

Use of skin carotenoids assessed using the Veggie Meter™ to evaluate fruit and vegetable intake among study participants

STEPHANIE JILCOTT PITTS, PHD

*WITH SOME SLIDES TAKEN FROM DR. LISA JAHNS, GRAND FORKS HUMAN NUTRITION RESEARCH CENTER

Outline

- Provide background on the Veggie Meter™
- Explain results of use of the Veggie Meter in two studies:
 - Jilcott Pitts SB, Jahns L, Wu Q, Moran NE, Bell RA, Truesdale KP, Laska MN. A non-invasive assessment of skin carotenoid status through reflection spectroscopy is a feasible, reliable and potentially valid measure of fruit and vegetable consumption in a diverse community sample. *Public Health Nutrition*.2018: 1-7.
 - Jilcott Pitts SB, Wu Q, Truesdale KP, Laska MN, Grinchak T, McGuirt JT, Haynes-Maslow L, Bell RA, Ammerman AS. Baseline Assessment of a Healthy Corner Store Initiative: Associations between Food Store Environments, Shopping Patterns, Customer Purchases, and Dietary Intake in Eastern North Carolina. [Int J Environ Res Public Health](#). 2017 Oct 7;14(10). pii: E1189. doi: 10.3390/ijerph14101189.
- Discuss possibilities for use of the Veggie Meter™ in additional studies.
- Explain caveats and next steps/future research.

Development of the Veggie Meter™

- Ermakov I, et al. Optical assessment of skin carotenoid status as a biomarker of vegetable and fruit intake. Archives of Biochem and Biophysics, Vol 646, 15 May 2018, Pages 46-54.
- Resonance Raman Spectroscopy (RRS) – AKA, Biophotonic Scanner: uses a laser or spectrally narrowed LED light source that excites the tissue carotenoids in their absorption band.
 - 10,000+ portable instruments are in use to monitor the effectiveness of carotenoid-containing nutritional supplement formulations (Biophotonic Scanner, NuSkin/Pharmanex, Inc.).
 - Available to researchers only via lease agreement.
- Reflection Spectroscopy (RS) uses a low-power, white light source for excitation.
 - The Veggie Meter™ is a pressure mediated variant of RS that measures the reflected light in a condition where the skin is put in physical contact with the light excitation.
 - Commercially available to researchers via Longevity Link Corporation.

How we came to use the Veggie Meter™ in our studies

- We were interested in using the Raman to evaluate the effectiveness of a healthy corner store initiative, due to our involvement in the USDA-funded Farm Fresh Foods for Healthy Kids project.
- After several emails/calls, I connected with Dr. Lisa Jahns who told me about Dr. Werner Gellermann and Dr. Igor Ermakov and the Veggie Meter™ .
- Acquired the Veggie Meter™ on loan and eventually ECU purchased it.

Use of the Veggie Meter™ to evaluate a Healthy Corner Store Initiative

HOUSE BILL 1030

HEALTHY FOOD SMALL RETAILER PROGRAM SECTION

SECTION 13.4.(a) Of the funds appropriated to the Department of Agriculture and Consumer Services, the sum of two hundred fifty thousand dollars (\$250,000) for the 2016-2017 (and again in 2017 – 2018) fiscal year shall be used to create a program to reimburse small food retailers for expenditures related to enhancing access to healthy foods in areas that qualify as food desert zones according to the Economic Research Service of the United States Department of Agriculture...Funds may be used to reimburse small food retailers for the purchase and installation of refrigeration equipment, display shelving, and other equipment necessary for stocking nutrient-dense foods, including fresh vegetables and fruits, whole grains, nuts, seeds, beans and legumes, low-fat dairy products, lean meats, and seafood.

Baseline paper:

<http://www.mdpi.com/1660-4601/14/10/1189>

Study 1-

Feasibility: RS vs self-report fruits & vegetables

- Customer intercept surveys with n = 466 race/ethnically diverse corner store participants.
- National Cancer Institute F&V screener (1 month)
- Veggie Meter™ scan
- Self-reported race/ethnicity, ht/wt, smoking, age
- We also conducted store audits and “bag checks” (not described today)

Study 1. Results

- Intra-individual variation = 6.8 %.
- No associations between self-reported F&V (NCI Screener) and RS (Veggie Meter™).
- Participants were receptive – only two out of 466 refused the measurement.

Set up in a corner store



Study 2-

Validity: RS vs plasma, self-report Fruits and Vegetables

- N = 30 total, 17 African American & 13 non-Hispanic white participants
- Blood sample (plasma carotenoids)
- Completed FFQ (1 month)
- RS (Veggie Meter) scan
- Ht/wt, socio-demographic questions

Study 2. Results

- There were positive associations between FV assessed via FFQ and RS (Veggie Meter) ($r = 0.48$, $p = 0.009$).
- There were positive associations between Plasma and RS-assessed skin carotenoids (Veggie Meter) ($r = 0.71$, $p < 0.0001$).

Additional studies using the Veggie Meter™

- In supermarkets and grocery stores – Nudge customers to purchase more Fruits and Vegetables.
- In Head Start preschoolers, middle schoolers, and high schoolers—to assess the effectiveness of nutrition interventions.

Caveats

- Skin carotenoid level is a status biomarker- many things influence carotenoid absorption and transport...
 - Oxidative stress
 - Sun exposure
 - Illness
 - ?
- Not all vegetables and fruits are high in carotenoids

What do the numbers mean?

- Is there a number that corresponds to adequacy?
- What does a score of 200 mean? Or 400?
- If the score jumps 200 points, what does that mean?
- What kinds of studies would we need to do to figure it out?

Uses for skin carotenoid detection

- We **cannot** use skin carotenoid scores by RRS or RS to assess “adequacy” of intake of fruits and vegetables.
- We **can** use this technology to:
 - Detect change in intake of fruits and vegetables.
 - Surveillance to rank people by their skin carotenoid score.
 - Nudge/prompt individuals to increase their scores.

Thank you!
Questions?

