

Competence Centre TEDD
Tissue Engineering for Drug Development and Substance Testing

TEDD Report

2015

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FIVE YEARS OF TEDD – LOOKING INTO THE FUTURE

Summary of achievements

In 2010 two co-founders, the section “Tissue Engineering” at the Zurich University of Applied Sciences (ZHAW) lead by Prof. Ursula Graf-Hausner and the company InSphero AG, represented by Dr. Jens Kelm received initial funding from Gebert Ruef Foundation (BREF 2010) to establish TEDD. The past five years of TEDD network were successfully used to build up the structure of the organization, to develop goals and directions, and to start several network projects. The highlight of TEDD activities include (details of each point can be read in the “TEDD Activities” section of this report):

- The project proposal “3D tissues – new perspective for medicine” was submitted by a consortium of 8 TEDD members in 2014, supported by swissuniversities (former SUC - Swiss University Conference) and approved by the State Secretariat for Education, Research and Innovation SBFI June 2015. To receive the federal project contributions 2017-20 (CHF 5.3 millions including 50% in kind contributions of the universities) the full proposal will be finished by end of 2015. Fig 1 presents the strategy of the comprehensive project.

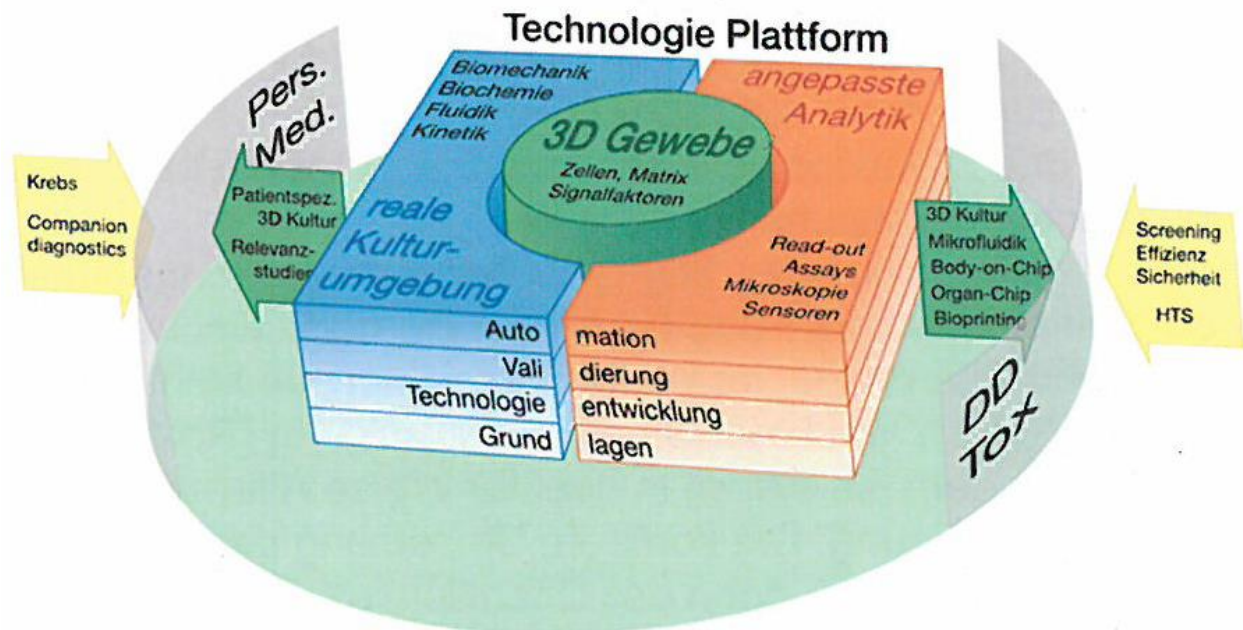


Figure 1: The concept of development and application of 3D cell cultures supported by TEDD.



- This consortium and project have matured during the elaboration of a research proposal for the National Research Program (NFP), submitted 2014 to the Swiss National Science Foundation entitled “3D meets 3R - Organ-like tissue models with prospects for medicine and animal welfare”. This proposal passed the first selection as one of six out of a total of 69 submitted proposals, but was not successful in the final round. But it strengthened the TEDD community.
- Acquiring close to 90 paying TEDD members from industry and academia and about 200 additional partners interested in our activities (status in October 2015).
- Covering the entire Swiss landscape with members from German, French and Italian speaking cantons.
- Acquiring new international (mainly European) partners (approx.12% of all TEDD partners).
- Several successful funding proposals (CTI, SNF) initiated by TEDD and matured on our platform.
- Organization of close to 40 events: workshops, symposia and company visits.
- Publication of special issue of the Advanced Drug Delivery Reviews (ADDR) with 19 reviews on 3D cell culture technology written by internationally renowned experts.
- Successful promotion of 3D cell culture among professionals and public opinion by regular media appearance (Newspaper, TV, ...).

Vision and future

It is evident that cell-based assays are going to be an important part of drug development, regenerative and personalized medicine. While significant progress has been made, there is still a huge demand for improvement, validation and implementation. In the coming 5 years, the centre aims at fostering 3D cell culture approaches, contributing actively to key technology development and translating *in vitro* assays into predictive tests of clinical and pharmaceutical relevance. By routine application of 3D tissue models the 3Rs initiative will be implemented by reducing and replacing animal experiments.

Measures to reach those goals are:

Scientific contribution and technology development

- We bring together industry, clinics and academia and sharpen the TEDD community in order to strengthen the research and business location Switzerland by responding to key medical, pharmaceutical and societal demands.



- We promote active knowledge sharing and technology transfer by workshops and symposia.
- With joined forces we develop dedicated and predictive 3D cell culture technologies of relevance to industry and clinical practice.
- We will be increasingly active in terms of international publications and visibility in the scientific and technological community.

Validation and implementation

- We support translation, implementation and use of organotypic tissue models in industry as well as society at large.
- As soon as 3D cell culture technologies are ready for validation we will act as a link between partners and regulatory institutions in Switzerland and Europe. Connection to authorities will be built up (Swiss Medic, EMEA, and others).
- TEDD is able to act as a validation centre that tests novel enabling technologies and coordinates R&D activity with all players.

Forming powerful consortia and expert teams

- Instead of performing only small bilateral CTI projects we will focus on initiating large grant proposals and supporting building of research consortia. By this we are able to combine competences and submit proposals for national and international calls, e.g. larger CTI network projects, Swiss initiatives, e.g. in the frame of Promotion of Education, Research and Innovation SBFI, EU calls and others.

International recognition and influence

- We establish TEDD internationally as an important platform and point of contact for all issues relating to three-dimensional cell and tissue systems.
- We also suggest the initiation of a collaborative TEDD R&D center as innovation hub, financed with the help of industrial partners, where technologies would be discovered, developed and validated in a highly relevant manner. This creates the special opportunity for Switzerland of becoming an internationally recognized leader in this area.
- We focus on international events and form strategic alliances in order to become recognized as the biggest European 3D cell culture organization similar to the community in the Boston area, USA.

