the leading ethics committee a coordinating role. But cooperation between the leading ethics committee and the other ethics committees continues to be suboptimal. Each ethics committee has its own priorities, and for the SAKK and clinical researchers altogether, it was difficult, at least in the first two years of the new Act, to plan for which requirements will be applied by which committee. This is now better today: The procedure usually works, and the time limits are met by both the ethics committees and Swissmedic.

Rolf Marti, PhD

Head of the office of the Swiss Cancer Research foundation

Peter Brauchli, PhD

Director of the Swiss Group for Clinical Cancer Research (SAKK)

Is there now less administrative burden in the authorization procedure?

No, on the contrary. One thing that is easier is that research project coordinators can now submit all documents via an online platform and thus with the multicentre SAKK studies it is easier for the hospitals. But for multicentre studies with about 15 participating centres, a total of approximately 80 documents have to be submitted. Each agreement with a centre must be signed by five persons. This takes enormous coordination efforts. A system where consent could be given online, analogous to e-banking, would be quite a bit more efficient.

How well do you think the new Act will achieve its purposes?

The goals of the Human Research Act are to, first, "protect the dignity, privacy and health of human beings involved in research"; second, "create favourable conditions for research involving human beings"; third, "help to ensure the quality of research involving human beings"; and fourth, "ensure the transparency of research involving human beings". In my opinion, the authorities are paying too little attention to whether with their procedure these four goals are be-

ing achieved. Instead, they are more concerned with implementing the letter of the law. This unavoidably results in getting lost in the details, which tends to lead to over-regulation. In other words, the basic conditions could be better. In oncology, the quality of research involving human beings was good already prior to the introduction of the new law, and from my perspective, it has not improved substantially. On the other hand, the Human Research Act has clearly missed the target goal of making research involving human beings more transparent. Nevertheless: The balance is positive. With the introduction of the Human Research Act, Switzerland has a pioneering role, as it has introduced a way of thinking that no other country has known before. If there is success in fully implementing the law and in striving to fulfil the purposes of the law, Switzerland as a centre for research will have gained a great deal.

Let's change the subject and talk about the second subproject aiming to strengthen translational research in Switzerland. For this subproject, the Swiss Cancer Research foundation conducted an analysis and found that translational cancer research in Switzerland does not actually need additional support. But the analysis revealed that there is a need for promotion of clinical research. Do you agree?

Translational research usually refers to the transition from the laboratory to medical practice, or in other words, concrete application of research in treating people. International ratings prove that Switzerland is very strong in basic research, and it is also well-positioned regarding funding. However, there continues to be vast unrealized potential, both structurally and financially, for the translation of this knowledge into medical practice. In recent years, only about 3% of studies submitted to Swissmedic were first-in-human studies (first human exposure to a procedure). For a research-intensive country like Switzerland, this percentage seems very low to me.

You mention structural and financial difficulties of clinical research.

It is not the basic researchers but rather other teams that take on the responsibility in clinical research. Two worlds collide here that must communicate with each other. Moreover, the initiation of a clinical trial is an immense undertaking that succeeds only as a joint effort. The financial resources are usually quite a bit higher than with classical laboratory research projects.

It has been known for decades that clinical research is weak in Switzerland.

Well, that continues to be true in general. But compared with other specialties, oncology is a special case, as here there has been a strong commitment to clinical research for the last 50 years. For this reason, cooperative research groups are still today strongly represented in oncology. And here, too, it is important to move ahead consistently and to promote "alternative drug development" (or drug repurposing), as does the SAKK, for instance. This is research that is not steered by large pharmaceutical companies' profit motive but instead arises in particular from academic basic research.

Why is it that good young researchers are being trained and promoted in basic cancer research but not in clinical cancer research?

People who go into basic research have different CVs and different prospects than people who go into clinical research. In Switzerland there are hardly any researchers doing only clinical research. They are all faced with a double burden; in addition to clinical research, they have to care for patients. Many then decide to do the one or the other, and in medicine that is usually the clinic.

How attractive is a research career in the clinical area?

Clinical research is for marathon runners: It demands strong personal effort and commitment, and it usually takes from three to more than ten years for a trial to be planned, approved, conducted and published. What is more, multicentre studies are done in a large group, which means that not everyone can have a top position in the author list of a publication. In today's promotion system at the universities, this is a disadvantage.

Are there problems attracting young researchers in oncology, too?

Young people increasingly evaluate commitment in a career versus personal needs and wants. Many are no longer willing to invest so much time for an uncertain academic career. In my opinion, however, there is no better engine for driving academic research forward than the striving of young physicians for recognition and academic honours. This striving for recognition needs to be facilitated and improved.

Looking back, have basic conditions improved or worsened for young researchers?

Specialists in oncology have themselves come to realize that they need to promote and advocate for their successors. That is the first step to improvements. The "war for talents" takes place in small contexts, in personal conversations. What that means is that today, heads of oncological clinics take much more care to retain their researching physicians and to offer them attractive conditions.

Many organizations have issued recommendations on how to promote the next generation of researchers. Why are there still problems with implementing promotion of young researchers?

I think it is good that the federal "master plan for the promotion of biomedical research and technology" puts a high priority on promoting young researchers. There is a lot being undertaken that is positive. But as soon as a measure costs money, things get difficult.

Recently, the SAKK, too, published an initiative for promotion of young researchers. Can you describe it briefly?

Our Young Investigator Initiative offers various workshops, such as training in good clinical practice, introduction to statistics, or writing scientific publications. Those are all important prerequisites for successfully conducting a study. The key element of our initiative is the Young Oncology Academy, where young physicians are supported and advised by experienced colleagues for a period of about eight months.

What do you personally think is the most important thing that must be done in order to alleviate the problem in recruiting the next generation of researchers for clinical research?

Young physicians who seek out the double challenge in the clinic and in research should have a part of their work time at their own disposal so that they can devote it to research. Weekend research has had its day. It is also important that young specialists learn to work in a team and that they can assess – and value – others' competencies.

What is your wish regarding improving the situation of the next generation of researchers in clinical research in Switzerland?

It is my wish that idealism and curiosity concerning research will live on particularly among young physicians. And that they utilize proven structures for implementation of their ideas for research studies: These structures can make the sometimes difficult path of clinical research easier and spare them some frustrations.



Rolf Marti, PhD

Rolf Marti is a member of the managing board of the Swiss Cancer League. He heads the Research, Innovation & Development department (formerly: Scientific Office) and is also the director of the Swiss Cancer Research foundation office.

Tel. +41 (0)31 389 91 45

rolf.marti@krebsforschung.ch

www.krebsliga.ch/forschung

www.krebsforschung.ch



Peter Brauchli, PhD

Peter Brauchli is director and CEO of the Swiss Group for Clinical Cancer Research (SAKK).

Tel. +41 (0)31 508 41 71

peter.brauchli@sakk.ch

www.sakk.ch

Switzerland has a national cancer registry

One goal of the National Strategy Against Cancer 2014–2017, in the action field ‘Epidemiology and monitoring’, is the creation of a national law on cancer registration. The first step has been taken: Parliament passed the new law for a national cancer registry in March 2016. Now the implementation provisions for the new federal act are being developed. All-inclusive, uniform collection of data on cancer incidence in Switzerland will begin on 1 January 2019.

Complete collection of epidemiological data on cancer allows us to understand cancer better, to plan targeted prevention measures, and to draw very precise conclusions concerning the effectiveness of treatments. For this reason, uniform and comprehensive cancer registration and its legal basis in federal law are very important from the perspective of health policy. Only with the data provided by the cancer registries can an effective cancer policy in Switzerland be envisaged. The situation up to now has been unsatisfactory. Fifteen cantonal or national cancer registries as well as the Swiss Childhood Cancer Registry collected data, but because there has been no reporting obligation, infor-

mation on new cases of cancer has not been collected comprehensively or uniformly. This means that the data are only partially comparable.

This will change with the new federal act on cancer registration. The cancer registration act provides for the introduction of a reporting obligation; diagnosed cancers must be reported by physicians, hospitals, and other private and public institutions in the health care system. Patients have the right to object to registration of their data at any time. The reporting obligation establishes a basis for the collection of high-quality data. The data can be used for the development of prevention and screening measures; for evaluation of the quality of care provision, diagnosis, and treatment; for supporting care provision planning in the cantons; and for cancer research.

The draft act passed by the Federal Council in 2014 for a national cancer registry was very well received by the Swiss Parliament and approved by the National Council followed by the Council of States. Against the proposal by the Federal Council, the Parliament voted to extend the time that original data will be stored to give researchers better access to the data. Also, a transitional provision was inserted for handling data that the cantonal cancer registries and the Swiss Childhood Cancer Registry collected in accordance with older laws. In the final vote in March 2016 the National Council and the Council of States passed the new act with only few opposing votes and abstentions.

The seven member organizations* of Oncosuisse – the umbrella organization fighting cancer – together with the Swiss Childhood Cancer Registry, closely accompanied the legislative process. Fortunately, the central concerns were included in the new law. In the eyes of Oncosuisse, the law adopted largely meets the requirements of modern disease monitoring and is well suited to the intended purposes. It is well balanced, for it takes full account of not only the benefit of information on cancer but also the protection of patient-related data.

In the second half of 2016 the Federal Office of Public Health (FOPH), with the involvement of key actors, worked out the foundations for the implementation provisions of the cancer registration act. Three workshops as well as various meetings with the cantonal cancer registries and the National Institute for Cancer Epidemiology and Registration (NICER) aided the FOPH in developing a first draft of the ordinance text. A working group at Oncosuisse also worked on the topics of the FOPH workshops and contributed to the end result. One of the workshop topics was the question as to what data in the cancer registry were essential for future health monitoring, for evaluation of cancer screening programmes, and for the national cancer statistics or national cancer report. Based on the discussion, 'basic data' and 'additional data' under the cancer registration act were defined.

The consultation procedure for the drafting of the text of the ordinance was started, as planned, in April 2017. According to the draft, the registration of cancer data builds on the existing system: Data on cancer cases are collected in the cantonal and regional cancer registries. At the national level, the data are then brought together and prepared by a national cancer registration office. Data on cancer in children will continue to be collected by the Swiss Childhood Cancer Registry. In the future, uniform basic data will be collected for each cancer case. This will include type of treatment, treatment goal, bases for making the treatment decision, start date of treatment, and result of initial treatment. Additional data comprise information on further treatments after completion of the initial treatment and any comorbidities. The new national cancer registration office, in consultation with experts, will define the specific dataset to be recorded.

Oncosuisse welcomes the general thrust of the ordinance's draft, which is aimed at harmonizing cancer registration in Switzerland and adapting it to meet the present-day requirements of oncological care provision. Especially welcome is the planned inclusion of additional data on treatment and patient follow-up information, which in the future will allow assessment of the quality of care provision and treatment and will contribute towards optimum patient care. The Oncosuisse organizations will continue to contribute actively to the consultation procedure, for the draft does not yet include, for example, aspects concerning data exchange between people reporting cancer cases and the cancer registries. This topic is also being examined by a newly formed working

* Since the autumn of 2016, alongside the five already existing member organizations of Oncosuisse – Swiss Cancer League (SCL), Swiss Cancer Research foundation (SCR), Swiss Group for Clinical Cancer Research (SAKK), Swiss Paediatric Oncology Group (SPOG), National Institute for Cancer Epidemiology and Registration (NICER) – the Swiss Society for Medical Oncology (SSMO) and the Swiss Society of Hematology (SSH) represent professional medical associations in Oncosuisse.

group on 'additional data/treatment quality' under the lead of NICER and the Swiss Society for Medical Oncology. On behalf of the legislators, the working group will produce a proposal for a detailed list of treatment data and quality indicators.

The provisions of the law are planned to enter into force in a staggered way: Provisions that pertain to the federal government will enter into force on 15 May 2018. The remaining provisions will take effect on 1 January 2019. Starting then, all cancer cases in the whole country will be registered, and a decades-old demand by the organizations fighting cancer will at last be met.



Franziska Lenz

During and after studying media and communication sciences, journalism, and contemporary history at the University of Fribourg, Franziska Lenz worked for almost ten years at the Parliamentary Services assisting the Federal Assembly in Bern. She then worked as a consultant at a public affairs

agency, advising clients on planning and implementation of measures for representing their interests and on their relations with government, the economy, and society.

Franziska Lenz has headed Policy & Public Affairs at the Swiss Cancer League since September 2016.

Tel. +41 (0)31 389 93 17

franziska.lenz@krebsliga.ch

Research funding by the cantonal

and regional cancer leagues

Cancer research at the Biotechnology

Institute Thurgau

48

The Biotechnology Institute Thurgau (BITg) at the University of Konstanz is an academic (non-profit) research institution of the Canton of Thurgau located in Kreuzlingen, Switzerland. The institute focuses on application-oriented basic research in the fields of tumour biology, immunology, and cell biology. Ongoing cancer research projects at the BITg are investigating the metastasis of cancer cells and aim in particular to contribute to the development of new therapeutic strategies.

The Biotechnology Institute Thurgau (BITg) at the University of Konstanz was founded in 1999 by the Foundation for Science and Research of the Canton Thurgau (*Thurgauische Stiftung für Wissenschaft und Forschung*) in close collaboration with the University of Konstanz. The foundation sees itself as a flexible platform for the Canton of Thurgau's collaboration with universities – also beyond national borders. A member of the Cantonal Council of Thurgau, currently Cantonal Councillor Monika Knill, serves as president of the foundation board. The foundation is the legal sponsor of BITg, two other institutes, and the Thurgau Cancer Registry. Since 2004, BITg has been recognized as a research institute of national importance by the Federal Department of Economic Affairs, Education and Research, and it is supported by the federal government.

Academically, BITg is associated with the University of Konstanz and affiliated with the Department of Biology. Members of the institute also participate in the university's lecturing, and at the institute they train young researchers in biomedical research. In doing so, BITg makes an important contribution to the canton's cross-border research and education policy. BITg is managed by an executive committee, of which the members are a representative of the University of Konstanz (Prof. Dr Marcus Groettrup, chair of immunology at the University of Konstanz and research group head at BITg), a director of operations of the institute (Prof. Dr Daniel Legler, research group head at BITg and member of the teaching staff of the University of Konstanz), and a representative of the foundation board (Dr Christian Taverna, senior physician in the oncology department at Cantonal Hospital Münstlingen). The quality of the research at BITg is ensured by a scientific advisory board. At present, three research groups are conducting different projects at the institute.

