

Dilute molecular crowders enhance activity of ligase ribozyme

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The RNA world hypothesis remains a hallmark in *origin of life* research despite very poor robustness and low reactivity of most model replicators studied so far.[1] A frequently used trick to enhance ribozyme activity is the use of high concentration molecular crowders (M to mM) to increase RNA concentrations by excluded volume effects.[2] Here we show, that excluded volume effect is not strictly required to enhance ribozyme activity using R3C ligase as a model ribozyme and polyethylene glycol (PEG) as a model crowding agent. As observed in other systems before, we found that also for the R3C system reactivity is increased in presence of crowder. However, our data shows higher affinity (lower K_m) at lower concentrations of crowder (1% wt/v). This suggests that excluded volume might not be the only effect. If so, enhanced activity should also be seen at even lower concentrations of crowder. Indeed, we found in our experiments a remarkable enhancement of R3C ligase activity at concentrations down to 50ppm (wt/v). With this, we suggest a beneficial role of polymeric crowders (impurities) during the origin of life.

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