

Fostering nutrition research in Switzerland

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Most of us don't organize our daily lives to optimize our long-term health; yet we do prepare or make decisions about the food we eat every day!

1. Challenges and chances for nutrition research

Nutrition research is currently experiencing a revolution mainly driven by spectacular developments in analytical sciences in biology and bioinformatics. Nutrition is characterised by the complexity of the interactions taking place between foods and the human organism. Indeed, foods are composed of thousands of nutrients which interact with the human organism. Each of these nutrients undergo a complex and subtle array of processes including their digestion, absorption, distribution, metabolism and excretion. Scientists now have access to powerful and sensitive analytical technologies that allow them to measure and analyse, not yet fully understand, these interactions. As a consequence of these technological possibilities, scientists realize more and more that they can no longer consider human subjects participating in their studies as anonymous members of a group of subjects and that each of these persons react individually to the ingestion of foods. This observation opens the door to personalized nutrition, what resonates in media and raises big hope at the consumer side. Nutrition research is therefore about to come of age and lose its image of a pseudo-science, falsely attributed by media and the public, exactly because of the complexity of the interactions taking place between foods and the organism.

Yet, the double burden of malnutrition (undernutrition and overnutrition) is gaining momentum worldwide so that the questions of both access to sufficient calories and nutritional quality of these calories are not globally resolved. To date dietary risk factors account for 22% of deaths worldwide and 15% of deaths in Western Europe (Christopher et al, 2019). The risk of suboptimal diets is higher than any other global risk including tobacco smoking. Solving these issues requires that a sufficient number of reliable biomarkers be available in order to more accurately assess food intake and nutrient metabolism in intervention studies as well as the behaviour of consumers in observation studies.

Also, our planet is under the strong ecological pressure induced by human activities, and the agricultural production is one important element of this eco-

logical pressure. Key questions have emerged during the last decade in particular the ecological impact of foods of animal origin. This pressure towards changing dietary patterns is further strengthened by ethical issues related to animal welfare.

Nutrition research is therefore globally faced with important challenges that need solutions. Governments and health authorities have recognized these issues and developed nutrition strategies for the coming decades that are, not surprisingly, very similar across the globe (see next section). In order for Swiss nutrition research to contribute efficiently to this global effort, and to be at the research forefront both internationally at the academic level and nationally on applied sciences, researchers working in this field in Switzerland need to come together to raise their competences and research delivery to the level that will be expected from them by the consumers, authorities, and economic actors in the near future. The Swiss nutrition researchers propose to reach this goal within a decade by creating a National Centre of Competence in Research (NCCR) "Healthy Nutrition".

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Fabian Wahl, Dr. rer. nat., ist Mitglied der Geschäftsleitung Agroscope und verantwortet den Strategischen Forschungsbereich « Mikrobielle Systeme von Lebensmitteln ». Nach dem Studium in Chemie an der Universität in Freiburg (D) promovierte Fabian Wahl ebenfalls in Freiburg, in organischer und analytischer Chemie bei Prof. Dr. Horst Prinzbach. Seine Doktorarbeit trägt den Titel « Die Pagodan-Route zu Dodecahedranen – ein verbesserter Zugang zum C₂₀H₂₀-Grundgerüst und totale Funktionalisierungen » (H. Prinzbach *et al.*, Nature, 2000, 407, 60–64.). Vor Agroscope arbeitete Fabian Wahl bei der Merck Group, einem in den Bereichen Healthcare, Life Science und Performance Materials international führenden Wissenschafts- und Technologieunternehmen. Als Head of New Business im Bereich Strategy & Transformation der Merck KGaA war er mitverantwortlich für die Entwicklung und Implementierung einer neuen Konzernstrategie aufbauend auf den zentralen Pfeilern Digitalisierung und Innovation. Zuvor arbeitete Fabian Wahl seit 1993 bei Sigma-Aldrich, die 2015 von Merck übernommen wurde. Bei diesem weltweit führenden Hersteller und Händler von chemischen, biochemischen und pharmazeutischen Forschungsmaterialien war er zuletzt Global Director Corporate Development. In dieser Funktion leitete er ein globales Expertenteam (Schweiz, USA, UK und Indien) und war für das analytische Portfolio zuständig. Forschungsprojekte u.a. in den Bereichen Analytik, Synthese, IoT, Blockchain spiegeln sich in zahlreichen Publikationen und Patenten wider.