For example, one research project, headed by Daniel Legler and supported by the Thurgau Cancer League, is studying the directed migration of (breast) cancer cells and the forming of metastases in lymph nodes. Various messenger molecules called chemokines are produced in different tissues in the body, so that when needed, immune defence cells can be recruited. The two continuously produced chemokines CCL19 and CCL21 are responsible for the migration and correct positioning of dendritic cells and T lymphocytes in secondary lymphoid organs. The migration of these immune cells to the lymph nodes is a fundamental step in every specific immune response to pathogens.

Prof. Daniel F. Legler, PhD

Director of operations of the Biotechnology Institute Thurgau

So that the immune cells can recognize and respond to CCL19 and CCL21, they start expressing a cell surface receptor called CCR7 on the surface of the cells. Certain cancer cells (such as in breast and prostate cancer) also express the chemokine receptor CCR7, and because they recognize the two chemokines, they, too, migrate to the lymph nodes and other organs of the lymphatic system, where they form metastases. Legler's research group recently discovered a new signalling pathway involving CCR7 that guides this cell migration. Triggering this signalling pathway are inflammatory factors that cause two or more CCR7 molecules to aggregate in the cell membrane. Larger aggregation of CCR7 molecules is also triggered by a naturally occurring point mutation. The aggregation of CCR7 molecules leads to the establishment of a signalling platform that can be used by Src kinases (potential proto-oncogenes), which results in considerably increased migration of immune cells. The current research project aims to examine the effect of the point mutation on the migration behaviour of immune and cancer cells. It will also study the effect of Src kinase inhibitors on signal transmission from CCR7 and the directed cell migration, as Src kinase inhibitors are already being used in the treatment of several types of cancer.

Another BITg research project, headed by Marcus Groettrup and supported by the Swiss Cancer Research foundation, is investigating the role of the immunoproteasome in the pathogenesis and treatment of colon cancer. The immunoproteasome is a large cylindrical complex in immune cells in which proteins are degraded to peptides. Groettrup's group recently discovered a new function of the immunoproteasome in the development of autoimmune diseases. They found that an inhibitor of one of the immunoproteasome subunits protected from the development and exacerbation of several autoimmune diseases in pre-clinical models. Chronic inflammation response in the colon and inflammatory cytokines also play a role in

the development and progression of colon carcinoma. The ongoing research project will examine the role of the immunoproteasome in the development of colon cancer and in addition test immunoproteasome inhibitors in preclinical studies.



Prof. Daniel F. Legler, PhD

Daniel Legler, biochemist, has been director of operations at BITg since 2005 and is a professor of immunology and cell biology at the University of Konstanz.

Contact

Biotechnologie Institut Thurgau
an der Universität Konstanz
Unterseestrasse 47
8280 Kreuzlingen
Tel. +41 (0)71 678 50 20
daniel.legler@bitg.ch
www.bitg.ch

List of funded research projects

The list shows the financial contributions granted in 2016.

Basel Cancer League

Christofori Gerhard | The functional role of long non-coding RNAs in epithelial-mesenchymal transition (EMT) and malignant breast cancer progression

Departement Biomedizin, Universitätsspital Basel, Basel

CHF 90 000.- | Duration: 1.10.2016 – 30.9.2017

D'Amico Lucia | Dissecting anti-tumour immune responses of a novel anti-HER2 anthracycline based antibody drug conjugate in an orthotopic breast cancer model

Departement Biomedizin, Medizinische Onkologie, Universitätsspital Basel, Basel

CHF 50 000.- | Duration: 1.6.2016 – 1.6.2017

Iezzi Giandomenica | Immune-modulation by stromal cells in human colorectal cancer

Departement Biomedizin, Universitätsspital Basel, Basel

CHF 53 626.- | Duration: 1.8.2016 – 31.7.2017

Ittig Simon | Bacterial targeting of prodrug-converting enzymes to solid tumours

Biozentrum, Universität Basel, Basel

CHF 60 000.- | Duration: 1.8.2016 – 31.3.2017

Matter Matthias | Identification of miRNAs involved in liver cell cancer metastasis

Institut für Pathologie, Universitätsspital Basel, Basel

CHF 20 000.- | Duration: 1.10.2016 – 31.9.2017

Muller Laurent | The immunosuppressive and prognostic role of Epstein-Barr virus latent membrane protein-1/2 (LMP-1/2) positive exosomes in plasma of patients with nasopharyngeal cancer and their interaction with regulatory B cells (Breg) in the tumour microenvironment

Hals-Nasen-Ohren-Klinik, Universitätsspital Basel, Basel

CHF 55 000.- | Duration: 1.3.2016 – 31.12.2017

Rothschild Sacha | Protocol SAKK 16/1 – Anti-PD-L1 antibody MEDI4736 in addition to neoadjuvant chemotherapy in patients with stage IIIA(N2) non-small cell lung cancer (NSCLC).

A multicentre single-arm phase II trial

Medizinische Onkologie, Universitätsspital Basel, Basel

CHF 21 000.- | Duration: 1.9.2016 – 31.12.2018

Terracciano Luigi M. | The role of HMGA proteins in gastroenteropancreatic neuroendocrine tumours

Institut für Pathologie, Universitätsspital Basel, Basel

CHF 40 000.- | Duration: 1.5.2016 – 30.4.2017

Tzankov Alexandar | Deep sequencing of nodal marginal zone B-cell lymphomas: diagnostic and theranostic perspectives

Institut für Pathologie, Universitätsspital Basel, Basel

CHF 60 000.- | Duration: 1.11.2016 – 30.10.2017

Bern Cancer League

Bonadies Nicolas | Biological characterization of clonal dynamics and converging oncogenic pathways in refractory/relapsing high-risk myelodysplastic syndromes

Klinik für Hämatologie und Hämatologisches Zentrallabor, Inselspital Bern, Bern

CHF 80 000.- | Duration: 1.1.2017–30.6.2018

Dettmer Mathias | Tumour heterogeneity and epigenetics in high-risk thyroid carcinomas

Institut für Pathologie, Universität Bern, Bern

CHF 70 000.- | Duration: 1.12.2016–31.5.2018

Eychmüller Steffen | Best care of the dying person during the last days of life: A qualitative study about patient-defined and proxy-defined core outcomes

Zentrum für Palliativmedizin, Inselspital Bern, Bern

CHF 30 000.- | Duration: 1.9.2016–1.3.2018

Furrer Marc | What kind of consequences do different surgical and non-surgical parameters concerning the removal of the bladder of bladder cancer patients have on patient's continence, potency, renal function, digestion, complication and the risk of cancer recurrence and therefore on their quality of life as well as on their life expectancy, and is there any room for improvement?

Klinik für Urologie, Inselspital Bern, Bern

CHF 40 000.- | Duration: 1.4.2016–1.10.2018

Luan Peiling | Characterization and therapeutic targeting of chemoresistance-driving pathways in lung cancer

Klinik für Thoraxchirurgie, Inselspital Bern, Bern

CHF 120 000.- | Duration: 1.10.2016–1.4.2018

Olariu Radau | Transcutaneous sentinel lymph node identification in malignant melanoma using indocyanine green. A prospective diagnostic accuracy clinical trial

Klinik für Plastische- und Handchirurgie, Inselspital Bern, Bern

CHF 20 000.- | Duration: 1.1.2017–30.6.2018

Papadia Andrea | Redirecting the natural history of HPV infection through immune check point inhibitors

Klinik für Frauenheilkunde, Inselspital Bern, Bern

CHF 25 000.- | Duration: 1.3.2017–1.8.2018

Sommer Grit | Pulmonary late-effects in long-term childhood cancer survivors – Development of guidelines for follow-up care

Institut für Sozial- und Präventivmedizin, Universität Bern, Bern

CHF 25 000.- | Duration: 1.1.2017–1.3.2018

Worni Mathias | Differential immunologic signature after pancreatic cancer treatment: does irreversible electroporation lead to a prolonged and potent T-cell mediated immune response compared to surgical resection?

Klinik für Viszerale Chirurgie und Medizin, Inselspital Bern, Bern

CHF 70 000.- | Duration: 1.10.2016–1.4.2018

Zaugg Kathrin | Cutting-edge radiation therapy: effect of delivery time and dose-rate on tumour cell survival and invasion and its clinical impact

Klinik für Radio-Onkologie, Inselspital Bern, Bern

CHF 70 000.- | Duration: 1.2.2017–1.2.2018

Central Switzerland Cancer League

Michel Gisela | Psychological late effects in long-term childhood cancer survivors – development of guidelines for follow-up care

Health Sciences and Health Policy, Universität Luzern, Luzern

CHF 36 000.- | Duration: 1.1.2015–31.12.2017

Winterhalder Ralph | Multi-centre, investigator-initiated single arm phase 2 trial to evaluate anti-EGFR immunoliposomes in patients with pre-treated triple-negative breast cancer

Luzerner Kantonsspital, Luzern

CHF 30 000.- | Duration: 1.2.2016–1.8.2018

Eastern Switzerland Cancer League

Ludewig Burkhard | Targeting breast cancer through manipulation of IL-7 producing tumour fibroblasts
Institut für Immunbiologie, Kantonsspital St. Gallen, St. Gallen
CHF 100 000.- | Duration: 1.1.2016 – 31.12.2017

Fribourg Cancer League

Camey Bertrand | Malignant haemopathies in the canton of Fribourg, statistical analyses of data collected by the Fribourg Cancer Registry since the beginning of 2006
Registre fribourgeois des tumeurs, Ligue fribourgeoise contre le cancer, Fribourg
CHF 4132.- | Duration: 1.1.2016 – 31.12.2016

52

Geneva Cancer League

Bühler Léo | New radioisotopes for the treatment of brain and pancreatic cancer
Service de Chirurgie, Hôpitaux universitaires de Genève (HUG), Genève
CHF 120 000.- | Duration: 1.1.2014 – 31.12.2016

Farina Annarita | Extracellular vesicles released in proximal fluids by pancreatic biliary cancers: characterization and evaluation of their role in biology and diagnosis of cancer
Département de Science des protéines humaines, Faculté de Médecine, Université de Genève, Genève
CHF 99 272.- | Duration: 1.7.2016 – 30.6.2017

Foti Michelangelo | Role of proteins binding to adenine-uridine-rich elements and P-bodies in hepatocellular carcinoma
Département de Physiologie Cellulaire et Métabolisme, Faculté de Médecine, Université de Genève, Genève
CHF 88 622.- | Duration: 1.7.2016 – 30.6.2017

Hibaoui Youssef | Study of the molecular mechanisms of leukemia associated with Down syndrome using a new model based on induced pluripotent stem cells (iPSCs generated from monozygotic twins discordant for trisomy 21)
Département de Médecine Génétique et Développement, Faculté de Médecine, Université de Genève, Genève
CHF 87 092.- | Duration: 1.7.2016 – 30.6.2017

Mandriota Stefano | Role of aluminium in the development of breast cancer
Fondation des Grangettes, Clinique des Grangettes, Genève
CHF 60 000.- | Duration: 1.7.2016 – 30.6.2018

Mary Camille | Characterization of the protein THEM6: a thioesterase potentially involved in cancer
Département de Science des protéines humaines, Faculté de Médecine, Université de Genève, Genève
CHF 47 000.- | Duration: 1.7.2016 – 30.6.2017

Serre-Beinier Véronique | Study of the role of the MIF/CD74 pathway in mesothelioma development
Département de Chirurgie, Université de Genève, Genève
CHF 85 081.- | Duration: 1.1.2015 – 31.12.2017

Toso Christian | Surgical treatment of patients with hepatocellular carcinoma
Service de chirurgie viscérale, Hôpitaux universitaires de Genève (HUG), Genève
CHF 109 676.- | Duration: 1.7.2016 – 30.6.2018

Walker Paul | Improving the efficacy of glioma immunotherapy
Service d'Oncologie, Hôpitaux universitaires de Genève (HUG), Genève
CHF 88 054.- | Duration: 1.1.2014 – 31.12.2016

Grisons Cancer League

Cathomas Richard | Clinical research for the long-term follow-up of patients

Onkologie/Hämatologie, Kantonsspital Graubünden, Chur

CHF 20 000.- | Duration: 1. 9. 2014 – 31. 12. 2016

Cathomas Richard | Project on testicular cancer

Onkologie/Hämatologie, Kantonsspital Graubünden, Chur

CHF 10 000.- | Duration: 1. 9. 2014 – 31. 12. 2016

Thurgau Cancer League

Schmidt Anne | Support Cancer Registry Thurgau

Krebsregister Thurgau, Kreuzlingen

CHF 10 000.- | Duration: 1. 1. 2016 – 31. 12. 2016

Ticino Cancer League

Catapano Carlo | Biological and genetic determinants of sensibility and resistance to small molecule inhibitors of STAT3 in human cancer

Istituto Oncologico della Svizzera Italiana (IOSI), Bellinzona

CHF 125 000.- | Duration: 1. 4. 2016 – 31. 3. 2017

Civenni Gianluca | Isolation, expansion in vitro and characterization of epithelial stem cells from human prostate biopsies

Istituto Oncologico della Svizzera Italiana (IOSI), Bellinzona

CHF 50 000.- | Duration: 1. 1. 2016 – 31. 12. 2016

Reinert Michael | RAMAN guided resection of glioma using nanoparticles targeted cell recognition in the mouse model

Neurocentro della Svizzera Italiana, Lugano

CHF 60 000.- | Duration: 1. 10. 2015 – 30. 9. 2018

Roggero Enrico | Comparison study to evaluate the impact of a multi-disciplinary board on the treatment of patients with prostate cancer

Istituto Oncologico della Svizzera Italiana (IOSI), Bellinzona

CHF 50 000.- | Duration: 1. 1. 2016 – 31. 12. 2016

Zurich Cancer League

Azzi Tarik | Generation of gamma-delta T cells targeting B-cell cancer harbouring Epstein-Barr virus

Abteilung Infektiologie, Universitäts-Kinderspital Zürich, Zürich

CHF 41 474.- | Duration: 1.1.2016 – 31.12.2016

Bernasconi Michele | Evaluation of therapeutic efficacy of peptide-targeted vincristine-loaded liposomes in rhabdomyosarcoma

Abteilung Onkologie, Universitäts-Kinderspital Zürich, Zürich

CHF 50 000.- | Duration: 1.1.2016 – 31.12.2016

Bourquin Jean-Pierre | Exploring the genomic landscape of myeloid and stem cell marker VNN2 positive unfavorable acute lymphoblastic leukemia

Abteilung Onkologie, Universitäts-Kinderspital Zürich, Zürich

CHF 64 094.- | Duration: 1.1.2016 – 31.12.2016

Chijioke Obinna | Role of activating receptor-ligand interactions in natural killer cell mediated immune control of lytic infection by the oncogenic Epstein-Barr virus

Institut für Experimentelle Immunologie, Universität Zürich, Zürich

CHF 69 564.- | Duration: 1.1.2013 – 31.12.2016

Meier-Abt Fabienne | Identification of new therapeutic targets against haematopoietic malignancies by proteomic analysis of (pre) leukemic stem cells

Klinik für Hämatologie, Universitätsspital Zürich, Zürich

CHF 33 020.- | Duration: 1.1.2016 – 31.12.2016

Shakova Olga | Delineating the molecular and cellular basis of therapy resistance in metastatic melanoma

Klinik für Onkologie, Universitätsspital Zürich, Zürich

CHF 63 000.- | Duration: 1.1.2014 – 31.12.2016

van den Broek Maries | Tertiary lymphoid structures in lung cancer

Institut für Experimentelle Immunologie, Universität Zürich, Zürich

CHF 55 000.- | Duration: 1.1.2015 – 31.12.2016

Wong Wei-Lynn | The role of inhibitors of apoptosis proteins in the tumour microenvironment

Institut für Experimentelle Immunologie, Universität Zürich, Zürich

CHF 56 866.- | Duration: 1.1.2015 – 31.12.2016







Circulating tumour cells and liquid biopsy

More than 90 % of cancer-related deaths are due to the development of metastases. Key players in the metastatic process are circulating tumour cells (CTCs). CTCs are cancer cells that detach from a primary tumour and enter the blood circulation, on their way to seeding a metastasis at a distant site. In cancer patients, CTCs are highly diluted in peripheral blood and are found on average at a concentration of one CTC per billion normal blood cells, making their isolation extremely challenging. Yet, with the development of specialized microfluidic technologies, scientists were recently able to isolate and interrogate CTCs from patient blood samples (i. e. from what is called a liquid biopsy)¹. This revealed highly unexpected features of the metastatic process and opened up a new field of research to study cancer vulnerabilities. Although many questions in the CTC and liquid biopsy field remain unanswered and are currently under investigation, recent exciting discoveries have highlighted the potential of liquid biopsies and CTC interrogation for the future of cancer care.

