Translational Biosciences Workshop Summary

The sixth and final research strategic planning session, held September 23rd at The Arizona Inn, focused on Translational Biosciences. Participants gathered for the session, from colleges across campus. Participants were identified for their expertise and diversity across areas of biosciences from basic discovery through clinical practice, with a focus on synergy between the main and health sciences campuses. A presentation was given by Dr. Clara Curiel, Associate Professor, Medicine, Dermatology and Director, Pigmented Lesion Clinic, Skin Cancer Institute, on the topic "From text to pixels: The new frontier for image-centric dermatological practice." Breakout discussions consisted of the following topics:

1) Aging and Age-related Diseases;
2) Enabling Omics Technologies – Genomics and Beyond;
3) Human Augmentation – Needs, Devices, Systems, Strategies and Approaches;
4) Infectious Diseases and Microbiome Science.

Session leads reported back to the full group on the opportunities for augmenting UA's strengths to develop new and strategic capabilities. The following represent the actionable items identified during the full-group discussion:

1. **Capitalize upon the demographics of Arizona to advance aging research across the Arizona Health Sciences Center and UA's main campus.** Aging was put forward as a "cross-cutting theme" that could be used to bridge areas of strength. Pockets of activity at UA were identified in basic science (Immunobiology, Molecular and Cellular Biology, Nutrition Sciences, among others) and clinical research (Alzheimer's Consortium, Arizona Center for Accelerated BioMedical Innovation, Precision Medicine, among others). Specific suggestions included:

    a. Session leaders and participants recognized that UA harbors a spectrum of expertise from molecular biology to community outreach/public health that could be brought to bear in aging research, and that UA's unique climatic and medical catchment area presents unique opportunities for aging research. Near-term project opportunities included:
        i. establishing partnerships with nursing homes and retirement community living centers to perform longitudinal studies;
        ii. utilizing wearable devices to improve the quality of life for Arizona residents across the lifespan and activity range (e.g., from highly active to chronic disease-burdened individuals as well as frail and end-of-life patients);
        iii. addressing health system costs, provider incentives, as well as economic burden questions of procedure-intensive health care vs. home care;
        iv. connecting clinical syndromes to molecular diagnoses by creating a molecular signature ('omics biomarkers) for diseases of aging.
    b. Building research bridges between UA's basic science and clinical expertise areas through specific mechanisms including:
        i. Support for a conference/workshop on topic of resilience and disparities and inequities in aging.
        ii. Capitalizing on federal funding opportunities, i.e., Center for Medicare and Medicaid Services (CMS) grants; developing a T32 on aging (noting that the NIH's National Institute on Aging receives few T32 applications and that CMS has a large share of the grant resources).

2. **Build competitiveness in omics technologies across the basic science, translational, and clinical research spectrum.** Omics was also widely explored - within the omics breakout session and across other sessions - as an enabling science and technology. Participants across sessions widely agreed that omics capabilities were a critical component of bioscience research, and weaknesses therein had presented, in some cases, an obstacle to grant competitiveness. Session leaders solicited input of participants to identify the major omics interest areas, yielding a diversity of responses across the spectrum of proteomics, genomics, and metabolomics. Participants expressed expansive needs in project areas such as diabetes and regenerative medicine, venom identification, monitoring therapeutics, environmental contaminants/toxicology, pulmonary hypertension patient phenotyping, microbiome, and gene-environment interactions. The major suggestions for investment in critical omics infrastructure included:

    a. Establishment of a central bioinformatics consulting, performance, and training resource to encompass the analytic needs of omic-null as well as omics-expert level investigators.
    b. Expansion of array technology (e.g., high-throughput capabilities, SNP mapping, genome-wide methylation) to strengthen the already existing genomics core facility.
    c. Establish/improve metabolomics in targeted research areas, increased proteomics sample capacity, and general issues of facility centralization to improve resource stability, standardize methodology, and offer guidance on outsourcing.
    d. Create a UA "yellow pages" (centralized facility directory) of omics support.
    e. Holding an Omics workshop to aid understanding of the benefits and capabilities of this complex field to investigators across campus..

3. **Advance leadership in the technology of human augmentation.** UA's clinical/public health strengths in chronic disease treatment and outcomes research, particularly in cardiovascular diseases, chronic obstructive pulmonary disease, diabetes, chronic renal failure, dementias could be leveraged with UA's activities in biomedical and systems engineering, optics and big data to use wearable technology for research to improve health outcomes, address health disparities and reduce the economic burdens of healthcare. The major suggestions were:

    a. Build capabilities for rapid prototyping of microgadgets which is well-integrated with electronics and optics. This may include self-service "maker-space" capabilities but needs expert support, and could be distributed with a central administrative hub linking capabilities across campus and regionally/nationally.
    b. Consider a capability to develop mobile apps to study human augmentation, and specifically, to demonstrate health/wellness outcomes.
    c. Develop partnerships with Athletics and military/governmental bases to test these wearable sensor technologies for human augmentation in performance applications.

4. **Broad approaches to leverage personnel and infrastructure for further advances in translational biosciences, including infectious disease, at UA.** The immediate needs identified were:
    a. Biobanking: create advanced partnerships across campus; including centralization or cooperation of sample repository capability.
    b. Data sharing: enhanced use of iPlant for storage/sharing of data by UA researchers; data-focused partnership with Barrow Neurological Institute and Banner Health.

c. Patient cohorts: listing of active and completed projects and cross-listing of cohorts with available sample repositories so that maximum research benefit can be obtained from these data.
d. Bring more clinicians more fully into ongoing research, with targeted research training/workshops and proposal assistance, promoting existing mechanisms for seed funding and protected time and examining new opportunities.
e. Continue to work with Banner on streamlining procedures related to human subjects protection and intellectual property.

Next Steps:

Workshops, pilot programs, and continued discussion is evolving around the topic areas mentioned above. For additional information please contact Jennifer Barton at barton@email.arizona.edu or Neal Armstrong at nra@email.arizona.edu. For information on the breakout session groups, including how to participate in follow-on meetings, please contact the group lead:

 Aging and Age-related Diseases, contact Tricia Serio, Molecular and Cellular Biology, tserio@email.arizona.edu, or Janko Nikolich-Žugich, Immunobiology, nikolich@email.arizona.edu.

 Enabling Omics Technologies – Genomics and Beyond, contact Craig Aspinwall, Chemistry & Biochemistry, aspinwal@email.arizona.edu, or Andrew Capaldi, Molecular and Cellular Biology, capaldi@email.arizona.edu.

 Human Augmentation – Needs, Devices, Systems, Strategies and Approaches, contact David Armstrong, Surgery, DGA@email.arizona.edu, Jeong-Yeol Yoon, Agriculture and Biosystems Engineering, jyyoon@email.arizona.edu, or Marvin Slepian, Medicine, chairman.syns@gmail.com.

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