

MORPHOLOGY MONDAY

HELP, WHAT IS IT?



Specialist Biomedical Scientist **Anas Nasir** presents six blood film case studies for readers to expand their morphology knowledge.

Remember those early days staring down the microscope, when blood cells looked more like alien life forms than anything in the textbooks, and neutrophils had more dramatic flair than a Shakespearean cast? That's exactly where Morphology Monday began.

It started with one confused biomedical scientist (me) and a desperate plea on social media: "HELP, what is it?" What followed was an unexpected ripple of replies – from fellow biomedical scientists to haematopathologists across the globe. That moment of collective curiosity sparked what would become a weekly tradition: #MorphologyMonday.

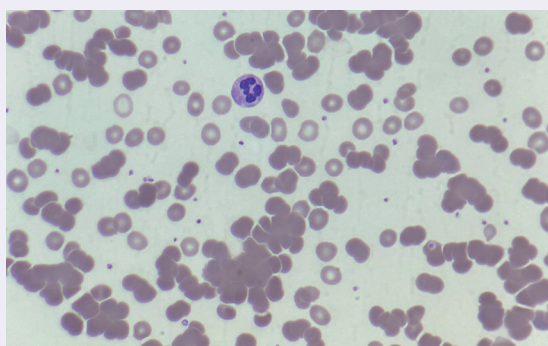
Most Mondays, I share a case; sometimes delightfully

diagnostic, more often delightfully confusing, across LinkedIn and Twitter/X. A mosaic of morphology in a handful of images. Endless interpretations. From clover-leaf nuclei in adult T-cell leukaemia/lymphoma to parasites in peripheral blood, these posts invite discussion, debate and the occasional diagnostic existential crisis (is it a monocyte, a lymphocyte having a rough day or the dreaded blast cell?).

Whether you're a beginner embarking on your first microscopic voyage or a seasoned veteran charting well-trodden cellular territories, Morphology Monday extends an invitation: zoom in, venture a guess and enrich your understanding – one cell at a time.

So, whether you're reading this on a Monday or not, why not have a crack at these cases? The answers are at the end of the article. 📧

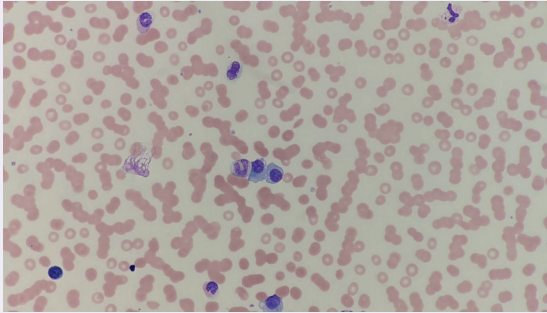
CASE 1: RECENT ONSET OF RAYNAUD'S PHENOMENON



This peripheral blood film is from a patient presenting with recent onset of Raynaud's phenomenon, particularly in cold weather. Their automated full blood count showed a markedly elevated mean corpuscular haemoglobin concentration (MCHC) of 480g/L. Considering the clinical presentation and the unusually high MCHC result, what is the underlying phenomenon visible on this blood film that is most likely contributing to this laboratory anomaly? Briefly outline a key pre-analytical step the laboratory should take to obtain a more accurate full blood count in such cases. 📧