Recent discoveries in the field of circulating tumour cells

The CTC research field is still in its infancy, with many open questions to be addressed, yet it has expanded extremely rapidly in the last decade. CTCs were first reported in 1869 in a post-mortem blood analysis of a cancer patient², but given their low concentration in patients' peripheral blood, their isolation has for a long time been hampered by technological constraints. It was only during the last decade that scientists developed specialized technologies to efficiently separate individual CTCs from billions of healthy blood cells, with high precision and in different cancer types³. To date, CTCs have been reliably found in cancers of the breast, colon, lung, prostate, and pancreas, as well as in non-epithelial cancers such as melanoma and glioblastoma multiforme, with their presence in the blood being widely associated with poor prognosis⁴⁻⁷.

Among the major discoveries in CTC biology to date we can mention the following: First, the presence of detectable CTCs in cancer patients has been highlighted in several studies as a strong risk factor and as associated with a poor prognosis, compared to patients in whom CTCs are not detected, or where they are detected below a defined threshold^{3,8-12}. This has led to the development of specialized CTC counting technologies (e.g. CellSearch) and protocols to stratify patients according to CTC number and the degree of aggressiveness of their cancer. Second, the understanding that CTCs are present in the bloodstream of patients as single cells and as clusters of cells, with the latter being highly efficient precursors of metastasis⁴. This finding has revealed CTC clustering to be an unexpected yet targetable mode of cancer dissemination, and it is being further explored. For example, in our laboratory we are attempting to target cell-cell junction components that are required for clustering of cancer cells in circulation but dispensable for clustering of normal epithelia throughout the body. Further approaches include the identification of the events that lead to the intravasation of CTC clusters into the bloodstream as well as the mechanisms of action that fuel their metastatic potential. Third, molecular analysis of CTCs has been instrumental to stratify chemosensitive versus chemorefractory patients before treatment¹³, and this approach holds great promise in the context of non-invasive patient stratification and treatment decisions. Fourth, when applying specific conditions, it has been possible to culture and expand CTCs from patients with various cancer types and use them to test drug susceptibility in each individual donor, as one of the first examples of real-time personalized medicine¹⁴⁻¹⁶. To date, CTC cultures have been derived from breast cancer^{14,17}, prostate cancer¹⁶, colorectal cancer¹⁵, and lung cancer¹⁸, providing examples for personalized drug screening starting from a minimally invasive liquid biopsy. More broadly, fuelled by these recent discoveries, which should be seen as proof-of-concept, the increasing understanding of the features that characterize CTCs offers the ambitious promise that we may one day implement CTC testing in clinical practice and develop new metastasis-tailored therapies.

Liquid biopsies and future cancer care

The term liquid biopsy refers to obtaining a sample from peripheral blood (and in some cases, other body fluids, such as saliva, urine, or cerebrospinal fluid) with the aim to identify CTCs and/or fragments of circulating tumour-derived DNA (ctDNA) released by tumour cells from anywhere in the body¹. Recently, liquid biopsy has received extraordinary attention because of its potential to revolutionize treatment decisions, disease monitoring, and early cancer detection. Although the field of liquid biopsy has expanded exponentially in the past few years and has set the stage for very high expectations in the near future, results must still be interpreted with caution.

Combined CTCs and ctDNA analysis from a liquid biopsy is thought to provide several layers of information on a patient's cancer. CTCs currently appear particularly promising for individualized drug screening approaches (as described above) and for understanding the biology underlying the metastatic process, but ctDNA analysis might offer a more sensitive method for the detection of cancerous lesions within the body, for quantification of minimal residual disease during therapy, and for patient stratification (i.e. the presence or absence of a particular genomic alteration that would render the patient eligible for a targeted treatment). Along these lines, with the liquid biopsy field advancing rapidly, the first two companion diagnostic tests for the determination of EGFR mutations in ctDNA have been approved by regulatory agencies in Europe and the United States. These tests can now be used to guide anti-EGFR treatment in EGFR-mutated non-small cell lung cancer patients, using blood samples when access to tissue is impaired.

Ultimately, the holy grail of liquid biopsies is to be able to detect cancer early enough – even before the patient experiences any cancer-related symptoms – so that the disease can be eradicated in a timely way and the patient cured. To this end, CTCs and ctDNA screening in healthy individuals could be used to identify cancer-related alterations arising over the course of a person's life. Several companies have already embarked on such projects, but the feasibility of this approach for early cancer detection remains to be assessed using large patient cohorts and validated assays that are able to overcome sensitivity and specificity issues, such as the distinction between benign and malignant tumours as well as overinterpretation of the results (i.e. the presence of a cancer-related

alteration does not guarantee that the patient has cancer, and its absence does not guarantee that the patient does not have cancer). It appears clear that in the near future scientists will be able to determine the accuracy of liquid biopsy for early cancer detection.

Summary and concluding remarks

The field of liquid biopsy in oncology is still in its infancy and presents with many open questions needing to be addressed, but its potential for the care of patients with cancer appears extraordinary. Within the next five to ten years, we could witness the implementation of liquid biopsy in the clinical setting, using non-invasive blood sampling rather than, or in addition to, tissues as a primary source of information for optimizing personalized medicine, disease monitoring, and early cancer detection. Whereas much effort needs to be made to address the value of liquid biopsy in large patient cohorts, its realization might lead to radical changes in the way oncology is currently practised and possibly result in a better outcome for cancer patients.



Prof. Nicola Aceto, PhD
Nicola Aceto completed a PhD in biochemistry at the Friedrich Miescher Institute in Basel and then had a postdoctoral fellowship at Harvard Medical School and Massachusetts General Hospital Cancer Center in Boston (USA). He is currently an SNSF Professor of oncology and group

leader of the Cancer Metastasis laboratory at the University of Basel. Research in his laboratory aims at identifying vulnerabilities of the metastatic process, with a particular emphasis on circulating tumour cells and liquid biopsies. His research program combines several disciplines and includes biologists, clinicians, engineers, and computational scientists, working together to identify new therapeutic and diagnostic tools for the treatment of metastatic cancers.

Tel. +41 (0)61 207 07 73

nicola.aceto@unibas.ch

www.cancermetastasislab.com

References

1. Alix-Panabieres C, Pantel K. Clinical applications of circulating tumor cells and circulating tumor DNA as liquid biopsy. *Cancer Discov.* 2016;6:479-91.
2. Ashworth TR. A case of cancer in which cells similar to those in the tumors were seen in the blood after death. *Aust. Med.* 1869;14:146-49.
3. Gkountela S, Szczerba B, Donato C, Aceto N. Recent advances in the biology of human circulating tumour cells and metastasis. *ESMO Open.* 2016;1:e000078.
4. Aceto N, Bardia A, Miyamoto DT, Donaldson MC, Wittner BS, Spencer JA, et al. Circulating tumor cell clusters are oligoclonal precursors of breast cancer metastasis. *Cell.* 2014;158:1110-22.
5. Luo X, Mitra D, Sullivan RJ, Wittner BS, Kimura AM, Pan S, et al. Isolation and molecular characterization of circulating melanoma cells. *Cell Rep.* 2014;7:645-53.

6. Paoletti C, Li Y, Muñiz MC, Kidwell KM, Aung K, Thomas DG, et al. Significance of circulating tumor cells in metastatic triple-negative breast cancer patients within a randomized, phase II trial: TBCRC 019. *Clin Cancer Res.* 2015;21:2771-9.
7. Sullivan JP, Nahed BV, Madden MW, Oliveira SM, Springer S, Bhere D, et al. Brain tumor cells in circulation are enriched for mesenchymal gene expression. *Cancer Discov.* 2014;4:1299-309.
8. Rack B, Schindlbeck C, Jückstock J, Andergassen U, Hepp P, Zwingers T, et al. Circulating tumor cells predict survival in early average-to-high risk breast cancer patients. *J Natl Cancer Inst.* 2014;106.pii: dju066.
9. Giuliano M, Giordano A, Jackson S, Hess KR, De Giorgi U, Mego M, et al. Circulating tumor cells as prognostic and predictive markers in metastatic breast cancer patients receiving first-line systemic treatment. *Breast Cancer Res.* 2011;13:R67.
10. Cristofanilli M. Circulating tumor cells, disease progression, and survival in metastatic breast cancer. *Semin Oncol.* 2006;33:S9-14.
11. Danila DC, Heller G, Gignac GA, Gonzalez-Espinoza R, Anand A, Tanaka E, et al. Circulating tumor cell number and prognosis in progressive castration-resistant prostate cancer. *Clin Cancer Res.* 2007;13:7053-8.
12. Bork U, Rahbari NN, Schölch S, Reissfelder C, Kahlert C, Büchler MW, et al. Circulating tumour cells and outcome in non-metastatic colorectal cancer: a prospective study. *Br J Cancer.* 2015;112:1306-13.
13. Carter L, Rothwell DG, Mesquita B, Smowton C, Leong HS, Fernandez-Gutierrez F, et al. Molecular analysis of circulating tumor cells identifies distinct copy-number profiles in patients with chemosensitive and chemorefractory small-cell lung cancer. *Nat Med.* 2017;23:114-9.
14. Yu M, Bardia A, Aceto N, Bersani F, Madden MW, Donaldson MC, et al. Ex vivo culture of circulating breast tumor cells for individualized testing of drug susceptibility. *Science.* 2014;345:216-20.
15. Cayrefourcq L, Mazard T, Joosse S, Solassol J, Ramos J, Assenat E, et al. Establishment and characterization of a cell line from human circulating colon cancer cells. *Cancer Res.* 2015;75:892-901.
16. Gao D, Vela I, Sboner A, Iaquinta PJ, Karthaus WR, Gopalan A, et al. Organoid cultures derived from patients with advanced prostate cancer. *Cell.* 2014;159:176-87.
17. Zhang L, Ridgway LD, Wetzel MD, Ngo J, Yin W, Kumar D, et al. The identification and characterization of breast cancer CTCs competent for brain metastasis. *Sci Transl Med.* 2013;5:180ra48.
18. Zhang Z, Shiratsuchi H, Lin J, Chen G, Reddy RM, Azizi E, et al. Expansion of CTCs from early stage lung cancer patients using a microfluidic co-culture model. *Oncotarget.* 2014;5:12383-97.

Selected results

Project

Elucidating the role of tumor microenvironment in adaptive/evasive resistance and regrowth of residual disease after B-Raf driver oncogene inhibition in a mouse model of melanoma, and assessing the potential of angiogenesis and c-Met inhibitors to restrain such relapse

Institut Suisse de Recherche Expérimentale sur le Cancer, EPF de Lausanne, Lausanne
CHF 265 300.- | Duration: 1. 1. 2013 – 31. 12. 2015 | KFS 3031-08-2012

Project coordinator

Prof. Douglas Hanahan, PhD | douglas.hanahan@epfl.ch

When the tumour microenvironment is to blame for therapy failure

Metastatic melanoma is treatable only to a limited extent, unfortunately. This is because, among other things, the immune cells in the microenvironment of the tumour help the cancerous cells to quickly adapt to the treatment, as researchers supported by the Swiss Cancer Research foundation have found.

If malignant melanoma is discovered only late, when melanoma cells have already begun to spread (or metastasize) to other parts of the body, prognosis is unfortunately grim. For some patients, there have been results with immunotherapy that can rightly be called breakthroughs in cancer treatment. But for the majority of patients, immunotherapy fails to have the desired effect.

Progress has been made also beyond immune treatments: Today, we have a much more accurate picture of how tumour cells and the cells in their microenvironment affect each other. Based on the findings, a number of newer drugs have been developed that, for instance, correct things when signalling pathways in tumour cells get out of hand (drugs called B-Raf inhibitors) or throttle the blood supply to tumour cells by inhibiting the growth of new blood vessels (drugs called angiogenesis inhibitors).

The Hanahan research group in Lausanne used mouse models to test the extent to which these new drugs stop or even prevent the development of the tumour. The researchers found that with pharmacological inhibition and disruption they could stabilize skin cancer but not eliminate it. "One of the mysteries of melanomas is that they have a lot of blood vessels but nevertheless can develop resistance to angiogenesis inhibitors", explains Hanahan.

When the researchers combined pharmaceutical agents, they were able to disrupt tumour growth for a longer time than with monotherapies. But also the combination therapy achieved only temporary and, unfortunately, no lasting benefit. When the tumour began to grow again, not only the behaviour of the tumour cells changed but also the behaviour of the immune cells in their immediate environment – and did so in a very irregular way: The team counted up to 25 different signalling pathways that were activated by the cells to evade the effect of the treatment. "Our findings are disappointing and sobering, but the reality is what it is: We still have no wonder drug against cancer", says Hanahan.

