

## Lipofuscin Granules in Normal, Benign and Malignant Human Prostatic Tissue\*

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**Summary.** Confirmation and extension of the identification and variation of the frequency of lipofuscin granules in sections of specimens of normal, benign and malignant human prostatic tissue by fluorescent microscopy was obtained. However, the suggestion of the possible relationship between the presence of these granules and alterations in the metabolic processes within the prostate occurring in consequence of senescence and/or

disease-specific factors is perhaps somewhat questionable as cellular and structural variations ranging from the benign to the most anaplastic were frequently observed in the same microscopic section.

**Key words:** Lipofuscin granules, normal, benign and malignant prostatic tissue.

### Introduction

Lipofuscin granules, derived by oxidation and polymerization of unsaturated tissue lipids or lipoproteins, are widely distributed in a variety of tissues in man and other species, e. g., adrenal cortex, cardiac muscle fibers, liver and nerve cells (1). In accord with present knowledge, it is generally agreed that lipofuscin granules are derived from hydrolase rich lysosomes (2, 3); increase with age (4) and in the presence of certain disease states, e. g., cachexia (1). Hamperl (5) initially observed lipofuscin granules in human prostatic tissue and Brandes (6) in his studies of the prostate in relation to sex hormones and aging observed a marked accumulation of lipofuscin granules in prostatic epithelial cells of elderly men in comparison to those seen in young individuals.

In the present study, an attempt has been made to confirm and extend present knowledge of the

occurrence of lipofuscin granules through the evaluation of their presence and frequency in normal, benign and malignant human prostatic tissue. Some preliminary observations have been made (7).

### Material and Methods

Representative 4 $\mu$ , unfixed frozen sections of specimens of normal and benign prostatic tissue obtained at necropsy from 6 patients (aged 17 to 68 years) expiring from diseases other than of prostatic origin and at the time of prostatectomy from 17 patients (aged 43-65 years) with benign prostatic hypertrophy (BPH), respectively, previously evaluated by fluorescent microscopy for *in vivo* bound immunoglobulins (8, 9) were examined for the presence and frequency of lipofuscin granules under dark field with UV illumination; a BG-38 suppression filter, UG-1 exciter filter and 44 barrier filter. Under such conditions lipofuscin granules may be observed by their characteristic yellow-orange pigmentation emitted with UV illumination.

Specimens of malignant prostatic tissue were obtained from 5 patients (aged 47 to 67) with various clinically and histologically staged and graded (classification according to Flocks (10)) carcinomas of the prostate (CaP) prior to surgery and examined for their content of lipofuscin granules as described above.

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### Results

Lipofuscin granules of various sizes were observed in both sections of normal and benign prostatic tissue. The granules were most often seen in clusters in the basal aspect of the cytoplasm of

secretory epithelial cells (Fig. 1) and on occasion in the fibromuscular stroma. The number of granules varied from cell to cell, but in the 23 specimens of normal (6 specimens) and benign (17 specimens) prostatic tissue examined, appeared to be more predominant in the hyperplastic prostatic