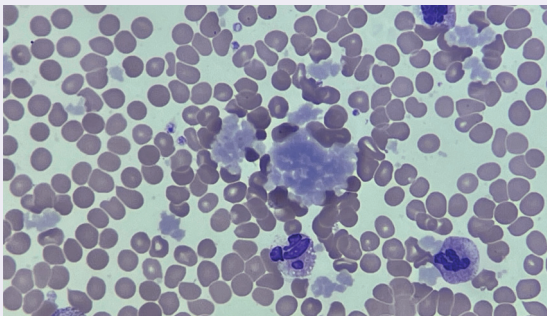


CASE 2: FATIGUE, BONE PAIN, ELEVATED SERUM PROTEIN



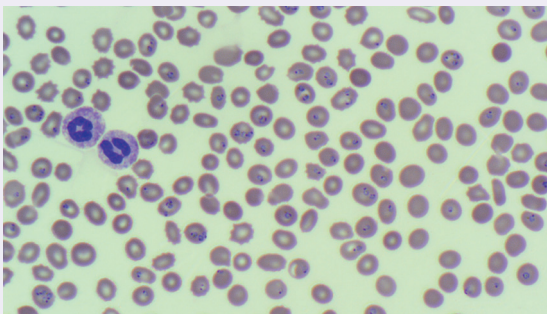
This peripheral blood film is from a patient presenting with fatigue, bone pain, and an elevated serum protein level. There is an unusual pattern in the arrangement of the red blood cells, differing from typical distribution. Scattered amongst these erythrocytes are also some distinctive cells that are “fried egg” shaped. What is the formal term for the specific pattern of red blood cell arrangement seen in this film? What type of cell is the “fried egg”? What underlying condition is strongly suggested by the presence of both these findings? ^{BS}

CASE 3: FAILED DELTA CHECKS FOR MCV AND PLATELET COUNT



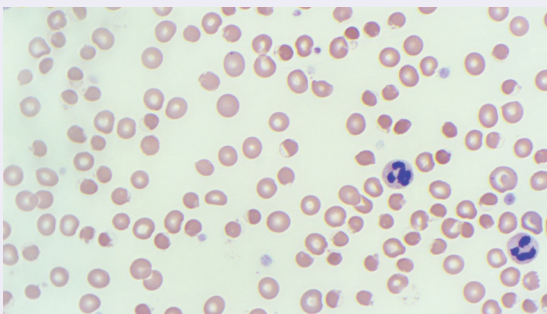
The peripheral blood film for this elderly male inpatient was requested following failed delta checks for MCV and platelet count, along with a WBC interference flag on the Beckman Coulter DXH 800 analyser. Microscopic examination reveals the presence of light grey, agranular, cloudy agglutinates. Given their agranular appearance, these are unlikely to be platelet clumps. What is the identity of these agglutinates? Under what clinical conditions are they typically observed? ^{BS}

CASE 4: DID NOT TAKE PROPHYLACTIC MEDICATION



This patient, who travelled to Nigeria for work purposes, did not adhere to recommendations for prophylactic medication. This blood film was examined following an FBC that was held up in the authorisation queue due to a critically low platelet count ($8 \times 10^9/L$). The sample was checked, and no clot was found. What unexpected surprise did the patient acquire during their trip to Nigeria? Is the thrombocytopaenia (low platelet count) genuine? ^{BS}

CASE 5: MISTAKENLY ATE SOME FAVA BEANS



This peripheral blood film is from a patient who went out for a fancy meal and mistakenly ate some fava beans. Upon examination of the film, what are the significant morphological features of the red blood cells that are immediately apparent? Based on these specific cellular abnormalities and the clinical history of fava bean ingestion, what is the most likely underlying red blood cell enzyme deficiency? ^{BS}



● **Morphology Monday** is a weekly online post from Anas Nasir in which questions are posed about a morphology case study.

● These are posted on LinkedIn and Twitter/X and people leave comments and discuss the potential diagnosis.

● In this article, we present six Morphology Monday case studies, with the answers at the end of the article.



EXPLORE FURTHER

● The Morphology Monday feed on LinkedIn: b.link/1uhg9fuh

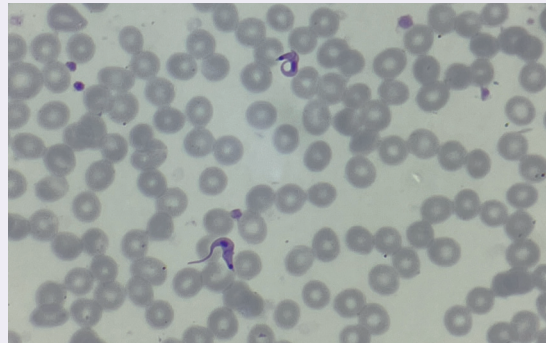
● Anas' morphology cases, explanations, and blog entries: b.link/sgsvbzsp

