

UC Irvine

UC Irvine Previously Published Works

Title

Reduced tetanus antibody titers in overweight children

Permalink

<https://escholarship.org/uc/item/5gr5k8r8>

Journal

Autoimmunity, 39(4)

ISSN

0891-6934

Authors

Eliakim, Alon
Schwindt, Christina
Zaldivar, Frank
[et al.](#)

Publication Date

2006

DOI

10.1080/08916930600870434

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

ERRATUM

The Publishers would like to apologize for an error that occurred in the title page of *Autoimmunity*, March 2006; 39(2): 137–141.

The correct title page is below.

Reduced tetanus antibody titers in overweight children

ALON ELIAKIM^{1,2}, CHRISTINA SCHWINDT¹, FRANK ZALDIVAR¹, PAOLO CASALI³,
& DAN M. COOPER¹

¹Department of Pediatrics, Pediatric Exercise Research Center, University Children's Hospital, University of California, Irvine, CA, USA, ²Pediatric Department, Sackler School of Medicine, Child Health & Sports Center, Meir General Hospital, Tel-Aviv University, Kfar-Saba, Israel, and ³Center for Immunology, University of California, Irvine, CA, USA

(Received 13 January 2005; accepted 25 January 2006)

Abstract

Under-nutrition impairs immune responses, but far less is known about the impact of over-nutrition, such as obesity, on the response to vaccines. We measured the effect of childhood overweight status on inflammatory mediators, circulating immunoglobulins and tetanus antibodies in fifteen overweight children (BMI > 85 age-adjusted percentile) and 15 age-matched normal weight controls. Fitness was measured by a progressive ramp type exercise test. Lean body mass (LBM) and fat mass were determined by DXA. Tumor necrosis factor- α (TNF- α), interleukin-6 (IL-6), interleukin-1 β (IL-1 β) and interleukin-1 receptor antagonist (IL-1ra) were used to assess the inflammatory status; and circulating immunoglobulins (IgM, IgA, IgG and IgG subclasses) and specific IgG titer to tetanus were used to assess humoral immunity. Overweight children had higher LBM and percent fat mass, and lower peak VO_2 normalized to body weight. IL-6 was significantly higher in the obese children (2.6 ± 0.3 vs. 1.3 ± 0.3 pg/ml, in overweight and normal weight children, respectively; $p < 0.05$). No significant differences were found in TNF- α , IL-1 β and IL-1ra between the groups. No significant differences were found in immunoglobulin levels (IgM, IgA, IgG and IgG subclasses) between the groups. Anti-tetanus IgG antibodies were significantly lower in the overweight children compared to normal weight controls (2.4 ± 0.6 vs. 4.2 ± 0.5 IU/ml, in overweight and normal weight children, respectively; $p < 0.05$). The reduced specific antibody response to tetanus in obese children and adolescent might be due to mechanical factors such as lower relative vaccination dose, or reduced absorption from the injection site due to increased adipose tissue, or related to reduce immune response due to the chronic low grade inflammation expressed by the higher levels of IL-6.

Keywords: *Childhood, obesity, tetanus, immunoglobulin, humoral immunity*

Introduction

Altered energy balance can impair immune function and the response to vaccines in children [1]. In particular, the adverse impact of under-nutrition on immunity and infectious diseases in children is substantial and well-studied. But far less is known about the immune effects of other abnormal conditions of energy balance such as obesity, now a virtual epidemic in children in many areas of the world [2]. There are emerging data to suggest that in otherwise healthy children, obesity and levels of physical activity can, indeed, alter immune and inflammatory function [3–5]. For example, in adults, Weber and coworkers

[6] and in children, Simo-Minana and coworkers [7] found reduced antibody responsiveness to hepatitis B vaccine in obese individuals.

The mechanisms for this impaired responsiveness to hepatitis B are not known, nor is it known whether antibody titers to other vaccines are also influenced by obesity. Mechanical factors, such as differences in concentration and volume of distribution of the vaccine in obese compared with normal weight individuals could play a role [8]. Alternatively, the impaired response to vaccines might be related to the chronic, low-level inflammatory state (characterized by elevated cytokines such as IL-6 and TNF- α) now known to be associated with obesity in adults and children [9].

Correspondence: D. M. Cooper, Department of Pediatric, Pediatric Exercise Research Center, Bldg 25, 2nd floor, 101 The City drive, Orange, CA 92868, USA. E-mail: Dcooper@uci.edu