

Pseudopyropoikilocytosis Leading to Spurious Results

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تعرض كريات الدم الحمراء للحرارة يؤدي لنتائج مخبرية زائفة ومضللة

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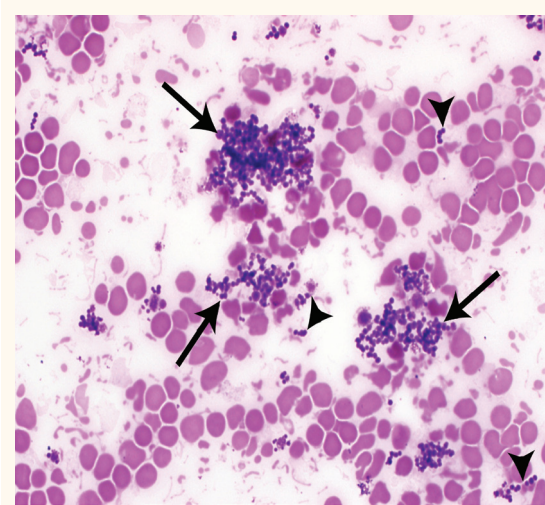


Figure 1: Blood film showing numerous small basophilic particles in clumps (arrow) and small chains (arrow head).

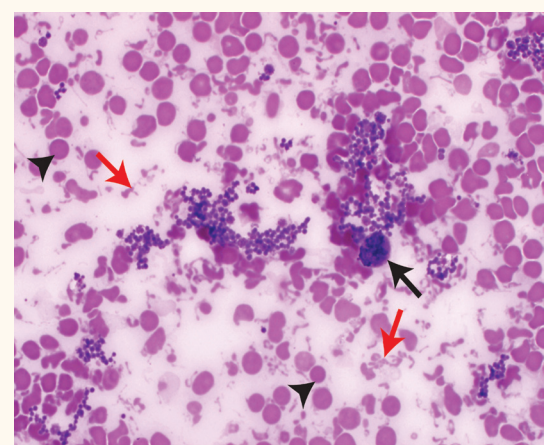


Figure 2: Blood film showing striking red cell poikilocytosis with numerous microspherocytes (arrow head) and irregular pleomorphic fragments (red arrows). A necrotic neutrophil with distorted nuclei can also be seen in the field (black arrow).

PSEUDOPYROPOIKILOCYTOSIS IS AN UNUSUAL phenomenon that is caused by the overheating of blood samples during transportation to the laboratory.¹ This results in the red blood cells (RBCs) displaying similar morphological features to blood films of individuals with hereditary pyropoikilocytosis and severe thermal burns. The morphological findings in these two pathological conditions are related to the thermal instability of the RBCs.² Both these morphological changes and the spurious results obtained from overheated samples can result in diagnostic confusion.

A 21-year-old female was referred to the Department of Haematology at the Sultan Qaboos Hospital, Muscat, in July 2012 following abnormal laboratory results. Her vital signs were stable and the physical examination was unremarkable. A complete blood count (CBC) obtained by the CELL-

DYN SAPPHIRE haematology analyser (Abbott Diagnostics, Lake Forest, Illinois, USA) showed marked thrombocytosis with a platelet count of $3,425 \times 10^9/L$ (normal range: $150-450 \times 10^9/L$), leukocytosis with a white blood cell count of $16.8 \times 10^9/L$ (normal range: $2.4-9.5 \times 10^9/L$), microcytosis with a mean corpuscular volume (MCV) of 68.5 fL (normal range: 78–95 fL), a high red cell distribution width (RDW) at 33.9% and an extremely high reticulocyte count of $5,435 \times 10^9/L$ (normal range: $20-150 \times 10^9/L$).

The blood film showed numerous small basophilic spherical particles in chains and variable clumps [Figures 1 and 2]. In addition, there was severe red cell poikilocytosis with bizarre poikilocytes, including microspherocytes and irregular pleomorphic fragments [Figure 2]. The white blood cells appeared necrotic. The potassium (K) level was high at 6.4 mmol/L (normal range: 3.5–5.1 mmol/L).

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The patient underwent a repeat CBC, and the new sample revealed normal indices. The repeated blood film and K levels were normal. The initial abnormal results were therefore attributed to the large number of small red cell fragments and the numerous spherical particles, which were thought to be precipitated proteins. The initial collection tube expiry date was verified. Gram stains and cultures on the initial sample, as well as on new samples, were negative. Since the clinic was located at a distance from the laboratory, it was concluded that the previous abnormal results were due to the possible thermal exposure of the sample during transportation, resulting in *in vitro* haemolysis, altered morphology and spurious results. However, a manufacturing defect in the original collection tube could not be ruled out.

Comment

Spurious results on haematology analysers should be promptly identified to avoid potential misdiagnoses.³ Abnormal results require a careful evaluation of the scatter plots obtained by the analyser as well as an examination of a well-stained blood film. This case provides an example of the spurious results that can result after a thermal injury to a blood sample. In addition, it gives a clear illustration of the different morphological abnormalities seen in this setting. These results were obtained by a different instrument than those seen in the previously published literature, illustrating the importance of recognising the different

characteristics of various analysers when examining the obtained results. The artificial thrombocytosis is likely to be secondary to the presence of the particles and the red blood cell fragments.⁴ Since the CELL-DYN SAPPHIRE haematology analyser uses impedance and optical methods (light scattering) of measurement, the presence of these particles caused an overestimation of the counts, as well as the low MCV and high RDW.

Haematologists and haematology laboratory scientists must be aware of the characteristics of their analysers when evaluating CBC results, and be able to recognise and circumvent anomalous results. The lack of recognition of spurious results can lead to unnecessary investigations, undue anxiety and potentially harmful interventions. Any unusual or abnormal findings should prompt a request for a blood film and a repeat sample.

References

1. Bain BJ, Liesner R. Pseudopyropoikilocytosis: A striking artifact. *J Clin Pathol* 1996; 49:772–3. doi:10.1136/jcp.49.9.772.
2. Zarkowsky HS, Mohandas N, Speaker CB, Shohet SB. A congenital haemolytic anaemia with thermal sensitivity of the erythrocyte membrane. *Br J Haematol* 1975; 29:537–43. doi: 10.1111/j.1365-2141.1975.tb02740.x.
3. Bain BJ, Lewis SM, Bates I. Basic haematological techniques. In: Lewis SM, Bain BJ, Bates I, Dacie J (Eds). *Dacie and Lewis's Practical Haematology*, 9th edition. Philadelphia: Churchill Livingstone, 2001. Pp.19–46.
4. Zandecki M, Genevieve F, Gerard J, Godon A. Spurious counts and spurious results on haematology analysers: A review. Part I: Platelets. *Int J Lab Hematol* 2007; 29:4–20.