

A simultaneous blow-up problem arising in tumor modeling

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© 2019, Springer-Verlag GmbH Germany, part of Springer Nature. Although macrophages are part of the human immune system, it has been remarkably observed in laboratory experiments that decreasing its number can slow down the tumor progression. We analyze through a recently mathematical model proposed in the literature, necessary conditions for aggregation of tumor cells and macrophages. In order to do so, we prove the possibility of having blow-up in finite time. Next, we study if the aggregation of macrophages can occur when having a low density of tumor cells, and vice versa. With this purpose, we consider the problem of analyzing the existence or not of a simultaneous blow-up. We achieve this goal thanks to a novel process that allows us to compare the entropy functional associated with the density of each population, which turns out to be also a method to find enough conditions for having a simultaneous blow-up.