The health benefits associated with fruit and vegetable consumption are attributed, in the main, to fiber and micronutrients and recent research has focused on the role of phenolics (polyphenols) in mediating healthful dietary effects. While most plants contain complex mixtures of polyphenols, isolated compounds, such as resveratrol, have been widely studied and shown to influence the activity of multiple cellular metabolic and signaling pathways. Indeed, based on its actions on several cellular regulatory systems, resveratrol has been proposed to be the active molecule underlying the benefits of grape and red wine consumption. To test the hypothesis that polyphenolic mixtures containing resveratrol produce variable and non-additive effects versus resveratrol alone, their antioxidant capacity (ORAC) and their effects in several in vitro models of cellular aging were compared using identical concentrations (µg polyphenols/ml). Compared to resveratrol alone, the same concentration of a mixture of muscadine grape polyphenols plus resveratrol produced synergistic effects on ORACability, but not ORACcapacity. Likewise, the polyphenolic mixture exhibited 10X greater potency versus resveratrol in inhibiting protein glycation.

INTRODUCTION

The grape polyphenol resveratrol is demonstrated to influence the activity of multiple cellular signaling pathways including those involved in cellular aging. Grapes and red wine, however, contain complex mixtures of polyphenols of which resveratrol represents a very minor component. It is possible that complex mixtures of polyphenols have different cellular actions than those of any single polyphenol comprising the mixture. To test this notion, the effects of resveratrol were compared to those of a mixture of resveratrol plus muscadine grape polyphenols in multiple models of cellular aging.

METHODS

An assay investigator conducted the following experiments:

- Antioxidant activity:
  - Dr. Phillip Greenspan, University of Georgia, Athens, GA

- Glycation of albumin:
  - Dr. Michael Zemel, University of Tennessee, Knoxville, TN

- Mitochondrial function:
  - Dr. Michael Zemel, University of Tennessee, Knoxville, TN

- Mitochondrial DNA damage:
  - Dr. Phillip Greenspan, University of Georgia, Athens, GA

RESULTS

- Sirt 3 expression:
  - Figure 4. Non-additive effects of resveratrol and muscadine polyphenols on Sirt 3 mRNA expression in human myotubes.

- Glutathione S transferase-P1 expression:
  - Figure 7. Non-additive effects of resveratrol and muscadine polyphenols on glutathione S transferase-P1 mRNA expression in human myotubes.

- Oxidative DNA damage:
  - Figure 8. Compared to resveratrol alone, a mixture of resveratrol and muscadine polyphenols produced greater protection against oxidative DNA damage in human pancreatic cells.

CONCLUSIONS

When compared to resveratrol alone, complex mixtures of polyphenols containing resveratrol produce non-additive effects in several models of cellular aging. Thus, the physiological effects of grape and red wine consumption may differ from those after consuming resveratrol alone.