THE EFFECTS OF DIETARY FAT TYPE ON ORAL, SUBCUTANEOUS AND INTRAPERITONEAL IMMUNISATION IN MICE

P.M. BYLEVELD, T. GRISSELL*, D.C.K. ROBERTS and G.T. PANG

Although diets containing n-3 fatty acids contribute to good health and appear to reduce inflammatory responses, it has been reported that these diets may reduce resistance to infection. Four experiments were conducted using specific pathogen free male Swiss mice to test the hypothesis that immunity to the influenza virus can be impaired by short term feeding with n-3 fatty acids. The mice were fed one of three diets (5 g/d) each providing 20% fat (w/w) in the form of either a fish oil, linseed oil or beef tallow blend. The diets contained equal amounts of n-6 fatty acids (11.5% of fatty acids) and the fish oil and linseed oil diets contained equal amounts of n-3 fatty acids (29%), and similar levels of monounsaturated fatty acids (26 - 28%) and saturated fatty acids (21 - 28%). On day 14 of each experiment, mice from each dietary group were immunised with live influenza virus (A/Qld). The mice were immunised orally (experiments one and two), intraperitoneally (experiment three) or subcutaneously (experiment four). On day 30 all mice were challenged intranasally with live influenza virus (A/Qld) at a dose of 5.04 loglo plaque forming units (loglo PFU) (experiment one) or 4.95 PFU (experiments two, three and four). On day 33 the mice were killed and serum and lungs collected for antibody determination (by ELISA assay) and determination of lung virus titer (by plaque assay).

Experiment	Diet	n	Immunisation dose (log_{10} PFU)	Antibody (absorbance mean ± SD)		Virus Titer (mean±SD) (log_{10} PFU/mL)
				Lung IgG	Serum IgG	
1	Fish oil	5	5.55	0.790 ± 0.277	0.550 ± 0.092	2.41 ± 0.91
	Linseed oil	5	oral	0.855 ± 0.109	0.581 ± 0.030	2.19 ± 0.42
	Beef tallow	5		0.732 ± 0.254	0.455 ± 0.085	2.81 ± 1.19
2	Fish oil	5	5.15	0.893 ± 0.454	0.910 ± 0.387	2.43 ± 0.97
	Linseed oil	5	oral	0.742 ± 0.531	0.769 ± 0.390	2.66 ± 0.94
	Beef tallow	6		0.818 ± 0.575	0.799 ± 0.465	2.58 ± 1.01
3	Fish oil	4	5.15	1.456 ± 0.023	1.578 ± 0.010	2.47 ± 0.60
	Linseed oil	4	intra-	1.174 ± 0.662	1.535 ± 0.135	2.42 ± 0.83
	Beef tallow	4	peritoneal	1.480 ± 0.011	1.628 ± 0.009	<2.00 ± 0.00
4	Fish oil	4	5.15	0.759 ± 0.509	1.426 ± 0.270	3.51 ± 1.10
	Linseed oil	4	sub-	0.953 ± 0.358	1.549 ± 0.031	3.29 ± 0.87
	Beef tallow	4	cutaneous	0.986 ± 0.445	1.540 ± 0.123	3.78 ± 0.53

Dietary n-3 fatty acids do not appear to have an effect on the level of each class of antibody after immunisation, however a difference was observed in the degree of protection from infection (virus clearance from the lungs) particularly with the intraperitoneally immunised group. In this case the greatest clearance of virus occurred with the beef tallow diet while there was a lower clearance with the fish oil and linseed oil (n-3) diets.

Disciplines of Nutrition and Dietetics and Pathology, The University of Newcastle, New South Wales 2308 *Australian Institute of Mucosal Immunology, Newcastle, New South Wales 2300