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Statistical Distortion Detection of Interference Microscope Image

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Abstract

The purpose of the article is reducing distortions of geometric characteristics which characterize the density uniformity of the erythrocytes quantity distribution on the plane of the microscope image due to the technical improvement of the optical scheme of the polychrome microscope, based on the use of the coherent source of light. For a comparative study of the operational properties of a semiconductor light source, two types of lasers were chosen: laser 1 is a light laser diode and laser 2 is a laser module with additional optical elements. The image plane was divided into 36 rectangular zones: 4 central, 12 intermediate and 20 edge. Counting of uniformity distributed erythrocytes number for each of the zones made it possible to statistically compare the distortions of the initial uniformity for lasers 1 and 2. The use of linear regression analysis with applying Fisher's F-statistics for evaluation of the regression statistical significance led to important conclusions. Statistical analysis showed that for lasers 1 and 2 there are different geometric curvatures of the image. Laser 2 has order of magnitude smaller edge effects for the average density of erythrocytes quantity for each of the 36 zones created with a help of modified chamber equivalent to a Goryaev chamber. It is proved that the edge effects for laser 1 are statistically uniform over the entire perimeter of the image. As for the laser 2, its use does not provoke geometric curvatures of the image, including geometric models of

edge effects. The presence of additional optical elements in the laser 2 solves the problem of technical improvement of the light source, ensuring the achievement of the purpose.

Keywords: interference microscope, erythrocytes shapes, linear regression analysis, microscope images, fisher statistics

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