

Learning from EQA: When the dog bites ...

Andrea Teuchert¹, Peter Carey², Dianne Hutchens³, Barbara De la Salle⁴, Joana Louriero¹, Bashori Rahman¹

¹UK NEQAS Haematology, Watford, WD18 8YX, UK; ²Newcastle upon Tyne Hospitals NHS Foundation Trust; ³East and South East London Pathology Partnership; ⁴UK NEQAS Charity

Introduction

UK NEQAS Haematology provides external quality assessment (EQA) programmes to support laboratory quality assurance in the UK and internationally. The Blood Film Morphology (BF) EQA programme aims to enhance laboratory skills in blood film analysis, manual differential counting, and blood parasite identification. Participants are expected to identify and report the morphological features seen on the film, which is monitored against the consensus opinion and that of an expert panel. They may also propose a “morphological syndrome” based on the blood film morphology; however, this is not performance-assessed.

Aim

A blood film from a patient with disseminated intravascular coagulation (DIC) and sepsis caused by *Capnocytophaga canimorsus* was used in a UK NEQAS exercise in September 2023 (distribution 2306BF). The clinical details provided with the film were: “A 42-year-old male with a total nucleated cell count of $13.5 \times 10^9/L$ and haemoglobin concentration of 56 g/L”. The exercise aimed to evaluate the ability of laboratory scientists to identify unusual yet clinically significant morphological findings. The expanded clinical details were made available in the full report after the exercise had closed (figure 1).

Full Blood Count results, including automated differential count, for 2306BF2					
Parameter	Result	Normal Range	Parameter	Result (x10 ⁹ /L)	Normal Range
RBC (10 ¹² /L)	1.77	4.40 – 5.80	WBC	13.4	3.0 – 10.0
Hb (g/L)	56	130 – 170	Neutrophils	12.3	2.0 – 7.5
Hct (L/L)	0.16	0.37 – 0.50	Lymphocytes	0.8	1.5 – 4.0
MCV (fL)	88.7	80.0 – 99.0	Monocytes	0.2	0.2 – 1.0
MCH (pg)	31.6	26.0 – 33.5	Eosinophils	0.0	0.0 – 0.4
MCHC (g/L)	357	300 – 350	Basophils	0.1	0.0 – 0.1
RDW (%)	15.0	11.5 – 15.0	NRBC	0.1	0.0 – 0.0
Platelets (10 ⁹ /L)	123	150 – 400			

Further results:

Coagulation
PT 25.0 secs (10.0 – 12.0)
APTT 42.0 secs (22.0 – 41.0)
Clauss Fibrinogen 1.38 (2.0 – 4.0)

Biochemistry

Parameter	Result	Normal Range	Parameter	Result	Normal Range
Sodium (mmol/L)	151	136 – 145	Total Bilirubin (μmol/L)	31	0–21
Potassium (mmol/L)	4.7	3.5– 5.1	Total Protein (g/L)	44	60–80
Chloride (mmol/L)	97	95– 105	Albumin (g/L)	27	35–52
Urea (mmol/L)	16.2	2.1 – 7.1	Globulin (g/L)	17	18–36
Creatinine (μmol/L)	313	62– 106	Alkaline Phosphatase (IU/L)	219	40–129
Creatine Kinase (U/L)	12373	40–320	Alanine Transaminase (IU/L)	1438	0– 41
Troponin T (ng/L)	833	0 - 15	Gamma G. Transpeptidase (IU/L)	55	8 – 61
C-Reactive Protein (mg/L)	148	0 - 5	Calcium (mmol/L)	1.70	2.15– 2.50
Phosphate (mmol/L)	2.42	0.81– 1.45	Magnesium (mmol/L)	1.23	0.66 – 1.07
Amylase (μ/L)	103	28–100			

Microbiology
Aerobic Gram Stain: Gram negative bacilli seen.
Capnocytophaga species detected by Bacterial 16S rRNA Gene Sequencing.

Figure 1 – Full case details of a 42 year old male, with a history of contact with dogs, presenting with DIC and sepsis

Methods

Blood films for EQA are prepared from fresh (<24 hours old) blood, generously donated by local laboratories. A minimum of 700 films is required to meet the needs of 570 registered laboratories (310 UK-based). The programme distributes 16 morphology cases annually, including eight white blood cell differential and eight parasite cases. Blood films are accompanied by essential details such as fixation, stain, patient demographics, total nucleated cell count, and haemoglobin concentration. However, full clinical history is excluded to prevent bias.