Project

Preclinical development of cancer vaccines using photosensitization as adjuvant for stimulation of cytotoxic CD8 T-cells

Dermatologische Klinik, Universitätsspital Zürich, Zürich

CHF 250 000.- | Duration: 1.11.2014–31.10.2016 | KFS 3451-08-2014

Project coordinator

Pål Johansen, PhD | pal.johansen@usz.ch

Pursuing a dream with photosensitive substances

64

One of the reasons why vaccines have not had the desired effect on cancer is that the body's own immune system does not process them optimally. Researchers supported by the Swiss Cancer Research foundation are using photosensitive substances to intervene in the processes within the immune cells – and are moving one step closer to the vision of vaccination against cancer.

Vaccination that protects the body from cancer is a long-held dream in medicine. The dream became a reality for the first time to a certain extent with the vaccine against certain types of human papillomavirus (HPV) that can cause cervical cancer. But unfortunately, there have been no solid successes in preventing other types of cancer. "That is because the immune system can process vaccines in two ways – and cancer vaccines go through the wrong processing", says Pål Johansen, head of a research team at the Department of Dermatology at the University Hospital Zurich.

Every immune response starts with specialized immune cells, called antigen-presenting cells, ingesting the antigen (or vaccine). Depending on whether the antigen is contained in a vesicle within the immune cell or swims freely in the cell fluid, it will be cut up in different ways and displayed on the surface of the antigen-presenting cells. Normally, antigens get into the cell vesicles and from there to a MHC-II-complex, which in the immune system plays a role mainly in the interactions for the production of antibodies. However, if an antigen enters the cell sap, it binds to a MHC-I-complex, which is mainly associated with the maturation of cytotoxic T-cells, the so called killer cells.

In the fight against tumour cells, killer cells have been found to be more effective than antibodies. For this reason, the research project conducted by Johansen and his team aims to deliver the vaccines from the cell vesicle into the cell fluid of the antigen-presenting cells. In experiments with mice, the researchers combined the antigen with a photosensitizer and administered it intradermally. When the mice were then exposed to intensive light, the photosensitive substance caused the cell vesicle within the antigen-

presenting cells to burst. As a result, the vaccine entered the cell fluid, and the immune response led to enhanced production of killer cells.

"The principle works well in mice", says Johansen. His team is now planning, in collaboration with an industry partner in Norway, first tests with humans. If the encouraging results of the animal experiments are confirmed, medicine will have made a further step toward fulfilling a great dream.

References

- Bruno C, Waeckerle-Men Y, Håkerud M, Kündig TM, Gander B, and Johansen P. Photosensitizer and Light Pave the Way for Cytosolic Targeting and Generation of Cytosolic CD8 T Cells Using PLGA Vaccine Particles. *J Immunol.* 2015;195:166-73.
- Håkerud M, Selbo PK, Waeckerle-Men Y, Contassot E, Dziunycz P, Kündig TM, et al. Photosensitisation facilitates cross-priming of adjuvant-free protein vaccines and stimulation of tumour-suppressing CD8 T cells. *J Control Release.* 2015;198:10-7.
- Håkerud M, Waeckerle-Men Y, Selbo PS, Kündig TM, Høgset A, and Johansen P. Intradermal photosensitisation facilitates stimulation of MHC class-I restricted CD8 T-cell responses of co-administered antigen. *J Control Release.* 2014;174:143-50.
- Hjálmsdóttir Á, Bühler C, Vonwil V, Roveri M, Håkerud M, Waeckerle-Men Y, et al. Cytosolic Delivery of Liposomal Vaccines by Means of the Concomitant Photosensitization of Phagosomes. *Mol Pharm.* 2016;13:320-9.

List of approved research projects in 2016

More information about the funded projects can be found on www.krebsliga.ch/researchprojects

Total funds allocated: CHF 9 985 600.-

Aceto Nicola | The role of hypoxia in the generation of circulating tumour cell clusters

Departement Biomedizin, Universität Basel, Basel

CHF 167 700.- | Duration: 1.11.2016 – 31.10.2019 | KFS 3811-02-2016

Baumgartner Martin | Understand and target growth factor-driven brain infiltration and growth of medulloblastoma

Abteilung Onkologie, Kinderspital Zürich, Zürich

CHF 375 000.- | Duration: 1.7.2016 – 30.6.2019 | KLS 3834-02-2016

Carbone Giuseppina | Functional, clinical and therapeutic impact of epigenetic cross-talks in ERG fusion positive prostate cancers

Istituto Oncologico della Svizzera Italiana (IOSI), Bellinzona

CHF 246 050.- | Duration: 1.8.2016 – 31.7.2018 | KFS 3872-02-2016

Cavalli Andrea | Structural basis for the inhibition of STAT3 transcription factor by small molecules

Istituto di Ricerca in Biomedicina (IRB), Bellinzona

CHF 245 450.- | Duration: 1.9.2016 – 31.8.2018 | KLS 3839-02-2016-R

Ciriello Giovanni | Dissecting the landscape of cancer epigenetic modifications to discover novel oncogenic and actionable targets

Département de biologie computationnelle, Université de Lausanne, Lausanne

CHF 286 950.- | Duration: 1.7.2017 – 30.6.2021 | KFS 3983-08-2016

Coppi Roberto | Beating cancer by hindering its stem-like attributes

Département de physiologie cellulaire et métabolisme, Université de Genève, Genève

CHF 375 000.- | Duration: 1.8.2016 – 31.7.2019 | KFS 3794-02-2016-R

Grzmil Michal | Identification of sensitizing targets to radiopharmaceuticals for cancer treatment

Zentrum für Radiopharmazeutische Wissenschaften, Paul Scherrer Institut (PSI), Villigen

CHF 220 000.- | Duration: 10.7.2017 – 9.7.2020 | KFS 3960-08-2016-R

Haefliger Jacques-Antoine | Targeting the endothelial connexin37 and connexin40 to reduce tumour growth by altering angiogenesis

Département de médecine, Centre hospitalier universitaire vaudois (CHUV), Lausanne

CHF 363 600.- | Duration: 1.3.2017 – 28.2.2020 | KFS 3796-02-2016-R

Hall Jonathan | Determining the drugability of Lin28-dependent cancers

Institut für Pharmazeutische Wissenschaften, ETH Zürich, Zürich

CHF 249 500.- | Duration: 1.8.2016 – 31.7.2018 | KFS 3816-02-2016

Hanahan Douglas | Comparing the effects of distinctive macrophage reprogramming agents on tumour associated macrophages to optimize immunotherapy

Institut suisse de recherche expérimentale sur le cancer (ISREC), EPF de Lausanne, Lausanne

CHF 369 850.- | Duration: 1.7.2016 – 30.6.2019 | KFS 3878-02-2016

Hediger Matthias | The role of neutral amino acid transporters in colorectal cancer progression

Institut für Biochemie und Molekulare Medizin, Universität Bern, Bern

CHF 373 600.- | Duration: 1.5.2017 – 30.4.2020 | KFS 3966-08-2016

Ho Ping-Chih | CD36-mediated metabolic adaptation guides formation of intratumoural regulatory T-cells and restrains their metabolic vulnerability

Département d'oncologie fondamentale, Université de Lausanne, Epalinges

CHF 247 400.- | Duration: 1. 2. 2017– 31. 1. 2020 | KFS 3949-08-2016

Hugues Stéphanie | How MHCII-restricted antigen-presentation by lymphatics impacts tumour immunity

Département de pathologie et d'immunologie, Université de Genève, Genève

CHF 291 600.- | Duration: 1. 7. 2017– 30. 6. 2020 | KFS 3950-08-2016-R

Ittig Simon | Bacterial cancer therapy: efficacy studies in mouse models of cancer

Biozentrum, Universität Basel, Basel

CHF 187 150.- | Duration: 1. 8. 2016– 31. 1. 2018 | KFS 3798-02-2016

Janscak Pavel | Molecular basis of oncogene-induced DNA damage

Institut für Molekulare Krebsforschung, Universität Zürich, Zürich

CHF 210 450.- | Duration: 1. 9. 2016– 31. 8. 2019 | KFS 3802-02-2016

Joyce Johanna | Targeting tumour-associated macrophages to enhance therapeutic efficacy in gliomas

Département d'oncologie fondamentale, Université de Lausanne, Lausanne

CHF 374 300.- | Duration: 1. 7. 2017– 29. 6. 2020 | KFS 3990-08-2016

Lingner Joachim | Targeting telomeres with reactive oxygen species in cancer

Institut Suisse de Recherche Expérimentale sur le Cancer (ISREC), EPF de Lausanne, Lausanne

CHF 374 700.- | Duration: 1. 8. 2016– 31. 7. 2019 | KLS 3824-02-2016

Lopes Massimo | Mechanisms of fork protection by the oncosuppressor BRCA2 as molecular determinants of cancer chemotherapy

Institut für Molekulare Krebsforschung, Universität Zürich, Zürich

CHF 370 250.- | Duration: 1. 2. 2017– 31. 1. 2020 | KFS 3967-08-2016

Manz Markus | Treating acute myeloid leukaemia with novel antibody therapies

Zentrum für Hämatologie und Onkologie, Universitätsspital Zürich, Zürich

CHF 242 450.- | Duration: 1. 6. 2016– 31. 5. 2019 | KFS 3846-02-2016

Meraldi Patrick | Investigating cyclin E overexpression as a potential target for anti-mitotic drugs

Département de physiologie cellulaire et métabolisme, Université de Genève, Genève

CHF 118 050.- | Duration: 1. 3. 2017– 28. 2. 2020 | KFS 3978-08-2016

Nadal David | T-helper cells promote AID-catalyzed mutagenesis in paediatric B acute lymphoblastic leukaemia

Abteilung Infektiologie und Spitalhygiene, Kinderspital Zürich, Zürich

CHF 365 950.- | Duration: 1. 1. 2017– 31. 12. 2018 | KFS 3958-08-2016-R

Nikolaev Sergey | Investigation of the whole genome mutational landscape of basal cell carcinoma for the identification of non-coding drivers and properties of UV-light induced mutagenesis

Médecine génétique et développement, Université de Genève, Genève

CHF 310 000.- | Duration: 10. 1. 2017– 9. 1. 2021 | KFS 3985-08-2016

Nombela-Arrieta Cesar | Structural and functional dynamics of the effects of acute myeloid leukaemia development and regression in the BM stromal microenvironment

Zentrum für Hämatologie und Onkologie, Universitätsspital Zürich, Zürich

CHF 325 000.- | Duration: 1. 6. 2017– 31. 5. 2021 | KFS 3986-08-2016

Ochsenbein Adrian Franz | IL-33/ST2 signalling in leukaemia stem cells

Klinik und Poliklinik für Onkologie, Inselspital, Bern

CHF 361 700.- | Duration: 1. 10. 2016– 30. 9. 2019 | KFS 3815-02-2016

Oricchio Elisa | Establishing the functional and therapeutic impact of Sestrin1 inactivation in follicular lymphoma

Institut suisse de recherche expérimentale sur le cancer (ISREC), EPF de Lausanne, Lausanne

CHF 247 400.- | Duration: 1. 6. 2017– 30. 5. 2020 | KFS 3982-08-2016-R

Petrova Tatiana | Understanding vulnerabilities of tumour vasculature in distinct colorectal cancer subtypes
Département d'oncologie fondamentale, Université de Lausanne, Epalinges
CHF 362 700.- | Duration: 1.2.2017 – 31.1.2020 | KFS 3933-08-2016

Piscuoglio Salvatore | Identification of molecular targets in hepatocellular carcinomas associated with HMG1A1 overexpression
Institut für Pathologie, Universitätsspital Basel, Basel
CHF 158 950.- | Duration: 1.5.2017 – 30.4.2019 | KFS 3995-08-2016

Reith Walter | The BTN2A2-dependent immunoregulatory pathway as a new target for cancer immunotherapy
Département de pathologie et d'immunologie, Université de Genève, Genève
CHF 375 000.- | Duration: 1.9.2016 – 31.8.2019 | KFS 3870-02-2016

Riggi Nicolo | Identification of the epigenetic determinants of cellular transformation and progression in clear cell sarcoma
Institut universitaire de pathologie, Centre hospitalier universitaire vaudois (CHUV), Lausanne
CHF 369 800.- | Duration: 1.1.2017 – 31.12.2019 | KFS 3973-08-2016

Sartori Alessandro A. | Peptide-based inhibitors of CtIP protein-protein interactions: from basic research tools to cancer treatment
Institut für Molekulare Krebsforschung, Universität Zürich, Zürich
CHF 245 900.- | Duration: 1.8.2016 – 31.7.2019 | KFS 3845-02-2016-R

Schäfer Beat W. | Pre-clinical in vivo characterization of recurrent rhabdomyosarcoma
Abteilung Onkologie, Kinderspital Zürich, Zürich
CHF 365 750.- | Duration: 1.9.2016 – 31.8.2019 | KLS 3868-02-2016

vom Berg Johannes | Further development of the local IL-12 immunotherapy of brain cancer in preparation of two large animal studies
Institut für Labortierkunde, Universität Zürich, Zürich
CHF 81 000.- | Duration: 1.9.2016 – 31.8.2017 | KFS 3852-02-2016

Wälchli Thomas | Nogo-A is a negative regulator of CNS angiogenesis – molecular mechanisms and applications in brain tumours
Abteilung für Neurochirurgie, Universitätsspital Zürich, Zürich
CHF 300 900.- | Duration: 1.8.2016 – 31.7.2019 | KFS 3880-02-2016-R

Weber Bruno | In vivo real-time imaging of the impact of ionizing radiation on cellular energy metabolism
Institut für Pharmakologie und Toxikologie, Universität Zürich, Zürich
CHF 153 850.- | Duration: 1.1.2017 – 30.6.2018 | KFS 3997-08-2016

Wehrle-Haller Bernhard | Integrin acetylation: controlling cancer cell adhesion, growth and ECM assembly
Département de physiologie cellulaire et métabolisme, Université de Genève, Genève
CHF 272 650.- | Duration: 1.9.2016 – 31.8.2020 | KFS 3856-02-2016

Approved bursaries in 2016

Total funds allocated: CHF 246 600.-

Jin Julie Ruili | Phosphoinositide 3-Kinase Y: adapter subunit-dependent activation in inflammation and allergy
Destination: Département für Biomedizin, Universität Basel, Basel
CHF 180 000.- | Duration: 1.9.2016 – 31.8.2019 | MD-PhD 3916-06-2016

Simonetta Federico | Development of multifunctional FITC-directed chimeric antigen receptors (CAR) effector cells for cancer immunotherapy
Destination: Division of Blood and Marrow Transplantation, Department of Medicine, Stanford University, Stanford, USA
CHF 66 600.- | Duration: 1.11.2016 – 31.10.2018 | BIL KLS 3806-02-2016







Unearthing treasure through reinvestigating old drugs? Drug repurposing for oncology

Advances in drug therapies in oncology have become almost exclusively dependent upon the commercial development of new drugs. It is due to this development pathway in the past years that there are an impressive number of in part highly effective new cancer drugs and treatments available. But the cost of developing the new, approved drugs increases on average by approximately 10% to 15% each year¹, which also makes the drugs more and more expensive. This makes it clear that our purely commercially-driven system of drug development is reaching its limits in terms of performance and efficiency. In academic research, too, clinical research is conducted today almost exclusively with a focus on new, commercially interesting drugs – and this often in dependency upon the pharmaceutical industry. In contrast, drug research not focusing on approval or indication expansion for new drugs has been increasingly marginalized.