Contribution to implement the 3Rs initiative

- With our alternatives for animal testing we will establish and use synergies to 3Rs supporter and focus on reduction and replacement of animal experiments. The following organizations could be potential partners:



- Eidgenössisches Departement des Innern EDI
- Bundesamt für Lebensmittelsicherheit und Veterinärwesen BLV
- Nationalrat und Parlament
- Tierschutz Versuchstiere
- Foundations like Animalfree Research
- We intend to participate in building up a National 3R center in Switzerland that does not exist so far (initiative of BLV, Caspar Jörgler).

Risk assessment and prevention

- Since we use innovative technologies like bioprinting we will also join forces with insurance companies like Swiss Re to help establishing risk assessment and risk prevention as technology experts.

Fig 2 gives an impression of the vision and future of TEDD.

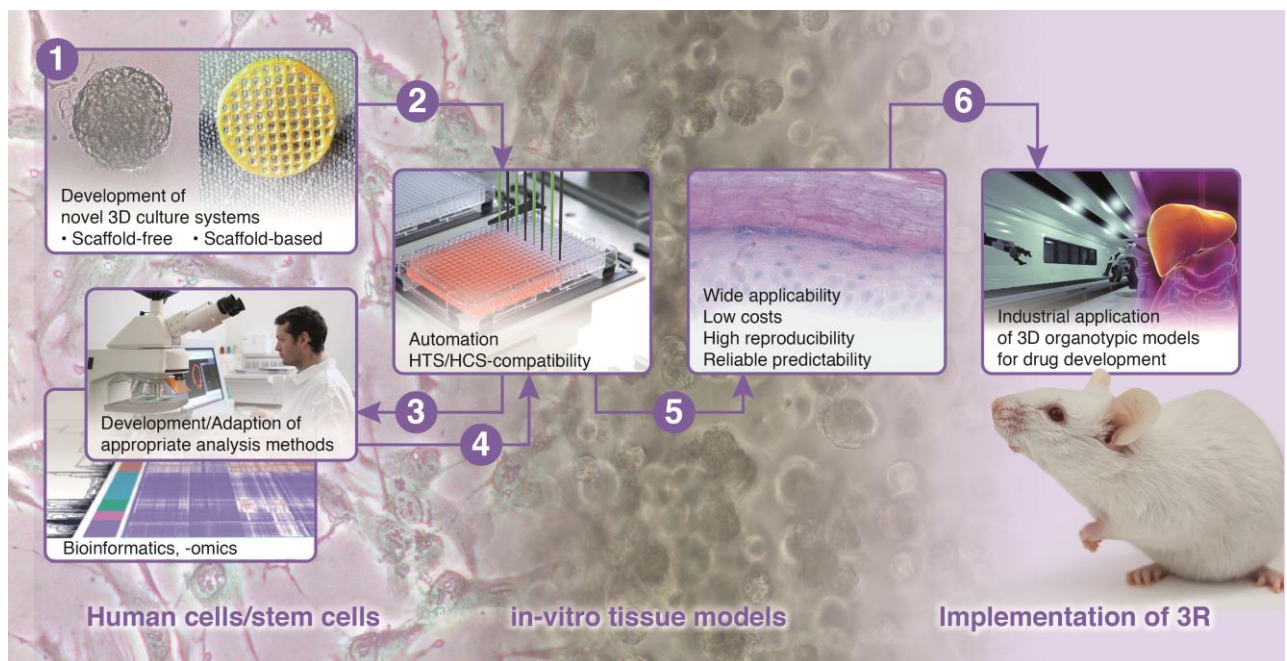


Fig 2: TEDD integrates all relevant natural sciences and technologies in order to create *in-vitro* organ-like tissues for their application in medicine and pharmacology. TEDD will provide a sustainable contribution to the 3Rs initiative



TEDD AS AN ORGANIZATION

Concept and motivation

Cell cultures are an invaluable technology used widely from basic research to industrial applications. The conventional 2D cell culture systems, based on cell lines and primary cells, has been used for a long time to understand the complex cellular physiology i.e. on how cells function and respond to stimuli. They have been also used in regenerative medicine, production of substances such as antibodies and in pharmaceutical and cosmetic industry to test compounds and drug candidates. However, technological advancements are necessary to address emerging complex challenges of the traditional systems.

3D cell culture technology

Physiological relevance is a key parameter for improving the predictive power of cell-based technologies. To achieve *in vivo* like features in *in vitro* cell culture, recently three dimensional (3D) culture systems were introduced. 3D cell cultures recapitulate tissue architecture, cell-cell and cell-matrix interactions in physiological manner. This area is one of the fastest growing experimental approaches in life sciences. The three dimensional cell culture market was \$438.1 million in 2013. The market was expected to grow to \$586.1 million in 2014 and about \$2.2 billion in 2019, with a compound annual growth rate (CAGR) of 30.1% (1).

First advances have been achieved, e.g. in tumor models, and 3D cell culture is currently entering the next phase, technology maturation, i.e. optimization of assays, protocols and kits, which should further facilitate its wider adoption. The compatibility with automated lab equipment and suitability for middle and high throughput screening (HTS) has been established for simple 3D models but have to be further developed for more complex systems for routine drug screening. Biomimetic tissue constructs that reproduce and model organotypic 3D structure that contain several types of cells are also emerging. They have in particular big potential for use in personalized and regenerative medicine but still require more investigation, especially in the clinical context. Fig. 3 presents examples of various *in vitro* models produced with different 3D cell culture technologies.

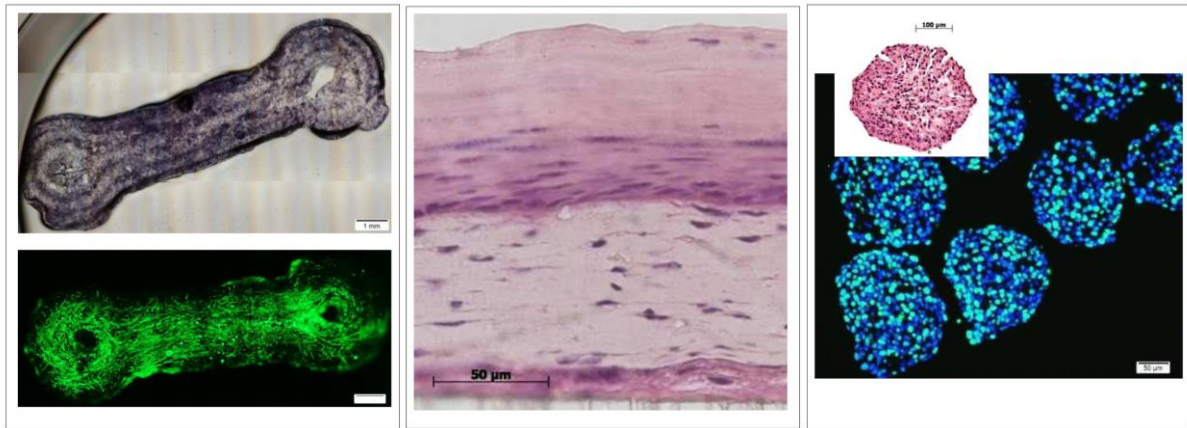


Figure 3: Examples of three dimensional (3D) tissue models. (left) 3D printed human tendon and skeletal muscle (top: MMT staining of cells, bottom: myosin) (2); (middle) Printed 3D skin (H&E staining) (3); (right) Multicellular cancer spheroid of osteosarcoma (Ki-67 staining of nucleus, insert: H&E staining) (4).

