

1 **Proceedings of the Inaugural International Summit for Medical Nutrition Education and**
2 **Research**

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52 (CL) and Lauren Ball (LB) and Sumantra Ray (SR) brought all sections together. All authors
53 contributed to the delivery of the Summit, writing of the manuscript and agreed on the submission.

54

55 ABSTRACT

56

57 Medical nutrition education (MNE) has been identified as an area with potential public health
58 impact. Despite countries having distinctive education systems, barriers and facilitators to effective
59 MNE are consistent across borders, demanding a common platform to initiate global programmes.
60 Therefore, a shared approach to supporting greater MNE is ideal to support countries to work
61 together. In an effort to initiate this process, the *Need for Nutrition Education/Innovation*
62 *Programme* (NNEdPro) group, in association with their strategic partners, hosted the inaugural
63 *International Summit on Medical Nutrition Education and Research* on August 8, 2015 in
64 Cambridge, United Kingdom (UK). Speakers from the UK, the United States, Canada, Australia,
65 New Zealand, Italy, and India provided insights into their respective countries including their
66 education systems, inherent challenges, and potential solutions across two main themes: (1)
67 *Medical Nutrition Education*, focused on best practice examples in competencies and assessment;
68 and (2) *Medical Nutrition Research*, discussing how to translate nutrition research into education
69 opportunities. The Summit identified shared needs across regions, showcased examples of
70 transferrable strategies and identified opportunities for collaboration in nutrition education for
71 healthcare (including medical) professionals. These proceedings highlight the key messages
72 presented at the Summit and showcases opportunities for working together towards a common
73 goal of improvement in MNE to improve public health at large.

74 **Introduction**

75 On August 8, 2015 in Cambridge, United Kingdom (UK), the *Need for Nutrition*
76 *Education/Innovation Programme* (NNEdPro) group hosted the inaugural *International Summit*
77 *on Medical Nutrition Education and Research*. Speakers for the event were from the UK, the
78 United States (US), Canada, Australia, New Zealand (NZ), Italy, and India. The presentations were
79 divided into two main themes: (1) Medical Nutrition Education (MNE), with a focus on best
80 practice examples in competencies and assessment; and (2) Medical Nutrition Research (MNR),
81 with a focus on translating research into education opportunities. Key organisations in attendance
82 are described in Table 1. Pre and post-meetings provided opportunities for key attendees to discuss
83 potential projects, collaborations and ideas generated by the Summit.

84 85 *NNEdPro Background*

86 The NNEdPro group is an independent knowledge generation, transfer/exchange and evaluation
87 platform¹. The group represents a strategic interdisciplinary partnership between doctors,
88 dietitians, nutritionists, researchers, nurses and other healthcare professionals. It is composed of
89 several partner organisations (Table 1). In 2014, the NNEdPro group launched the Global
90 Innovation Panel (GIP), with the intent to promote international initiatives and knowledge
91 exchange on nutrition education innovations relevant to clinical and public health practice. One of
92 the key projects of the GIP was to arrange the inaugural International Summit on Medical Nutrition
93 Education and Research².

94
95 The NNEdPro group works closely with the American Society of Nutrition (ASN), and members
96 of its Medical Nutrition Council (MNC) sub-committee³. The MNC focuses on meeting the needs
97 of those ASN members interested in clinical, research, educational, and/or training aspects of
98 nutrition and metabolism as it relates to optimal health and the prevention and treatment of human
99 disease. Objectives of ASN and MNC align well with the NNEdPro themes and the organizations
100 collaborated to organise the Summit.

101 102 **Aim of the Summit**

103 The aim of the inaugural Summit was to identify needs across regions and showcase examples of
104 potentially transferrable strategies related to implementation of MNE. Opportunities for
105 collaboration in nutrition education for healthcare (including medical) professionals were
106 identified. These proceedings highlight the key messages presented during the Summit and

107 opportunities for future collaboration (see Figure 1 for Summit goals and Table 2 for speakers and
108 key points).

