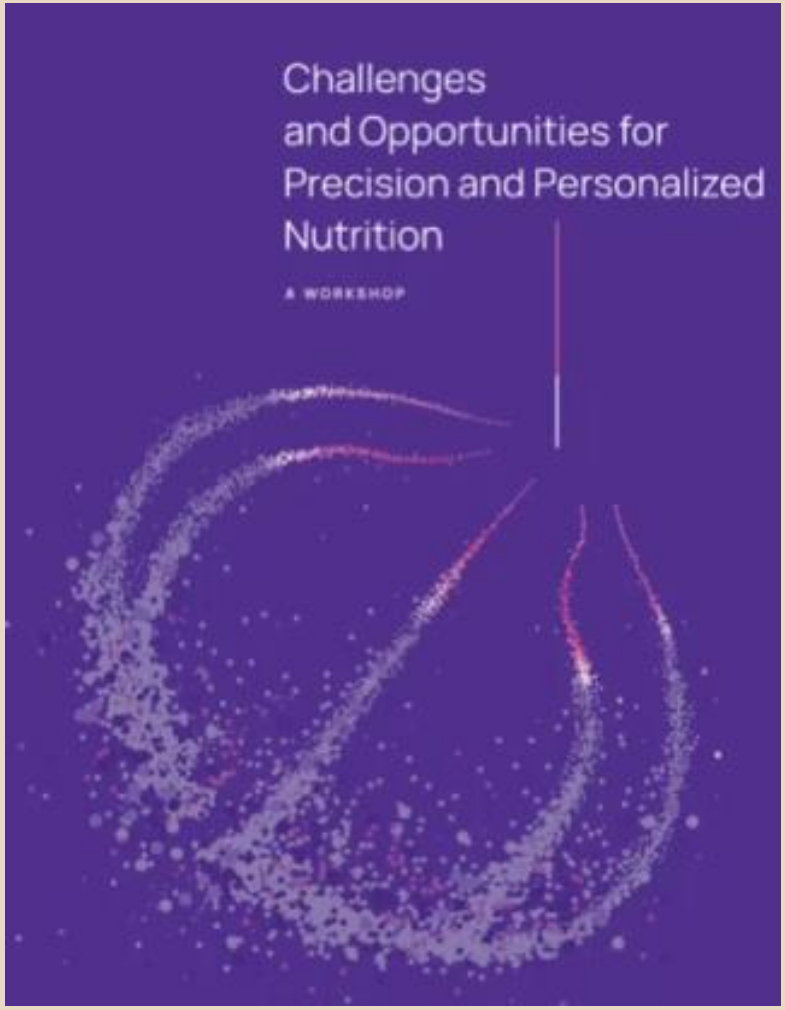

Cindy Davis

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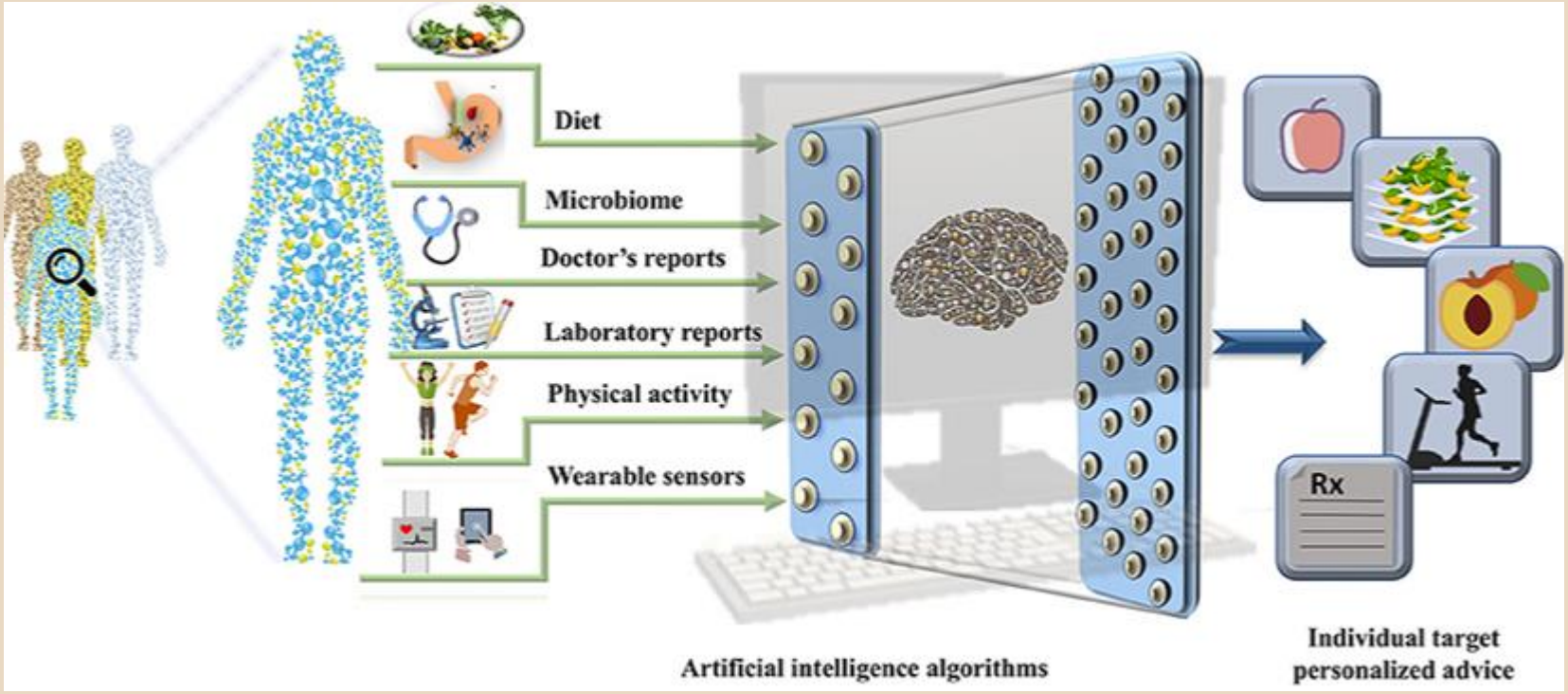
USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

