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1. When the understanding of tumor genetics is limited to dominant clone, diagnosis were found to be less accurate. Additionally, deep sequencing methods do not offer good prognosis when there are small populations of cancer cells present. The best current approach to understand the underlying genetics behind tumor development is to collect a variety of longitudinal specimens when treatment is being done and then use deep sequencing in a more predictive way. This is because although the cancer cells are present in very low quantities, their evolution and their inferred reaction to therapy can still be predicted. The evolution of the cancer cells may vary under different drugs and treatments since the elimination of cancer cells in different ways provides different selective pressures

2. As I explained, the genetics of a tumor can change in various ways after diagnosis and treatment. Currently there are no known drugs or treatments that can completely eliminate all traces of cancer and tumors, especially in the more advanced stages. Instead, drugs and treatments are used to eliminate more and more cancer cells based on the specific genetic traits of the cancer cells they target. As a result, the more effective cancer drugs and treatments are those that target the cancer cells most likely to uncontrollably reproduce and grow. Based on this, the way that the genetics of a tumor changes over time can best be compared to how a species population is limited after the introduction of a negative environmental factor. The more dangerously reproducing cancer cells are eliminated, and what is left is (hopefully) the more benign cancer cells and tumor remnants that are less likely to grow and spread around the body. In this way cancer is eliminated or “controlled” to the point that the body’s own immune system can handle what is left.

3. The role of timing and order of mutations in cancer clonal evolution is essentially multiplicative. Mutations that negatively affect DNA replication, produce genotoxins, the ability for DNA to repair itself, and edits DNA start off as smaller mutations. The reason why cancer evolution is described as clonal is because when cancer is first developed, it starts off as a single mutation in a cell. This mutation turns into a series of mutations and eventually these mutations create a selective growth advantage. In a tumors case this growth advantage starves out surrounding cells. An example of an evolutionary process that is not clonal is probably the evolution of our use of gut bacteria. The relationship between us and gut bacteria is something that is beneficial to us as well as the bacteria. This is not a parasitic/clonal relationship like cancer cells, but instead a mutually beneficial relationship.