# THE EFFECT OF HEPARIN ON LIPID METABOLISM AND ITS SIGNIFICANCE IN ATHEROSCLEROSIS.

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## INTRODUCTION

It has become customary in the classification of arterial disease, to consider arterio-sclerosis in the broad sense to include a variety of non-inflammatory arterial diseases. Within this broad group three sub-groups are distinguished (4).

(a) Atherosclerosis (or atheroma), which is the commonest, and is that condition in which focal lipoid deposits are present in the intima of the large arteries such as the aorta, and in particular in the cerebral and coronary arteries.

(b) Medial Calcification (Mönckeberg's sclerosis), in which the muscular arteries of the limbs are involved, and the characteristic lesion is degeneration and calcification in the media.

(c) Arteriolar sclerosis. In this condition the arterioles are involved, mainly the visceral vessels, and changes associated with thickening of the wall and narrowing of the lumen occur usually secondary to hypertensive changes

This present thesis is concerned entirely with the firs type of arteriosclerosis, atherosclerosis or atheroma. It is by far the most common and by far the most important type, since its involvement of the coronary and cerebral vessels in particular produce high morbidity and mortality figures. In fact, atheroma is the "killing disease", the other two types are not associated with the same functional vascular disturbances produced by atheromatous change.

Arterial disease is by far the major cause of death in most civilized countries, and certainly in Australia. Table I shows the causes of death in Australia in 1952 and 1953 (the most recent figures available). These figures have been adapted from official statistical records of the Commonwealth (5).

TABLE 1.

CAUSES OF DEATH IN AUSTRALIA IN 1952 and 1953

(Expressed as a percentage of total deaths from all causes.)

| Cause of Death | 1952 | 1953 |
|---|---|---|
| Arteriosclerosis and degenerative heart disease | 26.7 | 26.5 |
| Chronic rheumatic heart disease | 1.0 | 1.0 |
| Other heart disease | 2.5 | 2.6 |
| Hypertension | 4.4 | 4.5 |
| Malignant disease | 13.7 | 14.3 |
| Vascular lesions of the Central Nervous System | 13.2 | 13.3 |
| Trauma | 7.4 | 7.5 |
| Pneumonia | 3.4 | 3.3 |
| Other infective disease, including Tuberculosis | 4.0 | 3.5 |
| Infant diseases | 4.8 | 4.9 |
| Nephritis, Nephrosis | 2.0 | 2.0 |
| Diabetes | 1.3 | 1.4 |
| All other causes | 15.6 | 15.2 |

While it is appreciated that "death certificate data" is of necessity inaccurate in many cases, yet an approximate overall picture can be obtained from it. The major cause of death, as can be seen from Table 1, is "arteriosclerotic and degenerative heart disease", and it will be conceded that most of this death rate is due to atheroma of the coronary vessels. Another major cause of death is vascular disease of the Central Nervous System, and again it will be conceded that most vascular disturbance of the Central Nervous System is laid on the background of cerebral atherosclerosis. Thus some 40 per cent. of the total death rate is due directly to atherosclerosis. The nearest other single cause of death is neoplasia, which only accounts for 14 per cent. of the total. Thus atherosclerosis, and not arteriolar sclerosis nor medial sclerosis, is responsible for an annual death rate of 40 per cent. of the total. These figures represent a very real impetus to research into the cause of atherosclerosis. In fact it quite truthfully can be said that the two major problems awaiting solution in medical research today are those of atherosclerosis and of neoplasia.

The problem of atherosclerosis, however, has been dismissed in many minds as being an inevitable degenerative process, unavoidable, coming with age, and therefore unable to be affected or reversed by therapeutic measures. This concept has certainly been responsible for the delay in tackling it as a problem. Indeed it is only when it is accepted as a disease associated with other etiological, and thus treatable factors,

than age, that work has proceeded apace in an attempt to determine its etiology and retard or reverse the changes.

The fact that atheroma is not necessarily associated with ageing in a large proportion of individuals would serve to emphasise the possibility of other etiological factors. During the last decade or so this fact has been increasingly obvious with the description of atheromatous disease in young adults (6),(7),(8). In this connection the report of Enos et al. (8) of widespread coronary atheroma in young adults killed in Korea is startling. These workers have demonstrated in three hundred autopsies of soldiers of average age 22.1 years, evidence of coronary atheroma in 77.3 per cent. of cases. This evidence varied from "fibrous thickening" to complete occlusion of one or more of the main branches. These facts can only be explained if we allow other etiological factors in atheroma apart from age.