2. International and national nutrition policies

The United Nations Decade of Action on Nutrition 2016–2025 aims at undertaking 10 years of implementation of policies, programmes and investments to eliminate malnutrition in all its forms with a program centred on six impacts (UN, 2016)

1. Sustainable, resilient food systems for healthy diets;
2. Aligned health systems providing universal coverage of essential nutrition actions;
3. Social protection and nutrition education;
4. Trade and investment for improved nutrition;
5. Safe and supportive environments for nutrition at all ages;
6. Strengthened governance and accountability for nutrition.

In the US, the strategic plan 2020–2030 for nutrition research developed by the National Institute of Health (NIH) is organized around a unifying vision of precision nutrition research including four strategic goals:

1. Spur discovery and innovation through foundational Research – What do we eat and how does it affect us?
2. Investigate the role of dietary patterns and behaviours for optimal health – What and when should we eat?
3. Define the role of nutrition across the lifespan – How does what we eat promote health across our lifespan?
4. Reduce the burden of disease in clinical settings – How can we improve the use of food as medicine?

The World Health Organisation (WHO) has developed a set of global targets to reduce the burden of non-communicable diseases (NCDs), which include a 25% relative reduction in the risk of premature mortality from NCDs, as well as a 30% relative reduction in mean population intake of salt or sodium, and a zero increase in levels of diabetes and obesity (WHO, 2013).

For Europe, the WHO has published the European Food and Nutrition Action Plan 2015–2020. The mission of this Action Plan is to achieve universal access to affordable, balanced, healthy food, with equity and gender equality in nutrition for all citizens of the WHO European Region through intersectoral policies. The following objectives of the Action Plan were set for Europe by WHO:

1. Create healthy food and drink environments;
2. Promote the gains of a healthy diet throughout life, especially for the most vulnerable groups;
3. Reinforce health systems to promote healthy diets;
4. Support surveillance, monitoring, evaluation and research; Strengthen governance, alliances and networks to ensure a health-in-all-policies approach.

However, Member States of the European Region are overall not fully on-track to achieve the global NCD targets related to nutrition. Therefore, if countries are to shift this trend, more ambitious and comprehensive nutrition policies should be implemented at a faster pace. Moreover, expanded and more robust surveillance, monitoring and evaluation systems should be prioritized in order to understand progress and to guide timely and effective policies (Breda *et al.*, 2020).

In Switzerland the vision of the Swiss Nutrition Policy 2017–2024 “Eating well and staying healthy” is that everyone living in Switzerland is able to choose a balanced and varied diet, possesses the skills to do so and has the necessary environment to autonomously maintain a healthy lifestyle irrespective of origin, socio-economic status and age”. The Swiss Nutrition policy defines four action areas

1. Information and education
2. Framework conditions
3. Coordination and cooperation
4. Monitoring and research.

3. The satellite 2019 meeting on nutrition research in Switzerland

Translating this vision requests concretizing actions. The 16th edition of NuGOweek, the annual conference of the international nutrigenomics organisation NuGO, organized in Bern between 9th and 12th September 2019 and entitled “From Foodomics to Nutrigenomics: Translating food composition data into healthy Diets” was the occasion to address the future of nutrition research in Switzerland.

