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Influence of the type of triacylglycerol fatty acids on vitamin E bioavailability: pig data and intestinal mechanisms involved

Damien P. Prévéraud^{1,2}, Charles Desmarchelier², Estelle Devillard¹, Patrick Borel²

¹Adisseo France SAS - CERN, Commentry, France ;

²UMR NORT 1062 INSERM / 1260 INRA / Aix-Marseille Université, Marseille, France

Vitamin E (VE) is an essential fat-soluble micronutrient for pig health and it is commonly included in feed as dl- α -tocopheryl acetate (TAC). During digestion in the small intestine, TAC is solubilized into mixed micelles and hydrolyzed by carboxyl ester hydrolase (CEH) to free α -tocopherol (TOL), a necessary step for VE absorption. The absorption mechanism is assumed to be closely linked to that of dietary fat, mainly composed as triacylglycerol (TAG) fatty acids.

A meta-analysis based on the results from 13 publications was performed to assess the effect of the type of dietary TAG on TOL concentration in pig tissues. A trial on 96 growing pigs receiving different fat sources during 7 weeks was also conducted. Both studies suggested the positive effect of saturated (SFA) and mono-unsaturated (MUFA) fatty acids on tissue TOL deposition, whereas poly-unsaturated (PUFA) fatty acids systematically led to decrease TOL concentration in the targeted tissues (liver, muscle, adipose tissue, plasma). *In vitro* studies were carried out to investigate the effect of the type of TAG fatty acids on TAC solubilization in micelles (bioaccessibility) and hydrolysis by CEH. Results showed that the addition of 3% linseed, olive or safflower oil to the diet decreased TAC bioaccessibility (-41% vs control; $P < 0.003$), whereas coconut oil addition had no effect ($P = 0.983$). Micelles originating from the digestion of the diets with linseed or safflower oil were larger ($P < 0.03$) than those from the digestion of diets without fat (control) or coconut oil. TAC hydrolysis with CEH systematically decreased with the addition of fat to the diet (-51% vs control; $P < 0.003$), whatever the type of TAG fatty acids.

As a conclusion, SFA and PUFA exhibit opposite effects on micelle formation that could explain, at least partly, the differences observed in pig tissue TOL concentrations.