

“An immune clock of human pregnancy”

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The maintenance of pregnancy relies on a finely tuned immune balance between tolerance to the fetal allograft and protective mechanisms against invading pathogens. Using high-dimensional mass cytometry (CyTOF), we have identified communities of immunological events in maternal blood that precisely time gestation in a term pregnancy, and characterized an “immune clock” of pregnancy. Here, we combined the mass cytometry analysis of peripheral immune cell subsets with the high content analysis of circulating plasma factors to identify maternal immunological events that predict the onset labor. A novel cell-signaling Elastic Net (csEN) algorithm was applied to derive an integrated cytomic and proteomic model that accurately predicted the time from sample collection to onset of labor ($R = 0.91$, cross-validated $p = 7.07 \times 10^{-21}$). These results provide an analytical framework for future prospective studies identifying immunological events associated with the pathological onset of labor such as in preterm pregnancies.