The 2005 Dietary Guidelines for Americans recommend reductions in total fat intake and saturated fat intake to decrease the risk of chronic diseases and obesity. The potential impact of altered fat intake on the bioavailability of carotenoids has not been systematically investigated. We report the effects of dietary fatty acid composition on micellarization of carotenoids during simulated gastric digestion.

**Materials and Methods**

1. **Test Meal and Lipids**
   - The vegetables and fruits were homogenized to prepare a pured salad meal and stored in -80°C.
   - The fatty acid composition of the test meal was identified by gas chromatography.

2. **Simulated Digestion**
   - Carotenes are lipophilic plant pigments with various biological properties, including the ability to protect against free radical damage and to activate vitamin D. In order to deliver carotenes to their targets, they must be released from the food matrix and incorporated into micelles. The absorption of carotenes is affected by various factors such as the type of fat intake and the presence of bile and pancreatic enzymes.

3. **Carotenoid Extraction and Analysis**
   - Carotenoids were extracted from the test meal using a modified version of the method described by Li and colleagues. HPLC analysis was used to determine the bioavailability of the carotenoids.

**Results**

- **Experiment 1:** Bile salts, pancreatic enzymes, and dietary TG are required for micellarization of carotenoids from the test meal.
- **Experiment 2:** Micellarization of carotenoids, but not lutein, was enhanced with the increase of fatty acid chain length of TG.
- **Experiment 3:** Coconut oil enhances the micellarization of carotenoids compared to canola oil and safflower oil.
- **Experiment 4:** Limited amount of canola oil is required for micellarization of carotenoids.

**Summary**

- Micellarization of carotenoids during *in vitro* digestion requires both bile salts and pancreatic digestive enzymes.
- Efficiency of micellarization of lutein > α-carotene > β-carotene > lycopene.
- TG enhances micellarization of carotenones.
- Efficiency of micellarization depends on chain length and degree of saturation of fatty acids in TG.
- Relatively low amount of canola oil (approx. 1%, wt/wt) is required for maximum micellarization of carotenoids during digestion of the test meal.

**Conclusion**

Use of fat-free dressing with salad decreases micellarization and the bioavailability of carotenoids (and possibly other health-promoting fat soluble compounds) during digestion.

**References**