That focus has led to reduced efforts to utilize in the best possible way the available, old, and safe drugs for which the commercially lucrative part of their life cycle has ended, which is another way to seek progress. Slumbering in many familiar drugs are previously unknown molecular characteristics that would potentially make these drugs utilizable for new, targeted therapies particularly in oncology – often enough, far off from their original use. Utilizing known drugs in alternative areas is called drug repurposing². With drug repurposing, it is possible to arrive at new treatments considerably faster, at lower cost, and with far fewer risks than with development of a new drug that has the same effect. Particularly in oncology, drug repurposing offers great potential for the development of innovative, safe, and effective treatment options that remain affordable for society.

The development of new drugs to treat multiple myeloma is currently one of the most attractive areas in oncology for the pharmaceutical industry. The combined aspects of a relatively common indication that is still not curable, the long treatment duration, well defined molecular target structures, and high market prices have led all large pharmaceutical producers that are active in the field of haematologic cancers to operate with budgets in the three-digit million franc range for development of new therapies for advanced myeloma. Thus, it is all the more astounding that in the session on new drugs in multiple myeloma at the Annual Meeting of the American Society of Hematology (ASH) in 2016, a small phase 2 trial conducted by the Swiss Group for Clinical Cancer Research (SAKK) was assigned to be the first paper presented in the plenary hall³.

The study participants were 34 patients with extensively pre-treated multiple myeloma that no longer responded to proteasome inhibitor treatment. Up to now, there have been no treatment options for these patients, and also the latest generation myeloma drugs (pomalidomide, daratumumab, carfilzomib) achieve response rates of only between 15% and 30%. The SAKK-39/13 trial did not test any of these new drugs but instead tested additional treatment with the old HIV drug nelfinavir in combination with proteasome inhibitors. In the 1990s, nelfinavir was the worldwide standard therapy for HIV disease; it was then replaced on the market by new and more effective HIV drugs and is used only rarely today. It is no longer patent protected, and many manufacturers no longer produce nelfinavir. In the SAKK trial, treatment with nelfinavir achieved an overall response rate of 65% – a previously unattained, remarkable result in this patient group and one that has attracted international attention. A trial group in the United States is now preparing for an independent confirmation of this result. The cost of this

possible future treatment is less than 1000 francs per patient per month, which is less than 10% of the current monthly treatment costs with recent drug developments for treating myeloma.

The example of nelfinavir shows that there is great potential in repurposing well known and often already forgotten or generic drugs. A second example of this kind is thalidomide. Thalidomide was originally used as a sleeping pill, and when taken during pregnancy it led to dramatic congenital defects. Only later was it found to be a highly effective drug for treating multiple myeloma. Today, an entire class of drugs (immunomodulatory agents such as pomalidomide and lenalidomide) with highly modern antineoplastic and anti-angiogenic effects is based on the repurposing of the former sleeping pill⁴.

But unfortunately, successful repurposing of drugs has been the exception up to now. This is probably also because the framework conditions for research on known drugs are unfavourable. The existing system of drug development follows the logic of patent protection, which usually expires after 10 to 15 years. Within this period, a substance has to be developed as a drug and approved, because the enormous development costs for the product (as well as for all failed developments by the producer) are recouped only after market approval.

For this reason, drugs are developed under immense time pressure, on a pathway that is paved with failures: Of approximately 10 000 substances that are tested in pre-clinical laboratory studies, only about 250 move on to animal testing, and only approximately five make it to human testing. Of these, two fail in phase 1, which mainly tests safety, and another two fail in phase 2 due to insufficient efficacy or too high toxicity. And only one in 10 000 tested substances pass phase 3, when they are found to be superior to a standard treatment and are approved as a new drug. In the short period of market exclusivity (mostly only three to five years), the producer has a monopoly and can thus often price the drug very high. Under these conditions, the producer has an interest in repeatedly producing new drugs and putting them on the market for a short period of market exclusivity, in order to make profit.

But once a drug is no longer patent protected, it rapidly disappears from the viewpoint of development and progress.

The repurposing potential is probably immense, particularly for cancer therapies, which are more and more molecularly oriented: Internationally, there are over 3000 drugs that have successfully passed through all pre-clinical phases and also phase 1 trials². These substances can thus in principle be used with human beings. For most of these drugs, we have very incomplete knowledge today as to how they work in the human body, because that was examined only regarding a narrowly defined use in the context of a development programme, or because the testing options were limited at the time, or because the significance of many molecules and signalling pathways was not yet known. Particularly for malignant diseases, we have learned a lot more on that in recent years. Often, what is known about these drugs lies unused in the archives of the pharmaceutical industry. The data are not accessible to the public, even though the drug and its further development have been abandoned. However, if for one of these old drugs a desired molecular effect is identified for which there is a possible clinical application (possibly for a different indication than originally foreseen), then the starting position for successful development is actually very good: Because the substances are already available as drugs, they only have to successfully master the final spurt, which decreases the time for the development as well as the costs. In the case of nelfinavir, basic research discovered a molecular mechanism that in multiple myeloma leads to resistance against proteasome inhibitor therapy. The clinical side effects profile of nelfinavir suggested that it could possibly have precisely the desired molecular effect, which we were ultimately able to demonstrate *in vitro* and *in vivo* and then confirm clinically.

Still, most drug repurposing research projects fail at the threshold of the clinic, since financing them is practically impossible: When patent protection has expired, competitors of the producer can produce the drug. They save themselves the development costs and can offer the drug relatively cheaply. For this reason, commercially oriented pharmaceutical companies shy away from getting involved in this area. The research budgets and evaluation procedures of research funding organizations (such as the Swiss National Science Foundation or the Swiss Cancer League) focus on research more than on drug development and are also mostly much too small for projects of this kind. As the study drugs are not made available by the industry and, due to the health insurance laws, cannot be covered by the health insurance companies (even if they are less expensive than approved standard drugs that the health insurance companies cover), the drugs that are tested for repurposing in trials must be purchased at regular market prices. That easily puts the budgets for studies of this kind into the two-digit million franc range. In the case of nelfinavir, the entire development process up to the positive phase 2 trial cost approximately three million francs and took 15 years. It was funded by the SAKK and various foundations. Compared to development budgets for

new molecules that were also introduced at the same multiple myeloma session at ASH 2016, this amount is close to nothing – and yet it is high from the perspective of our research funding.

The strategic starting position and also the astonishing success of some developments, such as nelfinavir or thalidomide today, show that particularly for oncology, drug repurposing should be an attractive – and possibly indispensable – complement to conventional development of new drugs. In this way, we can not only considerably expand the targets and target structures for molecularly oriented therapies but also make use of drugs whose tolerability is ensured and market price is low. For this reason, public research programmes and institutions specifically for drug repurposing have been established in Great Britain and the United States – countries that are under particular pressure from high drug prices. There are now at least 30 journals that are devoted to publish papers exclusively to the topic of drug repurposing. Also in Switzerland, with its good basic research and its established structures for clinical cancer research, there is great potential in the repurposing of old drugs, from a scientific, medical, but also from an economic and societal perspective.



Prof. Christoph Driessen, MD

Christoph Driessen completed his clinical education and training in Germany, at the universities of Lübeck, Freiburg, and Tübingen. After a research fellowship in immunology at Harvard Medical School, he returned to Tübingen, where he established a research group and completed his habilita-

tion in 2006. He then joined Kantonsspital St. Gallen as a senior physician, where he was head of experimental oncology and head of the Clinical Trials Unit. Driessen was named head of the Department of Oncology and Haematology at Kantonsspital St. Gallen in May 2017.

Tel. +41 (0)71 494 10 62

christoph.driessen@kssg.ch

www.kssg.ch/aerzte/prof-dr-christoph-driessen

References

1. Nosengo N. Can you teach old drugs new tricks? *Nature*. 2016;534:314-6.
2. Corsello SM, Bittker JA, Liu Z, Gould J, McCarren P, Hirschman JE, et al. The Drug Repurposing Hub: a next-generation drug library and information resource. *Nat Med*. 2017;23:405-408.
3. Driessen C, Müller R, Novak U, Cantoni N, Betticher D, Mach N, et al. The HIV protease inhibitor Nelfinavir in combination with Bortezomib and Dexamethasone (NVd) has excellent activity in patients with advanced, proteasome inhibitor-refractory Multiple Myeloma: a multicenter phase II trial (SAKK 39/13). Paper presented at: 58th Annual Meeting of the American Society of Hematology (ASH); 2016 Dec 3-6; San Diego, USA.
4. Palumbo A, Facon T, Sonneveld P, Bladè J, Offidani M, Gay F, et al. Thalidomide for treatment of multiple myeloma: 10 years later. *Blood*. 2008;111:3968-77.

Selected results

Project

Effects of a 1-year partially supervised exercise programme in childhood cancer survivors – a randomized controlled trial

Pädiatrische Hämatologie-Onkologie, Universitäts-Kinderspital beider Basel, Basel
CHF 215 600.- | Duration: 1.1.2014 – 31.12.2016 | KLS 3175-02-2013

Project coordinator

Prof. Nicolas von der Weid, MD | nicolas.vonderweid@ukbb.ch

Does exercise help to prevent late effects?

A clinical study at University Children's Hospital Basel supported by the Swiss Cancer League is assessing the extent to which an active lifestyle can reduce or even prevent possible late effects of childhood cancer and its treatment.

Thanks to advances in treatment, a child with cancer is no longer condemned to a certain death, as was the case 50 years ago. Today, four out of five children on average can be treated successfully. But as we now know from many studies, for survivors of childhood cancer there is an increased risk of late effects of cancer or cancer treatment later in their lives.

In a study supported by the Swiss Cancer League, a group of researchers in the team of Nicolas von der Weid at University Children's Hospital in Basel are examining whether a programme of exercise and sports can help to reduce or prevent possible health issues, such as cardiovascular problems, overweight, chronic fatigue, or decreased mental health.

For the study, the researchers divided a total of 150 childhood cancer survivors into two groups. The participants in the control group are keeping on with their normal physical activity, whereas the participants in the training group are increasing their physical activity for one year and reducing their media consumption. They are being given personal exercise advice and tips for an active lifestyle. "The main goal of the study is to reduce cardiovascular late effects", explains von der Weid.

At the start of the study and again after 3, 6 and 12 months, various health data on the participants are being collected by the researchers. For example, a bicycle test is being used to measure physical fitness.

A questionnaire captures information on how often the participants exercise as well as participants' assessments of their quality of life and mental health.

It will probably be the summer of 2018 by the time that also the participants recruited last have completed all of the measurements, says von der Weid. It will then take about six months to evaluate the data carefully. Towards the end of 2018, the researchers will have a definitive answer to the question: "Do childhood cancer survivors benefit from an active lifestyle?"

Additional information

www.surfit.ch

Project

Characterization and targeting of cancer-initiating cells in lung cancer
Universitätsklinik für Thoraxchirurgie, Inselspital, Bern
CHF 167 450.- | Duration: 1.1.2015 – 31.12.2016 | KFS 3530-08-2014

Project coordinator

Thomas Michael Marti, PhD | thomas.marti@insel.ch

Finding vulnerabilities of cancer cells in their strength

Cancer cells can divide even when conditions are not ideal, such as when their genetic material is damaged. New findings of research supported by the Swiss Cancer Research foundation suggest that precisely this strength of cancer cells could be exploited to fight the disease.

76

To maintain their rapid proliferation, cancer cells rely on efficient metabolism that not only provides them with sufficient energy but also delivers an ample supply of building blocks for fast replication of the DNA. This time pressure makes cancer cells vulnerable to chemotherapies that damage DNA. But what happens when the DNA-damaging chemotherapy is combined with limitation of the building blocks? Could this dual pharmacological attack on cancer cells prove to be a successful strategy? That is what Thomas Marti, research group leader at the Department of Thoracic Surgery at University Hospital Bern, aimed to find out in his research project.

Marti and his team examined this approach in depth using lung cancer cells in the laboratory. The current standard treatment for lung cancer is simultaneous administration of pemetrexed and chemotherapy or radiation therapy. Pemetrexed is a chemotherapy drug that interferes with cell metabolism and inhibits the synthesis of nucleotides, the building blocks of DNA.

“Because defective parts of the strand of DNA are cut out and replaced, we wanted to test what effect a shortage of building blocks has”, Marti explains. And in fact, more cancer cells died when the researchers gave pemetrexed to the cell cultures in the laboratory prior to rather than during chemotherapy or radiation therapy. “Based on our results, further investigations are warranted to test whether the effectiveness of the current standard treatment for lung cancer can be improved through changing the timing of the treatment regime”, the researchers conclude in their articles.

As the next step, tests will need to be conducted on mice. Only when the findings have also been confirmed with mice and in addition also show that the increased effectiveness in eliminating cancer cells does not at the same time lead to increased toxicity

for healthy cells, can clinical trials be envisaged, Marti says. Furthermore, the patent for pemetrexed expires soon, so it remains to be seen how much interest the industry will have in investing in further development of this drug. “Our research project is one of many examples that show that it is often difficult to bring the findings of basic research to bear on the actual treatment of patients”, says Marti.

References

Dorn P, Tièche CC, Peng RW, Froment L, Schmid RA, Marti TM. Schedule-dependent increased efficiency of pemetrexed-ionizing radiation combination therapy elicits a differential DNA damage response in lung cancer cells. *Cancer Cell Int.* 2016;16:66.
Tièche CC, Peng RW, Dorn P, Froment L, Schmid RA, and Marti TM. Prolonged pemetrexed pretreatment augments persistence of cisplatin-induced DNA damage and eliminates resistant lung cancer stem-like cells associated with EMT. *BMC Cancer.* 2016;16:125.

