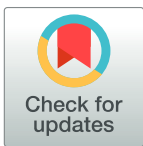


RESEARCH ARTICLE

Reproduction affects immune defenses in the guinea pig even under *ad libitum* foodFritz Trillmich^{1*}, Anja Guenther^{1,2}, Manuela Jäckel¹, Gábor Á. Czirják³

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Abstract

Reproduction is one of the costliest processes in the life of an animal. Life history theory assumes that when resources are limiting allocation to reproduction will reduce allocation to other essential processes thereby inducing costs of reproduction. The immune system is vital for survival. If reproduction reduces investment in immune function, this could increase the risk of disease, morbidity and mortality. We here test in the guinea pig, if even under *ad libitum* food conditions, pregnancy and lactation reduce the activity of the adaptive and innate immune system compared to the reaction of non-reproducing animals. In response to a challenge with keyhole limpet haemocyanin the antibody-mediated adaptive immunity during (pregnancy and) lactation was reduced. Pregnant and lactating females showed higher levels of bacterial killing activity, an integrated measure of innate immunity, than non-reproducing females. However, two major effectors of the innate immunity, the natural antibody and the complement of pregnant and lactating females showed lower levels than in non-reproducing females. Pregnant and lactating females did not differ significantly in the expressed levels of innate immunity. Our results indicate that changes in the immune response during reproduction are physiological adjustments to predictable allocation problems, because they happen even under *ad libitum* food availability.

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Data Availability Statement: The data underlying this study have been uploaded the University of Bielefeld's repository under the doi: [10.4119/unibi/2941457](https://doi.org/10.4119/unibi/2941457). Data are also available using the following link: <https://pub.uni-bielefeld.de/record/2941457>.

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Introduction

The demographic theory of optimal reproductive tactics [1] assumes that resources available to an individual are limited. As a consequence, selection acts on an animal's allocation decisions to create a balance between reproductive effort and self-maintenance in such a way that a maximal reproductive value results [1–3]. Given that reproductive effort can reduce further life expectancy [4] or future reproductive success [5] the question arises, which mechanisms the animals may use to balance increased expenses due to reproduction [6].

Increasing allocation for reproduction may lead to higher short-term fitness, but may reduce long-term survival through reduced expenditure on physiological maintenance and repair processes. One aspect that has received much attention is immune responses, which by defending the organism against micro- and macro-parasites constitute a major aspect of self-