109

110 **Theme 1: Medical Nutrition Education**

111 The importance of nutrition in medical and healthcare education has traditionally been
112 undervalued and widely neglected⁴⁻⁶. Despite evidence of continuing nutrition education neglect
113 in health care⁴⁻⁶, the development of nutrition care guidelines⁷ and a medical undergraduate
114 nutritional curriculum framework⁸, medical schools rarely implement nutrition-related material.
115 This situation poses a challenge to ensure that nutrition, whilst only a small element of the medical
116 curriculum, is demonstrated as important. It is important that doctors' crucial role is recognised in
117 ensuring nutrition is central to patient management and public health. As the emphasis on healthy
118 living increases, the demand by patients for education and tools to support their efforts to improve
119 their lifestyles will also intensify. Counselling patients in areas such as weight control, chronic
120 disease prevention, and living healthy generally, requires that health professionals have the
121 knowledge to provide clear, goal driven and evidence-based advice in nutrition.

122

123 *Medical Nutrition in the UK*

124 There are challenges that emerge when introducing the Undergraduate Medical Nutrition
125 Curriculum⁸ into a programme that is already “jam packed” with important subject matter.
126 Undergraduate medical students have many disparate areas to study, so having clear nutritional
127 outcomes that are signposted and assessed will support learning and develop students' confidence
128 in addressing nutritional issues as qualified practitioners. Using multiple strategies, including
129 problem based learning (PBL), case studies, lectures, symposia and student-selected components
130 will ensure nutritional content is accessible and feels “real” to the students. As presented, local
131 “nutrition champions” can be an asset to raise and then maintain the profile of nutrition and its
132 relevance to medical practice and patient care. Investing in a research and education dietitian as a
133 joint process between the local teaching hospital and medical school, also aims to provide
134 opportunities for embedding nutrition in the medical curriculum. This position signals a
135 commitment between education and practice that recognises the role of nutrition in the medical
136 care and management of patients.

137 *Medical Nutrition in the US*

138 The US perspective emphasised that deficiencies in nutrition education in US medical schools and
139 residency programmes have been noted for over 30 years⁹⁻¹². While curriculum hours and teaching

140 methods vary widely, nutrition educators suggest that a minimum of 25-hours is needed to train
141 medical students in nutrition¹²⁻¹⁴. Current trends in medical education are for team-based learning,
142 longitudinal learning environments, and inter-professional education, such as having students from
143 medical, nursing, physician assistant, occupational therapy, and pharmacy schools learning clinical
144 content together.¹⁵ This is an ideal time to ensure that all students and practicing health
145 professionals have a positive attitude towards nutrition, along with nutrition-related knowledge
146 and skills relevant to public health and practice. These attributes are needed to help their patients
147 improve their dietary behaviours to reduce, prevent, treat, and manage acute and chronic
148 diseases¹⁶⁻²¹.

149
150 In the US and Canada, the 2015 Liaison Committee on Medical Education (LCME) curriculum
151 incorporates nutrition into several sections^{16, 22}. Given that the LCME is the degree accrediting
152 organisation, nutrition content should be incorporated into all medical school curriculum to meet
153 the standards and graduate medical education competencies^{16,18-24}. The health of the nation
154 depends upon this important training at both the medical school and residency level¹⁶.

155 156 *A Canadian Example*

157 The Canadian presentation focused on an example for educating health professionals through an
158 education intervention called WellnessRx, designed to address gaps in knowledge, skills and
159 attitudes regarding nutrition and physical activity (PA)²⁵⁻²⁷. The presentation focused on the
160 establishment of the WellnessRx initiative, the education programme development and the
161 findings from the curriculum pilots. The aim was to assess the level of knowledge, skills and
162 attitudes of health professional students and practitioners regarding nutrition and PA; assess
163 changes in these attributes after completing the nutrition and PA curriculum; and to evaluate the
164 effectiveness of an online delivery approach used for the learning modules²⁵. Revision of
165 curriculum modules is on going and based on participant evaluations.

166
167 The WellnessRx initiative fills a documented curricular gap in the domains of nutrition and PA
168 across preclinical health professional education programmes at the University of Alberta. By
169 empowering current and future healthcare professionals and giving them the tools they need to
170 council on nutrition and PA, the goal is to facilitate a shift from a healthcare system focused on
171 disease treatment to one which incorporates health promotion and disease prevention.

172

173 *On going work in Australia*

174 The content of nutrition within entry-level medical courses in Australia is highly variable. A 2009
175 survey of Australian medical schools found that there was no clear integration of learning
176 opportunities for nutrition knowledge or skills across medical courses and that assessment of
177 nutrition knowledge and skills varied widely²⁸. A 2013 survey indicated that the barriers to the
178 introduction of nutrition competencies were an overcrowded curriculum, inability to train
179 educators, lack of prioritisation, cost and inability to capitalise on technology²⁹.

