CELL FUNCTIONALITY

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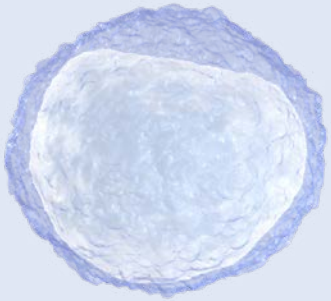
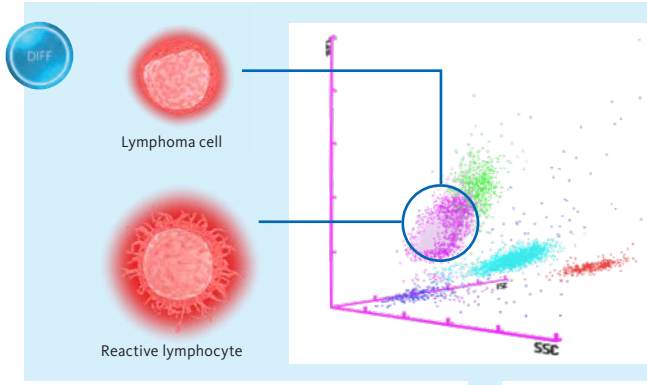
From cell count to cell functionality: the potential of fluorescence flow cytometry technology

Blood cell counts and cell differentiation based on morphology are valuable diagnostic assets. However, when it comes to pathological results, determining cell functionality provides important information on what is currently going on in the patient's body. Usually this involves special testing, which tends to be costly and time-consuming. Making information on cell functionality available by routine blood testing helps laboratories and clinicians gain the needed information faster and more efficiently. By using an ingenious reagent system, Sysmex's haematology analysers permit to differentiate cells by their functionality, overcoming limitations of morphological examination.

The Sysmex analysers' unique reagents are designed to react with lipid components of cell membranes. White blood cells have different membrane compositions depending on their maturity, function and activation status. Also, lipid rafts, which play important roles in protein trafficking and cellular signalling, are elements of cell membranes that vary between resting mature cells, activated cells (e. g. T lymphocytes) and immature cells. The specific reagents used in the WPC channel, dedicated to the analysis of white precursor and pathological cells, have an effect on the permeabilisation of the cell membrane due to the loss of lipid rafts from the membrane.

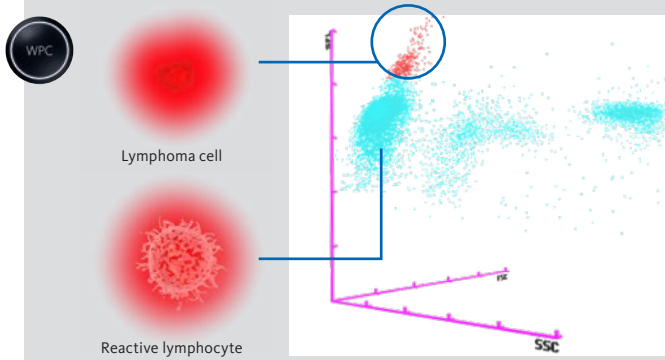


Conspicuous lymphocyte,
lymphoma cell or reactive lymphocyte?



In the WDF measurement channel, cells with increased fluorescence move towards an elevated scattergram position. Both reactive lymphocytes and lymphoma cells show increased fluorescence, resulting in the flag(s) 'Blasts/Abn Lympho?' and/or 'Atypical Lympho?'.

Automated reflex test



In such cases, automatic reflex analysis in the WPC channel helps to identify the cells' state. For example, membranes of neoplastic lymphocytes are more readily permeated, causing higher fluorescence signals clearly separated from those of mature cells (incl. reactive lymphocytes), which results in the flag 'Abn Lympho?'.

