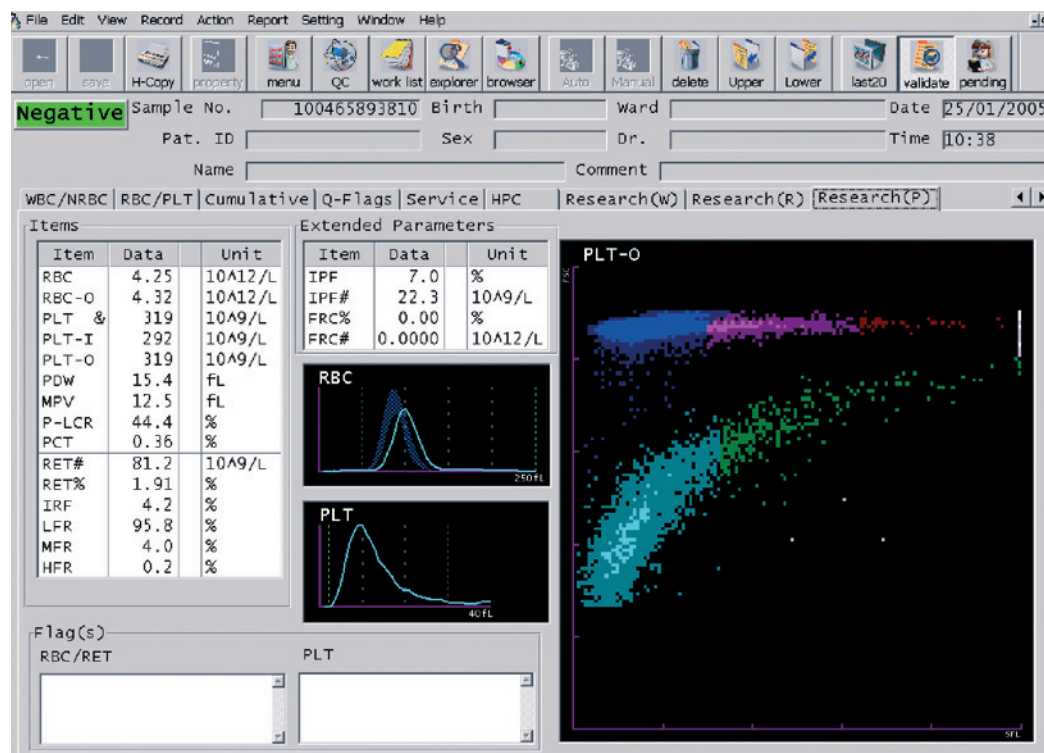


## The immature platelet fraction (IPF) – The first to know about megakaryocyte activity

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Immature platelets were first described as reticulated platelets in 1969. RNA condensations in platelets were observed by microscope, similar to immature red blood cells after staining of the reticulum. Several flow cytometric methods have been described in the past 20 years and the importance of the reticulated platelet has been recognised. However, using a general-purpose flow cytometer to analyse reticulated platelets is time consuming and requires skilled laboratory staff. In addition, standardisation of reticulated platelet measurement with flow cytometry has not yet been achieved.

It is now possible to investigate the utility of the immature platelet fraction due to the availability of an easy to use, fast and stable routine test by employing Fluorescence Flow Cytometry (FFC). The analysis of the immaturity status of platelets can be determined by using the XE-IPF Master optional software module on the XE-2100, which is standard incorporated in the more advanced XE-5000 analysers.



**Fig. 1** Example of a user-defined PLT-research display. The immature platelets are displayed in green and the mature platelets are displayed in light blue colour.

After installation of this plug-in module onto the XE-2100, this method offers automated sampling, fixed incubation time with polymethine RNA marker under strict temperature control, adaptive cluster analysis (ACAS) and automatic gating with a Sysmex proprietary algorithm. The immature platelet fraction (IPF %) is reported in percent of the total platelet count and provides a rapid indication of the platelet production status. On the research PLT display an absolute value (IPF#) is also available.

Megakaryocytes pinch off reticulated platelets which develop into mature platelets within one or two days. An indication for the rate of thrombopoiesis is the amount of reticulated platelets found in peripheral blood. A reactive bone marrow will result in an increased value of reticulated platelets. The RNA content of platelets correlates with megakaryocyte activity.

This information enables to distinguish whether a bone marrow failure or an increased destruction or loss of platelets in the peripheral blood is the reason of a thrombocytopenia. By analysis of the IPF%, a second dimension of the platelet count becomes available as a result of which a bone marrow examination might be avoided.