List of approved research projects in 2016

More information about the funded projects can be found on www.krebsliga.ch/researchprojects

Total funds allocated: CHF 7 308 550.-

Ansari Marc | The childhood hepatic tumour international collaboration (CHIC)
Unité d'onco-hématologie pédiatrique, Hôpitaux universitaires de Genève (HUG), Genève
CHF 68 100.- | Duration: 1.1.2017–31.12.2018 | KFS 3936-08-2016

Beer Hans-Dietmar | Survival or death: the molecular mechanisms underlying the antagonistic links between Nrf2 and inflammasomes in skin cancer
Dermatologische Klinik, Universitätsspital Zürich, Zürich
CHF 242 450.- | Duration: 1.2.2017–31.1.2020 | KFS 3940-08-2016-R

Digkha Antonia | NAPAGE: a phase IIa clinical trial of gemcitabine and nab-paclitaxel in advanced soft tissue sarcoma
Département d'Oncologie, Centre hospitalier universitaire vaudois (CHUV), Lausanne
CHF 182 900.- | Duration: 1.2.2017–31.1.2020 | KFS 3944-08-2016

Fierstra Jorn | Unravelling glioblastoma imaging complexity: novel quantitative phenotype-genotype mapping with functional MRI
Klinik für Neurochirurgie, Universitätsspital Zürich, Zürich
CHF 220 850.- | Duration: 1.1.2017–31.12.2019 | KFS 3975-08-2016-R

Gillissen Sommer Silke | A phase III trial of Aspirin and Pravastatin in patients with castrate-resistant prostate cancer (Peace 4)
Bereich Onkologie/Hämatologie, Kantonsspital St. Gallen, St. Gallen
CHF 373 900.- | Duration: 1.4.2017–31.3.2020 | KFS 3874-02-2016

Grochola Lukasz Filip | The identification and functional analysis of inherited human genetic variants that affect the prognosis and therapy of pancreatic cancer
Klinik für Viszeral- und Transplantationschirurgie, Universitätsspital Zürich, Zürich
CHF 125 000.- | Duration: 1.7.2016–30.6.2017 | KFS 3697-08-2015

Guckenberger Matthias | Dose-intensified image-guided fractionated stereotactic body radiotherapy for painful spinal metastases (DOSIS) versus conventional radiation therapy: a phase II randomized controlled trial
Klinik für Radio-Onkologie, Universitätsspital Zürich, Zürich
CHF 179 500.- | Duration: 1.1.2017–31.12.2019 | KFS 3956-08-2016-R

Hegi Monika | Characterizing invasiveness of patient derived glioblastoma xenografts by gene expression profiling in association with in vivo 1H magnetic resonance spectroscopy (MRS) and MR imaging. A pilot project
Département des neurosciences cliniques, Centre hospitalier universitaire vaudois (CHUV), Epalinges
CHF 115 500.- | Duration: 1.3.2017–28.2.2018 | KFS 3998-08-2016

Jacob Francis | Functional characterization of bisecting GlcNAc-dependent signalling pathways for the intervention of serous ovarian cancer omental metastasis
Departement Biomedizin, Universitätsspital Basel, Basel
CHF 340 150.- | Duration: 1.10.2016–30.9.2019 | KFS 3841-02-2016

Joerger Markus | Enzalutamide in combination with metformin versus enzalutamide in patients with castration-resistant prostate cancer progressing on androgen deprivation therapy (SAKK 08/14): a mass spectrometry-based, quantitative systemic metabolomics substudy
Bereich Onkologie/Hämatologie, Kantonsspital St. Gallen, St. Gallen
CHF 99 600.- | Duration: 1.1.2017–31.12.2019 | KFS 3943-08-2016

Keller Annika | Determining the protein atlas of normal human blood-brain barrier and glioblastoma blood-brain barrier – towards understanding glioblastoma biology and improved therapies

Klinik für Neurochirurgie, Universitätsspital Zürich, Zürich

CHF 329 350.- | Duration: 1. 6. 2016 – 31. 5. 2020 | KLS 3848-02-2016

Lengerke Claudia | Investigation of catecholamine-based mechanisms regulating leukaemia induction in a xenotransplantation model of human AML

Departement Biomedizin und Klinik für Hämatologie, Universitätsspital Basel, Basel

CHF 307 300.- | Duration: 1. 1. 2017 – 30. 6. 2019 | KFS 4013-08-2016-R

Mach Nicolas | Personalized, cell-based cancer immunotherapy, combining irradiated autologous tumour cells and encapsulated allogeneic cells engineered to release GM-CSF: a multicentric, single arm phase II study for advanced head and neck carcinoma patients in Switzerland

Service d'Oncologie, Hôpitaux universitaires de Genève (HUG), Genève

CHF 239 050.- | Duration: 1. 7. 2016 – 30. 6. 2019 | KLS 3867-02-2016

Matter Matthias | Identification of mechanisms that promote liver cancer

Institut für Pathologie, Universitätsspital Basel, Basel

CHF 125 000.- | Duration: 1. 8. 2016 – 31. 7. 2017 | KFS 3876-02-2016

Mazzucchelli Luca | Role of BCL2 genetic heteroclonality in the pathogenesis of B-cell lymphomas with BCL2 rearrangement

Istituto cantonale di patologia, Locarno

CHF 255 200.- | Duration: 9. 1. 2017 – 8. 1. 2020 | KFS 3977-08-2016

Meyer Sara Christina | Dual targeting of oncogenic MAPK- and tyrosine kinase signalling as therapeutic approach in myeloid malignancies

Klinik für Hämatologie, Universitätsspital Basel, Basel

CHF 239 650.- | Duration: 1. 6. 2017 – 31. 5. 2019 | KFS 3858-02-2016

Monnier Yan | Mechanisms of extracapsular spread in metastatic lymph nodes of head and neck cancer

Service d'oto-rhino-laryngologie et de chirurgie cervico-faciale, Centre hospitalier universitaire vaudois (CHUV), Lausanne

CHF 210 200.- | Duration: 1. 8. 2016 – 31. 7. 2019 | KLS 3853-02-2016-R

Omlin Aurelius | Single arm open label phase II pilot study of carboplatin in patients with metastatic castration-resistant prostate cancer and DNA repair defects

Departement Medizinische Onkologie und Hämatologie, Kantonsspital St. Gallen, St. Gallen

CHF 100 500.- | Duration: 1. 1. 2017 – 30. 6. 2019 | KFS 3999-08-2016

Pabst Thomas | Evolving concepts of stem cell mobilization and high-dose chemotherapy for patients with myeloma

Universitätsklinik für Medizinische Onkologie, Inselspital, Bern

CHF 112 700.- | Duration: 1. 7. 2016 – 30. 6. 2019 | KFS 3795-02-2016

Papadia Andrea | Prospective validation trial on indocyanine-green sentinel lymph node mapping in endometrial cancer

Universitätsklinik für Frauenheilkunde, Inselspital, Bern

CHF 126 750.- | Duration: 1. 1. 2017 – 31. 12. 2019 | KFS 3969-08-2016

Peng Ren-Wang | Unravelling and reversing drug resistance of human lung cancer

Universitätsklinik für Thoraxchirurgie, Inselspital, Bern

CHF 229 850.- | Duration: 1. 4. 2016 – 31. 3. 2019 | KFS 3772-08-2015-R

Pica Alessia | High resolution ophthalmic magnetic resonance imaging at 1.5T: towards a non-invasive method to assist proton therapy planning for uveal melanoma

Zentrum für Protonentherapie, Paul Scherrer Institut (PSI), Villigen

CHF 302 000.- | Duration: 16. 1. 2017 – 15. 1. 2020 | KFS 3860-02-2016

Pruschy Martin | Targeting ADAM17 in combination with ionizing radiation

Klinik für Radio-Onkologie, Universitätsspital Zürich, Zürich

CHF 375 000.- | Duration: 1. 1. 2017 – 31. 12. 2019 | KFS 3993-08-2016

Reyes Mauricio | Multidimensional response assessment in glioma patients – MANAGE

Institut für chirurgische Technologien und Biomechanik, Universität Bern, Bern

CHF 370 600.- | Duration: 1. 4. 2017– 31. 3. 2021 | KFS 3979-08-2016

Sessa Cristiana | IVINCA trial (Ivermectin IN CAncer), phase I trial of ivermectin as an anticancer WNT-TCF response inhibitor in patients with solid tumours

Ospedale Regionale Bellinzona e Valli, Istituto Oncologico della Svizzera Italiana (IOSI), Bellinzona

CHF 156 800.- | Duration: 22. 7. 2016– 21. 7. 2019 | KFS 3875-02-2016

Simon Christian | SAKK EORTC 1420 GORTEC: phase III study assessing the "best of" radiotherapy (IMRT) compared to the "best of" surgery (trans-oral surgery (TOS)) in patients with T1-T2, N0 oropharyngeal carcinomas

Service d'oto-rhino-laryngologie et de chirurgie cervico-faciale, Centre hospitalier universitaire vaudois (CHUV), Lausanne

CHF 150 000.- | Duration: 1. 1. 2016– 31. 12. 2019 | KFS 3761-08-2015

Speiser Daniel E. | Local, regional and systemic mechanisms of T-cell inhibition in melanoma, associated with lymphatic endothelial/stromal cells

Département d'oncologie fondamentale, Université de Lausanne, Epalinges

CHF 362 600.- | Duration: 1. 4. 2017– 31. 3. 2020 | KFS 3971-08-2016

von Gunten Stephan | Siglecs – implications of tumour hypersialylation on cytotoxic T-cell responses

Institut für Pharmakologie, Universität Bern, Bern

CHF 375 000.- | Duration: 1. 2. 2017– 31. 1. 2020 | KFS 3941-08-2016

Weller Michael | Death induced by CD95 or CD95 ligand elimination (DICE) in glioblastoma

Klinik für Neurologie, Universitätsspital Zürich, Zürich

CHF 374 900.- | Duration: 1. 7. 2016– 30. 6. 2019 | KLS 3814-02-2016

Zaidi Habib | Towards MRI-only or PET/MRI-guided radiation therapy treatment planning

Médecine nucléaire et imagerie moléculaire, Hôpitaux universitaires de Genève (HUG), Genève

CHF 255 250.- | Duration: 1. 8. 2016– 31. 7. 2019 | KFS 3855-02-2016

Zucca Emanuele | High-dose chemotherapy and autologous stem cell transplant or consolidating conventional chemotherapy in primary CNS lymphoma – randomized phase III trial (MATRix/IELSG43)

Istituto Oncologico della Svizzera Italiana (IOSI), Bellinzona

CHF 362 900.- | Duration: 1. 1. 2017– 31. 12. 2019 | KFS 4003-08-2016

Approved bursaries in 2016

Total funds allocated: CHF 168 250.-

Dubouchet Laetitia | Toward immune biomarkers for tolerance and Graft-Versus-Host-Disease (GVHD) after allogeneic haematopoietic stem cell transplantation in humans

Destination: Service d'hématologie, Hôpital Saint-Louis, Paris, F

CHF 90 500.- | Duration: 1. 2. 2017– 31. 1. 2019 | BIL KFS 3988-08-2016

Klass Natalie Desiree | Pain response and quality of life after palliative radiotherapy in bone metastases – a quantitative and qualitative approach

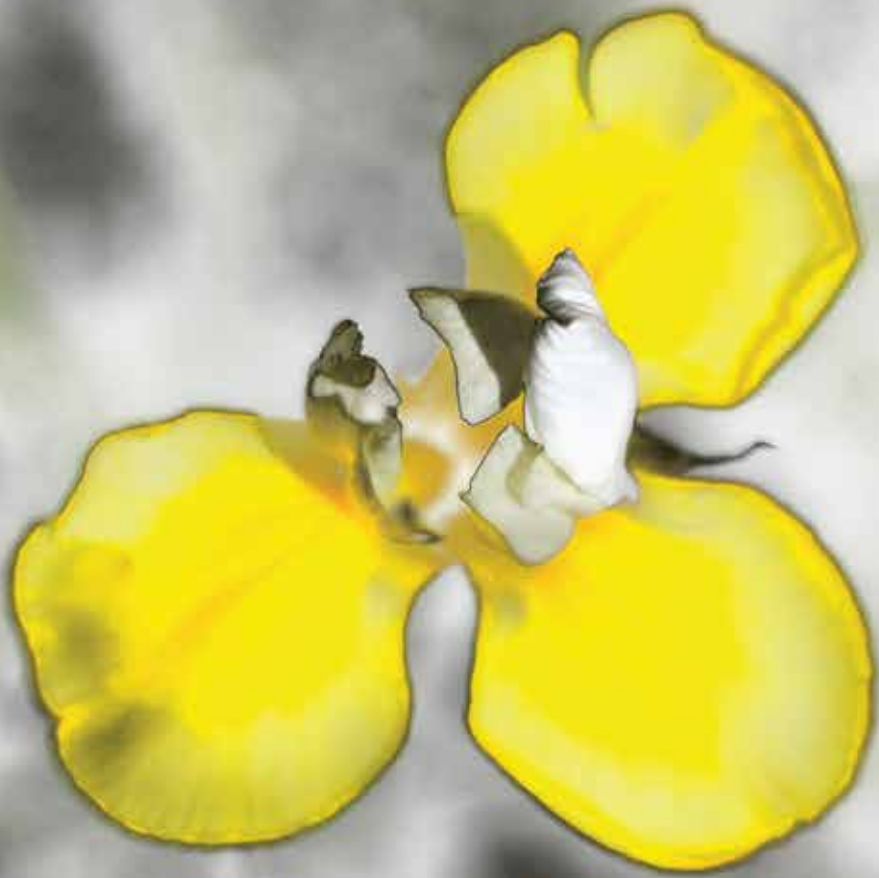
Destination: Department of Radiation Oncology, Erasmus University, Rotterdam, NL

CHF 48 500.- | Duration: 1. 11. 2016– 31. 10. 2017 | BIL KLS 3822-02-2016

Saner Flurina Anna-Carina Maria | Genetic determinants for treatment response and survival in women with high grade serous ovarian cancer

Destination: Cancer Genomics and Genetics Program, Peter MacCallum Cancer Center, Melbourne Victoria, AUS

CHF 29 250.- | Duration: 1. 1. 2017– 31. 12. 2018 | BIL KFS 3942-08-2016







Psychosocial needs of survivors of childhood cancer

The treatment of childhood cancer is a success story. In Switzerland today, over 80% of children with cancer are cured. In adulthood they are called long-term survivors¹. But the other side of the coin is that there is a high risk of late effects. As a consequence of childhood cancer and mainly of treatments, more than two thirds of adult survivors report late effects 30 years later; more than a third experience severe late effects, which in some cases cause death².

