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# Downregulation of the immune system in low-quality child care: The case of Secretory Immunoglobulin A (SIgA) in toddlers

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## ABSTRACT

Does the experience of stress during child care lead to downregulation of the immune system, in particular in low-quality care? Saliva was collected from 68 toddlers attending center or family child care at home and at child care, and assayed for secretory IgA (SIgA). Caregiver sensitivity was used as an index of quality of care and was observed during three videotaped episodes of 10 min. Diurnal patterns of SIgA showed a steep fall in the morning followed by a flattening out. SIgA was not associated with type of care, but lower caregiver sensitivity was associated with lower SIgA levels in both types of care. Quality of child care is associated with a non-specific secretory component of children's mucosal immunity with well established protective effects against upper respiratory infections.

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## 1. Introduction

In adults the experience of persistent stress has the potential to lower or even compromise immune activity [1,2], in particular when chronic stressors are associated with changes in identity or social roles [3]. Virtually no research on social determinants of children's immune system is available. We suggest that during infancy and early childhood, the formative years of the immune system, the experience of stress through regular attendance of group child care may lead to downregulation of the immune system, in particular when quality of care is low (chronic stress). This downregulating effect of low-quality group care might partly explain why children attending child care more often fall ill than children who stay at home [4]. That is, stress as experienced through caregiving of lower quality may alter the immune response by making the organism more vulnerable to infection. Indeed, higher levels of stress in adults and children have been associated with increased susceptibility to acute infection, for instance upper respiratory infections (URIs) [5,6]. It should be noted that the distinction between chronic and acute stress is relevant because both suppressive and enhancing effects of stress on the immune response have been documented [7]. Acute or short-term stress experienced at the time of immune activation can enhance the immune response, whereas chronic or long-term stress can suppress immunity. In the current study, we consider the experience of stress through regular attendance of group child care as chronic or long-term stress.

One of the major classes of immunoglobulins (antibodies) that protect humans against antigens such as toxins or viruses is Immunoglobulin A (IgA). Secretory IgA (SIgA) is present in abundance in mucosal secretions and its levels in oral fluids serve as a key component of the first line of defense against antigens that cause upper respiratory infection, periodontal disease, and caries [1]. Unlike cortisol as a marker of stress, the study of SIgA as a marker of stress is a relatively under-explored area, especially in children. In a study on eight healthy adults [8], it was confirmed that salivary SIgA showed a similar diurnal cycle to cortisol: An early morning peak was followed by a decline to a stable base 6 h after awakening. Furthermore, as in cortisol, chronic stress in adults has been associated with a reduction in SIgA, whereas rises in SIgA have been reported when acute stress is involved [8].

The effects of relatively long-term stress on immune parameters, such as SIgA, have been well documented in studies on adults and studies employing animal models [9,10]. Across studies the negative direction of the effect is reliably observed, and the magnitude, on average, of the effect of stress is estimated to be 10% [1]. Deinzer et al. [11], for example, tested the influence of a tough academic examination on SIgA in medical students, immediately before and after the examination, as well as 14 days afterwards. They found significantly lower SIgA levels in students who took the exam compared to a control group, even 14 days after the end of the examination period. Shirtcliff, Coe and Pollak [12] reported that a stressful early childhood history (early deprivation through institutionalization and physical abuse) affects the long-term functioning of the immune system (SIgA) in adolescents. Antibody profiles were still altered years after adoption into a more benevolent environment with supportive families.

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