

THE VALIDITY OF HEMAVIEW™ IN SCREENING FOR OXIDATIVE STRESS

AUTHOR: Quilla Watt, *BNat(Hons)* Southern Cross University, Lismore, NSW

BACKGROUND INFORMATION

Hemaview™ is a qualitative screening tool that uses darkfield microscopy to assess a drop of blood from a finger-prick. Interpretations are primarily based on characteristics of blood cell morphology.

Oxidative stress results in widespread damage to erythrocyte membranes and microskeletal structures. This disrupts erythrocyte functionality and cause changes to red blood cell morphology visible with Hemaview.[1] One of the most commonly seen signs of oxidative stress in Hemaview™ is poikilocytosis. Poikilocytosis is a general term for the presence of abnormally shaped red blood cells in a blood sample (Figure 1). Oxidative stress also causes haemolysis - the breakdown of red blood cell membranes causing the contents to leak out.[1]

The aim of this study was to provide preliminary data pertaining to the validity of Hemaview™ in screening for oxidative stress by analysing the correlations between markers of oxidative stress and Hemaview parameters such as poikilocytosis and haemolysis.[2]

METHOD

Twenty-one smokers and ten non-smokers were recruited for a study conducted at Southern Cross University. Participants submitted a urine sample that was analysed for levels of malondialdehyde (MDA) and 8-hydroxy-2-deoxyguanosine (8-OHdG) – see Table 1. On the same day Hemaview™ assessments were performed and statistical analysis of the resultant data looked for correlations between the Hemaview™ parameters and urinary levels of MDA and 8-OHdG.

Table 1: Pathology tests used to detect oxidative stress.

ANALYTE	INTERPRETATION
8-Hydroxy-deoxyguanosine (8-OHdG)	Urinary levels of 8-OHdG are used as a non-invasive marker of DNA oxidative damage. 8-OHdG is formed from a hydroxyl radical attacks the deoxyguanosine component of DNA. When this type of oxidative damage occurs, repair mechanisms remove the 8-OHdG from the DNA. The excised 8-OHdG molecule is water-soluble, and is excreted in the urine.
Malon-dialdehyde (MDA)	Reactive oxygen and nitrogen species degrade polyunsaturated lipids found in cell membranes or the membranes of cell organelles such as mitochondria, forming malondialdehyde (MDA).

RESEARCH FINDINGS

In the control subjects there was no observable correlation between the Hemaview™ parameter counts and subjects' urinary levels of MDA and 8-OHdG.

In the smoking group the mean poikilocyte count was significantly higher compared to the controls ($p < 0.01$). Correlations were also found between:

- Poikilocyte counts and urinary MDA levels ($p < 0.03$); and
- Numbers of haemolysed erythrocytes and urinary 8-OHdG levels ($p < 0.03$).

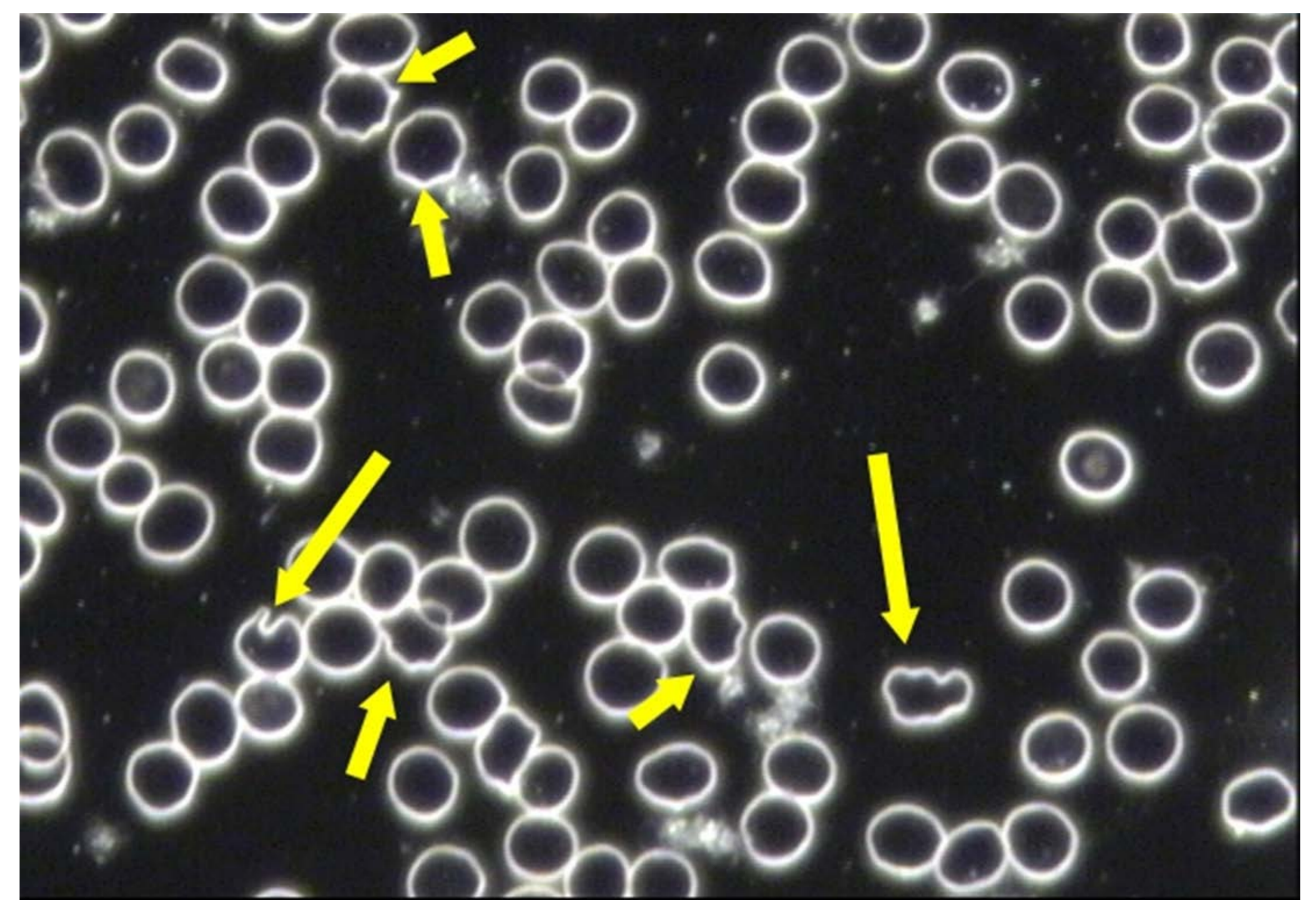


Figure 1: Poikilocytes as seen in Hemaview™.

In addition, a correlation between poikilocyte counts and 8-OHdG levels in smokers came close to being statistically significant ($p = 0.06$). However, if a significant relationship were to exist between these parameters, it was unable to be detected due to lack of statistical power.

CONCLUSION

It is difficult to comment on the validity of LBA-DM based on the findings of this study due to issues of small sample size and poor statistical power. More research into the field is required to determine the validity of LBA-DM in screening for oxidative stress.

REFERENCES

1. Hseu YC, et al. Humic acid-induced echinocyte transformation in human erythrocytes: Characterisation of morphological changes and determination of the mechanism underlying damage. *J Toxicol Environ Health*, 2000; part A, 60(3): 215-230.
2. Watt Q. 2013. The validity of live blood analysis using darkfield microscopy in screening for oxidative stress. Honours thesis – Southern Cross University, Lismore (NSW).