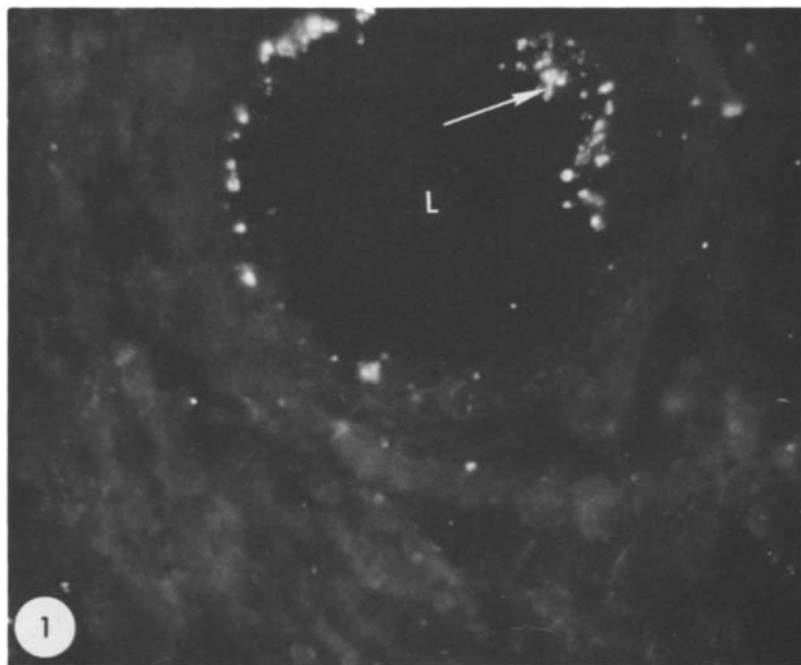


Fig. 1. Section of prostatic tissue from patient with benign prostatic hypertrophy illustrating high frequency of lipofuscin granules (arrow). X 250

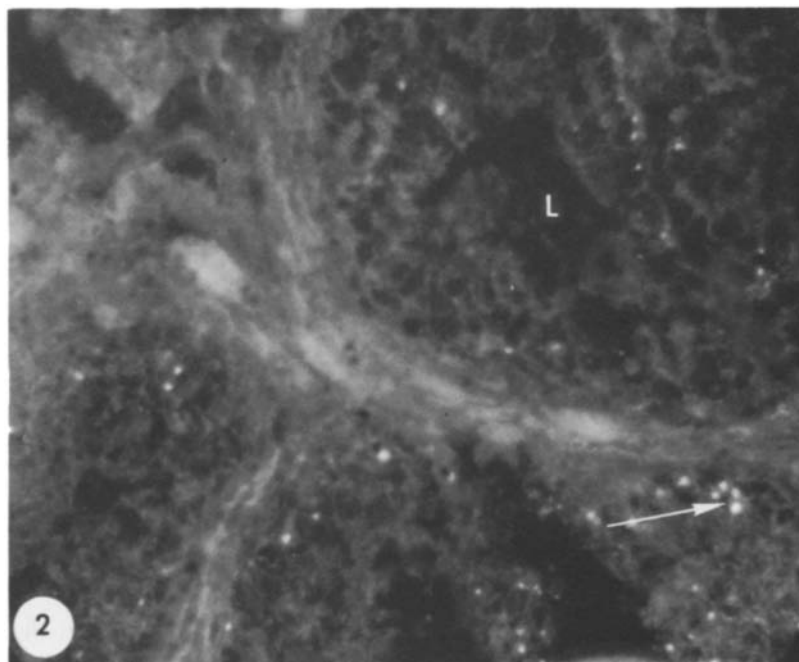


Fig. 2. Section of prostatic tissue from patient with carcinoma of the prostate Stage II (10). Note paucity of lipofuscin granules (arrow) in comparison to those seen in benign prostatic tissue as shown in Figure 1. X 250

tissue than in the normal. In contrast, as shown in Fig. 2, there was a considerably marked paucity of lipofuscin granules in malignant prostatic tissue, with some sections showing no detectable (by present methodology) evidence of granules. That is based upon subjective visual observations of a limited number of representative sections from the 5 patients with CaP included in the present study, 3 patients with advanced malignancy, i. e., Stage III, showed no lipofuscin granules. However, the two other patients with Stage II CaP included in the present study showed a frequency of lipofuscin granules ranging from a high incidence as shown in Figure 1 to a low incidence as shown in Fig. 2.

### Discussion

Observations of the present study and of those recently reported by Müntzing and Nilsson (11) are suggestive of the possible relationship between the occurrence of lipofuscin granules and alterations in the metabolic processes within the prostate in consequence of senescence and/or disease-specific factors and in general offer confirmatory evidence to the earlier studies of Brandes (6).

Any discrepancy between the apparent frequency of lipofuscin granules in normal prostatic tissue as observed in the present study and of the frequency of lipofuscin granules observed in "histologically normal-looking prostatic epithelial cells" of hyperplastic prostatic tissue as described by Müntzing and Nilsson (11) are most probably due to patient population age differences. The author however, is of the opinion following the opportunity to examine numerous sections of normal and pathologic prostatic tissue specimens since his preliminary report (7), that attempts to support changes in the frequency of lipofuscin granules due to age with data from hyperplastic and malignant disease states are somewhat questionable as cellular and structural variations ranging from the benign to the most anaplastic forms of malignancy were frequently, following careful examination, seen in the same microscopic section prepared from benign and malignant prostatic tissues included in the present study.

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