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# Brain, Behavior, and Immunity

journal homepage: [www.elsevier.com/locate/ybrbi](http://www.elsevier.com/locate/ybrbi)

## Psychobiological correlates of allostatic overload in a healthy population

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### ARTICLE INFO

#### Article history:

Received 7 July 2011

Received in revised form 19 September 2011

Accepted 22 September 2011

Available online 7 October 2011

#### Keywords:

Stress  
Distress  
Allostatic load  
Well-being  
Blood donors  
Biological correlates

### ABSTRACT

The concept of allostatic load (AL) represents the cost of the continual adjustment of the internal milieu required by an organism to adapt to different challenges. The majority of studies concerning AL have focused mainly on identifying its biological components. Recently, new criteria for a clinimetric evaluation of AL have been introduced, adding a new definition of allostatic overload (AO). This study aims to identify psychological and biological correlates of AO in a population of blood donors, according to this new definition of AO.

Participants included 240 blood donors recruited from May 2007 to December 2009 in 4 different blood Centers. Blood samples from each participant were collected for laboratory analysis and self-rating instruments were administered on the same day. Biological parameters included those usually assessed during blood donation. Individuals were selected based on the criteria for the clinimetric evaluation of AO. Differences in biomarkers between subjects with and without allostatic overload were performed using the GLM with biological measures as dependent variables, AO groups as the fixed factor and specific confounders as covariates.

Based on the selection criteria for allostatic overload, 98 subjects have been identified as presenting with AO. Results showed that individuals with allostatic overload presented lower levels of serum proteins, erythrocytes and immune differential count than donors without allostatic overload. Further, greater mean corpuscular volume has been found in persons included in the AO group. The evaluation of the AO correlates, along with a biomarker profile, may help to identify those conditions that, by exceeding individual resources, may constitute a danger to health.

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### 1. Introduction

The concept of allostatic load, as introduced by [McEwen and Stellar \(1993\)](#), represents the cost of the continual adjustment of the internal milieu required by an organism to adapt to different social, environmental, and personal challenges. In normal situations, the allostatic response is initiated by a stressor, sustained for an appropriate interval, and then turned off ([McEwen, 2007](#)). Thus, the threshold between a tolerable level of stress (a physiological state buffered by the personal and interpersonal resources of the individual that occurs within a time-limited period) and toxic stress (strong, frequent and/or prolonged activation of the body stress response system in the absence of buffering factors/protection) does not lend itself to an easy distinction ([Shonkoff et al., 2009](#)). [McEwen and Wingfield \(2010\)](#) define allostatic overload as the transition to this extreme state. Thus, the physiological unbalance is the consequence of the 'wear and tear' resulting from repeated or chronic challenges or from the failure of the allostasis management.

The majority of studies concerning allostatic load have focused mainly on identifying its biological components, since such components are believed to mediate the relationship between stress and illness. However, a state of allostatic overload entails some clinical manifestations that can be observed in clinical settings. Examples may be provided by worsening of symptoms during weekends or vacation (inability to shut off one's response associated with lack of distraction entailed by work), or breakdowns which occur just when a stressor has terminated (caregivers of patients successfully recovering after a long struggle) ([Fava et al., 2010](#)). Also, as recently highlighted by [Sensky \(2010\)](#), stressful situations, especially work-related stressors, may lead to sickness absence even when no formal psychiatric diagnosis is present.

Recently, according to the clinimetric approach ([Feinstein, 1987](#)), [Fava et al. \(2010\)](#) have introduced specific criteria for evaluating allostatic overload in a clinical setting ([Table 1](#)). The term clinimetrics ([Feinstein, 1987](#)) refers to a domain concerned with indexes, rating scales and other expressions that are used to describe or measure symptoms, physical signs and other distinctly clinical phenomena which are not included in the customary taxonomy. According to [Fava et al. \(2010\)](#), the first criteria (A) deals with the specification of the stressor. This specification includes

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