In recent years, a lot of research has been conducted at the national and international level on the medical late effects of childhood cancer in adults. Large national childhood cancer survivor studies in the United States, England, and also Switzerland were set up and have produced diverse and important results³.

Switzerland is also participating in two European projects: PanCare SurFup (www.pancaresurfup.eu) and PanCare LIFE (www.pancarelife.eu). Those projects are investigating severe late effects such as cardiovascular problems, second tumours, or late mortality and are developing recommendations for clinical follow-up care. Psychological late effects have also been studied internationally and also in Switzerland⁴. The findings highlight the importance of regular, often life-long medical follow-up for most survivors.

There has been little research on the needs of childhood cancer survivors as viewed from their own perspective. But it is indispensable not only to provide adequate follow-up care from a medical standpoint but also to adapt follow-up care both in content and structurally to survivors' needs. For Switzerland, we found that the most important wishes for clinical follow-up care concern the survivors' own health: Survivors understandably want to be sure that they will not have a recurrence of cancer or have late effects⁵.

Mental health was not quite as important to the survivors as physical health. Less significant were wishes, at least in clinical follow-up care, concerning the areas of education and employment.

However, in personal interviews and at survivor meetings, we learned that precisely these relatively non-specific areas that are not clearly connected with cancer are very important to many survivors and that survivors have a lot of unmet needs. In the following brief overview, we describe various psychosocial problems that childhood cancer survivors face that give rise to the different needs for support or for contact centres.

Psychological problems

Psychological late effects include depression, anxiety, or also post-traumatic stress symptoms. Anxiety and depression are relatively common also in the general population but are significantly more frequent among childhood cancer survivors. In Switzerland one quarter of childhood cancer survivors report psychological problems⁴. Only about one third of those affected are in psychotherapy, however⁶. Psychological problems are especially frequent in association with somatic late effects. With increasing age of childhood cancer survivors and increasing somatic effects, the difficulties therefore tend to increase and more psychological problems can be expected.

Education

A majority of patients with childhood cancer are confronted with a cancer diagnosis during their education. Schooling is therefore directly affected, and many patients with childhood cancer stay out of school for a longer period, require private lessons, or repeat a grade. Also later, many survivors report concentration and memory problems or reduced working speed⁷. These problems are especially frequent among sur-

vivors of brain tumours. Despite these difficulties, in Switzerland we fortunately did not find disadvantages regarding final educational attainment. The percentage of survivors completing studies at universities or universities of applied sciences was comparable to the percentage in the general population⁸. But also here, survivors of central nervous system tumours and those who had a recurrence were less successful.

Employment

The problems mentioned in the cognitive area can have negative effects later in employment. In many countries, the percentage of survivors that are not gainfully employed is slightly higher than in the general population. Particularly at risk are survivors of brain tumours. But also female survivors that had radiotherapy and survivors with late effects have a higher risk of not finding work. Chronic fatigue is a common late effect after childhood cancer that can impede or hinder education and also employment later on.

Personal relationships

Personal relationships are also not always simple for some survivors. The drastic experience of cancer, especially when it is consciously experienced by older children and adolescents and has an important impact on everyday life, makes many patients mature faster than their friends and peers. Many survivors report psychological changes called 'posttraumatic growth' as a result of surviving childhood cancer⁹. Mutual understanding among friends and making new acquaintances can be adversely affected by the vast differences in experience, and it can make closer relationships more difficult. In Switzerland, fewer sur-

vors have a life partner or spouse than is the case with their siblings or in the general population¹⁰. Another important late effect associated with domestic partnership or marriage is fertility. Some survivors are sterile as a result of cancer and cancer treatment, and many of them are afraid to disclose this to their life partner or spouse. In addition, survivors fear for the health of their future children. All of these things can put a strain on personal relationships and also affect survivors' psychological well-being.

Studies have thus shown that survivors of childhood cancer face particular psychosocial challenges. But up to now, there has been little research on what needs survivors have in this regard.

Needs for support, contact centres, and psychosocial follow-up care

The problem areas described above show that survivors should have access to specialists in a great variety of disciplines. Cooperation between the hospital and the school already during treatment is ideal, with the aim to inform fellow students and the teachers about the cancer and to prevent stigmatization of the child with cancer. After treatment, a stay by the whole family at a specialized rehabilitation clinic has been shown to be useful. Psychologists and mainly psychotherapists in close cooperation with the clinical after-care should be readily contactable to provide professional help with psychological problems. Experienced vocational counsellors can guide survivors with various difficulties towards appropriate vocational paths. And the disability insurance system should provide information and assistance to survivors with health restrictions.

All providers of this psychosocial follow-up care should not only have experience in their own special area but also be familiar with the diverse problems that survivors of childhood cancer can face. Unlike

adult patients with cancer, survivors of childhood cancer are cured. Ten years ago, the Erice Statement emphasized the importance of the word 'cure'¹¹. However, it must not be forgotten that survivors have a high risk of late effects or are already dealing with consequences of the cancer and cancer treatment. The original disease, the treatment, the risk of late effects, and the effects themselves must be taken into consideration, so that the survivors receive the right support.

In a new research project we are investigating what needs survivors of childhood cancer have in terms of psychosocial follow-up care but also how survivors can deal successfully with problems (HSR-4080-44-2016). This project will contribute towards improving psychosocial support after cancer in childhood and thus towards improving survivors' quality of life.



Prof. Gisela Michel, PhD

Gisela Michel holds a PhD in psychology from the University of Fribourg. She has been working in the area of childhood cancer since 2004. She participated in the renewal of the Swiss Childhood Cancer Registry and the development of the Swiss Childhood Cancer Survivor Study. After a

post-doctoral research fellowship at the University of Sheffield, UK, she studied the needs of survivors of childhood cancer regarding clinical long-term follow-up care under an Ambizione grant from the Swiss National Science Foundation. Since 2013 she has been an associate professor in Health and Social Behaviour at the University of Lucerne. She is studying the consequences of childhood cancer for the whole family as well as examining ways to improve long-term follow-up care in the psychosocial area.

Tel. +41 (0)41 229 59 55

gisela.michel@unilu.ch

www.unilu.ch/en/faculties/faculty-of-humanities-and-social-sciences/institutes-departements-and-research-centres/health-sciences-health-policy/staff/prof-dr-gisela-michel

References

1. Gatta G, Botta L, Rossi S, Aareleid T, Bielska-Lasota M, Clavel J, et al. Childhood cancer survival in Europe 1999-2007: results of EUROCARE-5 – a population-based study. *Lancet Oncol.* 2013;15:35-47.
2. Oeffinger KC, Mertens AC, Sklar CA, Kawashima T, Hudson MM, Meadows AT, et al. Chronic health conditions in adult survivors of childhood cancer. *N Engl J Med.* 2006;355:1572-82.
3. Kuehni CE, Rueegg CS, Michel G, Rebholz CE, Strippoli M-PF, Niggli FK, et al. Cohort profile: The Swiss Childhood Cancer Survivor Study. *Int J Epidemiol.* 2012;41:1553-64.
4. Michel G, Rebholz CE, von der Weid NX, Bergstraesser E, Kuehni CE. Psychological distress in adult survivors of childhood cancer: the Swiss Childhood Cancer Survivor Study. *J Clin Oncol.* 2010;28:1740-48.
5. Michel G, Gianinazzi ME, Eiser C, Bergstraesser E, Vetsch J, von der Weid N, et al. Preferences for long-term follow-up care in childhood cancer survivors. *Eur J Cancer Care (Engl).* 2016;25:1024-33.
6. Gianinazzi ME, Rueegg CS, von der Weid NX, Niggli FK, Kuehni CE, Michel G, et al. Mental health-care utilization in survivors of childhood cancer and siblings: the Swiss childhood cancer survivor study. *Support Care Cancer.* 2014;22:339-49.
7. Wengenroth L, Rueegg CS, Michel G, Gianinazzi ME, Essig S, von der Weid NX, et al. Concentration, Working Speed and Memory: Cognitive Problems in Young Childhood Cancer Survivors and Their Siblings. *Pediatr Blood Cancer.* 2015;62:875-82.
8. Kuehni CE, Strippoli M-PF, Rueegg CS, Rebholz CE, Bergstraesser E, Grotzer M, et al. Educational achievement in Swiss childhood cancer survivors compared with the general population. *Cancer.* 2012;118:1439-49.
9. Gianinazzi ME, Rueegg CS, Vetsch J, Lüer S, Kuehni CE, Michel G. Cancer's positive flip side: Posttraumatic growth after childhood cancer. *Support Care Cancer.* 2016;24:195-203.
10. Wengenroth L, Rueegg CS, Michel G, Essig S, Ammann RA, Bergstraesser E, et al. Life partnerships in childhood cancer survivors, their siblings, and the general population. *Pediatr Blood Cancer.* 2013;61:538-45.
11. Haupt R, Spinetta JJ, Ban I, Barr RD, Beck JD, Byrne J, et al. Long term survivors of childhood cancer: cure and care. The Erice statement. *Eur J Cancer.* 2007;43:1778-80.

Selected results

Project

Comparative study in adolescent oncofertility decision making
Institut für biomedizinische Ethik, Universität Basel, Basel
CHF 25 000.- | Duration: 1.9.2015 – 28.2.2017 | KFS 3520-08-2014

Project coordinator

Dorit Barlevy | dorit.barlevy@unibas.ch

Delicate conversations in difficult moments

What goes through the minds of young people with cancer, when they must decide – together with their parents and their physicians – whether they should freeze their sperm or eggs before cancer treatment begins, so that they can later perhaps have children? In a research project supported by the Swiss Cancer Research foundation, researchers are examining this emotionally very challenging issue.

Fortunately, due to advances in treatment, cancer in childhood or adolescence no longer means certain death, as it did 50 years ago. Today, four out of five patients can be treated successfully. With this welcome development, there is now a need to increasingly address issues that have less to do with immediate survival and more with long-term quality of life after treatment. For many of the people affected, one of these issues is reproductive health and the option to build a family in the future.

Physicians must hold a discussion concerning preserving fertility by freezing sperm or eggs not only with the adolescent diagnosed with cancer but also with the patient's parents – their legal representatives. In a research project funded by the Swiss Cancer Research foundation, Dorit Barlevy and her colleagues at the Institute for Biomedical Ethics at the University of Basel studied what it is like for adolescents and their parents in this triangle of decision making.

The researchers followed two lines of inquiry. For one, they systematically evaluated the existing scientific literature on the topic. They found that measures for fertility preservation are much more frequently recommended to male adolescents than to female adolescents. This is mainly because obtaining unfertilized eggs (in contrast to obtaining sperm) often takes several weeks – and thus conflicts with the need to begin cancer treatment as soon as possible.

For another, Barlevy conducted interviews with adolescent cancer survivors and their parents in Israel and in Switzerland. While she was able to interview more than 30 persons within a few months' time in Israel, it was much more difficult to find willing interviewees in Switzerland. "After the traumatic experience of cancer and treatment, many people want to get back to a normal life and do not want to revisit the difficult time that they have just gone through", Barlevy says.

All in all, the interviews in both countries pointed up mainly one issue that needs to be taken into consideration in the future: A young person who decides in favour of fertility preservation must also decide what should happen to the sperm or eggs if they should have an early death. However, none of the persons that Barlevy spoke with could recall their physician discussing this issue with them. Barlevy thinks that the situation could be improved by giving the patients and their relatives written educational information to take with them.

Reference

Barlevy D, Elger BS, Wangmo T, and Ravitsky V. Adolescent oncofertility discussions: Recommendations from a systematic literature review. *AJOB Empir Bioeth.* 2017;8:106-15.

List of approved research projects in 2016

More information about the funded projects can be found on www.krebsliga.ch/researchprojects

Total funds allocated: CHF 438 200.-

88

Berney Alexandre | Undergraduate training for medical students on breaking bad news in oncology: a continuation study exploring the patient perspective

Service de psychiatrie de liaison, Centre hospitalier universitaire vaudois (CHUV), Lausanne

CHF 117 750.- | Duration: 1. 3. 2017 – 31. 8. 2018 | KLS 3805-02-2016-R

Eicher Manuela | Co-creating and testing the effectiveness of an integrated peer-to-peer self-management programme for breast cancer survivors: a stepped wedge cluster randomized study (COSS-Study)

Institut universitaire de formation et de recherche en soins, Université de Lausanne, Lausanne

CHF 75 000.- | Duration: 13. 9. 2016 – 12. 9. 2020 | KFS 3823-02-2016

Kollár Attila | Predictors of returning to work and quality of life in disease-free adult extremity sarcoma patients after definitive treatment

Universitätsklinik für medizinische Onkologie, Inselspital, Bern

CHF 46 000.- | Duration: 7. 1. 2016 – 31. 6. 2018 | KLS 3812-02-2016

Michel Gisela | Improving follow-up care of childhood cancer: implementation of screening for psychological distress

Gesundheitswissenschaften & Gesundheitspolitik, Universität Luzern, Luzern

CHF 199 450.- | Duration: 5. 1. 2017 – 30. 4. 2020 | KFS 3955-08-2016







Breast cancer in young women: rare but on the rise

Breast cancer is the most common type of cancer among women in Switzerland. Each year, 6000 new cases of cancer are diagnosed¹. At the time of diagnosis, most women are already in menopause, and breast cancer in women under the age of 40 is rare¹ (making up 5% of all breast cancer cases in Switzerland). For women aged 30 to 40 years, however, breast cancer is the most frequent type of cancer (40% of all cancer cases) and the most frequent cause of cancer deaths (25% of cancer deaths). In addition, the number of young patients with breast cancer has risen rapidly since 2005². Breast cancer rates in women aged 20 to 39 are increasing annually by 1.8%; the annual increase in breast cancer rates in women aged 40 to 49 is 0.5%. For women older than 50, incidence rates have decreased since 2002–2003. This is mainly due to the significant decline in the prescription of hormone replacement drugs.

The alarming increase in breast cancer rates in young women in Switzerland, and especially in Geneva, is also found in other European countries and in the United States^{3,4}. There is no systematic screening of women under the age of 40; this means that the increase in breast cancer diagnoses cannot be ascribed to increased screening and surveillance in young women. It is probably due instead to an increased number of risk factors, including altogether new risk factors, for young women – from girlhood to motherhood.