180

181 To address the barriers to MNE, the Nutrition Competency Framework (NCF) was discussed,
182 consisting of four knowledge and five skill-based nutrition competencies for medical graduates,
183 and the development of the Web-based Nutrition Competency Implementation Toolkit
184 (WNCIT)²⁹. WNCIT supports medical programmes to meet the competencies outlined in the NCF.
185 The WNCIT includes an instruction manual, the NCF (with Student Learning Outcomes), a
186 nutrition curriculum mapping tool, nutrition competency assessment tools and a set of nutrition
187 teaching exemplars. The NCF has been well received by medical educators and WNCIT has
188 provided opportunities for further networking and development of nutrition education in medical,
189 nursing and allied health curricula.

190

191 *The New Zealand Perspective*

192 Approximately 30% of medical graduates express interest in becoming General Practitioners
193 (GP)³⁰, highlighting an important area of focus. For GP training, the Royal New Zealand College
194 of General Practitioners introduced a nutrition syllabus into the training programme in 2012, with
195 competencies that GP registrars are expected to develop throughout their training³¹. The Australian
196 Medical Council that accredits NZ medical schools specify that medical graduates must have the
197 ability to apply nutrition knowledge in practice³². However, no nutrition competencies are formally
198 integrated or mandated into either of the two medical courses.

199

200 Nutrition has been included in the medical curriculum at the University of Auckland's Medical
201 School. The team in Auckland have undertaken an evaluation of this nutrition education and found:
202 (a) while medical students gain nutrition knowledge and improve their nutrition behaviours when
203 nutrition is included in the early stages of undergraduate education, they lack confidence to provide
204 nutrition care; (b) medical students at the completion of their training, GP registrars and GPs all
205 have positive attitudes towards nutrition care, yet low confidence in their effectiveness to help

206 people improve their dietary behaviours; (c) GPs perceived a lack of time as a barrier to provide
207 nutrition care in consultations with patients. Lack of confidence to provide nutrition care suggests
208 that nutrition education may not be delivered appropriately, and that GP registrars and GPs need
209 to be supported to provide nutrition care at all appropriate opportunities.

210

211 *Changes and Challenges in Italy*

212 For an Italian perspective, details of higher education on human nutrition in Italy were provided.
213 The Italian University system was outlined for the 3-year technical degrees, as well as the 5-6 year
214 medical degrees, which can include a specialization in clinical nutrition after completion of a
215 medical degree (see Figure 2 for details). The breakdown of courses included in nutrition education
216 was also provided, including the combination of nutrition and sport. It was explained how the
217 *Human Nutrition Research: International Center for Assessment of Nutritional Status (ICANS)* at
218 the University of Milan is responsible for training of dietitians, medical doctors, PhD students and
219 students of Scuola di Specializzazione in Scienza della Alimentazione. Treatments available in
220 human nutrition provided through this centre included dietary counselling, psychological
221 counselling, medications, medical devices, and bariatric surgery.

222

223 *Medical Education, Nutrition Training and India*

224 A unique perspective regarding the current state of play in medical education in India was
225 presented. It was proposed that the current medical/paramedical education system in India does
226 not have sufficient focus on nutrition and doctors are not adequately trained in providing nutrition
227 care. The practical application of nutrition training in the doctor's practice is of paramount
228 importance in India, which has a widely diverse population. It was also discussed how different
229 medical and paramedical education systems (such as ayurveda, homeopathy, dentistry) should be
230 monitored to develop a consistent approach to nutrition education in the Indian education system.
231 The diversity between culture, language and thus differences between food preparations must be
232 carefully addressed in student learning in order for doctors to be supported to provide nutrition
233 care to patients.

234

235 **Theme 2: Medical Nutrition Research**

236 Translating research into practice through education is an important consideration in MNE and
237 public health. With increasing focus on evidence based medicine³³, mechanisms to provide
238 appropriate evidence to the right professionals is crucial to support effective and safe medical

239 practice and improve public health outcomes. The presenters in this section discussed how they
240 have translated evidence into practice, including barriers and facilitators to this translation.

