Published in final edited form as:

Ann N Y Acad Sci. 2010 March ; 1190: 179–183. doi:10.1111/j.1749-6632.2009.05257.x.

TRANSLATIONAL NUTRITION RESEARCH AT UC DAVIS – THE KEY ROLE OF THE CLINICAL AND TRANSLATIONAL SCIENCE CENTER

Sidika Kasim-Karakas^{1,5}, Dianne Hyson^{2,3}, Charles Halsted¹, Marta van Loan⁴, Erica Chedin², and Lars Berglund^{1,2,5}

¹Department of Medicine, University of California Davis, Sacramento, CA

²Clinical and Translational Science Center, University of California Davis, Sacramento, CA

³Department of Nutrition, California State University, Sacramento, CA

⁴Western Human Nutrition Research Center, Davis, CA

⁵VA Northern California Health Care System, Sacramento, CA

Abstract

The National Institutes of Health's Clinical and Translational Science Award (CTSA) program has had a profound impact on clinical research and training methods at the University of California, Davis (UC Davis). UC Davis was among the first 12 institutions to receive NIH funding for this award, and created its Clinical and Translational Science Center (CTSC) in 2006. The funding accelerated and further integrated an existing conscientious and careful planning effort for translational research with a stepwise approach to gradually increase our institutional competencies, capabilities, and resources in this area. The development of our CTSC has led us to develop new ways of bringing together a diverse faculty and facilitating research. The CTSC has impacted virtually every area and infrastructure resource involved in promoting clinical and translational research at our institution.

Keywords

Nutrition; Translation; Clinical research

Introduction

The University of California, Davis (UC Davis) has a long history of agricultural and nutritional research. From its inception as a land-grant institution a centennial ago, UC Davis has been an integral component in agriculture research and implementation in California. Throughout this period our agriculture heritage has intermingled, through highly collaborative research and training programs, with other research programs at UC Davis, namely, the biological, environmental, chemical, veterinary, engineering, and biomedical

sciences. This collaborative research environment has facilitated clinical and translational research at UC Davis focused on nutritional studies. The National Institutes of Health's Clinical and Translational Science Award (CTSA) program, awarded to UC Davis in 2006, has offered unparalleled opportunities to further strengthen translational research in the field of nutrition (1,2). UC Davis was among the first cohort of 12 institutions to receive NIH funding for this award, and transformed its newly funded General Clinical Research Center (GCRC) to a Clinical and Translational Science Center (CTSC) in 2006 (3).

The planning process to create a vision for a CTSC emerged from a strong, collaborative foundation at UC Davis and from a multi-year, focused process to create a powerful research infrastructure (4). Our long history of highly collaborative research and training programs spans diverse scientific and clinical areas, and has prepared us for a new era of team science and integration. The CTSC has led us to develop new ways of supporting clinical and translational research at our institution, and nutrition research is one area where the CTSC has enabled fruitful clinical and translational collaborations.

Nutrition and Clinical Research – strong foundation for a CTSC

An important program in setting the stage for the UC Davis CTSC was the NIDDK-funded UC Davis Clinical Nutrition Research Unit (CNRU). The CNRU was initially funded in 1985 as an outgrowth of a decade of informal research and teaching collaborations among faculty from the School of Medicine and the College of Agriculture and Environmental Sciences (CA&ES). The CNRU provided important infrastructure core facility resources to support a wide spectrum of nutrition research and training, focused on clinical studies as well as on the use of animal models (5). Importantly, the CNRU provided seed funding and resources for translational research in areas such as genetics of obesity and other nutritional disorders; aging and neurodegeneration; and nutritional regulation of cellular processes underlying inflammatory and metabolic disorders, and cancer (6). Through these efforts, the CNRU paved the way to link basic research conducted largely at the Davis campus with clinical research, conducted at the UC Davis Medical Center in Sacramento. The CNRU played an important role during the inception of the UC Davis GCRC, and close ties were forged between the two programs. The creation of a new Department of Veterans Affairs (VA) hospital in Sacramento to replace an outdated facility in 2003 provided an outstanding opportunity to develop a clinical research facility. After a year of preparation, the initial application for a GCRC at UC Davis was funded by the NIH in September 2004, and the very first GCRC study was focused on nutrition. The collaboration between the CNRU and the GCRC fostered a large number of nutrition and metabolism studies undertaken in the GCRC.

UC Davis is also home to the USDA-funded Western Human Nutrition Research Center (WHNRC), located in Davis in a new 50,000 square foot building that houses all core staff, scientists, support functions, and research laboratories. WHNRC researchers were also avid users of the GCRC, and currently partner with the CTSC regarding nursing support, as two members of the CTSC nursing staff share time between the CTSC and WHNRC. In addition to individual research laboratories, the center currently maintains four core units or

laboratories that include Administration, Human Studies, a Bioanalytical Support Laboratory, and a Physiology Support Laboratory.

