INTRODUCTION

THE CONCEPT OF STRESS AND ITS HISTORICAL DEVELOPMENT

"He who thus considers things in their first growth and origin, whether a state or anything else, will obtain the clearest view of them."

Aristotle, circa 450 BC

The term "stress" has been used, and occasionally abused, by scientists and by the lay public, in almost every single language of the civilized world. Many definitions and meanings have been ascribed either consciously or unconsciously to the word. Nevertheless, despite a lack of general agreement about its meaning, the term has prevailed because it attempts to address a basic principle of Nature, that of maintenance of balance, equilibrium, or harmony in the face of disturbing forces on the one hand and counteracting reestablishing forces on the other. One potential reason for the confusion surrounding the term "stress" is that it has been variously used to describe the disturbing forces, the disturbed balance or disequilibrium, and/or the results of the counteracting, reestablishing forces.

The term "stress" is, according to dictionaries, synonymous with the term "strain." The roots of these words go far back into the origins of Indo-European language. In ancient Greek, it was the root for "strangale," which means a halter, and the verb "strangaleuin," which means to strangle. In Latin, it gave the root for the verb "stringere," which means to draw tight, to press. Thus, the roots of stress have always meant the exertion of primarily adverse forces. Modern words like "distress" or "strenuous" imply similar connotations.

Hans Selye, in the late 1930's, was the first man to use the term "stress" more or less as we know it today. He borrowed the term from physics and set it to mean the mutual actions of forces that take place across any section of the body. The selection of the term was thus conceptually, etymologically, and phonetically sound.

The brief historical approach to stress that will be attempted will be divided into three parts. First, we will try to answer the question, "What is stress?" or at least to propose a current, conventionally accepted definition. This will not only allow us to look back at its historical development but also will allow scientists from diverse disciplines, to communicate with each other. Second, we will try to answer the question, "How was the concept of stress developed to mean what it means today," and, third, we will try to answer the question, "Which are the developmental milestones that led to our current understanding of stress mechanisms?" This, of necessity, will be a very brief overview of an extraordinarily complex and multifaceted subject.
What is Stress?

Stress is the state of threatened balance, equilibrium, or harmony. The "balanced" state directly translated from the Greek "homeostasis" means "steady state." The disturbing forces or threats to homeostasis we call "stressors", and the counteracting reestablishing forces we call "adaptive responses". Homeostasis pertains not only to a steady milieu of chemical or physiological parameters but also to states of mind. Stressors are not only physical, like cold, hot, pain or loss of blood, but also emotional, like psychological loss or uncertainty. Finally, the adaptive responses of the body can be specific to a given stressor or, in other settings, general, and independent of the type of stressor.

Excessive or chronic activation of adaptive responses to stressors can have their own noxious effects, themselves acting as threats to homeostasis. They produce a syndrome that was first noted by Hans Selye and gave him the impetus for formulating his concept of a nonspecific generalized response against any major threat to homeostasis.

Homeostasis, in summary, is the steady, harmonious state of mind and body; 'stress' is the recognition by the body of a stressor and therefore the state of threatened homeostasis; stressors are threats against homeostasis; and adaptive responses are the body's attempt to counteract the stressor and reestablish homeostasis. These responses can be specific to the stressor, or generalized and nonspecific, probably depending on the magnitude rather than the type of the stressor.

How was the Concept of Stress Developed?

The first written reference to homeostasis was by the natural philosopher Empedocles about 450 B.C. He considered all matter as a mixture of essential elements existing together in a state of harmonious balance (Table 1). Hippocrates, a contemporary, extended the concept in living beings considering the state of harmonious balance as health and the state of dys-harmony as disease.

The next scientist to address the concept of homeostasis, was Claude Bernard. He talked about the stability of the internal environment and described the "milieu interieur formed by the circulating organic liquid which surrounds and bathes all the tissue elements." Walter Cannon coined the term homeostasis, at the turn of the century and provided a clear description of this state. He wrote:

"The living being is stable. It must be so in order not to be destroyed, dissolved or disintegrated by the colossal forces, often adverse, which surround it. In a sense it is stable because it is modifiable, the slight instability is the necessary condition for the true stability of the organism".

The first reference to disturbed homeostasis and stressors was by Hippocrates in 400 B.C. He considered diseases in general as states of disequilibrium and imbalance. He ascribed natural causes to diseases, defining them as stressors. An excerpt of his words on effects of external natural forces on epilepsy is given below:

"As for this disease called divine, surely it has its nature and causes, as have other diseases. It arises - like them - from things which enter and quit the body, such as cold, the sun and the winds, things everchanging and never at rest. Such things are divine or not as you will, for the distinction matters not and there is no need to make such division anywhere in