241

242 *NNEdPro and Medical Nutrition Research*

243 The introduction to this second theme provided an overview of MNR, including one framework
244 for knowledge translation, the Knowledge to Action (KTA) process.³⁴ The KTA includes
245 development of knowledge, synthesis of information and implementation into practice by
246 understanding context, barriers and facilitators. Through the KTA process, the NNEdPro group
247 aims to synthesize knowledge, and understand the context, barriers and potential solutions to
248 incorporating research into evidence-based care through knowledge translation.

249

250 An example of knowledge translation by the NNEdPro group was provided regarding the complex
251 relationships between diet and cardiovascular disease/metabolic risk as a way to highlight new
252 evidence and the importance of translating this into practice through healthcare education. This
253 approach is exemplified through the Nutrition and Vascular Studies (NVS) Platform/Team
254 associated with NNEdPro which has a particular interest in understanding how diets rich in (or
255 supplemented with) fruit, vegetables and/or phytonutrients can modulate cardio-metabolic
256 pathways in at-risk populations, such as the overweight and obese. Based on NVS work, the
257 NNEdPro group aims to translate key findings and other supporting evidence from the wider
258 literature, into educational innovations for healthcare professionals. This work is explained
259 through three strands including: *Experimental*: Individual Diets, Nutrition and
260 Vascular/Endothelial Function; *Epidemiological*: Population Diets, Nutrition and Cardiovascular/
261 Metabolic Risk; and *Translational*: Evidence Synthesis and Knowledge Exchange for Researchers
262 and/or Practitioners.

263

264 *Integrating Nutritional Genomics in the Medical School Curriculum*

265 An example of integrating evidence-based practice into the medical curriculum was provided with
266 a focus on nutritional genomics. It was explained that everyone has numerous functionally
267 significant genetic variants and that some are associated with clinically relevant health
268 consequences. A variety of examples and teaching opportunities were presented to explain how
269 exploring interactions of nutrient metabolism and genetic variation could enhance MNE. An

270 example from the preventive approach focused on a common generic variant (rs762551) associated
271 with slowed metabolism of caffeine. People with this particular genetic variant are exposed to the
272 stimulant, caffeine, for longer after ingestion than those without the variant and there are potential
273 consequences. If used in medical teaching, discussion could relate to a variety of topics from the
274 genetics to the clinical impact, through to public health significance. Other teaching examples are
275 included in Figure 3.

276 It was highlighted that most medical school curricula in the US already include nutrigenomic
277 issues, but usually without referencing the actual term or concept. Nutrigenomic concepts can be
278 included in many diverse instructional settings, such as basic science courses, case-based learning,
279 and clinical rounds. Most medical nutrition educators would like to see a significant expansion of
280 nutrigenomic teaching.

281 *Translation of Hydration Research into Education*

282 The NNEdPro group presented their work on a hydration education project for GPs, which has
283 included the development of a blended learning package. The evidence regarding the importance
284 of adequate hydration is transitioning from a complete focus on hydration in sports, to its impact
285 on specific medical conditions, overall health and public health impact. For this project, a review
286 of scientific literature and clinical guidelines was conducted, followed by the conversion of key
287 learning points to education material for the target audience (GPs). A survey of the group's
288 hydration knowledge, attitudes and self-reported practices (KAP) identified key gaps, which were
289 used to inform the intervention. Once the material was brought together and reviewed by
290 researchers and practitioners, a pilot of the education package with the target group was conducted
291 and evaluated for changes in KAP. Qualitative feedback regarding the training was also collected.
292 Suggestions from the evaluation were incorporated into the material and adapted for the next
293 group.

294
295 Delivery of the hydration package for GPs involved both face-to-face teaching and provision of
296 online materials. The evaluation of both aspects included feedback on the quality of the materials,
297 quality of tutors and key learning points. A more objective evaluation was also conducted by
298 measuring hydration KAP immediately before and after the face-to-face session as well as
299 completion of online activities. The group continues to offer this teaching to GPs and to apply the
300 learning to other topic areas.

301

302 **Conclusion**

303 All speakers presented unique perspectives on MNE and MNR based on their region and
304 experiences. A consistent message was the need for collaborations at a global level to ensure
305 nutrition is prioritised in medical curricula. Curriculum integration strategies such as toolkits or
306 champions were thought to be transferable and adaptable to other contexts or regions. Use of online
307 learning modules such as WellnessRx were seen as other potential areas for collaboration.

