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# Stochastic Chiral Symmetry Breaking Process

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**Abstract:** Chiral symmetry breaking is the process of unequal formation of enantiomers with different configuration [1]. This phenomenon is directed related to life, which is well exemplified by the absolute presence of L-amino acids in proteins and D-carbohydrates in sugars [2]. Many theoretical works have been developed in order to understand the reasons of that unexpected break. Most of these works were performed considering deterministic approaches and they concluded that chemical systems composed by autocatalytic and competition reactions, under small perturbations as initial enantiomeric excess, are able to reach asymmetric final states.

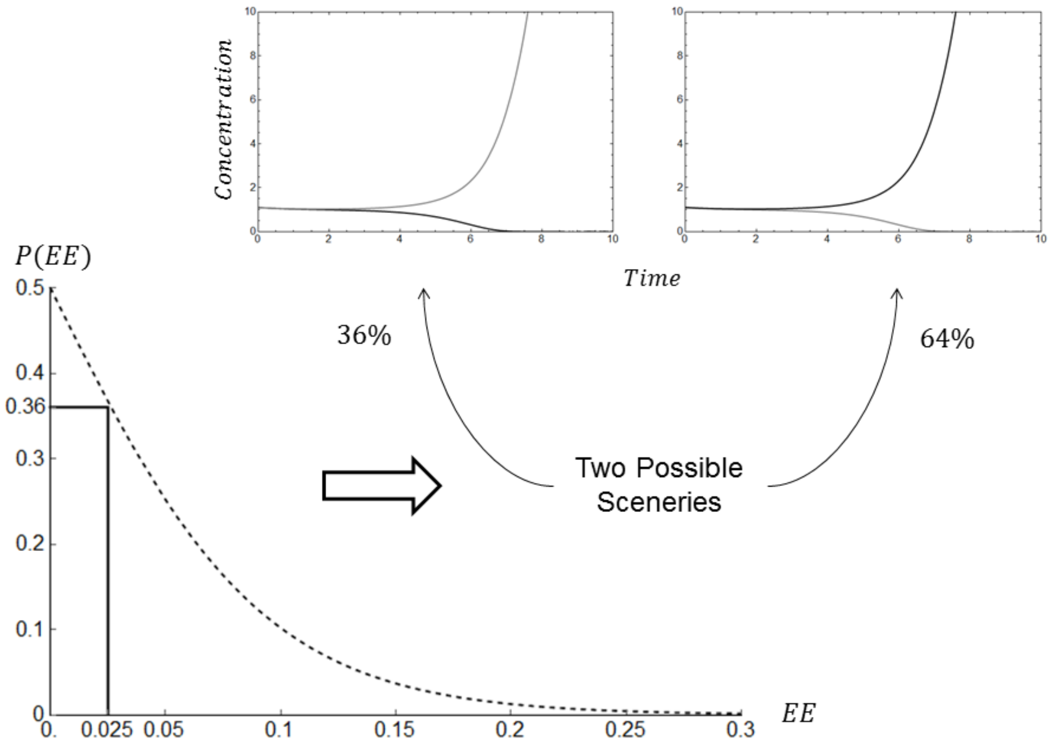


FIG. 1. Probability of the two possible final states, $P(EE)$, as function of Enantiomeric Excess (EE), where $EE = [L] - [D]$ and $\alpha = 21.78$. Considering initial excess $EE = 0.025$, the probability of enantiomer $D$ dominates the final state is 36%, whereas the probability of the enantiomer $L$ dominates the final state is 64%. The component $L$ is represented by black line and $D$ by gray line.

Moreover, following these results, the configuration of the final state is always the same of the chemical specie with initial enantiomeric excess *(EE)* [3-5]. However, in Nature the last consideration is not true [6]. The enantiomer with initial excess is probabilistic favored if statistical fluctuation is present. From that, stochastic approaches can offer a complete description of chiral symmetry breaking by taking into account the initial enantiomeric excess and the statistical fluctuation [7]. So, considering the Frank`s model we obtained the law $P(EE) = 1/(e^{\alpha EE} + 1)$, where the favoring probability ($P$) decreases exponentially with the initial enantiomeric deficiency (*ED*=-*EE*) mediated by statistical fluctuation, see FIG. 1. Concluding, this work breaks to the widespread idea that the configuration of the final asymmetric state is defined by the initial enantiomeric excess.

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