Transition from the UC Davis GCRC to the CTSC

After less than two years of operation, the GCRC transitioned into the CTSC and was revised as the Participant and Clinical Interactions (PCIR) program. This has provided additional opportunities to support translational research studies, and, as seen in Table 1, nutrition researchers are major PCIR users. In addition to patient visits and admissions, the CTSC supports nutrition research studies with dietary, laboratory, and physiological assessment services. The range of CTSC nutrition activities include two complex, week-long inpatient studies with multiple metabolic interventions and nutrition modulation to short-term metabolic challenges such as fat loads and glucose tolerance tests. Important functions of the CTSC include consultation on study design, training of research staff and, where appropriate, performing procedures for the measurement of body composition and changes therein, including the following procedures:

- Anthropometry
- Bioelectrical impedance analysis
- Dual-energy x-ray absorption (DEXA)
- Bod Pod measurement of body composition
- Resting metabolic rate
- Total Energy Expenditure
- Exercise performance and physical activity

In addition, the PCIR unit of the CTSC offers nutritional support for determination of dietary intake using customized nutrient analysis software, assists in study design and implementation, develops and tests specialized diets, prepares and distributes specialized meals, administers test surveys (satiety questionnaires, food frequency, etc.) throughout studies as needed, provides patient nutrition education, and ensures the incorporation of updated information regarding national nutrition issues/surveys in the conduct of all activities in the core. The unit is housed in a metabolic kitchen, and staffed by a dietitian to fill the protocol needs of investigators carrying out nutrition research. The meal service ranges from research diets needed for study participants admitted on an in-patient basis to in-patient and out-patient studies that require preparation of customized weighed metabolic balance diets requiring precision. Composites of metabolic meals are prepared for each study and can be chemically analyzed for accuracy, as required. This unit has been used extensively, providing critical meal services for study protocols as well as nutrition assessment.

From the inception of the GCRC and through the development of the CTSC, strong ties have been forged with the WHNRC, which is uniquely equipped to provide more extensive nutrition competencies. Through a continuous and expanded collaboration with the WHNRC, the CTSC is in an ideal position to provide critically needed support of nutrition

studies and to facilitate a further expanded use by nutrition researchers (7). Nutrition and obesity remain a primary focus of many clinical researchers at UC Davis across colleges and departments who are active in the CTSC (8).

CTSC and Translational nutrition research – national and international perspectives

Nutrition research is of fundamental importance in a global health perspective, and is well suited as a test bed for translational approaches. The problems at hand are complex and ideally suited for national and international collaborations. Research areas addressing under- as well as overnutrition bridging basic and clinical research are highly relevant and of significant public health importance (9,10). Therefore, nutrition research is truly global, and historically, many of the gains in nutritional research have resulted from national and international collaborations. At present, CTSA programs have been awarded to 38 academic health centers throughout the United States, including many institutions with prominent nutrition centers. To be able to effectively assist researchers at different institutions and to carry out the mandate to advance translational research, the CTSA centers in partnership with the NIH have developed a national infrastructure, the CTSA consortium. To be able to fully implement and realize the CTSA concept, a strategic plan for the CTSA consortium was recently developed, focusing on four overriding goals, including the development of consortium-wide collaborations, of key relevance to nutrition researchers. In addition, initiatives similar to the U.S. CTSA program have been considered and planned in Europe and Japan. Together, these initiatives provide a fertile setting to implement collaborative projects across institutional and national boundaries, and researchers in the nutrition area stand to gain by taking full advantage of such opportunities.

Training and mentoring the future generation of translational nutrition researchers

One of the most important goals of the CTSA initiative is to train the next generation of scientists. A federated career support for translational scientists was identified as a major goal of the CTSA strategic plan. The CTSA institutions have agreed to develop a coordinated approach to training, education, and career development in clinical and translational and science. Key features of this goal include an efficient training of emerging investigators, standardization of clinical and translational research education, team building and management, development of guidelines for promotion policies for translational scientists, and enhancement of interactions between basic and clinical scientists. Many of these concepts are aligned with competencies identified as important in clinical nutrition training (5,11).

Many of these goals are underway through the UC Davis CTSC. Since its inception, the Education program of our CTSC has strived towards a broad integration of interdisciplinary training programs, aiming to create a continuous and coordinated education and training resource to expedite scholarly development toward translational research scientists. Important features of this approach are efforts to further mentor development, promote

mentored research projects, develop core translational research competencies, and foster individualized and team career development plans. These efforts represent excellent opportunities for partnership with the FFHI in building a cadre of investigators trained in translational research relevant to nutrition. Through the FFHI, we will be able to identify and recruit content experts to build competency-based curricula that are highly relevant to individual trainees. Through active collaborations in organizing workshops, symposia and outreach activities, the CTSC and the FFHI will promote effective training opportunities in interdisciplinary team science.