3R meets 3D – cell culture as alternative to animal testing

Animals are currently used in studies, where an absolute requirement for tissue-specific information is needed, such as in drug efficacy and toxicity testing. For example in cancer research, tumor is established in rodent models by either surgically implanting tumor cells, patient derived xenografts (PDX) or creating genetically-engineered animals that spontaneously develop human-like tumors (5). However, animal testing often fails to predict the effects of drugs on human. Moreover, the use of animals in research, teaching and testing is an important ethical and political issue, because many of these experiments cause pain to the animals involved or reduce their quality of life (5). These facts are motivating governments and regulatory organizations around the globe to support the implementation of alternative methods for animal testing. 3R principles (Replacement, Reduction, and Refinement) have subsequently become embedded in national and international legislation regulating the use of animals in scientific procedures. *In vitro* 3D cell culture have the potential to replace *in vivo* animal testing and provide more reliable data as they bridge the *in vitro* to *in vivo* gap between cell and human tissues. 3D cultures may greatly improve cell-based drug screening and identify toxic and ineffective substances at an earlier stage of the drug discovery pipeline than animal or clinical trials. Moreover, they can reduce ethically controversial animal testing.



National competence Centre TEDD - the first of its kind

TEDD was established together with the introduction of 3D cell cultures technologies to wider audience. The goal is to support development of these complex tissue systems and implement it into the routine application. In order to maximize the success, cooperation of partners with complementary skills –academia, industry (in particular biotechnology, pharmaceutical, medtech and cosmetics companies) and clinics is required. 3D cell culture became a widely acceptable and desirable technology, however it did not yet reach its full potential. Therefore, further efforts should be made to maintain progress of 3D cell technologies development. TEDD also set itself as a goal to support the 3R principles implementation and introduction of 3D cell culture technologies as alternative for animal testing.

The TEDD Competence Centre is a collaborative innovation platform, dedicated to 3D cell culture technology and organ-like tissue models for drug development, substance testing, personalized and regenerative medicine. The network pools and transfers knowledge and technologies in order to promote the further development and routine application of 3D cell culture. By combining diverse skills through integrative cooperation among our academic, clinical and industrial partners, TEDD covers the entire development and value chain as well as forms a powerful and successful network.

History and organization

The national Competence Centre Tissue Engineering for Drug Development and Substance Testing TEDD was founded in 2011 by the section “Tissue Engineering” at the Zurich University of Applied Sciences (ZHAW) lead by Prof. Ursula Graf-Hausner and the company InSphero AG, Swiss leading supplier of organotypic *in vitro* 3D microtissues for drug testing. TEDD received initial funding from Gebert Ruef Foundation (BREF 2010). TEDD is embedded in the ZHAW, in the research consortium *biotechnet* Switzerland and the National Thematic Network (NTN) *Swiss Biotech*. Fig. 4 summarizes the structure of TEDD.

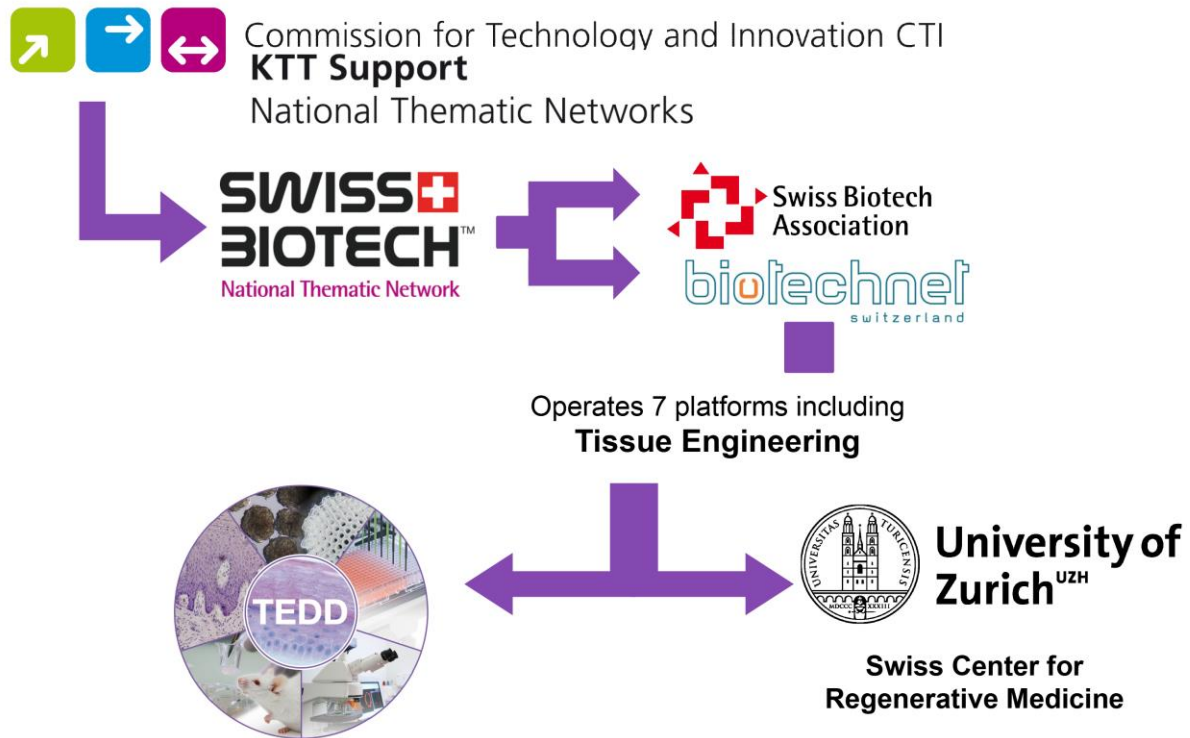


Figure 4: TEDD in the structure of the National Thematic Network Swiss Biotech.

TEDD is guided by the **steering committee** that consists of experienced academic and industrial professionals. Members of steering committee meet on the regular basis once or twice a year to identify milestones for TEDD.

Members of steering committee:

- Prof. Ursula Graf, ZHAW, Wädenswil
- Dr. Katharina Maniura, Empa, St. Gallen
- Dr. Jens Kelm, InSphero AG, Schlieren
- Dr. Oliver Peter, Actelion, Allschwil
- Dr. Christoph Rindlisbacher CELLnTEC, Bern

Steering committee is mentored by the **international advisory board**. The advisors are academic and industrial world recognized experts. The board is involved in defining well adapted strategies according to the international recognise needs and requirements with the final goal to implement 3D cell culture into routine application.