308

309 There are many barriers to overcome within MNE and MNR, ranging from the evolving nature of
310 nutrition evidence, through to the competing priorities of students and practicing health
311 professionals. Although the focus of many talks related to curricula and teaching methods, the
312 overarching aim is for health professionals to have the knowledge, skills and confidence to advise
313 their patients, thus impact the health of the population.

314

315 Following the presentations, discussion continued regarding the specifics of continued
316 collaboration including joint papers, funding applications and planning for the 2016 Summit.
317 Many of these ideas progressed throughout 2015, resulting in continued discussion, an Australia
318 and New Zealand (ANZ) NNEdPro Network³⁵ and student research projects. One idea was to
319 conduct a research priorities setting project to determine what key stakeholders see as the way
320 forward. Results of the project were presented at the 2016 Summit¹ held in Cambridge in June
321 2016.

322

323 These discussions and future collaborations brought through this inaugural event have the potential
324 to impact public health by increasing the knowledge, skills and attitudes of healthcare
325 professionals through increased education. It is essential that all health professionals provide
326 evidence-based advice to their patients and support public health strategies in nutrition.

327

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335

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The main goals of the Summit were to:

1. Share information on the current state of medical nutrition education and associated research in each region.
2. Share examples of learning from each region, including successful and unsuccessful initiatives and actions.
3. Identify common or shared needs across regions.
4. Showcase examples of transferable models of strategies across regions.
5. Identify opportunities for joint strategies in medical nutrition education.

Figure 1: The main goals of the Summit

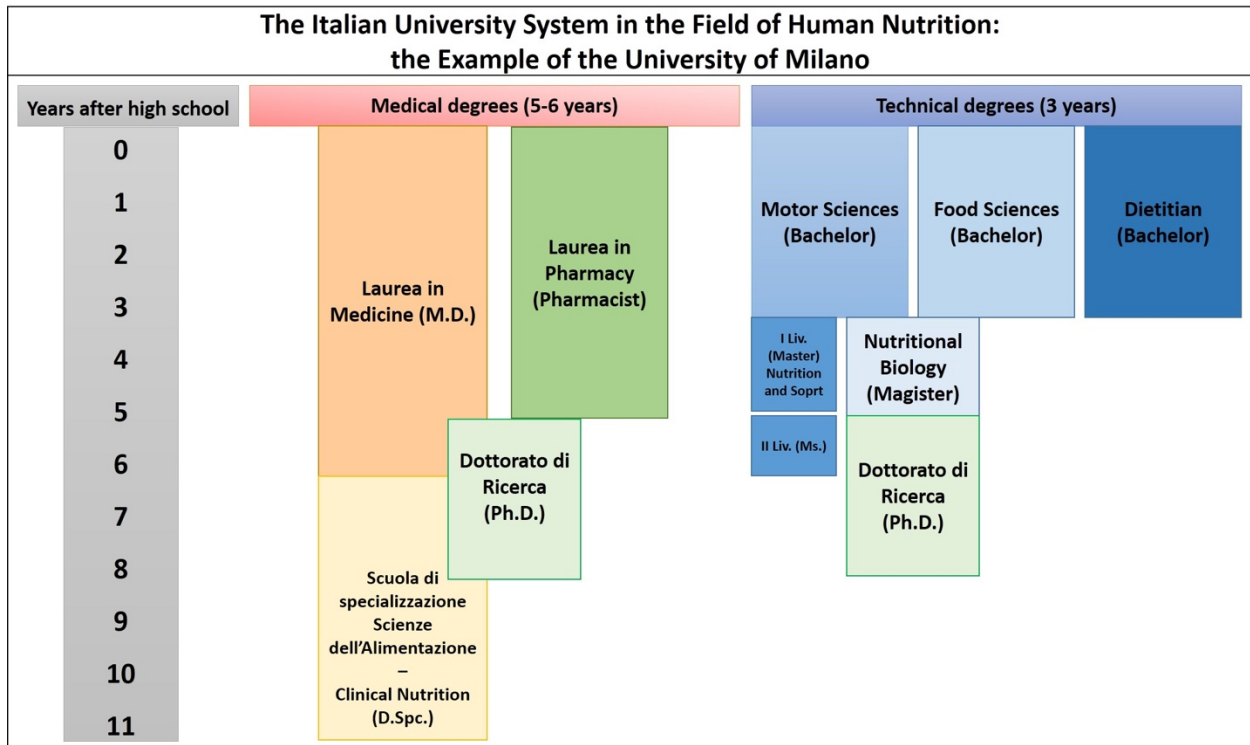


Figure 2: Overview of the Italian university system for human nutrition.

