Relationship of Ploidy and Chromatin Condensation in the Rat Liver, Moreover a Comparison of the Nuclear Texture in Sections and Touch Preparations*

W. Romen, A. Rüter, K. Saito, H. Harms, and H.M. Aus
Pathologisches Institut und Institut für Virologie und Immunbiologie der Universität Würzburg, D-8700 Würzburg, Federal Republic of Germany

Summary. In touch preparations and tissue sections from normal rat hepatocytes and α-amanitine- and actinomycin D-poisoned liver cells the extent of chromatin condensation relatively to the degree of ploidy and the chromatin distribution were studied by means of computer aided cytophotometry. It could be found, that the relationship of the condensed and decondensed chromatin is independent of the degree of ploidy and first of all dependent upon the intoxicant. Therefore, the extent of chromatin condensation can be utilized also in sections as additional parameter for automated cell screening.

Introduction

A usual parameter for automated cell screening is the chromatin distribution in the measured histograms as reported by Sandritter et al. (1974), Borst et al. (1979), Brugal et al. (1979) Ploem et al. (1979) and Smeulders et al. (1979). The usefulness of this parameter in computer aided analysis is limited, however, if the chromatin distribution depends on the degree of ploidy. Assuming such a dependency, this parameter would not be applicable to sections, because registrated alterations could result from either malign cell transformation or polyploidisation. The latter possibility can not be excluded in sections, because the DNA-content is undetermined in cut nuclei. Whether a dependency exists was investigated in touch preparations from normal and acute intoxicated rat livers.

Material and Methods

Six approximately 200 g male Sprague-Dawley rats were poisoned with α-amanitine or actinomycin D (1 mg/kg body weight). A lobe of the liver was removed from each animal four hours after...
Fig. 1 A–D. Demonstration of the management of a liver nucleus by computer aided cytophotometry. 

A Histogram (dotted) and the smoothed histogram (lined) of the scanned rectangular part of the nuclear image (inset). On the left a pseudo-gray value playback image using the shown intensity-thresholds $T_1$, $T_2$, $T_3$ from the histogram. 

B The programs nucleus finding with an elliptical mask around the areas in the intensity range $O$, $T_2$ by a given minimum pixel number for this areas. 

C Calculated concentric rings: dark points = 1/5 nucleus edge ring, gray points: 4/5 nucleus center area. 

D Calculated pie shaped sectors. 

E The computer generated and normalized 8 sector histograms. 

Abscissa: distance from the middle of nucleus (left: middle, right-hand: nuclear envelope), ordinate: mean intensity in sector.