RESEARCH ABSTRACT

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Title: Ability of dietary conjugated linoleic acid (CLA-60) to improve the efficacy of a swine dysentery vaccine by enhancing the cell-mediated immune response. **NPB #99-208**

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ABSTRACT

To evaluate the effects of conjugated linoleic acid (CLA) on cell-mediated immunity, early-weaned pigs (n = 32) were distributed into two isocaloric and isonitrogenous (0, and 1.33% CLA) diets. A factorial (2 × 2) arrangement within a split-plot design, with 2 littermate pigs as the experimental unit for vaccination, and pig within litter as the experimental unit for dietary treatment, were used in data analysis. Vaccination with a proteinase-digested *Brachyspira hyodysenteriae* bacterin preparation was performed on d 21, 28, and 42 to evaluate the efficacy of CLA in expanding a $CD8^+$ cell subset enhanced by vaccination. The increase of peripheral CD8□□$^+$ cells induced by vaccination has been shown to be correlated with protection against spirochetal-induced colitis. Thus, the targeted enhancement of particular subsets of peripheral lymphocyte pools, induced either by dietary means or through vaccination, might aid in the induction of effective immune protection against specific groups of pathogens. Activation of $CD8^+$ lymphocytes bearing the TCR□□CD8□□ phenotype (i.e., cytotoxic T cells) is central for the development of protective responses against viruses (i.e., cell-mediated immunity), whereas the TCR□□CD8□□ phenotype would be involved in the development of immune responses against bacterial antigens, mucosal protection, and tolerance.

Polyunsaturated fatty acids, like CLA, modulate fatty acid metabolism and inhibit eicosanoid production, possibly, through a PPAR-□-dependent pathway of gene regulation. While other antiinflammatory agents decrease eicosanoid production but do not affect CD8α expression, CLA does. We hypothesized that the CLA-induced expansion of $CD8^+$ cells involves one or more distinct cell phenotypes and enhances specific $CD8^+$-mediated functions. Here, we demonstrated that dietary CLA promotes an increase of $CD8^+$ lymphocytes. Particularly, we showed that dietary CLA alone expanded TCRαβCD8αβ T lymphocytes (CTL), a critical T cell subset involved in protection against intracellular pathogens such as viruses. CLA alone or in combination with vaccination expanded TCRγδCD8αα T lymphocytes, and $CD3^-CD16^+$CD8αα (NK) cells within the peripheral pool. The expansion of TCRγδCD8αα T lymphocytes could enhance a type of protective immunity that, upon infection with *B. hyodysenteriae*, would ameliorate the signs associated with the onset of disease. The CLA-induced expansion of peripheral blood TCRαβCD8αβ cells was consistent with increased percentages of CD8$\alpha\beta^+$ and $CD4^-CD8^-$ thymocytes. Functionally, CLA enhanced the CTL cytotoxic effector potential, and both CLA and vaccination enhanced TCRγδCD8αα proliferation on d 63. The latter function was not correlated with increased proliferation of $CD4^+$ cells. Collectively, our investigations identified a nutrient that enhances cellular immunity by modulating phenotype and function of $CD8^+$ cells involved in both adaptive and innate immunity. Identification of nutrients, such as CLA, that influence $CD8^+$ lymphocyte kinetics will aid to expand the knowledge regarding the role of distinct $CD8^+$ subsets in porcine health and disease.

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