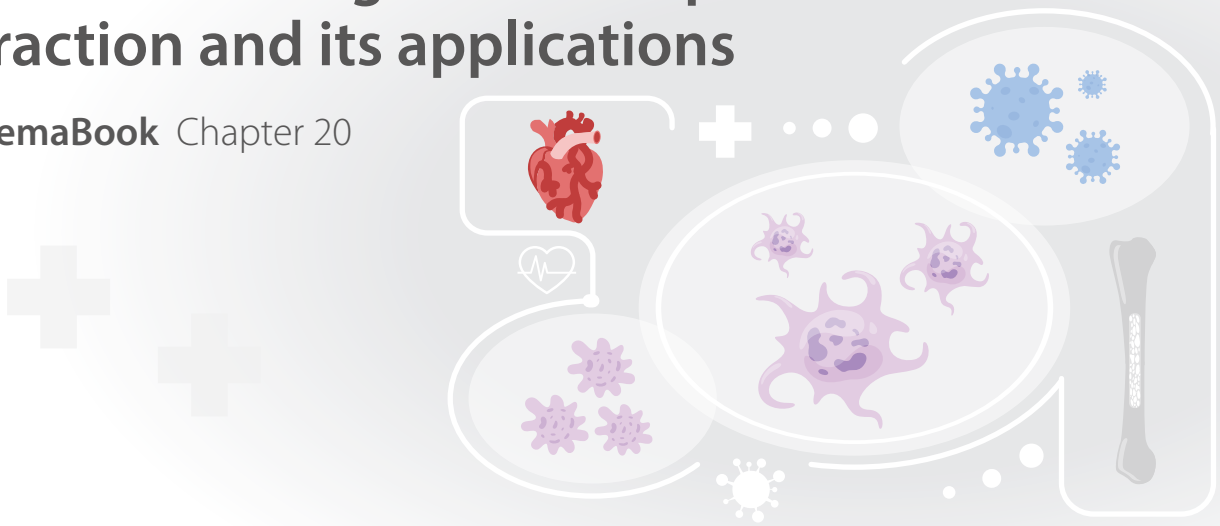
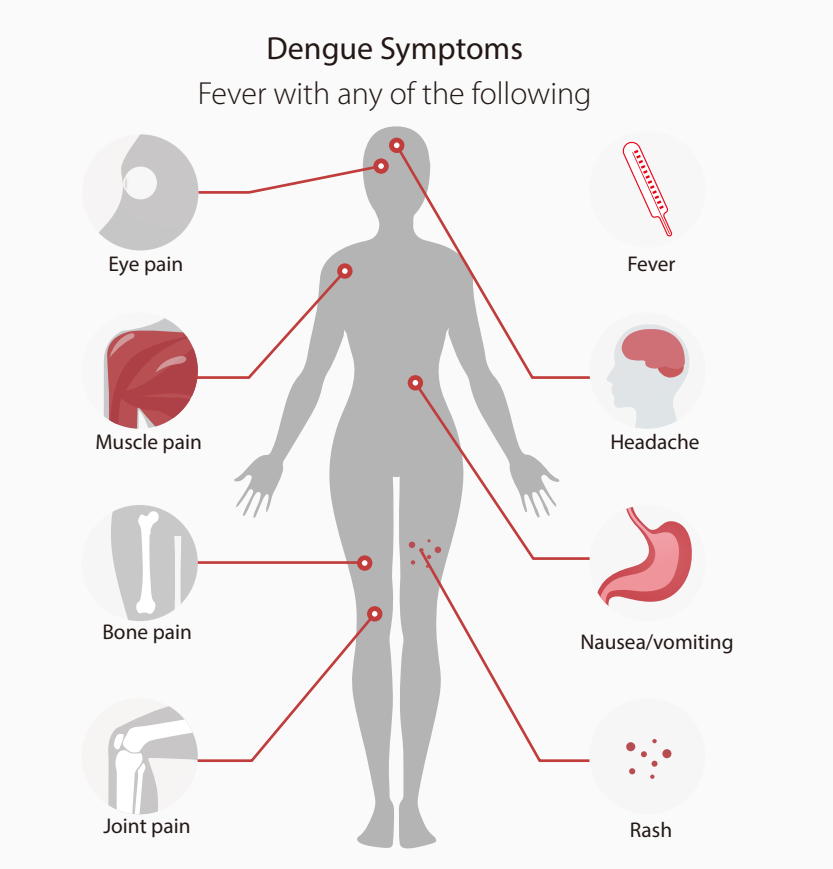
Understanding immature platelet fraction and its applications

