# Concurrent Session 11: Fish and Omega-3 Fatty Acids

## A comparison of the effects of free and microencapsulated omega-3 PUFAs on early colorectal cancer biomarkers in the azoxymethane animal model

LS Nyskohus, Y Hu, RK LeLeu, GP Young
*Flinders University, Bedford Park, SA 5042*

**Background** – The potential of using fish oil as a chemopreventative agent for colorectal cancer is significant. Strong trends in epidemiological and *in vivo* studies highlight a link between high fish consumption or high levels of omega-3 polyunsaturated fats (n-3 PUFAs) and a low colorectal cancer risk. Advances in food technology such as the microencapsulation (ME) process of lipids aims to enhance such health benefits. Whether this ME process potentiates any protective effects of n-3 PUFAs against colorectal carcinogenesis is not yet known.
**Objective –** To compare diets containing free tuna oil and ME tuna oil in the rat-azoxymethane (AOM) model and establish whether the process of microencapsulating tuna oil enhances any possible protective effects by measuring early biomarkers of colorectal cancer development.
**Design –** Groups of rats (n=12) were placed on a standardised sunflower oil diet containing either free tuna oil or ME tuna oil at varying doses. After 4 weeks rats were given a single injection of AOM (10mg/kg) body weight and killed by $CO_2$ asphyxiation 6h post injection. A variety of tissues were collected for analysis of phospholipid fatty acid compositions. Acute homeostatic responses to the carcinogen including rates of DNA adducts ($O^6$medG), apoptosis and cell proliferation were measured in the distal colon using immunohistochemistry.
**Outcomes –** Levels of n-3 PUFAs increased in a dose-dependant manner in all animal tissues measured and across all groups. N-3 PUFA levels in animals fed the ME tuna product were equivalent to levels measured in free tuna animals. Tuna oil, either fed freely or in the ME form did not significantly alter levels of apoptosis or cell proliferation in the distal colon when compared to the control, however, DNA adduct load was significantly reduced in the 7% free tuna oil group and the 15% ME tuna oil group.
**Conclusion –** Omega-3 PUFA's may achieve protection during the initiation stages of colorectal carcinogenesis through their influence on DNA adduct levels. The microencapsulation of omega-3 PUFA's may potentiate this protective effect.

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## Fish and fish oil intake in older Australians at risk of cardiovascular disease

AJ Owen, L Shiel, D Wong, C Wood, CM Reid
*Dept Epidemiology & Preventive Medicine, Monash University, VIC 3004*

**Background** – Consumption of n-3 polyunsaturated fatty acids from fish has been found to be associated with a lower risk of cardiovascular disease (CVD). Australian intake of n-3 fatty acids is thought to be less than that recommended for maintenance of cardiovascular health, but the current intake status of those who are at greatest risk of a CVD event (older persons with major CVD risk factors, or a history of CVD) is not well defined.
**Objectives** – To determine fish intake and fish oil capsule use in older Australians at risk of CVD.
**Design** – 10-year follow-up of the Second Australian National Blood Pressure Study cohort collecting self-reported current intake of fish and fish oil capsules, and major cardiovascular events over the past 5 years.
**Outcomes** – The reporting cohort (n=1155) had mean age ± SEM of 81.4 ± 0.1 y and 51% were male. Females were more likely to take fish oil supplements (F:M, 35.6%:25.5%, $p<0.001$), and consume at least two serves of (non-fried) fish/week (F:M, 42.1%:35.8%, $p<0.03$). Those hospitalised for arrhythmia, heart attack, coronary bypass, angioplasty, stroke or heart failure over the previous 5 years did not differ from those free of CVD events in their adequacy of (non-fried) fish intake, but were significantly less likely to be taking fish oil capsules (25%:33%, $p=0.015$).
**Conclusion** – A substantial proportion of this high-risk population had n-3 intakes below that recommended for maintaining cardiovascular health. Those in higher risk categories (men, those with a prior recent CVD event) are less likely to be taking fish oil supplements. Maintaining an adequate n-3 intake for both primary and secondary CVD prevention in our ageing population remains a health promotion challenge.