

Antimicrobial effects of synthetic phenolic antioxidants on dietary fibre degrading bacteria

S. Shallangwa, P.J. Morgan, A.W. Walker and A.W. Ross
The Rowett Institute, University of Aberdeen, Aberdeen, UK

Synthetic phenolic antioxidants, Butylated hydroxytoluene (BHT) and Propyl gallate (PG), exert antimicrobial effects on pectin degrading bacteria of the gut microbiota.

BHT and PG are synthetic antioxidants commonly used by the food industry to inhibit the oxidation of fats to prolong the shelf life and palatability of products⁽¹⁾. However, these antioxidants may also have antimicrobial properties and therefore interfere with the beneficial gut microbiota.

Given that such activity could have potential implications for human health, in this study we examined the ability of the antioxidants BHT and PG to interfere in the fermentation of pectin, a soluble fibre enriched in citrus fruits, apples and some vegetables, by human gut bacteria.

Pure cultures of four strains of pectin degrading bacteria found in the human gut, namely *Prevotella copri*, *Bacteroides ovatus*, *Bacteroides vulgatus* and *Bacteroides thetaiotaomicron* were inoculated into basal M2 pectin media in Hungate tubes (7.5 ml) containing different concentrations in parts per million (ppm) of BHT or PG, or a combination of BHT and PG, dissolved in 95% ethanol. Optical densities (650 nm) were measured over a period of 48 hours to determine antimicrobial effects of these antioxidants on the growth of these bacterial strains. Confirmation of the identities of the cultures of pure strains of pectin degrading bacteria were confirmed by morphology and Gram staining.

Relative to the ethanol vehicle control (300ul) without antioxidant (0.44 ± 0.12), PG (400 ppm) exerted the greatest antimicrobial effect on *P. copri* with an OD value of 0.14 ± 0.01 ($P = 0.00003$) (t-test). PG at 400 ppm showed a strong toxic effect towards *B. ovatus* with OD value of 0.10 ± 0.02 relative to its ethanol vehicle control (0.22 ± 0.15) ($P = 0.02$). Similarly, PG (400 ppm) was also toxic to *B. vulgatus* (0.08 ± 0.01) in comparison to its ethanol vehicle control (0.11 ± 0.02) ($P = 0.00002$). The growth of *B. thetaiotaomicron* was also greatly reduced at 400 ppm of PG (0.18 ± 0.04) compared to its ethanol vehicle control (0.44 ± 0.16) ($P = 0.0004$).

The study confirms that, *in vitro*, PG at a concentration within the range used in foods does show antimicrobial properties against some pectin degrading bacteria from the gut, but BHT is less potent.

References

1. Saad B, Sing YY, Nawi MA *et al.* (2007) *Food Chem* **105**(1), 389–94.
2. Schroeder N, Marquart LF & Gallaher DD (2013) *Nutrients* **5**(6), 2093–113.