Members of advisory board:

- Dr. Markus Ehrat, EK Bioscience, Magden
- Prof. Dave W. Grainger, University of Utah, USA



- Prof. Uwe Marx, TU Berlin and TissUse GmbH, Germany
- Dr. Thomas Singer, Hoffmann-La Roche, Basel
- Prof. Marcus Textor, ETH, Zurich

Execution of goals defined by the steering committee and advisory board together with organisation and administration is done by the **core team**.

Members of core team:

- Prof. Graf-Hausner, Head of TEDD Competence Centre
- Dr. Katarzyna Kopanska, Project Manager (40% assistance)
- Additional assistance is provided by other staff personnel of Institute of Chemistry and Biological Chemistry (ICBC), ZHAW.

Financing

TEDD is financed by several sources:

- TEDD is part of the technology platform “Tissue Engineering” within the research consortium biotechnet Switzerland. biotechnet itself belongs to the National Thematic Network Swiss Biotech, which is funded by the Commission for Technology and Innovation CTI, the Swiss Confederation’s innovation promotion agency. An annual budget to support TEDD activities can be submitted to biotechnet. Throughout past three years TEDD received 180 000 CHF from CTI. In order to gain this support, every year the auditors from CTI evaluate TEDD based on its performance. CTI defines goals that need to be fulfilled such as new partners acquisition, project initiation, events organization etc. that need to be achieved in order to get the support.
- ZHAW finances 0.5 FTE for administrative and strategic tasks within TEDD.
- The members of steering committee and advisory board work free of charge.
- TEDD members pay an annual fee of CHF 500.
- Some events, especially symposia, have a participation fee that contributes to the budget.
- A few specific activities are sponsored by TEDD Partners such as company visits (by the company) or Symposium “Frontiers in Personalized Medicine” (by Swiss Tissue Culture Society).



Partnership

Professionals from various fields can join TEDD network: experts from basic, applied and clinical research, technology companies, pharmaceutical and cosmetic industries, medical product manufacturers, hospitals, funding associations, societies and clusters.

Partners have the opportunity to actively contribute to the TEDD platform and take advantage of the available activities. Funding applications to kick off network projects (CHF 10,000) for are assessed and approved by the steering committee. The full list of benefits for TEDD partners is presented in details below.

TEDD partner benefits:

- **Priority access to TEDD events to obtain first-hand information**

The competence centre TEDD initiates and co-organizes several workshops, seminars, symposia and company visits to keep you up-to-date with the latest developments in the field of 3D cell culture and its applications. Flag conferences: Personalised Medicine Workshop in June, TEDD Annual Meeting in October, and 3D Cell Culture Symposium (Dechema).

- **Professional networking and high visibility in the community**

TEDD brings together national and international business and academic partners, and provides an interactive platform to exchange information on trends in technology, applications, demands, risks and chances of advanced methodologies.

- **Seed funding for new projects**

TEDD partners have the opportunity to apply for a National Thematic Network *Swiss Biotech* grant (CHF 10,000), funded by the Commission for Technology and Innovation (CTI). The aim of the seed funding is to enable interdisciplinary network projects with high innovation potential in 3D cell culture and its applications. Information on the criteria is available from TEDD on request.

- **Long-term support for scientific projects**

Partners benefit from integration into larger interdisciplinary projects in collaboration with industry and academia, and participate in grant applications initiated and supported by the TEDD network (including national research programmes, national thematic networks, European projects, SNF programmes e.g. Sinergia, and applied research projects founded by the CTI).

- **Communication through periodic reports**



TEDD publishes periodic reports of events on the *biotechnet Switzerland* and NTN *Swiss Biotech* platform. This gives TEDD partners the opportunity to communicate their news, and inform about their competencies and products.

- **Access to technologies within the network**

Industrial partners have access to the methodologies and state-of-the-art equipment of competent academic units. TEDD also provides individual advice on how to find the most competent partner for a particular project, taking into account its concept and demands.

- **Expanded market and advertisement platform**

During TEDD meetings, priority is given to partners for the presentation of their products to the 3D cell culture community. Each partner's logo is displayed on the TEDD website to increase awareness of their competences, products and services.

- **Access to selected scientific information free of charge**

Partners receive login details and a password to access scientific information, selected publications, and presentations from conferences in the 3D cell culture field.

The number of TEDD partner steadily increased from 2011 to 2015. Number of partners joining varies depending on the given year (Fig. 5).

