Umbilical cord blood (UCB) is an attractive source of hematopoietic stem cells (HSCs). However, the number of HSCs in UBC remains limited and the attempts to amplify them in-vitro remain of poor efficiency. Several publications document amplification of HSC/progenitors with endothelial or mesenchymal cells, but the lack of homogeneity in culture conditions or HSC qualification impairs direct comparison of these results. Therefore, we compared the possible HSCs amplification using placental mesenchymal progenitors and Akt-activated umbilical vein endothelial cells. After HSCs isolation from UCB (defined as Lin-CD45-CD34+CD38-CD90+) on confluent feeder layer, the number of total cells and HSCs were monitored over 21 days. We demonstrate important cellular expansion on both niches. Most of the expanded cells were differentiated when characterized by flow cytometry. Only endothelial cells could trigger HSCs amplification with a pick at 14 days. Those amplified HSCs were able to differentiate in all cell lineages as attested by colony forming assays. Mesenchymal progenitors mainly triggered the amplification of CD38+ cells previously defined as precursors. A competitive assay demonstrated that HSCs had an in-vitro preference to interact with endothelial cells. Cytokines and transcriptomic analysis of our feeders indicate the mechanisms involved in HSC amplification and differentiation in both cases.