● Morphology articles in *The Biomedical Scientist*: b.link/rygllgc9



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CASE 6: RETURNED FROM HOLIDAY IN SOUTH AMERICA



This peripheral blood film is from a patient who recently returned from a holiday in rural South America. The patient presents with fever, lymphadenopathy and mild hepatosplenomegaly. Microscopic examination of the stained blood smear reveals motile, C-shaped parasites with a prominent kinetoplast. What is the name of the parasitic species observed in this blood film? [BS](#)

ANSWERS

Case 1 answer: The high MCHC is likely due to red blood cell agglutination caused by cold agglutinins. These IgM antibodies bind to red cell antigens at low temperatures, forming clumps visible on the film. Automated counters may interpret these clumps as single, larger cells, falsely elevating the MCHC. To address this, the laboratory should pre-warm the blood sample to 37°C before analysis. This disaggregates the red cell clumps, leading to a more accurate cell count and MCHC result. If the cold agglutinins are extremely strong, warming the sample may not correct the MCHC.

Case 2 answer: The “fried egg” appearance refers to plasma cells, which in stained blood films often exhibit an eccentrically placed nucleus and a pale area adjacent to it. The unusual stacking of red blood cells like coins observed in this film is termed rouleaux. This formation is a consequence of elevated serum proteins, commonly immunoglobulins produced in excess by the malignant plasma cells. The presence of both these findings – rouleaux and

increased numbers of plasma cells – is highly indicative of multiple myeloma.

Case 3 answer: The grey cloud-like structures are cryoglobulins. These are abnormal proteins made up of antibodies and complement proteins and have the distinctive characteristic of agglutinating below 37°C. While the most common association is hepatitis C virus infection, cryoglobulinaemia can also be seen in other conditions, such as multiple myeloma, Waldenström macroglobulinaemia and autoimmune disorders such as systemic lupus erythematosus. The temperature-dependent agglutination of these proteins can lead to spurious results on automated blood cell counters, particularly affecting MCV and platelet counts and potentially triggering WBC interference flags.

Case 4 answer: This blood film demonstrates a marked *Plasmodium falciparum* infection given the presence of a large number of trophozoites (ring forms). As the causative agent of the most severe form of malaria, this parasite poses a risk of serious complications. At initial presentation, the patient’s parasitaemia was measured at 62%, far exceeding

the approximately 2% single-digit threshold that indicates high parasitaemia. *P. falciparum*’s capacity for rapid multiplication in the bloodstream leads to a high parasite burden and severe anaemia, characterised by the accelerated destruction of red blood cells.

Case 5 answer: The significant morphological features evident in this peripheral blood film include irregularly contracted red blood cells, some with a characteristic “bite” or “blister” appearance, often described as hemighost cells. These cells appear as if a portion has been removed, leaving a pale, ghost-like area. Other affected erythrocytes lack the normal biconcave disc shape and appear smaller and denser. Polychromasia indicates an increased number of reticulocytes reflecting the bone marrow’s response to the haemolytic process. Considering these specific cellular abnormalities, notably the hemighost cells, in the context of recent fava bean ingestion, the most likely underlying red blood cell enzyme deficiency is Glucose-6-Phosphate Dehydrogenase (G6PD) deficiency. Fava beans contain oxidants that trigger haemolysis in individuals with

this deficiency. The lack of functional G6PD leaves red blood cells vulnerable to oxidative stress, leading to haemoglobin denaturation and membrane damage. Rapid removal by splenic macrophages means hemighost cells are usually detectable only during periods of active damage.

Case 6 answer: The parasitic species observed in this blood film is *Trypanosoma cruzi*, the causative agent of Chagas disease, also known as American trypanosomiasis. In the peripheral blood, the characteristic stage seen is the trypomastigote. Though typically C-shaped, their shape may vary on blood films. They measure around 12–30 µm in length, and possess a prominent kinetoplast (a large mitochondrion containing DNA), a centrally located nucleus, an undulating membrane, and a flagellum that runs along the undulating membrane. The kinetoplast in *T. cruzi* trypomastigotes is notably large and located at the posterior end of the parasite, often appearing almost terminal or subterminal. In contrast, the African trypanosomes that cause sleeping sickness have a smaller, more posterior kinetoplast.