Nucleic acid containing units (NACU); a new parameter in haematology

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We would like to introduce and briefly describe a new parameter, the nucleic acid-containing units (NACU) count, developed for ADVIA 2120 and ADVIA 2120i Haematology systems (Siemens Healthcare Laboratory Diagnostics, Tarrytown, NY).

Neutrophil extracellular trap (NET) formation is a rapidly expanding area of clinical interest across a wide range of pathophysiological states. For example, NETs have been shown to have prognostic value in sepsis correlating both with the severity of sepsis and degree of organ dysfunction. With sepsis, cell-free DNA (cfDNA) is suspected to be released by activated neutrophils via the process of NETosis while cfDNA in trauma has been shown to originate mainly from injured or necrotic cells. cfDNA has also been shown to be a good predictor of patient outcome in ICU patients.

For the first time, NETs may be rapidly detectable via a routine blood count. While developing the reticulated platelet parameter as part of the v6_10_9 software update (released in 2019) it became apparent that the capability of this channel extended to the detection of other events that stain positive for nucleic acid (Figure 1).

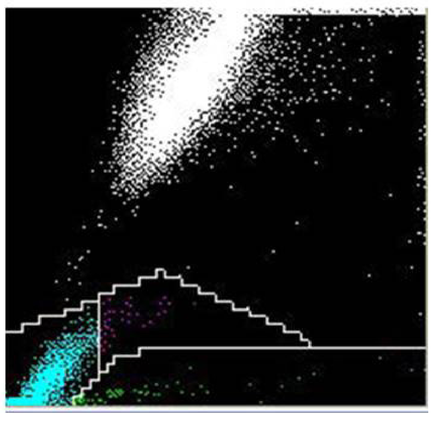

Figure 1. Cyan: Mature Platelets, Purple: Reticulated Platelets, Green: Nucleic Acid Containing Units (NACU) and White: Red blood cells and White blood cells.

ADVIA 2120 and 2120i Haematology systems utilise Oxazine 750 for staining cells according to their nucleic acid content in order to detect and enumerate reticulocytes and reticulated platelets. In addition, the NACU count identifies NACU by counting signals with high absorption values and low refractive index that are below the reticulated platelet area.

Preliminary investigations suggest that these particles may be from NETs, bacteria, fungi, RNA from lysed red blood cells (reticulocytes), malarial parasites, DNA strands from destroyed white blood cells or other sources of cfDNA and cell-free RNA (cfRNA).

NACU counts are also suspected to have a role in detecting damaged endothelial cells from diabetes as well as atherosclerosis. Certainly, NET formation has been implicated in these conditions and others as well as revising our understanding of thrombus formation.

Our preliminary research regarding a normal range for NACU counts suggest a value <15. NACU values above the reference range indicate that abnormal levels of cfDNA or cfRNA may be present.

Currently the NACU count is research use only (RUO) and no diagnostic claims can be made.

We encourage our clinical and laboratory colleagues to evaluate the NACU count in clinical settings where NACU may play a role. As more research is carried out, we will gain greater clinical understanding of the role of the NACU count as a disease marker.

Further nucleic acid-containing structures in the peripheral blood may remain to be discovered, as well as further applications of the NACU count.

The ability to detect cfDNA and cfRNA offers a new approach to what haematology analysers can do in the future.

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