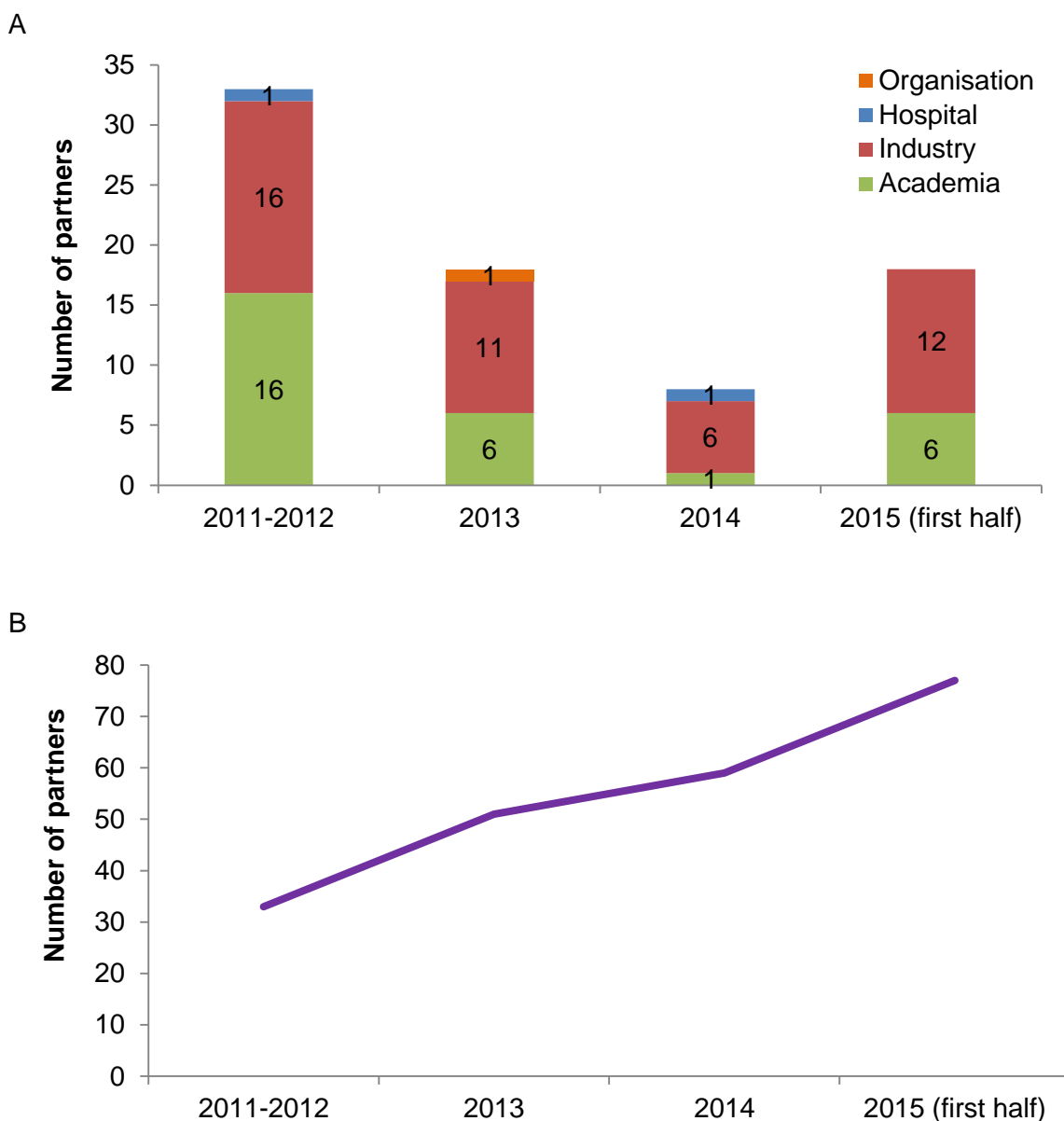


Figure 5: (A) TEDD partnership from 2011 to 2015 (first half of 2015). Stacked bars show number of partners joining each year divided by type of organization. (B) Cumulative TEDD partner number between 2011-2015 (first half of 2015).

Currently TEDD consists of close to 80 partners from industry (58 % of total), academia (38 %), hospitals (3%) and organizations (1%) (Fig. 6).

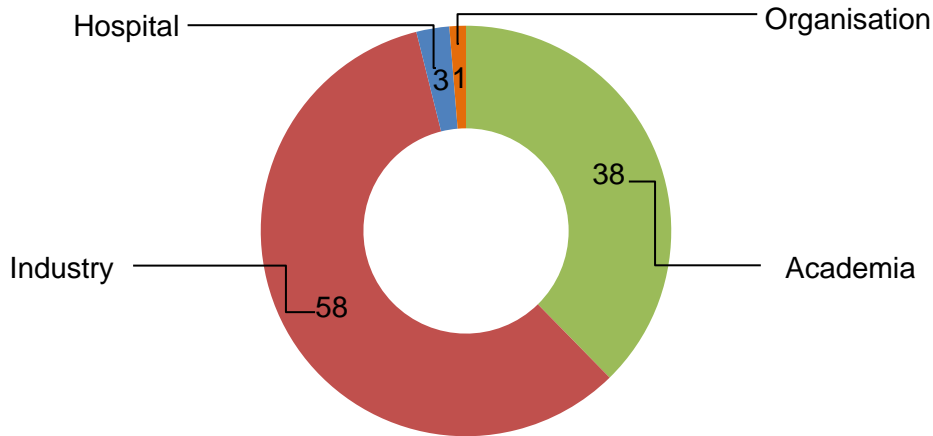


Figure 6: TEDD partnership divided by type of organization as percent of total partners number (until first half of 2015).

TEDD Partners cover entire area of Switzerland and are represented in all major cities (Fig. 7). International partners (from which most are European) constitute approximately 12% of all members.

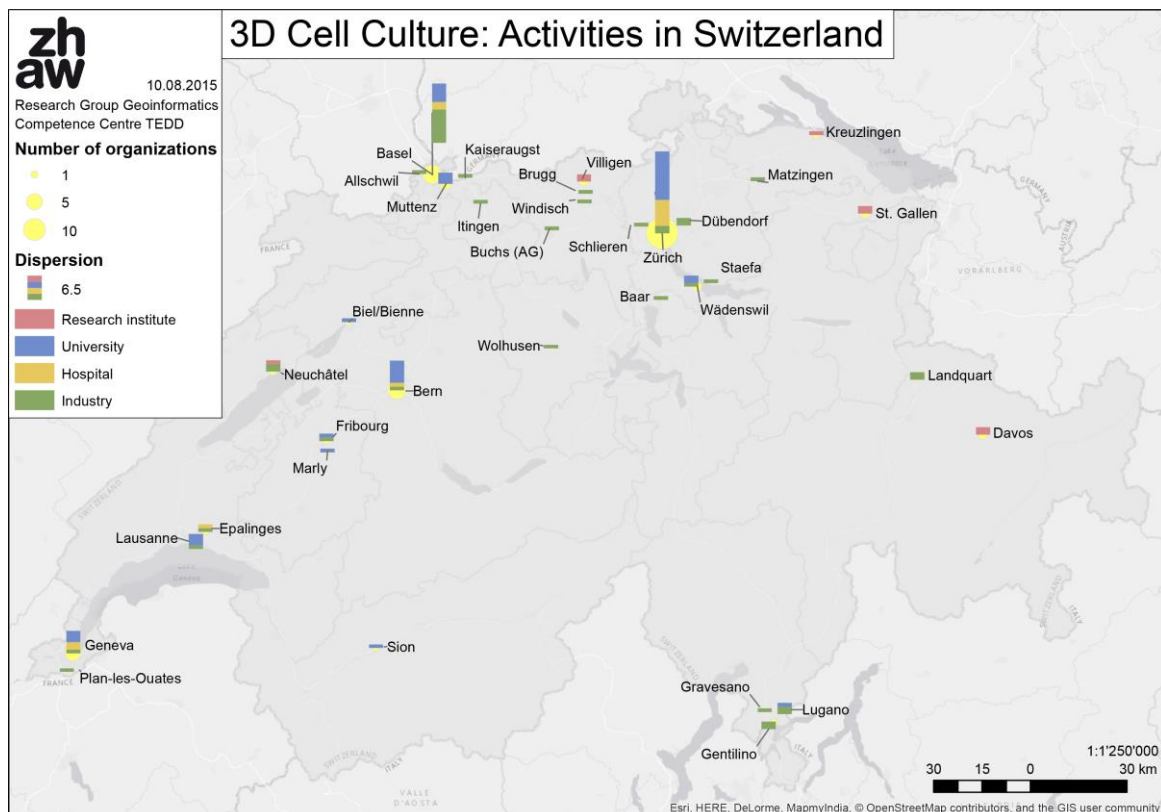


Figure 7: TEDD partners and 3D cell culture activities in Switzerland number (until first half of 2015).



TEDD activities

The competence center is an important platform from which 3D cell culture technology can be actively influenced. Regular events and activities at national and international level ensure exchange and progress. In order to combine research and industry TEDD organises activities like workshops, seminars, symposia, company visits, special issues for scientific reviews and provides a platform to generate research consortia, network projects and grant applications.