At present, the CTSC has had several rounds of application for the most prestigious training program (K12), and altogether 8 scholars have been awarded this 3 year funded training grant. Attesting to the importance of nutrition at UC Davis, four of the 8 scholars (50%), are pursuing nutrition-focused research. Further, of these four scholars, three are from the Department of Pediatrics, focusing on obesity, insulin resistance and the gut microbiome, respectively.

CTSC pilot grants and nutrition research

An important tool for the CTSA program is the opportunity to provide seed funding as pilot grants. In keeping with the spirit of the CTSC as a translational research incubator we have linked our calls for pilot studies to ongoing activities in our translational program. In several calls, thematic concepts have been underscored. In general, nutrition researchers have been competitive in many of these calls and six pilot grants have been awarded to support nutrition research, ranging from novel aspects on the importance of vitamins B12 and D for health, the importance of milk oligosaccharides for the intestinal flora of premature infants, diet and exercise practice in subjects with mental illness, pediatric diet counseling, and new techniques to assess body water content. Many of our pilot grant calls have been linked to workshops focused on the topic of interest, and we expect this strategy to include the FFHI in the future.

Summary

The UC Davis CTSC has already to a major extent impacted on the way clinical and translational research is conducted throughout at our institution. This has in particular resulted in substantial benefit for nutrition researchers at UC Davis. Metrics of success include an improved availability and strong use of clinical research resources, translational training opportunities for junior faculty and students, and the support of novel and innovative nutrition research. We anticipate that this strong trajectory will be further enhanced through a formalized collaboration between the UC Davis CTSC and the FFHI.

Acknowledgments

The project was supported by the UC Davis Clinical and Translational Science Center (RR 024146).

References

1. Zerhouni EA. US Biomedical Research. Basic, Translational, and Clinical Sciences. JAMA. 2005; 294:1352–1358. [PubMed: 16174693]

2. Zerhouni EA. Clinical research at a crossroads: the NIH roadmap. *J Investig Med*. 2006; 54:171–173.
3. Asmuth D, Wun T, Mullen N, Garcia E, Chedin E, Whitney E, Gillis M, Anderson K, Tarantal A, Kenyon N, Curry F, Berglund L. UC Davis Clinical and Translational Science center: Coming of age. *Clin Transl Sci*. 2009 in press.
4. Berglund L, Tarantal A. Strategies for innovation and interdisciplinary translational research: Removal of barriers through the CTSA mechanism. *J Investig Med*. 2009; 57:474–476.
5. Halsted CH. Toward standardized training of physicians in clinical nutrition. *Am J Clin Nutr*. 1992; 56:1–3. [PubMed: 1609746]
6. Halsted CH. Perspectives on obesity and sweeteners, folic acid fortification and vitamin D requirements. *Fam Pract*. 2008; 25(Suppl 1):i44–i49. [PubMed: 18826993]
7. Allen LH. To what extent can food-based approaches improve micronutrient status? *Asia Pac J Clin Nutr*. 2008; 17(Suppl 1):103–105. [PubMed: 18296313]
8. Fisler JS, Warden CH. Dietary fat and genotype: Toward individualized prescriptions for lifestyle change. *Am J Clin Nutr*. 2005; 81:1255–1256. [PubMed: 15941873]
9. Cummings BP, Digitale EK, Stanhope KL, Graham JL, Baskin DG, Reed BJ, Sweet IR, Griffen SC, Havel PJ. Development and characterization of a novel rat model of type 2 diabetes mellitus: The UC Davis type 2 diabetes mellitus UCD-T2DM rat. *Am J Physiol Regul Integr Comp Physiol*. 2008; 295:R1782–R1793. [PubMed: 18832086]
10. Dewey KG, Adu-Afarwuah S. Systematic review of the efficacy and effectiveness of complimentary feeding interventions in developing countries. *Matern Child Nutr*. 2008; 4(Suppl 1):24–85. [PubMed: 18289157]
11. Halsted CH. The relevance of clinical nutrition education and role models to the practice of medicine. *Eur J Clin Nutr*. 1999; 53(Suppl 2):S29–S34. [PubMed: 10406434]

TABLE 1

Nutrition research studies in the UC Davis CTSC

<i>Year</i>	<i>Nutrition research studies</i>	<i>Outpatient visits</i>	<i>Inpatient use</i>
2004	6/11	571/692	N.A.
2005	9/28	676/960	306/308
2006	11/29	670/1,084	535/540
2007	13/41	997/1,366	360/383
2008	14/62	1,139/1,884	22/24

Results are expressed as nutrition-related activity (studies, outpatient visits or inpatient use) in relation to total activity.