Diseases of pregnancy, such as preeclampsia, are believed to be caused by trophoblast dysfunction. However, ethical considerations prevent studies on the early stages of pregnancy when such diseases are initiated. Human embryonic stem cells (hESCs) can be coaxed to differentiate into placental trophoblast cells resembling those in early pregnancy by using a protocol (**BAP**) that involves the addition of **B**one Morphogenetic Protein 4 (BMP4), along with inhibitors of **A**ctivin/Nodal (A83-01) and FGF2 (**P**D173074) signaling. Our goal is to determine the minimum time hESCs must be exposed to BMP4 to provide complete differentiation to trophoblast, thereby providing insight into the process of trophoblast differentiation. To do this, the BAP medium was replaced with control medium, i.e. minus the BMP4, but still containing the inhibitors, at different times during a 7-day culture. The hESC (5×10^5 cells per d35 dish) were cultured under BAP conditions for either 6 h, 12 h, 24 h, or the seven days (control). After each set period, the medium was switched to contain A83 and PD173074 (AP), and no BMP4. Medium was collected on days 5, 6, and 7 to assess the production of pregnancy hormones (progesterone and human chorionic gonadotropin). We also collected photomicrographic images of the cells on these same days to compare with control data. Although the hormone assays are incomplete, the appearance of the cells exposed to BMP4 for 6 h was indistinguishable from all other cultures, including controls held under BAP conditions for 7 days. Colony expansion, an epithelioid-like morphology to the cells, and cell syncytialization were indistinguishable between treatments, suggesting that a BMP4 exposure of only 6 h is sufficient to prime the hESC for differentiation to trophoblast. Further strengthening of this hypothesis is expected from the hormone measurements conducted on the media samples and accurate assessment of colony areas.