Project proposals and grant applications

- In January 2014 National Research Program (NFP) proposal of Swiss National Foundation was developed on TEDD platform with the title “3D meets 3R - Organ-like tissue models with prospects for medicine and animal welfare”. The idea of the proposal was to set a 3D tissues technology platform for three applications: drug development and toxicology, regenerative medicine and personalized medicine (Fig. 1). Proposal went through the first round of selection (six selected out of 69 submitted proposals.) It was however not granted in the last round of the selection.
- In spring 2014 another proposal was submitted “3D tissues – new perspective for medicine” to Swiss Higher Education Council (former SUC –Swiss University Conference). The project is focused on the perspectives of 3D cell cultures in personalized medicine. Project matured on TEDD platform with partners: ZHAW (Leading House), University of Fribourg, University of Bern, ETHZ BSSE Basel, Balgrist University Hospital Zurich, HES-SO Sion, Empa St. Gallen and consulting partner for implementation Hoffmann-La Roche. In June 2015 the first round of selection was approved on CHF 5.3 millions (50% internal contribution) for years 2017-2020.

Network projects

Several projects have been built up on the basis of TEDD including various CTI and SNF proposals. All project of TEDD network from 2013-2015 are listed in the Appendix 2.

Publications

In 2014 TEDD initiated and coordinated the publication of special issue of Advanced Drug Delivery Reviews ADDR “Innovative tissue models for drug discovery and development” edited by members of Steering Committee (Editors: U. Graf-Hausner, K. Maniura-Weber,



J.M. Kelm, M.P. Lutolf, M. Textor, D. W. Grainer, 2014). The issue contains of 19 reviews from top academic and industrial contributors and helped to gain international recognition for TEDD.

Media releases

Information about TEDD activities are regularly published in the national press: ChemiePlus, Life SciencePlus, Chimia, Medizin & Technik, BIOSpektrum, Zürichsee Zeitung, Neue Züricher Zeitung. The publications can be access on TEDD website: www.icbc.zhaw.ch/tedd.

Events

Events are organized on the regular basis in collaboration with the hosting companies or academic institutions belonging the TEDD network.

Workshops

Date	Event	Location
2015		
21.01.2015	Models of the Respiratory Tract and their Application	Adolphe Merkle Institute, Fribourg, CH
22.04.2015	Clinical partners talk about their needs	Swiss Center for Regenerative Medicine, Zürich, CH
11.06.2015	Biology inspired microphysiological systems – status and future	Berlin, Germany
18.06.2015	Frontiers in Personalized Medicine	ZHAW, Wädenswil, CH
18.11.2015	Olten Meeting 2015	Olten, CH
2014		
27.03.2014	Disease cell-models, their use in industry	HES-SO, Sion
18.11.2014	Organs-on-Chip Seminar	ARTORG Center, Bern, CH
19.11.2014	Olten Meeting 2014 - For Crystal-clear Insights	Olten, CH
2013		
14.03.2013	In Vitro Barrier Models: How Reliable and Clinically Relevant are these Systems?	Empa, St. Gallen, CH
29.05.2013	User Group Meeting (organized by InSphero	Schlieren, CH



	AG): Predictive drug de-risking with 3D-cell-culture systems for new and experienced 3D microtissue users	
27.11.2013	Olten Meeting 2013 - Make Changes	Olten, CH
2011-2012		
12.05.2011	Medienorientierung	ICBC, ZHAW
21.06.2011	Kick off Meeting Kompetenzzentrum TEDD	ICBC, ZHAW
28.09.2011	Workshop on Bioprinting	ICBC, ZHAW
02.10.2012	TEDD workshop "In vitro skin – trends and methods"	ICBC, ZHAW
28.11.2012	Olten Meeting 2012	Olten, CH

Symposia

Date	Event	Location
2015		
08.02.2015	SLAS (Short Course)	Washington, DC, USA
19.08.2015	NTN Swiss Biotech Innovation Day, 19 August 2015	Zug CH
22.10.2015	TEDD Annual Meeting 2014	ZHAW, Wädenswil
2014		
19.01.2014	SLAS (Short Course)	San Diego, CA, USA
03.04.2014	Symposium 3D-Printing - A disruptive technology	ZHAW, Winterthur
25-27.06.2014	Dechema 3D Cell Culture - Advanced Model Systems, Applications & Enabling Technologies - workshops: In vitro liver models, Advanced in vitro liver model for toxicological profiling	Freiburg, Germany
09.10.2014	TEDD Annual Meeting 2014	ZHAW, Wädenswil
18.12.2014	Ersatzmethoden fördern - Tierversuche ersetzen, 8. Tierversuchstagung des Schweizer Tierschutz STS	Olten, CH
2013		
13.01.2013	SLAS2013 3D Cell-Based Assays for Drug De-Risking (Short Course)	Orlando, FL, USA



23-26.06.2013	CLINAM 2013: TEDD Satellite symposium	Basel, CH
22.10.2013	TEDD Annual Meeting 2013	ZHAW, Wädenswil
2011-2012		
14-16.03.2012	Dechema 3D Cell Culture – Advanced Model Systems, Applications & Enabling Technologies	Technopark Zürich
23.10.2012	TEDD Annual Meeting 2012	ZHAW

Company visits

Date	Event	Location
2015		
03.03.2015	Tissue Engineering in Geneva: visit to Epithelix, Onco Theis, Neurix, Hepia	Geneva, CH
22.04.2015	Phillip Morris International R&D	Neuchâtel, Switzerland
2014		
08.01.2014	regenHU Ltd	Villaz-St-Pierre
2013		
28.01.2013	F. Hoffmann-La-Roche	Basel, CH
16.04.2013	Geistlich Pharma AG	Wolhusen, CH
11.06.2013	Novartis Pharma AG	Basel, CH
2011-2012		
11.06.2012	InSphero AG	Schlieren, CH
27.07.2012	Actelion Pharmaceuticals Ltd.	Allschwil, CH
14.09.2012	Givaudan Schweiz AG	Dübendorf, CH



References

1. 3D Cell Culture: Technologies and Global Markets. (Jan 2015) BCC Research Biotechnology Report.
2. Rimann, M., S. Laternser, H. Keller, O. Leupin, and U. Graf-Hausner. (2015). 3D Bioprinted Muscle and Tendon Tissues for Drug Development. *Chim. Int. J. Chem.* 69: 65–67.
3. Mathes, S., H. Ruffner, and U. Graf-Hausner. (2013). The use of skin models in drug development. *Adv Drug Deliv Rev.* .
4. Rimann, M., S. Laternser, A. Gvozdenovic, R. Muff, B. Fuchs, J.M. Kelm, and U. Graf-Hausner. (2014). An in vitro osteosarcoma 3D microtissue model for drug development. *J. Biotechnol.* 189C: 129–13
5. Antoni, D., H. Burckel, E. Josset, and G. Noel. (2015). Three-Dimensional Cell Culture: A Breakthrough in Vivo. *Int. J. Mol. Sci.* 16: 5517–5527.



Contact



Prof. Dr. Ursula Graf-Hausner

Head of Competence Centre TEDD

Zurich University of Applied Sciences

Institute of Chemistry and Biological Chemistry

Einsiedlerstrasse 31

CH-8820 Waedenswil

Switzerland

Tel.: +41 58 934 55 18

E-Mail: ursula.graf@zhaw.ch

info.tedd@zhaw.ch



www.icbc.zhaw.ch/tedd



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Appendix 1

Table 1: List of TEDD Members.