A meeting entitled “Filling in the Gaps in Swiss Nutritional Research – the Stakeholders’ Perspective” took place in Berne on 12 September 2019 with the participation of 71 experts from around 45 different institutions. Stakeholders from the spheres of nutritional research, agriculture, the food and nutrition industry, nutritional counselling and public health were represented. The satellite meeting aimed to promote innovative nutritional research in Switzerland. A report primarily directed at participants in the satellite meeting, as well as decision-makers in the sphere of Swiss nutritional research is available (Mühlemann, 2019). Although this lays no claim to completeness, its findings can be considered representative of the Swiss nutritional research landscape.

The satellite meeting showed that the different stakeholder groups have numerous interests in common. Despite the high relevance of thematic gaps in Swiss nutritional research, the experts unanimously agreed that their top priority should be looking into setting up a Swiss Centre of Excellence for Nutritional

Research. This conclusion resulted in the following recommendations:

1. The creation and regular updating of a National Nutrition Research Strategy as an orientation aid for all nutrition research professionals;
2. Creating a “nutrition science quality initiative” to improve the quality of Swiss nutritional research;
3. Promoting collaborative research at national and international level;
4. Promoting exchange or networking between nutritional researchers at national and international level; promoting dialogue between research and practice, and raising the profile of Swiss research;
5. Bundling the financing for nutritional research in Switzerland, and increasing transparency in this domain;
6. Improving the quality of information and boosting confidence in nutritional research, thereby increasing credibility.

A number of structural weaknesses in the Swiss nutritional research landscape were identified back in a 2010 expert survey. Various measures suggested at the time were also mentioned at the satellite meeting, including promoting interdisciplinary nutritional research and strengthening the topic of nutrition at policy level.

Many of the weaknesses and gaps discussed (e.g. the lack of reproducibility of scientific findings) are not the exclusive problem of nutritional research, but affect all life-science fields. However, owing to the complexity of nutritional science (ingredient interactions, the complex effects of the ingredients in the human body, various factors influencing eating behaviour, etc.), the weaknesses and gaps in nutritional research were more prominently highlighted. The report of the satellite meeting concluded that time has come to speak with one voice, *inter alia* in order to strengthen confidence in nutritional research. The will of the different stakeholder groups to shape the future of nutritional research in Switzerland together was also palpable. The satellite meeting finally called for concrete action.

4. The NCCR Healthy Nutrition initiative

As a follow up of the 2019 satellite meeting, a series of meetings took place in 2020 with a wide range of stakeholders from the food and nutrition landscape. During these meetings, a decision was taken to bundle Swiss nutrition researchers towards the joint submission of a National Centre of Competence in Research at the occasion of the next call by the Swiss National Science Foundation (SNF).

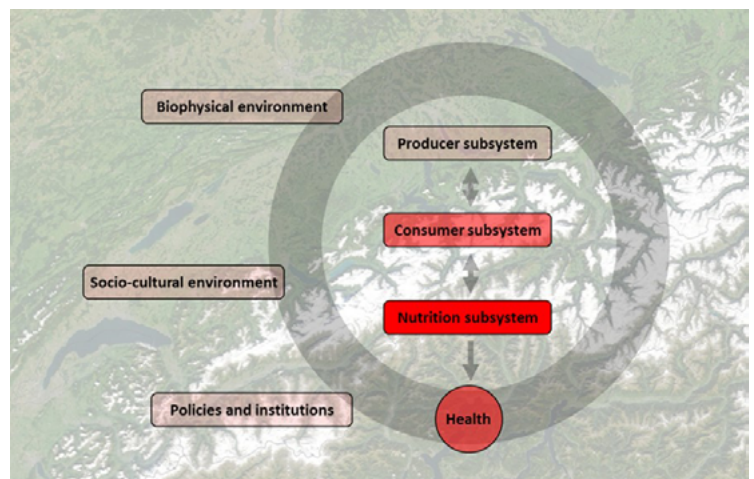
Although a date for the next call for NCCR proposals has not been communicated yet, the authors prepare

