LYMPHOID TISSUE RESPONSES TO EMULSIFIED PERFLUOCARBONS IN RATS: EFFECTS OF A NOVEL FORMULATION

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Previous work has shown that lymphoid tissue responses to emulsified perfluorocarbons (PFC) depend on species used, together with composition and dose of emulsion administered (Lowe and Bollands, 1985; Bollands and Lowe, 1986a,b). Therefore, such variables must be considered in the overall assessment of PFC emulsions as components of potential oxygen-transport fluids. While previous work has evaluated commercial preparations including Fluosol-DA (F-DA) and Oxypherol (FC-43; Green Cross, Japan), the development of "second generation" emulsions with enhanced stability (Davis et al, 1986) has provided a more extensive range of potential biocompatible materials. We therefore report the effects of injecting low doses of a novel emulsified PFC formulation on lymphoid tissues and responses to a standard immunological 'challenge' in rats.

Female Wistar rats (body weight 140-160g, n = 12) were used. Animals were initially injected either intraperitoneally (i.p.) or intravenously (i.v.) via a tail vein with 10 $ml.kg^{-1}$ of a 20% emulsion of perfluorodecalin (FDC) containing 4% Pluronic F-68 surfactant and 1% perfluoroperhydrofluoranthrene (C-16 oil) to enhance stability (Davis et al, 1986); control animals were injected with sterile saline (0.9% w/v NaCl). 24 h later, all animals received a further i.p. injection of 5×10^8 double-washed sheep red blood cells (SRBC) suspended in 1.0 ml Hank's balanced saline. Blood samples were collected by retro-orbital bleeding at 3 and 5 days later. On day 7, animals were sacrificed and weight of liver, spleen, thymus and mesenteric lymph nodes (MLN) recorded. The specific plasma antibody titre to SRBC was measured using a conventional serial-dilution haemagglutination test with a 0.5% suspension of cells.

Mean liver weight was increased by 16% ($P < 0.01$) following i.p. or i.v. injection of emulsion whereas spleen weight increased by 15% ($P < 0.05$) in animals receiving i.p. emulsion only. No significant changes in either thymus or MLN weights occurred after injection of emulsion with mean values similar to controls (thymus: 0.24 $\pm$ 0.02% body wt; MLN: 0.07 $\pm$ 0.01% body wt). Mean (+ S.E.) $\log_2$ plasma antibody titres to SRBC showed a progressive rise up to day 5 in all animals with a further small increase in those injected i.p. with emulsion. However, titres on day 7 were not significantly different from the mean control value (6.1 $\pm$ 1.4).

These results show that an FDC emulsion containing a C-16 oil additive can be used in vivo in rats with no obvious adverse effects. The observed increases in liver and spleen weights after injection of emulsion were comparable to changes in lymphoid tissue weights in rats and mice receiving identical doses of F-DA (Bollands and Lowe, 1986a,b). However, the finding that antibody titre to SRBC was unaffected by prior treatment of rats with FDC emulsion conflicted with previous observations of enhanced antibody production following i.p. F-DA injection in rats and mice (Bollands and Lowe, 1986a,b). It is possible that this difference reflects a less potent immunopotentiating effect of the novel emulsion compared with F-DA but this remains to be clarified.

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