No	Country	Company	Department	Group	Main contact
2011-2012					
ACADEMIA					
1	United States	University of Utah	Department of Engineering	Biomedical Polymers Laboratory	David Grainger
2	Germany	TU Berlin	Medical Biotechnology	TissUSE	Uwe Marx
3	Switzerland	University of Applied Sciences and Arts Northwestern Switzerland FHNW	Institute for Chemistry and Bioanalytics		Daniel Gygax
4	Switzerland	University of Zurich	Swiss Center for Regenerative Medicine	Regenerative Medicine Program	Simon P. Hoerstrup
5	Switzerland	CSEM AG			Helmut Knapp
6	Switzerland	Bern University of Applied Science	Engineering and Information Technology		Franz Baumberger
7	Switzerland	CSEM AG	Landquart		Laurent Barbe
8	Switzerland	MCI MANAGEMENT CENTER INNSBRUCK			Christoph Griesbeck
9	Switzerland	THE ENTREPRENEURIAL SCHOOL University of Applied Sciences and Arts Northwestern Switzerland FHNW	School of Life Sciences, Institute for Ecopreneurship		Philippe Corvini
10	Switzerland	University of Zurich	Institute of Medical Microbiology		Markus Seeger
11	Switzerland	University of Bern	ARTORG Center for Biomedical Engineering Research	Tissue and Organ Mechanobiology	Benjamin Gantenbein
12	Switzerland	University Hospital Zurich	Department of Obstetrics	Laboratory for Cell and Tissue Engineering	Martin Ehrbar
13	Switzerland	ETH	Department of Biosystems Science and Engineering (D-BSSE)	Bio Engineering Laboratory	Andreas Hierlemann



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14	Switzerland	HES-SO Valais-Wallis	Institute of Life Technologies		Bruno Schnyder
15	Switzerland	Balgrist University Hospital	Laboratory for Orthopedic Research		Bruno Fuchs
16	Germany	University of Tübingen	Natural and Medical Sciences Institute (NMI)	BioMEMS/Sensorik	Martin Stelzle
17	Switzerland	ZHAW	Life Sciences und Facility Management	Institut für Biotechnologie	Vera Luginbühl
18	Switzerland	EMPA	Bioactive Materials	Laboratory for Biomaterials	Katharina Maniura Barbara Rothen- Rutishauser
19	Switzerland	Adolphe Merkle Institute	BioNanomaterials		
20	Switzerland	EPFL	The interfaculty Institute of Bioengineering	Laboratory of Stem Cell Bioengineering	Matthias Lutolf
INDUSTRY					
21	Switzerland	EK-Biosciences			Markus Ehrat
22	Switzerland	CELLnTEC Advanced Cell systems AG			Peter Girling
23	Switzerland	Mibelle Biochemistry			Franziska Wandrey
24	Switzerland	F. Hoffmann-La Roche	Roche Pharmaceutical Research and Early Development	Mechanistic Safety, Pharmaceutical Sciences	Adrian Roth
25	Switzerland	Tecan Group Ltd.			Isabel Patocchi
26	Switzerland	Novartis Insitut for Biomedical Research			Heinz Ruffner
27	Switzerland	Geistlich Pharma AG			Jürg Zumbunn
28	Switzerland	DSM Nutritional Products			Remo Campiche
29	Germany	Cellendes GmbH			Brigitte Angres
30	Switzerland	regenHU SA			Marc Thurner
31	Switzerland	Actelion Pharmaceuticals Ltd	HTS and Compound Management		Oliver Peter
32	Switzerland	InSphero AG			Jens Kelm
33	Switzerland	THOT.COM Communication Consulting			Elsbeth Heinzelmänn
34	Switzerland	Celtec Biotek AG			Adam Papadimitropoulos
35	Germany	Thermo Electron LED GmbH			Iris Pavenstädt
36	Switzerland	Givaudan Schweiz AG			Andreas Natsch



2013

ACADEMIA

37	Switzerland	University of Bern	ARTORG Center for Biomedical Engineering Research	Lung Regeneration Technologies	Olivier Guenat
38	Switzerland	ETH	Institute for Biomechanics		Stephen Ferguson
39	Switzerland	University of Applied Sciences Hepia	Centre de Competence Micro- et bio-ingénierie		Luc Stoppini
40	Switzerland	ETH	Department of Health Science and Technology (D-HEST)	Cartilage Engineering and Regeneration	Marcy Zenobi
41	Switzerland	Swiss Stem Cell Foundation			Gianni Soldati
42	Switzerland	Bern University of Applied Science	Institute for Applied Laser, Photonics and Surface Technologies	Thin Films and Surfaces	Patrick Schwaller

ORGANISATION

43	Switzerland	Animalfree Research			Stephanie Schindler
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INDUSTRY

44	Switzerland	credentis ag			Michael Hug
45	Switzerland	Hamilton Bonaduz AG			Mario Arangio
46	Germany	Greiner Bio-One GmbH			Thomas Schreiber
47	Switzerland	Tribotron AG			David Ziltener
48	Switzerland	Epithelix Sarl			Samuel Constant
49	Switzerland	Huberlab AG			Yvette Hatebur
50	Switzerland	Systemex Suisse AG			Alain Gehrig
51	Switzerland	Weidmann Plastics Technologies AG			Kurt Eggmann
52	Switzerland	3Brain GmbH			Kilian Imfeld
53	Germany	Praeventicon GmbH			Ellen Fritsche
54	Germany	CellTool GmbH			Karin Schütze



2014					
ACADEMIA					
55	Switzerland	Baermed Centre for Abdominal Surgery	THTC Lab		Hans Ulrich Baer
56	Austria	University of Natural Resources and Life Science (BOKU)	Department of Biotechnology	Cell and tissue engineering	Cornelia Kasper
INDUSTRY					
57	Switzerland	Hightechzentrum Aargau AG			Rudolf Tanner
58	Germany	Bioregeneration GmbH			Friedo Schröder
59	Belgium	JSR Micro N.V.			Hanssens Ides
60	Switzerland	BioTissue AG			Eszter Tanczos
61	United Kingdom	Reinnervate Ltd.			Richard Rowling
62	Finland	UPM			Pia Nilsson



2015

ACADEMIA

63	Germany	Fraunhofer-Institut für Grenzflächen- und Bioverfahrenstechnik IGB	Translationszentrum »Regenerative Therapien für Krebs- und Muskuloskelettale Erkrankungen« – Institutsteil Würzburg	In-vitro-Testsysteme	Heike Walles
64	Switzerland	Swiss Tissue Culture Society (STCS)	FAMH Medizinische Genetik Universitätsspital Basel	Medizinische Genetik	Friedel Wenzel
65	Switzerland	SUPSI	Department of Innovative Technologies	Laboratory of biomedical and pharmaceutical technologies	Giuseppe Perale
66	Switzerland	University of Zurich	Institute of Physiology		Carsten Wagner
67	Switzerland	CHUV	Department of Psychiatry	Center for Psychiatric Neuroscience	Kim Do Cuenod