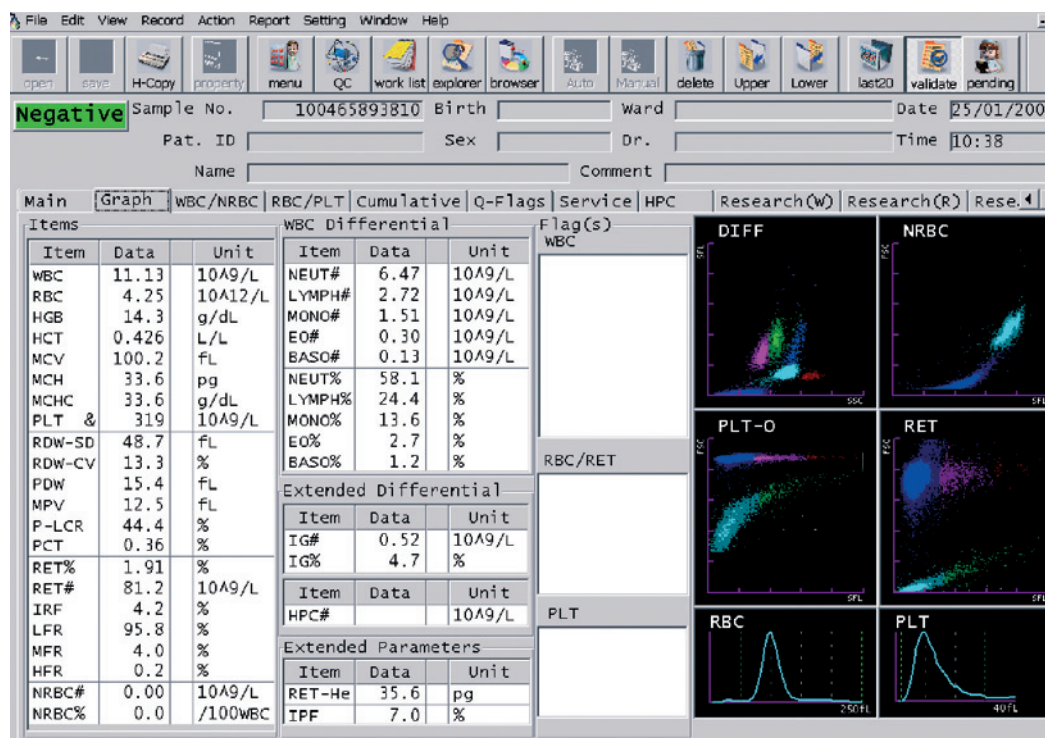


Fig. 2 The main graphical display of the XE-IPF Master shows the IPF% as well as the scattergrams of WBC, RBC and fluorescent PLT (user-definable).

The finding of megakaryocytes in the bone marrow excludes the diagnosis of hypoplastic thrombocytopenia but bone marrow evaluation has several disadvantages. A clear differentiation between the causes of thrombocytopenia, whether there is platelet destruction or an aplastic bone marrow can be easily achieved by using the IPF%.

In cases of thrombocytopenia due to increased peripheral platelet destruction and turnover, the bleeding episodes are less common than in bone marrow failure and bone marrow recovery after cytotoxic therapy.

Platelet destruction or consumption can be found in diseases like autoimmune thrombocytopenic purpura (AITP) and thrombotic thrombocytopenic purpura (TTP). The IPF% value reflects the reaction of the bone marrow depending on the severity of platelet destruction. IPF% is raised in AITP and acute TTP patients.

Increased platelet destruction or consumption can also be found in diseases like disseminated intravascular coagulation (DIC), congenital platelet dysfunctions, heparin-induced thrombocytopenia (HIT), cardiovascular diseases and following organ transplantations.

The Sysmex control blood e-check (XE) provides also an assay value for IPF%. By participation in IQAS Online, XE-series users can join the international external quality control program directly over the Internet. All it takes is simply submitting online the daily e-check (XE) quality control analysis data. This online service offers a fast feedback on the reported QC results.

## References

- [1] **Yamaoka G et al.** (2010): *The immature platelet fraction is a useful marker for predicting the timing of platelet recovery in patients with cancer after chemotherapy and hematopoietic stem cell transplantation.* *Int J Lab Hematol* 32:e208–e216.
- [2] **Cremer M et al.** (2009): *Immature platelet fraction as novel laboratory parameter predicting the course of neonatal thrombocytopenia.* *Br J Haematol* 144: 619–621.
- [3] **Takami A et al.** (2007): *Immature platelet fraction for prediction of platelet engraftment after allogeneic stem cell transplantation.* *Bone Marrow Transplant* 39: 501–507.
- [4] **Abe Y et al.** (2006): *A simple technique to determine thrombopoiesis level using immature platelet fraction (IPF).* *Thromb Res* 118: 463–469.
- [5] **Briggs C et al.** (2006): *Immature platelet fraction measurement: a future guide to platelet transfusion requirement after hematopoietic stem cell transplantation.* *Transfus Med* 16: 101–109.
- [6] **Briggs C et al.** (2004): *Assessment of an immature platelet fraction (IPF) in peripheral thrombocytopenia.* *Br J Haematol* 126: 93–99.