Recent studies have shown that neural crest-derived progenitor cells can be found in diverse mammalian tissues including tissues that were not previously shown to contain neural crest derivatives, such as bone marrow. The identification of those « new » neural crest-derived progenitor cells opens new strategies for developing autologous cell replacement therapies in regenerative medicine. However, their potential use is still a challenge as only few neural crest-derived progenitor cells were found in those new accessible locations. In this study, we developed a protocol, based on wnt1 and BMP2 effects, to enrich neural crest-derived cells from adult bone marrow. Those two factors are known to maintain and stimulate the proliferation of embryonic neural crest stem cells, however their effects have never been characterized on neural crest cells isolated from adult tissues. Using multiple strategies from microarray to 2D-DIGE proteomic analyses, we characterized those recruited neural crest-derived cells, defining their identity and their differentiating abilities.