bone marrow, stating that the bone marrow "is a common homing and surviving organ not only for breast cancer cells but also for cancer cells from other organs. These cells are likely to escape from the host immune system in a dormant state until internal and/or external signals might enable them to move and grow out to overt metastases at different organs." In short, in cancers associated with various organs, individual cancer cells may migrate to the bone marrow and, after a period of residence, leave the bone marrow for the circulation and initiate new tumors.

A similar scenario, involving migration of CTCs to bone marrow, occurs in *head and neck squamous cell carcinoma* (HNSCC). According to Grobe et al. (182), "disseminated tumor cells (DTC) in bone marrow has been shown to be a … prognostic indicator for patients with … HNSCC … studies on bone marrow samples from patients … revealed a positive correlation of DTC detection to relapse and metastases. However, because repeated and sequential bone marrow analyses are only possible in selected patients during follow-up observations, analysis of peripheral blood has become a promising alternative to investigate tumor cell dissemination … the presence of circulating tumor cells (CTC) in peripheral blood is associated with a worse prognosis."

Studies of CTCs and of DTCs are currently directed to the goal of establishing these cells as biomarkers for use in prognostic tests and predictive tests in cancer. The studies have addressed the correlation of CTCs with cancer and the correlation of DTCs with cancer. A number of studies have addressed the possible correlation of CTC measurements with DTC measurements (183,184,185,186,187). For example, Grobe et al. (188) state that there is a, "[l]ack of correlation between detection of CTCs and DTCs." Issues in the potential utility of CTCs as a biomarker include the need to capture more CTCs, in order to overcome the problem that the heterogeneity of CTCs prevents meaningful results from analysis of only a small number of these cells (189).

[182]Grobe A, Blessman M, Hanken H, et al. Prognostic relevance of circulating tumor cells in blood and disseminated tumor cells in bone marrow of patients with squamous cell carcinoma of the oral cavity. Clin. Cancer Res. 2013;20:425–33.

[183]Grobe A, Blessman M, Hanken, H, et al. Prognostic relevance of circulating tumor cells in blood and disseminated tumor cells in bone marrow of patients with squamous cell carcinoma of the oral cavity. Clin. Cancer Res. 2013;20:425–33.

[184]Hartkopf AD, Wallwiener M, Hahn M, et al. Simultaneous detection of disseminated and circulating tumor cells in primary breast cancer patients. Cancer Res. Treatment; 2015. http://dx.doi.org/10.4143/crt.2014.287.

[185]Riethdorf S, Pantel K. Disseminated tumor cells in bone marrow and circulating tumor cells in blood of breast cancer patients: current state of detection and characterization. Pathobiology 2008;75:140–8.

[186]Kruck S, et al. Disseminated and circulating tumor cells for monitoring chemotherapy in urological tumors. Anticancer Res. 2011;31:2053–8.

[187]Braun S, Naume B. Circulating and disseminated tumor cells. J. Clin. Oncol. 2005;23:1623–6.

[188]Grobe A, Blessman M, Hanken H, et al. Prognostic relevance of circulating tumor cells in blood and disseminated tumor cells in bone marrow of patients with squamous cell carcinoma of the oral cavity. Clin. Cancer Res. 2013;20:425–33.

[189]Andrews NA. Circulating and disseminated tumor cells: many challenges, and even more opportunities for the cancer and bone field. IBMS Bonekey. 2012; Article no. 12 (2012) Int. Bone and Mineral Society (IBMS) Nature Publishing.