INTRODUCTION

Claud Bernard is credited as being the first biologist to propose the principle embodied in the sentence:

"The vital mechanisms of an organism have one object, preserving constant their internal environment." This principle was given the name homeostasis by Cannon (1929) and in chemical reactions is familiar as the 'Le Chatelier's Theorem'.

Brody (1945) took homeostasis as the theme for his book 'Bioenergetics and Growth'. He points out the wide application of the principle not only in maintaining body temperature or blood composition constant, but also with regard to the growth and development of animals. Brody has demonstrated that growth, at least in the later stages, proceeds as if the normal condition were the mature size and that the rate of growth is proportional to the growth needed to reach mature size. Consequently an animal whose growth has been retarded exhibits, when the restriction is removed, a rate of growth greater than is normal in animals of the same chronological age. Bohman (1955) has termed this abnormally rapid growth relative to age 'compensatory growth'.

The development of meat animals, or the change in form with increasing size, is as important as the rate of live weight gain. Huxley (1932) demonstrated with various animals such as chidler crabs and deer that their development followed a centripetal pattern. This is caused by waves of high growth intensity commencing in the body extremities and converging along the back line to the loin. Hammond (1932) showed that all the tissues are subjected to this wave of high growth intensity, in orderly succession, achieving their maximum rate of growth in the following order: nervous tissue, skeletal tissue, muscular tissue, fat tissue.

The profound effect exerted by the rate of growth on body conformation and composition has been amply demonstrated for domestic animals by means of the technique of quantitative growth analysis. The effect of breed or genetic variation in growth rate upon body development has been examined by Hammond (1932) and Palsson (1940).

Changes in growth rate induced by varying the plane of nutrition, and the subsequent effects upon development have been studied in detail, using the smaller domesticated species. (McMeekan 1940, 1941; Palsson and Verges 1952; Wallace 1948; Wilson 1952, 1954 A and B, 1958).

Retardation of the rate of growth has the greatest effect upon the late maturing tissues and regions of the body and may alter the proportions of the body permanently. Thus the body form may be said to exhibit considerable plasticity in response to variations in the rate of growth.

However Palsson (1955) reviewing this subject has pointed out the remarkable recuperative capacity of the tissues and organs in animals when the restriction on their growth is removed. Wilson (1954) using chickens demonstrated this clearly.

The development of animals, which exhibits plasticity in response to restricted nutrition, possesses in addition a contrasting resilience when the restriction is discontinued. It would appear that here again the same homeostatic mechanism is at work, tending to maintain the relationship between body form and size constant.

The following brief review of literature, and the experiment herein described, seeks to examine the factors controlling this aspect of homeostasis and the physiological processes through which it operates.