HemaBook Chapter 20

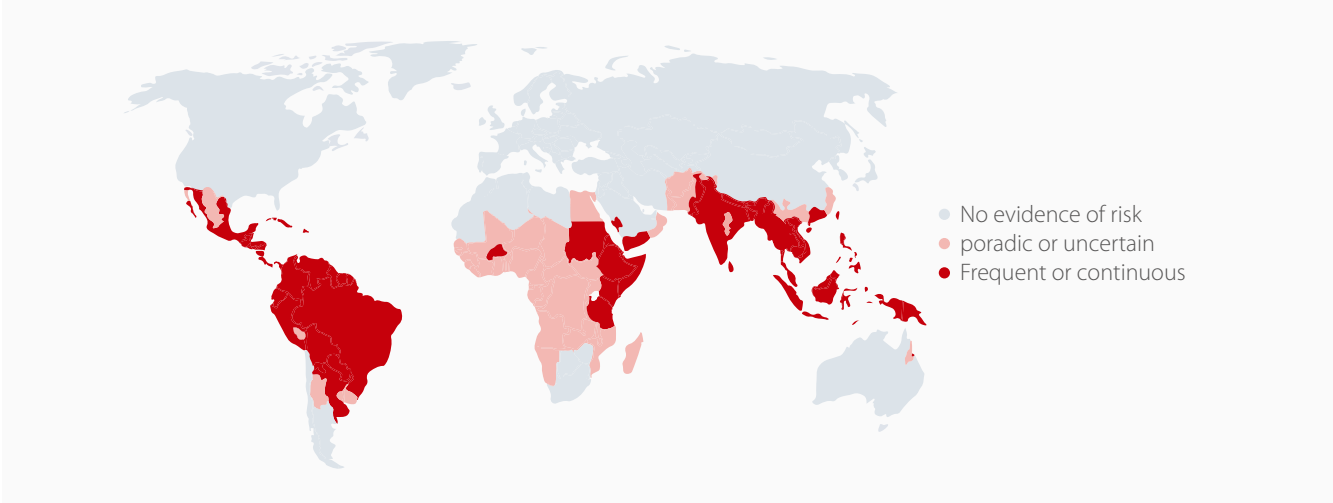


Immature Platelet Fraction (IPF)



According to the SKY News, dengue fever cases in Ibiza prompted a warning to tourists from Spanish health officials on Mar 9, 2023. This alert comes after six German tourists were infected while visiting the Balearic island between August and November last year.

Dengue is a mosquito-borne viral infection that is common in warm, tropical climates. Infection is caused by any one of four closely related dengue viruses (called serotypes) and these can lead to a wide spectrum of symptoms that may require medical intervention and hospitalization. In severe cases, fatalities can occur. Typical symptoms of dengue include headaches, fever, joint pain, rash, and vomiting.



Adapted from CDC 2022[3]

The Americas, South-East Asia and Western Pacific regions are the most seriously affected, with Asia representing approximately 70% of the global burden of disease.

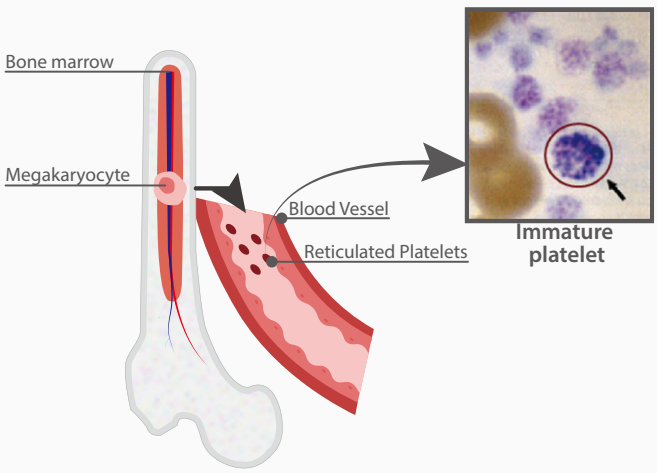
There have been many news reports mentioning that people who traveled to other countries were infected with dengue fever after returning.

IPF can serve as a predictive marker of platelet recovery in dengue

The most frequently reported complications in dengue patients are thrombocytopenia and bleeding, which may require platelet transfusion. A study suggested using the immature platelet fraction (IPF) as a predictive marker of platelet recovery in dengue.

What is IPF?

