

Vitaport: A Learning and Artistic Path for Public Outreach on Transporter Biology, Health and Drug Discovery

Valentina Rossetti^a and Jean-Louis Reymond^{*b}

Abstract: On the occasion of its conclusion, the National Center of Competence in Research (NCCR) TransCure launched a temporary learning and artistic path in the city of Bern named ‘Vitaport – Was unser Körper transportiert’. The path explained how nutrients are transported through our body and how molecules find their way to the right organ to achieve their effect there. NCCR TransCure researchers, together with students of the Bern School of Design, developed ceramic objects, texts and information graphics that took the public on a multidisciplinary journey of discovery through the human body. In this article, we report about aims, development, challenges and outcome of this ambitious science outreach project in which we could experience a rewarding and successful collaboration between scientists and artists.

Keywords: Drug discovery · Health and medicine · Membrane transport · Public outreach · Science communication



Valentina Rossetti pursued her bachelor and master studies in Applied Mathematics in Milano (IT) and successively obtained a PhD in theoretical evolutionary biology at the University of Zurich (CH). Afterwards, she decided to pursue a career in research management and completed continuing education degrees in this field and in scientific journalism. In the past, she coordinated a Swiss-wide PhD program based

at the University of Zurich and worked as scientific coordinator at the Neurology department of the Bern University Hospital. Valentina joined the NCCR TransCure team as Scientific Officer and Communication Delegate in August 2015 and remained in the network until its conclusion in 2022. Currently, she works on strategies and programs for the management of transmissible diseases at the Federal Office of Public Health in Bern.

1. Introduction

The National Centers of Competence in Research (NCCRs) are long-term funding schemes of the Swiss National Science Foundation that support research in specific fields with a high relevance for the society. Besides science, NCCRs are also active in management areas such as technology transfer, equal opportunities, and communication, including public science outreach. The spectrum of outreach activities in which scientists can engage is broad, and can target specific groups (*e.g.* children or schools) or generally the local population.^[1,2] A major distinction can be made between disseminating and participative activities. These two paradigms of science communication stress respectively the one-way transmission of scientific content to the public and the two-way, dialogue-based interaction between scientists and citizens.^[3,4]

The aims of science communication are manifold: typically, it increases awareness, interest, opinion-forming, and understanding^[2,5] but can be also used to generate political support for sci-

ence and to collect and make use of local knowledge.^[4] The importance of engaging in science communication outside academia was perceived already in the past: a report of the Royal Society in the 1980s (the ‘Bodmer report’^[6]) recommended the scientists to “*Learn to communicate with the public, be willing to do so and consider it your duty to do*”. Many scientists enjoy this type of activity and have a positive attitude towards it, however, many burdens hinder their engagement, such as lack of time, resources, adequate training and support of supervisors or institutions.^[7,8] Despite the challenges and complexity of this field, the NCCR TransCure increasingly worked on science communication during its lifetime (see Section 1.1). In this paper, we share our experiences with the latest and largest of our outreach activities, namely the realization of the learning path ‘Vitaport: what our body transports’, that led us to discover the potential of the collaboration between science and art.

1.1 Outreach Activities of the NCCR TransCure

The Swiss population appreciates the effort of researchers, is interested in scientific topics and participative projects, as one can read in the latest report of the Swiss Academy of Science^[1] and consulting the ‘Science Barometer Switzerland’.^[9] Along these lines, from the start of the NCCR TransCure in 2010, we regularly organized activities for children, such as open lab days, public events in collaboration with local institutions (*e.g.* Bern botanical garden) and we participated in science festivals such as the Night of Research (University of Bern) and the Scientifica (University of Zurich and ETHZ). We also had a long-lasting collaboration with the Parent Association of Highly Talented Kids, to which we offered four *ad hoc* courses in chemistry, biology and physiology. Besides events in presence, we produced a series of public videos about the NCCR TransCure projects,^[10] we issued two newsletters per year, and we were active *via* social media on Twitter and LinkedIn.

