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# WAVELET TRANSFORM: A NONLINEAR TOOL FOR CHARACTERIZING Β-THALASSAEMIA SYNDROMES

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**Abstract**. Fractal analysis has been applied with great success to many different biological systems, and many of them have been found to be either spatial or temporal fractals. The present model of erythrocytes (blood cells) viscoelastic properties is another example of a temporal fractal in biological systems. Human red blood cells are viscoelastic, showing viscous and elastic components integrated in a complex viscoelasticity when undergo fluid shear stress. This dynamic behaviour has a physiological importance since in vivo the erythrocytes continually change their shape and adapt passively to capillary circulation. The objective of the present work is applying wavelet transfom, to investigate and characterize different populations of red blood cells subjected to fluid shear stress, by means of Information Theory tools. Our preliminary studies on red blood cells (RBC); complex behaviour have shown to be a crossover between mathematic nonlinear quantifiers and human blood disease. On this basis we applied a new concept in the study of the manifestation of this behaviour. We introduce Wavelet based Information Theory quantifiers: the Normalized Total Shannon Entropy, the Martín-Plastino-Rosso (MPR), to find out the evident manifestation of a random process on red cell samples of healthy individuals (controls), and its sharp reduction of randomness on analyzing a human haematological disease, such as β-thalassaemia minor. β-thalassaemia syndromes constitute an heterogeneous group of genetic alterations characterized by deficiency or absence on the synthesis of β-globin chain, which have grown in the last decades. So far, the wavelet based complexity-entropy plane of erythrocytes performed by laser diffractometry could be very useful to investigate the cell membrane alterations.