

NEURO-ENDOCRINO-IMMUNOLOGY

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INTRODUCTION

Neuro-endocrino-immunology is a point of intersection in immunology. It is also referred to in the literature as psychoneuroimmunology. The emerging concept is that cells of the immune and inflammatory systems communicate directly with the peripheral and/or central nervous system. This connection or communication pathway is also mediated via the bloodstream and, therefore, involves hormonal communication. The term hormones does not only signify the classical endocrine system, but also

molecules released by the nervous or immune systems which have functional effects at some distance, such as, for example, catecholamines and a variety of neurotransmitters. Thus, the brain and the nervous system are part of the neuroimmuno-regulatory network in which the various components of the network not only communicate with each other and affect each other, but also regulate additional sites through this mechanism.

ROUTE OF INTERACTIONS BETWEEN NEURO-ENDOCRINE SYSTEM AND DEFENCE SYSTEM

Thus, antigen can interact with a T or B cell, macrophage, dendritic or mast cell through antigen specific receptors (antibodies) which, when bridged, will cause release of a host of immune and inflammatory mediators including:

1. cytokines,
2. growth factors,
3. eicosanoids,
4. histamine,
5. serotonin,
6. neurotransmitters, etc.

These can act locally on the nervous system which then transmits information through the normal efferent pathway, and results either in local axon reflexes or transmission of information via ganglia to the spinal cord, and thence to the brain. In turn, the brain,

can initiate events peripherally through such peripheral afferent signalling mechanisms or through intrinsic mechanisms, initiated for other reasons of communication within the central nervous system. These pathways either use traditional systems of nervous conduction or the hypothalamic-pituitary-adrenal (HPA)-axis. This axis involves corticotrophin releasing factor (CRF) and this axis is operative in a series of situations in which "stress" appears to play a role. These include responses to environmental and social factors, psychiatric and psychological adaptation, and immunologic and inflammatory responses to infectious agents such as viruses, bacteria and parasites.

INFLUENCE OF STRESS ON THE QUALITY OF THE DEFENCE RESPONSE

Stress is stated by *Black* (1995) to be "a state of disharmony or threatened homeostasis provoked by a psychological, environmental or physiological stressor". Stress is also invoked as part of the normal adaptive response to stimuli and should not be thought of as an abnormal reaction, since it involves the adaptation to "fight or flight". Much of this response is mediated through the HPA and is integrated via the hypothalamus by adjustment to certain functions such as the sympathetic nervous system and endocrine secretion. *Blalock* (1989) defined this as an active bi-directional communication pathway between the nervous and immune systems. While

the normal stress response is also characterised by secretion of corticosteroids a myriad of chemical messages in addition are involved in these responses.

Classical Pavlovian psychological conditioning has also been shown to regulate immune responses and is not only capable of up-regulation, but also down-regulation or inhibition. These are extensively reviewed in a book on the subject (*Ader et al.*, 1991) since the nervous system has both inhibitory (negative) and activating (positive) pathways. Many neurotransmitters such as somatostatin and calcitonin gene-related peptide are both inhibitory and activating.

CONCLUSION

These systems are extremely complex but are known to regulate biological activities as diverse as neuronal repair and regeneration, and homeostasis of the internal environment. At times, these systems may act entirely separately from each other, and at other

times intimate and very active regulatory interactions come into play, ranging from fine tuning of reactions to major participation in physiological and dysfunctional events. The role of these factors in initiation or control of disease is only just beginning to be clarified.

LITERATURE

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