Specific measurement channel reactions

WDF channel

The lysing reagent initially perforates the cell membranes while leaving the cells largely intact. The fluorescence marker labels the intracellular nucleic acids (mainly RNA). The composition of these two reagents effects a mild reaction with the blood cells, so that almost all of the blood cell structures remain intact and optimal cell separation is achieved.
Activated cells and immature cells are characterised by a higher RNA content than their resting counterparts, which results in their higher fluorescence signal intensity.

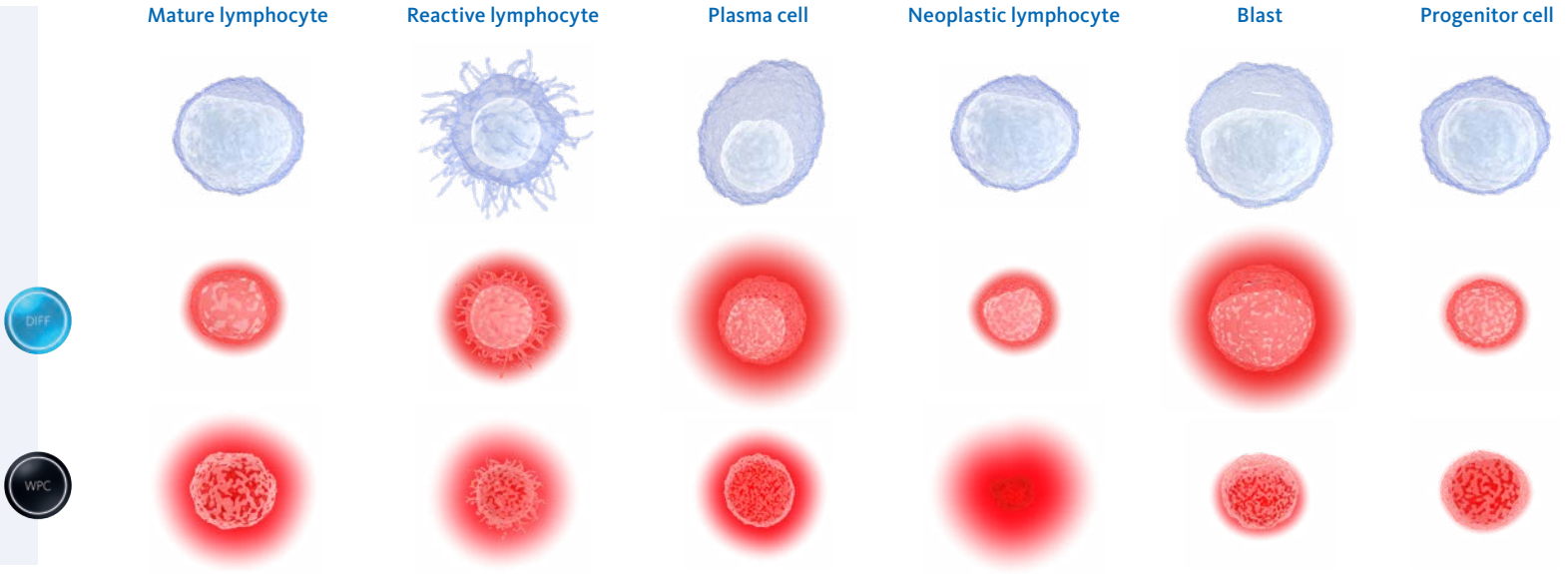
WPC channel

A high degree of membrane damage caused by the lysing reagent leads to cellular components leaking through the pores, resulting in a decreased cell size. Additionally, more fluorescence marker can enter the cell and bind even to nuclear DNA, which in turn leads to a higher fluorescence signal intensity.
Due to their membrane lipid composition, immature cells such as blast cells are not permeated very strongly. Neoplastic lymphocytes are more mature so their membranes are more readily permeated, causing higher fluorescence signals.

The analysers' uniquely composed lysing and fluorescence reagents for different measurement channels allow conclusions on

- the maturity of a cell,
- the malignancy of a cell,
- the activation state of a cell.

For more information on cell functionality and reagent reactions in our free white papers visit **www.sysmex-europe.com/whitepapers**



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