Dynamics of neutrophil extracellular trap (NET) formation

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Neutrophils are the most abundant type of immune cells in the human blood system and central for innate immunity. Recently, it was found that neutrophils and other cells are able to catch and kill pathogens by expelling a fibril network made from their own DNA (neutrophil extracellular traps, NETs). This process, termed NETosis, is distinct from other forms of cell death such as necrosis and apoptosis and is therefore of central importance for cell biology. During NETosis, a massive rearrangement of the materials inside the cell takes place. So far, the mechanisms that govern this complex process are poorly understood. Here, we show how cytoskeleton and membrane structure change the mechanical properties oft the cells, which finally leads to the release of NETs. We show that NETosis can be divided into three distinct phases. DNA passively diffuses out of the disassembled nucleus until it fills the complete cell lumen. Then cells rounds up while they still adhere to the substrate and finally the membrane is ruptured. In summary, these results demonstrate how NETs-release is temporarily regulated by mechanical properties of cell membranes and cytoskeleton.