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The Trouble With "Total Antioxidant Capacity" as a Biomarker

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Dear Editor,

Total antioxidant capacity (TAC) assays—FRAP, ORAC, TEAC, and their relatives—remain widely used to characterize foods and biological samples, and TAC values frequently appear in nutrition research and on product marketing. I write to caution against over-interpreting them, because their connection to *in vivo* biology is weaker than their popularity suggests.

According to PubMed, a review of the *in vitro* measurement and interpretation of TAC concluded that different TAC assays correlate poorly with one another because each is sensitive to a particular combination of compounds while excluding others, and—critically—that TAC values for foods cannot be translated to *in vivo* human antioxidant defenses or to the health effects of that food. The same review argued that conclusions drawn from TAC should not be used to make decisions affecting population health.

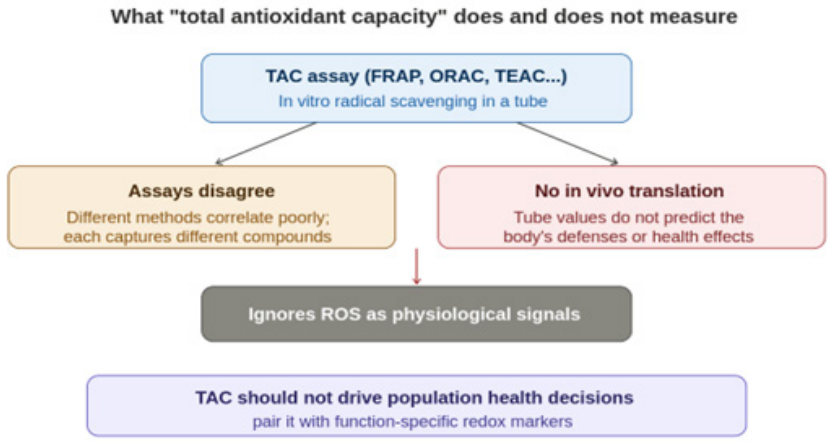
This limitation is conceptual, not merely technical. A TAC assay measures the capacity of a sample to quench radicals in a tube; it says nothing about absorption, metabolism, tissue distribution, or—most importantly—about the signaling roles that reactive oxygen species play in healthy physiology. A high TAC value is not evidence that consuming a food will reduce oxidative stress *in vivo*, let alone improve an outcome.

None of this means TAC is useless. According to PubMed, observational work on dietary TAC has reported associations with several cardiovascular risk factors, which can be hypothesis-generating. But association at the level of whole diets is a very different thing from the mechanistic and marketing claims often attached to single-food TAC numbers.

I would encourage authors, reviewers, and editors to treat TAC as a limited descriptive index rather than a functional biomarker, to report which specific assay was used and acknowledge its selectivity, and to pair TAC with markers that reflect actual *in vivo* redox status and signaling. Above all, TAC values should not be used to justify population-level dietary or supplement recommendations.

Sincerely,

Mueen Ahmed KK



Isolated single- nutrient trials strip away the food matrix and often overshoot the hormetic dose, testing nearly the opposite of the mechanism that makes whole foods beneficial.

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