^{*}Correspondence: Prof. Dr. J.-L. Reymond^b, E-mail: jean-louis.reymond@unibe.ch; ^aInstitute of Biochemistry and Molecular Medicine, University of Bern, Bülhlstrasse 28, CH-3012 Bern, Switzerland; ^bDepartment of Chemistry, Biochemistry and Pharmaceutical Sciences, University of Bern Freiestrasse 3, CH-3012 Bern, Switzerland

2. Vitaport: Development and Outcome

In 2020, although challenged by the pandemic, the NCCR TransCure was planning the last years of activities. In this time, we elaborated the idea of a closing, major outreach event that would bring the topic of the network – membrane transport – closer to the population and illustrate its relevance in health and medicine. We envisaged the creation of a temporary learning path in Bern for summer 2022, possibly close to the popular river Aare, that winds through the city and was an important transportation route in the past.

After intensive brainstorming, based on the suitability of topics and the availability of the scientists, we defined three subtopics, matched by three research projects within the NCCR TransCure, that would compose the path:

- iron transport, connecting to our focus on the structural biology and physiology of iron transporters in health and disease;^[11,12]
- endocannabinoid transport system, related to the discovery of a novel pathway for this important regulatory phenomenon in the brain;^[13,14]
- transport of amino acids through the body, related to an ongoing NCCR TransCure project aimed at a novel treatment approach for cancer.^[15,16]

The title ‘Vitaport: what our body transports’, thanks to the combination of ‘Vita’ for life and ‘port’ for door, conveyed the idea of membrane transporters as gates enabling vital processes. We also planned a series of public seminars on related topics where the public could meet the researchers.

2.1 Teaming up with Artists

At the same time, we found that such complex topics needed a ‘partner’ to become more appealing to the non-academic public – why not art? Although we had no clear idea about the type of art that could fit the scope, we searched for a suitable institution ready to collaborate and we made a find with the School of Design Bern and Biel (*Schule für Gestaltung Bern und Biel*). This vocational school provides professional training to 15–18 years old students in several artistic fields.

Within about 5 months (Jan–Jun 2021), we agreed with the school on the project plan: four stations made of illustrated content panels, ceramic sculptures and QR codes (linking to a dedicated website providing more insights), in the Elfenau park in Bern (in the proximity of the river Aare), from mid-August to mid-October 2022. The sculptures would be a free interpretation of the scientific content by the students of the School of Design and work as eye catcher. We decided to develop the exhibition in German only, as we wanted to target the local population, and adding more languages could not be accomplished with the available resources. The school involved four classes to work on the project: polydesign, graphics, ceramic and interactive design. After a kick-off event (Aug 2021), several bilateral meetings followed, that became more frequent in the final phase (Apr–Jul 2022). While we carefully reviewed the scientific texts to ensure correctness and proper storytelling, we left substantial freedom to the artists in terms of graphics and ceramic sculptures.

2.2 Acquiring Financial Support for the Project

For the realization of Vitaport we forecasted expenses for material costs, IT services, advertising campaign, formal permissions, and organization of related events, for a total of about 80'000 CHF, part of which was covered by the budget of the NCCR TransCure. The fundraising activity started in spring 2021 as soon as the project plan was defined. On one side, we secured the support of the University of Bern, which provided recommendation letters useful for grant applications, and a deficit guarantee. On the other side, we applied to several foundations based in Switzerland. Major contributions have been received by

the Gebert Rüf Foundation, which has a specific area of activity dedicated to science communication (‘Scientainment’), from the Jubiläumsstiftung der Mobiliar and the Johanna Dürmüller-Bol Foundation. Further, we acquired smaller contributions from the Burgergemeinde Bern and the IBSA Foundation for Scientific Research. The fundraising campaign was successfully concluded and the obtained funding, together with part of the deficit guarantee of the University of Bern, covered all the expenses.

2.3 The Path in the Elfenau Park

On August 12th, 2022, we officially opened Vitaport in the Elfenau park, with October 16th, 2022 as the closing date. This area, easily reachable by public transportation in about 10 minutes from the city center, is crossed by many people going for a walk or swim in the Aare and is well known for local cultural activities. The Vitaport path was a circular walking trail, accessible to wheelchairs and strollers, to be covered in about 30 minutes. There was no entrance ticket and was freely accessible to the public. Each station was complemented by a QR code to access a dedicated website where we published additional information, video animations, a feedback form, and quizzes. The Vitaport exhibition resulted in an extremely variegated and original collection of artistic and scientific content.