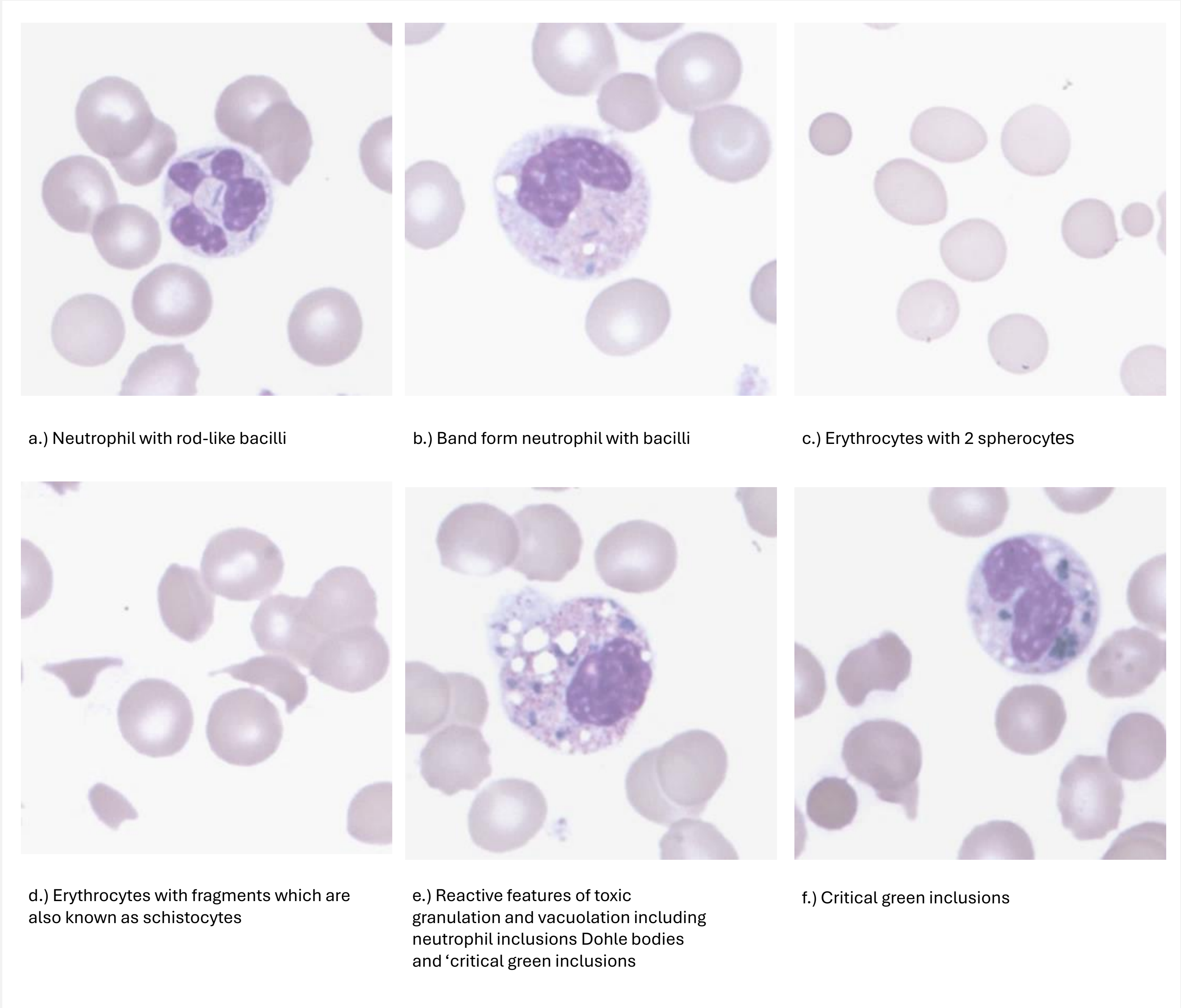


Figure 2 – Clinically significant morphological findings

Results

The most common morphological comment selected by participants was fragments/schistocytes (94.5%) (figure 2d), followed by toxic granulation (68.4%) (figure 2e), thrombocytopaenia (68.1%), nucleated RBCs (40.6%) and left shift (34.8%). Other features of interest were neutrophil vacuolation (figures 2 b and e), including Döhle bodies (blue-grey inclusions related to remnant endoplasmic reticulum) and ‘critical green inclusions’, (figures 2 e and f) and the presence in a small number of neutrophils of the rod-like bacilli of the infecting organism (figures 2 a, b, e and f). 149 participants (28.2%) made some mention of bacteria in the neutrophils, while 32 (6.1%) mentioned ‘critical green inclusions’. 183 (34%) participants made some mention of sepsis in their diagnosis with a further 137 (25.9%) making some mention of DIC, with 6 laboratories suggesting the specific bacteria that was involved in this case! This case was well answered by participants and was a beautiful film that should be treasured by all laboratories in their teaching sets. A number of rare and important features were present on this film which makes it a perfect learning opportunity for new or inexperienced biomedical scientists and highlights the important educational aspect of EQA.

Conclusions

This is the first time a case of sepsis and DIC due to *Capnocytophaga canimorsus*, a common organism found in the oral cavity of dogs, was included in the programme. It was encouraging to see that most participants recognised the key morphological features, and performed well in the performance scoring and in recognising the expert flags, highlighting the value of EQA in exposing laboratories to rare but clinically significant morphological cases.