Immature platelets (IPs) or reticulated platelets (RPs) are platelets newly released from the bone marrow. They are larger in size, more reactive and contain more ribonucleic acid (RNA) than mature platelets. IPF is obtained by measuring young and immature platelets in peripheral blood.



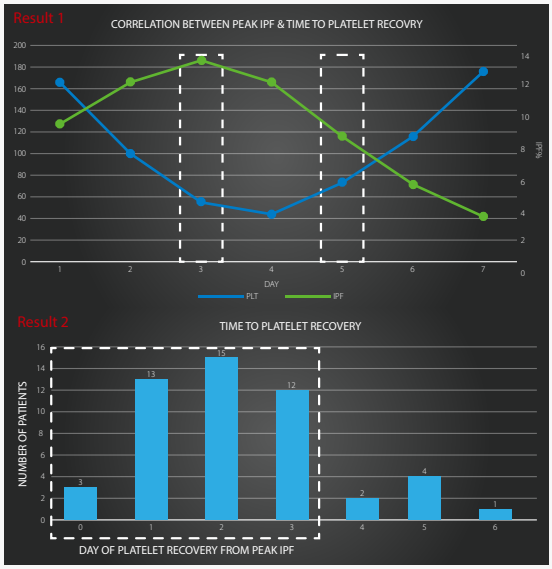
IPF is a parameter that measures RPs/IPs which can be counted using flow cytometry or automated hematology analyzers. However, there is no standardization of RPs/IPs in flow cytometry analyzers. Hence, hematology analyzers are adopted more widely for rapid diagnosis, therapy monitoring and risk prediction.

$$IPF\% = \frac{\text{Immature platelet count}(10^9/L)}{\text{Total platelet count}(10^9/L)} \times 100\%$$

IPF# = Immature platelet count

retPLT = Reticulated platelet count

In this study, the author established peak IPF values in thrombocytopenic patients with dengue and attempted to establish the time to platelet recovery from peak IPF values.



Result 1

Peak IPF% offered a strong correlation with the time for recovery of platelet counts.

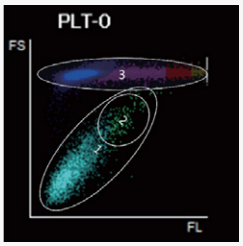
Result 2

100% patients showedsignificant platelet recovery **after attaining peak IPF values, 86%** of them within **72 hours**.

The use of a hematology analyzer makes it easier to detect IPF. In conclusion, peak IPF is a promising predictor of the time to recovery of platelet counts in thrombocytopenic patients with dengue and therefore helps to avoid unnecessary platelet transfusion.

How to measure IPF using a Mindray hematology analyzer?

Mindray's BC-6800Plus hematology analyzer adopts fluorescent flow cytometry with a semi-conductor diode laser. It analyzes IPF in the reticulocyte channel where an asymmetric cyanine dye measures RNA, since there is a large amount of RNA in IPF presenting relatively high FL (Fluorescent Light, RNA) and FS (Forward Scatter, size) signals. IPF is gated within a certain area of the platelet scatter plot showing stronger fluorescent signals in the optical platelet (PLT-O) measurement. IPF can be expressed as either an absolute value (IPF#) or a percentage (IPF%).



PLT O Scattergram

1. Platelet
2. Immature Platelet
3. Optical red blood cell

The clinical significance of IPF

- Identify severe inflammation
- Monitor platelet recovery in dengue fever
- Identify sepsis
- Differentiate the cause of thrombocytopenia
- Predict platelet recovery

IPF is known to have many important clinical implications, and it can be detected accurately and rapidly with a hematology analyzer. Together with clinical information, IPF can aid in the prediction and monitoring of infections, cardiovascular disease, bone marrow transplantation and many other diseases.

References

[1] Franks, J. (2023, March 9). Dengue fever cases in Ibiza prompts warning to tourists from Spanish health officials. Sky News. https://news.sky.com/story/dengue-fever-cases-in-ibiza-prompts-warning-to-tourists-from-spanish-health-officials-12829302

[2] World Health Organization: WHO. (2019, October 24). Dengue and severe dengue. https://www.who.int/health-topics/dengue-and-severe-dengue

[3] Abeysuriya, V., Seneviratne, S. L., De Mel, P., Clarice, C. S. H., De Mel, C., Chandrasena, L., Yip, C., Yap, E. S., & De Mel, S. (2022). The immature platelet fraction, a predictive tool for early recovery from dengue-related thrombocytopenia: a prospective study. Transactions of the Royal Society of Tropical Medicine and Hygiene. https://doi.org/10.1093/trstmh/trab135

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