2.3.1 Admiring a Cell

The path started with an *introductory station* (Fig. 1a) encompassing the map of the exhibit, information about the organizing institutions and basic concepts of membrane transport such as the structure of cellular membranes and the types of transport through the cells (ATP pumps, ion channels, carriers, etc.). A pierced, white ceramic column was placed nearby (Fig. 1b). This sculpture, with its green-glazed holes sprouting some from inside and some from outside, was reminiscent of a cell or a membrane, and represented the idea of transporters as gates enabling passage of substances. Interestingly, one could also hear ‘noises’ from the underlying terrain through the holes. This effect was not made on purpose, but it made the ceramic cell almost ‘alive’ and was appreciated by the visitors.

2.3.2 Elegant Iron Transport

The second station, about *iron transport*, displayed a diverse graphical implementation. The first two panels illustrated the content as in a children’s book, with pastel colors and soft traits (Fig. 1c). Here we depicted, in the form of a short story, how iron is absorbed in the gut and is transported in the blood. We also introduced some facts about iron-related diseases such as anemia and hemochromatosis, and iron-rich nutrition. The third panel dealt with research methods and open questions, showing the importance of scientific research in this field. This panel’s graphic was a contrast in comparison to the other two, since it had a dramatic character resulting from black and white, severe traits. The three sculptures behind the panels dominated with their elegant look and reddish color reminding iron and blood and could be seen as blood cells, blood vessels or intestinal walls (Fig. 1d). For the art students, the creation of these objects was a methodological challenge due to the dimensions and the curvy, intersecting shapes.

2.3.2 A Forest of Synapses

At the third station dedicated to *endocannabinoids*, fifteen ceramic ‘buttons’, mounted on thin supports, arose from the ground as if they were mushrooms or a colored forest (Fig. 2a). With their blue-green tones and sophisticated engraving on their surfaces, they were intended to represent brain synapses, their complexity and large number. As the art students explained, these sculptures encompassed two different styles, namely a minimalistic, clean design (the white supports) and a more gentle, flowery one (surface lines). This station dealt with the function, significance for



Fig 1. The start and the 'Iron transport' stations. a) Basic information about the exhibit and membrane transport are displayed. b) The large 'living cell' ceramic illustrate a cell and its membrane traversed by a complex network of transporters and channels and attracted the curiosity of visitors. c) The panels illustrate the science with very different styles: soft traits and colors for the basics of iron transport, black and white for the research questions. d) The reddish sculptures may represent blood or intestine vessels.

health and transport mechanism of endocannabinoids. The first panel, with a large representation of brain cells in the background, introduced the concepts of endocannabinoids, neurotransmission, and synapses. The second panel, through a schematic abstraction, conveyed information about endocannabinoid production, transport and degradation. Finally, the third panel, by mean of graphics in children's book style, focused on the consequences on mood of balanced vs imbalanced level of endocannabinoids in the brain (Fig. 2b). Here, we also referred to the novel therapeutic approaches explored by the NCCR TransCure spin-off Synendos Therapeutics.^[17]

2.3.2 Mysterious Amino Acids

The last station, about amino acid transport, illustrated with graphical creativity some basic information about amino acids as well as their relevance as a target in cancer research. After introducing the concepts of proteins and of amino acids as their building blocks, we illustrated the transport of amino acids in the cell through the membrane. These two panels showed a marked graphical creativity: for example, clusters of aluminum foil and pearl necklaces inspired the representation of amino acid chains, proteins and membrane transporters (Fig. 2c). The last panel focused on applications in the medical field. The paintings used metaphoric images to represent the therapeutic approach, for example a cork placed on transporters to depict the inhibition of transport. The accompanying sculpture, resembling a big snake, composed by a round, donut-like piece and a two-arch part, was the most enigmatic of the path: attracting not only for the shape, but also for the vivid colors and striated pattern, it could be interpreted in several ways (Fig. 2d). The idea behind this object was that the visitor could sit between the two pieces and 'become' a membrane transporter enabling the amino acid (the round part) enter the cell through the membrane (the arched part). The child in Fig. 2d well represents the concept!