Session 1: The Current Evidence Base and Limitations

Focus was on setting the current evidence base of precision nutrition and identifying gaps in knowledge



Human Variability- A Basis for Precision and Personalized Nutrition

John Mathers
Newcastle University

- We all differ in many different ways
- Genetic factors explain some of those inter-individual differences
- Other relevant biological factors include the epigenome and microbiome
- Psychological (and sociological) factors are likely to be critical in implementing effective precision and personalized nutrition strategies that improve public health
- Future developments of precision and personalized nutrition should include greater focus on individual aspirations, barriers and facilitators and should address inequities

Precision Nutrition and the Intersection of History and Genomics

- Both precision medicine & precision nutrition only work when they are precise
- African-Americans have a 75% rate of hypertension and a 3-fold higher mortality rate from kidney failure than other demographic groups
- Black Americans of slave descent did not come from the West African coast, but rather from the sodium-deficient deep interior.
- They were genetically-adapted to 200 mg/sodium/day, but in the U.S. today consume 3,400 mg/sodium/day.
- America's one-size-fits-all nutritional standards represents a 1700% greater sodium intake for the 37 million African-Americans of slave descent than what their ancestors consumed.
- Modern genomics and the testing of DNA ancestry has given our society the opportunity to bring greater precision to the sodium needs of all Americans by stratifying its recommendations according to DNA Ancestry.

Constance Hilliard
University of North Texas

Integrating Microbiome and Dietary Data

Abigail Johnson
University of Minnesota

- Foods and dietary patterns help to shape the microbiome
- Diet-microbiome relationships are personal
- Multidimensional dietary data can be another “ome” to be integrated with multi-omics data
- Dietary analysis can be enhanced using computational tools from the microbiome space

Opportunities and Obstacles in Precision Nutrition from an Engineering Perspective

- Stable isotope tracing is an invaluable tool for probing the metabolism of biological systems and understanding disease
- Dysregulated amino acid and sphingolipid metabolism can drive peripheral neuropathy and macular disease
- MacTel is a familial macular disease characterized by dysregulated amino acid metabolism (low serine and glycine)
- Diabetes rewires hepatic metabolism to impact serine, glycine and neuropathy
- Quantifying metabolic dynamics can be more informative than static metabolomics

Christian Metallo
Salk Institute

Psychosocial Influences on Eating Behavior

Susan Carnell
Johns Hopkins University

- **Appetitive characteristics show a genetic influence and influence weight in children and adults**
  - need to understand more about development through the life course
- **Appetitive characteristics may influence the effect of the food environment factors or interventions on diet and weight**
  - need to consider individual differences in population and intervention research
- **Considering an individual's appetitive as well as physiological characteristics may help increase the impact of personalized nutrition**
  - need to directly assess effect of such combined interventions

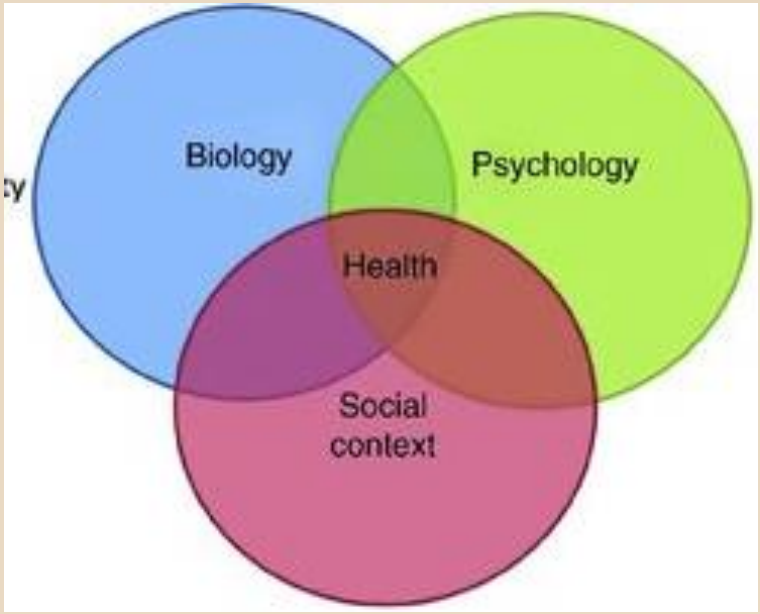
Precision Health Using Big Data

- Health is a product of genome and exposome
- Multivariate longitudinal testing can lead to early detection of disease
- Wearable sensors are worn by 20% of US population and make 100,000's of measurements each day
- Wearable sensors can detect Covid-19 and other infectious diseases prior to symptoms via elevated heart rate
- Wearable sensors enable personalized predictions of clinical laboratory measurements

Michael Snyder
Stanford University

Take Home Thought

Need to think about a systems approach such as the biopsychosocial model



What are some of the new innovative methodologies and technologies?