for a call in 2024–2025. To this end, a Task Force “Swiss Research Network – Healthy Nutrition (SRN-HN)” composed of two representatives from ten research institutes involved in nutrition research has started its activities in October 2020. The following institutes are represented in the Task Force: Agroscope, Berner Fachhochschule BFH, École polytechnique fédérale de Lausanne EPFL, Fernfachhochschule Schweiz, Haute école spécialisée de Suisse occidentale HES-SO, Swiss Vitamine Institute, Université de Lausanne, Universität Zürich UZH, ETH Zürich, Zürcher Hochschule für Angewandte Wissenschaften ZHAW. The Task Force has set an agenda with the aim of framing the main lines of the NCCR Healthy Nutrition until the middle of 2021.

A key question was the scope of the nutrition research that should be conducted in the broader context of food and nutrition systems. In that regard, the Task Force confirmed the outcome of the 2019 satellite meeting as well as of the stakeholder meetings 2020 to focus the research frame of the NCCR on the “nutrition subsystem”, including in particular the impact of nutrition on health and consumer sciences. The NCCR Healthy Nutrition will however leave room to important components of the nutrition system including food sciences (producer subsystem), public health (policies and institutions), and sustainability (socio-cultural environment; biophysical environment) (see Figure).

The first decision of the Task Force was to define the title of the NCCR. The Task Force proposed the title “Healthy Nutrition” to highlight the preventive nature of nutrition to support human health. The Task Force then defined a series of research question that should be addressed by the research projects to be advanced by the NCCR Healthy Nutrition.

1. How does nutrition impact on human health?
2. How can Swiss consumers be encouraged to eat healthy diets?



3. How can precision nutrition foster health?
4. How can technologies contribute to healthy nutrition?
5. How can food innovation be driven by health?

These research questions set the frame for defining the main research projects that will be addressed by the NCCR Healthy Nutrition. The Task Force is currently defining these research questions. The NCCR Healthy Nutrition aims at bundling forces in the nutritional landscape to build a strong Swiss nutrition research, which reaches excellence in the international scene as well as impacts on the health of Swiss citizen. The NCCR Healthy Nutrition will therefore federate Swiss research institutes in academic institutions (universities, ETHZ/EPFL), applied research institutions (Agroscope, universities of applied sciences) as well as non-profit organizations (Swiss Vitamin Institute...). It will also closely collaborate with professional societies in the food and nutrition sector. As the research conducted by the NCCR Healthy Nutrition must translate into solutions that impact on consumer food choice and health, the NCCR will create a scientific board with members of stakeholders in the nutrition sector. As food production and transformation is key to consumer health and dietary choice, the food sector will also be represented in the scientific board.

As mentioned at the beginning of this article, metabolic diseases, with its main physiological and clinical manifestations – dyslipidemia, insulin resistance,

hypertension, type 2 diabetes and cardiovascular diseases – impose a heavy burden on society, also in Switzerland. As nutrients are key in shaping human metabolism, nutrition provides a key entry point for scientists to develop and encourage the implementation by the consumers of dietary solutions that will mitigate metabolic diseases. The NCCR initiative Healthy Nutrition will therefore centre its research program on the topic of metabolic health. To this end, the network of scientists contributing to the NCCR initiative will propose a translational research that will evaluate the impact of nutrition, be it nutrients, foods and dietary patterns of plant and animal origin, across a wide range of scientific disciplines including food sciences, mechanistic molecular research on cells, animal models and human subjects, nutritional intervention and observational studies in human cohorts, in particular with the establishment of a Swiss nutrition cohort, consumer sciences and public health nutrition. The concept developed by the initiative NCCR Healthy Nutrition is still in a dynamic phase and, thus, evolving.

The Task Force NCCR Healthy Nutrition is currently building the research network around the program metabolic health, and the first granting initiatives to gradually establish this network will be started at the national level in fall 2021. If successful, Switzerland will have a strong competitive research community in the field of nutritional research that will be able to respond to the important nutritional challenges awaiting the Swiss society in the next decades. ■

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