2.4 Advertisement and Monitoring

Vitaport was advertised through digital and analogue channels, such as social media, websites, flyers and postcards distributed to various institutions, a T-shirt with the logo (Fig. 3) and an advertising spot in Radio Bern 1 and a campaign in buses and trams of Bern and the region. About 15% of the overall budget was dedicated to advertisement and promotion. This investment of resources allowed us to reach a wide public at the local level: for example, the Bernese public transportations are used by about 70. Mio passengers per year,^[18] while the local Radio Bern 1 is listened by on average 58'000 people daily.^[19] Flyers could be distributed also at large events such as the Night of Research of the University of Bern, in September 2022, attended by ca. 10'000 visitors.^[20] We organized a press release and an official opening with media, and we had a good coverage in regional newspapers and radio journals. Vitaport was also included on the official cultural program of the City of Bern for Autumn 2022. The Department of Chemistry, Biochemistry and Pharmaceutical Sciences of the University of Bern supported the advertisement by featuring Vitaport in the program of the 'BioChemie am Samstag 2022' activity. Finally, we offered a few guided tours to academic and non-academic selected groups. Visitor monitoring was a major challenge. First, the path was exposed to vandalism: right after the opening, the starting station was damaged by sprayers and consequent cleaning and protection through a special anti-graffiti transparent film were needed. Second, since no registration or ticket were necessary, we could not count visitors systematically, and we had to rely on feedback through the website, website usage and random personal observation.

2.5 Accompanying Events at Botanical Garden

In August and September 2022, in parallel to the exhibition, we organized four public lectures at the Botanical Garden of the



Fig. 2. The 'Endocannabinoid transport' and 'Amino acid transport' stations. a) Visitors looking at the ceramic 'synapses' that illustrated the brain's complexity. b) The panels illustrate the scientific content starting with the brain structure and continuing with insights into the endocannabinoid system. c) Simple objects such as a tinfoil ball or pearl necklets inspired the representation of an amino acid and transporters. d) The snake-like sculpture interpreting the concept of amino acid transport was appreciated by children.

University of Bern. The topics encompassed bioelectricity in plants, psychoactive plants, iron transport in pregnancy and usage of natural substances in the development of cancer therapies. The seminars included interactive parts in which the public was directly involved by asking questions and engaging in simple experiments. The events were advertised through the Vitaport communication channels and by the botanical garden that included them in their official agenda and flyer.

3. Conclusion and Outlook

The realization of Vitaport required a major coordination effort and project management within and between the NCCR TransCure and the School of Design, a solid fundraising, and the support of public institutions such as the University of Bern and the city of Bern (e.g. for permission to use public ground). At the same time, it provided a unique opportunity of collaboration between scientists and artists, and in particular with young

apprentices without exposure to science besides mandatory schooling.

In terms of communication, the first challenge was for researchers to simplify their language, convey correct information, and create a narrative for their content. As a second challenge, when art was put in place, they needed to familiarize with further simplification, interpretation, abstraction, and new ways of rendering. This implied a substantial 'unclasp' of 'their' science, letting this becoming the basis for the artistic creation. While such a process encompassed challenging aspects, it disclosed an unexpected potential. Indeed, we experienced the power of graphics and sculpture in the storytelling: the diverse techniques used for the panels and the ceramics allowed for the communication of many topics without overwhelming the visitor.

Although the learning path was based on a one-way, dissemination paradigm, it was complemented by a significant two-ways communication aspect: on one side, the information exchange with the artists represented a first and fundamental step of science communication and allowed both parties to learn from each other's perspective and approaches. On the other side, meeting the public at the botanical garden seminars has been an opportunity for spontaneous dialogue with the citizens. Overall, Vitaport enabled us experience how art and science can join forces to reach the broad public and we very much hope that this project will inspire more researchers in exploring new types of public outreach about science.

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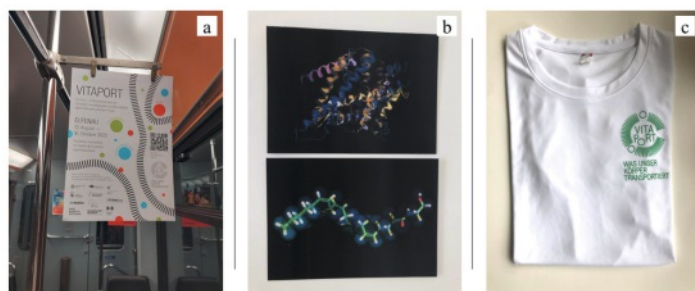


Fig. 3. Advertising material. a) Flyer of Vitaport hanging in a Bernese bus. b) Hologram cards displaying a 3D-model of an iron transporter (upper card) and of the endocannabinoid anandamide (lower card). A caption explaining the image and an advertisement for Vitaport was printed on the backside (not shown). c) Vitaport T-shirt with the logo.

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