Especially aggressive tumours

In women under the age of 40, breast cancer is frequently more aggressive and responds less well to hormone therapies than breast cancer in older women⁵. (In young women, 50% of tumours have hormone receptors that make hormone therapy possible. In patients older than 50, that number is 85%.) Also, breast cancer is diagnosed in women under the age of 40 at

Elisabetta Rapiti, MD
Head physician at the Geneva Cancer Registry

Prof. Christine Bouchardy, MD
Director of the Geneva Cancer Registry

an advanced stage⁶ (45% of tumours have a diameter greater than 2 cm). In addition, the percentage of young female patients with a family history of breast cancer and patients who have a genetic predisposition to breast cancer is higher than that among older women with cancer⁵. Some studies have found, for example, that 20% of young women with aggressive breast cancers (called triple-negative breast cancers) have a BRCA1 gene mutation – a significant genetic risk factor⁷.

Special treatment

For this reason, breast cancer in young women – with a higher risk of local recurrence of breast cancer and generally poorer survival⁸ – has poorer outcomes as compared to in older women. Young women with breast cancer need to have especially intensive therapies. Despite scientific advances, optimal treatment is still under discussion. Indication for breast conserving therapy is considered also for young women. And although young age represents a negative prognostic factor, it is not decisive for the question of whether mastectomy is required^{9,10}. Due to the larger tumour volume and the risk of recurrence in young women, some experts recommend mastectomy¹¹.

There are frequently also indications for chemotherapy and radiation therapy. Hormonal therapy is seldom recommended, as there is only a low percentage of tumours in young women for which hormone therapy is indicated. Some oncologists recommend initial treatment with chemotherapy, to reduce the tumour volume and make preserving the breast possible. The risk that aggressive treatment will be required is particularly high for young women. And in fact, young women with even small tumours (with a diameter of less than 1 cm) are treated with chemotherapy even when there is no lymph node involvement (40% of young women versus 10% of older women)¹². The risk of local recurrence rate of nearly 20% remains high even after breast-conserving surgery and radiation therapy¹³. This heightened risk is attributable more to the specific characteristics of the tumours than to the age of the patients. To reduce the risk of local recurrence in young women specialists often recommend mastectomy¹³. In patients with HER2 overexpression, the risk can be lowered through treatment with trastuzumab (Herceptin).

Survival rates after breast cancer have improved, but in young women they are still lower than in older patients. More research is needed to identify the factors that lead to local recurrence and distant metastases and are associated with mortality. Only with this knowledge will physicians be able to determine the optimal treatment strategies for these patients.

Major psychological and social consequences

Receiving a breast cancer diagnosis and undergoing treatment are drastic experiences that have major effects on the affected women's relationships and their family, work and social life. This applies particularly for young women, for whom many things at the social, family and vocational levels are still in development: completing their higher education, career and family planning, raising children, and so on. In addi-

tion, the long-term toxicity of cancer treatments can cause big problems, such as reduced fertility or early menopause, that additionally affect the young women's physical, emotional and psychosocial well-being – not to mention side effects, including exhaustion, memory problems, dental problems, joint pain, cardiotoxic effects and more¹².

Does pregnancy affect breast cancer prognosis?

Many young women, especially if they do not yet have children, plan to build a family. Many patients that undergo breast cancer treatment want to have children (or more children). It is estimated that 70% of all women who are treated for cancer desire children after treatment and that 7% of all patients aged 40 and younger become pregnant. Up to the 1970s, experts agreed that women who had been treated for breast cancer should not become pregnant. In many cases, they even recommended sterilization. Contrary to the view held at that time, pregnancy after breast cancer treatment does not appear to have an effect on the prognosis of the treated cancer. For breast cancer patients with a good prognosis, the earlier recommended delay between the end of treatment and pregnancy no longer appears to be necessary. If the prognosis is not as good, the outlook is poor with or without pregnancy. Breast cancer patients are usually told to wait for at least two years after the end of treatment before trying to become pregnant¹⁴. There are still no uniform recommendations, however, and more research is needed.

In conclusion

Breast cancer is relatively rare under the age of 40, but the incidence is increasing. The natural course of the disease in young patients has been little studied as yet. Young women with breast cancer are very

rarely included in observational and clinical studies. To identify specific risk factors and predictive factors for the development of breast cancer among young women, multicentre studies with a large number of patients are needed. Studies of that kind could be planned in Switzerland at the national level, especially with the introduction of the new law for a national cancer registry. A better understanding of breast cancer in young women would make it possible to improve medical treatment of this type of cancer and the quality of life of affected women.



Elisabetta Rapiti, MD

After completing medical studies, a doctorate and initial training in medical statistics at Sapienza University of Rome, Elisabetta Rapiti obtained a Master of Public Health at Johns Hopkins University in Baltimore, Maryland. She then conducted research studies for the World Health Organization, the Public Health Agency of the Latium Region in Rome, Italy, and Geneva University Hospitals (HUG) in the areas of clinical epidemiology, prevention and public health. Since 2008 she has been head physician at the Geneva Cancer Registry, which is affiliated with the Institute of Global Health of the Faculty of Medicine at the University of Geneva. Her research work deals mainly with breast cancer, cervical cancer and colon cancer, and her special research interests include cancer at a young age and family history of cancer.

Tel. +41 (0)22 379 49 56

elisabetta.rapiti@unige.ch

www.unige.ch/medecine/rgt/collaborateurs



Prof. Christine Bouchardy, MD

Christine Bouchardy earned her MD in Geneva. After specializing in internal medicine and then in public health, she completed a diploma in biostatistics at Pierre and Marie Curie University (University of Paris VI). She specialized in cancer epidemiology and then received two research fellowships,

at the Institut Gustave Roussy in Villejuif and at the International Agency for Research on Cancer in Lyon. In 1992 she became the director of the Geneva Cancer Registry, and in 2008 she was appointed professor in the Faculty of Medicine at the University of Geneva. Bouchardy started the breast cancer screening programme in Geneva and played a part in developing the National Institute for Cancer Epidemiology and Registration (NICER), of which she is today the vice president. In her research, she focuses on breast cancer risk factors, breast cancer diagnosis and the quality of breast cancer treatment.

Tel. +41 (0)22 379 49 56

christine.bouchardymagnin@unige.ch

www.unige.ch/medecine/rgt

References

1. nicer.org [Internet]. Switzerland's National Institute for Cancer Epidemiology and Registration [cited 2017 May 17]. Available from: www.nicer.org
2. Bouchardy C, Fioretta G, Verkooijen HM, Vlastos G, Schaefer P, Delaloye J-F, et al. Recent increase of breast cancer incidence among women under the age of forty. *Br J Cancer*. 2007;96:1743-6.
3. Merlo DF, Ceppi M, Filiberti R, Bocchini V, Znaor A, Gamulin M, et al. Breast cancer incidence trends in European women aged 20-39 years at diagnosis. *Breast Cancer Res Treat*. 2012;134:363-70.
4. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA Cancer J Clin*. 2011;61:69-90.
5. Assi HA, Khoury KE, Dbouk H, Khalil LE, Mouhieddine TH, El Saghir NS. Epidemiology and prognosis of breast cancer in young women. *J Thorac Dis*. 2013;5 Suppl 1:S2-8.
6. Partridge AH, Hughes ME, Ottesen RA, Wong Y-N, Edge SB, Theriault RL, et al. The effect of age on delay in diagnosis and stage of breast cancer. *Oncologist*. 2012;17:775-82.
7. Robertson L, Hanson H, Seal S, Warren-Perry M, Hughes D, Howell I, et al. BRCA1 testing should be offered to individuals with triple-negative breast cancer diagnosed below 50 years. *Br J Cancer*. 2012;106:1234-8.
8. Maggard MA, O'Connell JB, Lane KE, Liu JH, Etzioni DA, Ko CY. Do young breast cancer patients have worse outcomes? *J Surg Res*. 2003;113:109-13.
9. Gentilini O, Botteri E, Rotmensz N, Toesca A, De Oliveira H, Sangalli C, et al. Breast-conserving surgery in 201 very young patients (<35 years). *Breast*. 2010;19:55-8.
10. Vila J, Gandini S, Gentilini O. Overall survival according to type of surgery in young (≤ 40 years) early breast cancer patients: A systematic meta-analysis comparing breast-conserving surgery versus mastectomy. *Breast*. 2015;24:175-81.
11. van Nes JG, van de Velde CJ. The preferred treatment for young women with breast cancer--mastectomy versus breast conservation. *Breast*. 2006;15 Suppl 2:S3-10.
12. Agnese DM, Yusuf F, Wilson JL, Shapiro CL, Lehman A, Burak WE Jr. Trends in breast cancer presentation and care according to age in a single institution. *Am J Surg*. 2004;188:437-9.
13. Quan ML, Paszat LF, Fernandes KA, Sutradhar R, McCready DR, Rakovitch E, et al. The effect of surgery type on survival and recurrence in very young women with breast cancer. *J Surg Oncol*. 2017;115:122-130.
14. Christinat A, Pagani O. Fertility after breast cancer. *Maturitas*. 2012;73:191-6.

Selected results

Project

Comprehensive international research programme for childhood liver cancer
Unité d'Oncologie et Hématologie Pédiatrique, Hôpitaux universitaires de Genève, Genève
CHF 50 400.- | Duration: 1. 2. 2014 – 31. 1. 2016 | KFS 3351-02-2014

Project coordinator

Prof. Marc Ansari, MD | marc.ansari@hcuge.ch

Global collaboration in the fight against liver cancer in children

Because the patient numbers are often so small that they do not allow generalization, very rare diseases pose a great challenge for research. In a research project supported by the Swiss Cancer Research foundation, researchers mastered the challenge by bringing together and re-evaluating clinical data on young patients with liver cancer from all over the world.

Hepatoblastoma is a type of liver cancer. It is usually found in children, but fortunately, it is rare, diagnosed in fewer than about one in a million children. However, the rareness of the cancer also makes it a challenge for researchers like Marc Ansari at Geneva University Hospital, who aim to improve and advance treatment of hepatoblastoma.

“With such small patient numbers, there is only one way to obtain a sufficient amount of clinical data, and that is close international collaboration”, says Ansari. In his research project supported by the Swiss Cancer Research foundation, the aim was to combine and re-evaluate the data of published clinical trials in Europe, Japan, and the United States in the last 25 years.

The international collaboration of this study group is called the Children’s Hepatic tumors International Collaboration (CHIC). Thanks to this global approach, Ansari and his colleagues succeeded in bringing together data to form a database of 1605 hepatoblastoma cases with tumour and treatment data.

To be able to compare the clinical data from all corners of the world, it was necessary for the specialists to intensively exchange information, since in each region, the medical profession had its own systems of classification and staging of this rare liver cancer. In a series of meetings, Ansari and trial group leaders settled upon a unified approach that not only made

it possible to move the old data into the shared database but also at the same time paved the way for future improvement of treatment strategies.

That is because due to the re-evaluation of the unified old data, young patients could be divided into groups with differing risk of recurrence, Ansari explains. Together with his colleagues, Ansari is now planning a worldwide study to examine how treatment should be optimized for each different risk group, to cure more children with liver cancer and to reduce the side effects of chemotherapy.

References

- Czauderna P, Häberle B, Hiyama E, Rangaswami A, Krailo M, Maibach R, et al. The Children’s Hepatic tumors International Collaboration (CHIC): Novel global rare tumor database yields new prognostic factors in hepatoblastoma and becomes a research model. *Eur J Cancer*. 2016;52:92-101.
- Meyers RL, Maibach R, Hiyama E, Häberle B, Krailo M, Rangaswami A, et al. Risk-stratified staging in paediatric hepatoblastoma: a unified analysis from the Children’s Hepatic tumors International Collaboration. *Lancet Oncol*. 2017;18:122-131.

List of approved research projects in 2016

More information about the funded projects can be found on www.krebsliga.ch/researchprojects

Total funds allocated: CHF 1 013 750.-

98

Clough-Gorr Kerri | An update of cancer risk in persons infected with HIV in Switzerland – continued analysis and results

Institut für Sozial- und Präventivmedizin, Universität Bern, Bern

CHF 177 000.- | Duration: 1.7.2016 – 30.6.2018 | KFS 3862-02-2016

Rapiti Elisabetta | Importance of family history of cancer on colorectal cancer occurrence and outcome: population-based study in Geneva

Registre genevois des tumeurs, Université de Genève, Genève

CHF 200 250.- | Duration: 1.1.2017 – 31.12.2018 | KFS 3932-08-2016-R

Spycher Ben D. | Spatial variation of childhood cancer risk in Switzerland and associations with traffic-related air pollution

Institut für Sozial- und Präventivmedizin, Universität Bern, Bern

CHF 272 600.- | Duration: 1.1.2017 – 31.12.2019 | KFS 4012-08-2016

von der Weid Nicolas | Cardiovascular disease after childhood cancer: diagnosing early stage disease

Pädiatrische Onkologie und Hämatologie, Universitäts-Kinderspital beider Basel, Basel

CHF 363 900.- | Duration: 1.1.2017 – 31.12.2019 | KLS 3886-02-2016

Approved bursaries in 2016

Total funds allocated: CHF 106 000.-

Lupatsch Judith | Do early infections protect against the risk of brain tumours in children?

Destination: Centre de Recherche Epidémiologie et Statistique Sorbonne Paris Cité, Paris, F

CHF 10 000.- | Duration: 1.7.2016 – 31.12.2016 | BIL KLS 3885-02-2016

Wettstein Marian Severin | Underutilization of re-resection in T1 bladder cancer and the impact on oncological outcomes – a population-based study

Destination: Division of Urology, Princess Margaret Cancer Center, Toronto, CAN

CHF 96 000.- | Duration: 1.7.2017 – 30.6.2019 | BIL KFS 4009-08-2016

We need your support!

To better understand the causes of cancer, prevent its development, detect it earlier, and treat the disease more effectively, continued strong investment in research is needed. With our work, we support researchers in their intensive efforts to improve the understanding of cancer and contribute to the development of improved treatment methods and optimal care of persons with cancer and their families.

Help us in our fight against cancer.
Thank you very much!

Donations account PC 30-3090-1
Swiss Cancer Research foundation, Bern
www.krebsforschung.ch



Printed on non-chlorine-bleached paper.



krebsliga schweiz
ligue suisse contre le cancer
lega svizzera contro il cancro

krebsforschung schweiz
recherche suisse contre le cancer
ricerca svizzera contro il cancro
swiss cancer research