- Mechanisms of gene-nutrient interactions and inherited nutritional individuality
- Evolutionary and short-term genomic adaptations to nutrition exposure
- Research methods and study types for the investigation of gene-nutrient interactions
- Principles and practice of assessing evidence for nutritional genomics
- Inherited food and nutrient intolerances
- Genetic variability of appetite control, metabolic rates and body composition
- Mechanisms and relevance of nutrition-related epigenetic modifications before and after birth
- Practice and public health implications of genetically differential response to nutrition

Figure 3: Key learning points for medical student regarding nutritional genetics

Table 1: Key organisations in attendance at the Summit

Key Organisations in Attendance	Country
British Dietetic Association (BDA)*	UK
British Medical Association (BMA)	UK
Cambridge University Health Partners*	UK
Medical Research Council*	UK
American Society for Nutrition (ASN)	USA
Academy of Nutrition and Dietetics (AND)	USA
WellnessRx	Canada
Students and faculty from over 15 universities worldwide.	

*NNEdPro partner organization. The Society for Nutrition Education and Behaviour is a partner but was not in attendance.

Table 2: Speaker, affiliation and key points from each section of the Summit.

Medical Nutrition Education			
Speaker	Country	Presentation	Key Message
Dr Kathy Martyn, from the Brighton and Sussex Medical School	UK	<i>Medical Nutrition in the UK</i>	Pedagogical challenges emerge when introducing the Undergraduate Medical Nutrition Curriculum ⁸
Dr Lisa Hark from the Sidney Kimmel Medical College, Philadelphia	USA	<i>Medical Nutrition in the US</i>	There are deficiencies in nutrition education in US medical schools and residency programmes
Melita Avdagovska, on behalf of her team at University of Alberta, Edmonton,	Canada	<i>A Canadian Example</i>	The evolution of WellnessRx: Initiating a paradigm shift from “illness-care” to “health-care” through nutrition and physical activity education
Professor Caryl Nowson from the School of Exercise and Nutrition Sciences, Deakin University,	Australia	<i>On going work in Australia</i>	There are gaps and barriers to adequate medical nutrition education, however support tools exist to address these gaps.
Dr Clare Wall and Jennifer Crowley from the University of Auckland	New Zealand	<i>The New Zealand Perspective</i>	Medical students gain nutrition knowledge and improve their nutrition behaviours when nutrition is included in the early stages of undergraduate education, however they still lack confidence to provide nutrition care.
Dr Livio Luzi, Professor of Endocrinology, Università degli Studi di Milano Director, Endocrinology and Metabolism San Donato Hospital and Scientific Institute	Italy	<i>Changes and Challenges in Italy</i>	Nutrition is included in many aspects of the higher education system in Italy.
Dr Anand Ahankari of the University of Nottingham and Halo Medical Foundation, India	India	<i>Medical Education, Nutrition Training and India</i>	The current medical/paramedical education system in India does not have sufficient focus on nutrition and doctors are not adequately trained in providing nutrition care.
Medical Nutrition Research			

<p>Dr Sumantra Ray, NNEdPro Chair and Honorary Professor, Senior Clinician Scientist at the UK Medical Research Council (MRC), and Unit Senior Medical Advisor and UK National Diet and Nutrition Survey (NDNS) Lead Clinician</p>	<p>UK</p>	<p><i>NNEdPro and Medical Nutrition Research</i></p>	<p>Introduction to Medical Nutrition Research and the role of the NNEdPro Group.</p>
<p>Dr Martin Kohlmeier, a Research Professor and Director of <i>Nutrition In Medicine</i>, from the University of North Carolina, Chapel Hill</p>	<p>USA</p>	<p><i>Integrating Nutritional Genomics in the Medical School Curriculum</i></p>	<p>Nutrition education in medical curricula could be enhanced by exploring interactions of nutrient metabolism and genetic variation.</p>
<p>Pauline Douglas, RD and Dr Lynn McCotter, RD from the Ulster University hub of the NNEdPro Group</p>	<p>UK</p>	<p><i>Translation of Hydration Research into Education</i></p>	<p>Examples exist regarding how to translate research into practice, such as the hydration education project.</p>