INDUSTRY

68	Switzerland	Phonak AG			David Wäckerlin
69	United States	Cellular Dynamics International Inc.			Augustin Martin
70	Italy	IVTech SRL			Tommaso Sbrana
71	Switzerland	Neurix SA			Mathurin Baquie
72	Switzerland	Culture collection of Switzerland AG			Silvano Landert
73	Switzerland	Philip Morris Product S.A.			Stefan Frentzel
74	Switzerland	Cell Culture Technologies			Ferruccio Messi
75	France	Celenys			Adrien Decheix
76	Switzerland	Promega AG			Joanna Stevenson
77	Switzerland	Roche Diagnostics International Ltd	Professional Diagnostics	Companion Diagnostics	Yvonne Greber
78	Switzerland	Maco Pharma International GmbH			Beny Scherer
79	Switzerland	Vitaris			David Bosshard



This report shows status of TEDD members until first half of 2015. Below listed are members that joined TEDD after June 2015.

Country	Company	Department	Group	Main contact
ACADEMIA				
Switzerland	Hôpitaux Universitaires de Genève	Le service d'ophtalmologie	Groupe thérapie génique DMLA et biomatériaux	Martina Kropp
Switzerland	Institute iPrint			Fritz Bircher
Switzerland	Swiss Institute for Regenerative Medicine			Antonino Tramonte
INDUSTRY				
Switzerland	CellSpring AG			Christopher Millan
Switzerland	Corning Life Sciences			Beate Gehret
Switzerland	FGen GmbH			Andreas Meyer
Switzerland	Microsynth AG			Christoph Grünig
Switzerland	Ectica Technologies			Bejamin Simona
Switzerland	BioTek Instruments GmbH			Juerg Wetterwald



Appendix 2

Table 2: TEDD Network Projects

Titel	Amount CHF	Academia share	Industry share	Date approved	Funding insitution	Main applicant	Co-applicant academic	Co-applicant industrial
2015								
Bioprinted kidney model for nephrotoxicity assessment	498'550.00	498'550.00	N/A	23.07.2015	SNF (precoR) 20PC21_16 1566 / 1	ZHAW, Prof. Dr. Ursula Graf-Hausner	Universität Zürich, Prof. Dr. Carsten Wagner	-
Entwicklung eines 3D in vitro Systems zur Bestimmung der immunsuppressiven und kollagenstimulierenden Wirkung von kosmetischen Wirkstoffen	587'096.00	216'020.00	371'076.00	03.07.2015	KTI Projekt 17849.1	ZHAW, Dr. Matthes Stephanie	-	Rahn AG, Stefan Hettwer
Skin Layer Detection	880'662.00	367'682.00	512'980.00	01.05.2015	KTI Projekt 17850.1	NTB, Prof. Dr. André Bernard	ZHAW, Dr. Matthes Stephanie	Pantec Biosolution AG, Roland Winteler
Liver bioprinting	23'500.00	10'000.00	13'500.00	18.06.2015	Cash, Novartis	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	Novartis Institutes for BioMedical Research, Dr. Armin Wolf



Microfluidic two-tissue platform for combined drug efficacy and toxicity testing	2'180'864.00	705'676.00	1'475'188.00		KTI	ETHZ, Dr. Olivier Frei	-	InSphero, Hoffmann-La Roche, Dr. Adrian Roth
2014								
A novel multiwell device for drug development with bioprinted 3D human tendon and skeletal muscle tissues	1'438'633.00	867'903.00	570'730.00	03.01.2014	KTI	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	Weidmann Medical Technology AG, Kurt Eggmann, Novartis Institutes for BioMedical Research, Dr. Hansjörg Keller, regenHU Ltd., Marc Thurner
Establishment of a platform for the study of liver disease (fibrosis) in vitro	445'662.00	213'852.00	231'810.00	01.05.2014	KTI	FHNW, Dr. Laura Suter-Dick	-	InSphero AG
3D bioprinting of renal proximal tubuli	30'000.00	N/A	30'000.00	25.09.2014	Cash, Hoffmann-La Roche	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	Hoffmann-La Roche, Dr. Adrian Roth
Wirkungstest von MMP-Inhibitoren in 3D Zellkultur	10'000.00	10'000.00	N/A	15.02.2014	Anschub, biotechnet	ZHAW, Prof. Dr. Ursula Graf-Hausner	ZHAW, Prof. Dr. Rainer Riedl	InSphero, Dr. Jens Kelm



Entwicklung eines komplexen <i>in vitro</i> -Modells für Nierengewebe mittels Bioprinting	10'000.00	10'000.00	N/A	15.07.2014	Anschub, biotechnet	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	Hoffmann-La Roche, Dr. Adrian Roth
Medikamentenentwicklung mit 3D Knochentumorgewebe	20'320.00	N/A	20'320.00	24.10.2014	Anschub intern, ZHAW	ZHAW, Prof. Dr. Ursula Graf-Hausner	Uniklinik Balgrist, Prof. Dr. Roman Muff	-
Development of BioInk Produktion for regenHU	35'920.00	N/A	35'920.00	12.03.2014	Cash, regenHU	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	regenHU Ltd., Marc Thurner
Self-assembling peptides for regeneration of the periodontal ligament	1'663'125.00	1'233'055	430'070	01.11.2014	KTI	ZHAW, Dr. Matthes Stephanie	-	Credentis
2013								
Development of BioInk Produktion for regenHU	8'220.00	N/A	8'220.00	25.09.2013	Cash, regenHU	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	regenHU Ltd., Marc Thurner
2012								
Skin Bioprinting: an innovative approach to produce standardized skin models on demand	575'050.00	311'872.00	263'178.00	01.06.2012	KTI 14331.1 PFLS-LS	ZHAW, Prof. Dr. Ursula Graf-Hausner	BFH-TI, Prof. Christoph Meier	regenHU Ltd., Marc Thurner



3D <i>in vitro</i> Muskelfaser-Modell	5'000.00	N/A	5'000.00	25.11.2012	Cash, Novartis	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	Novartis Institutes for BioMedical Research, Dr. Hansjörg Keller, regenHU Ltd., Marc Thurner
Entwicklung eines Knochentumor-Modells mit der „hanging drop“-Methode	10'000.00	10'000.00	N/A	15.09.2012	Anschub, biotechnet	ZHAW, Prof. Dr. Ursula Graf-Hausner	Uniklinik Balgrist, Prof. Dr. Roman Muff, Prof. Dr. Bruno Fuchs	InSphero, Dr. Jens Kelm
Applikationsrelevanter Bioassay zur Vorhersage allergischer Hautreaktionen	854'404.00	364'560.00	489'844.00		KTI 13484.1;4 PFFLE-LS	ZHAW, Prof. Dr. Ursula Graf-Hausner	-	Givaudan CellnTech