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**A two-scale model for correlation between B cell VDJ usage in zebrafish** KEYAO PAN, MICHAEL DEEM, Rice University — The zebrafish (*Danio rerio*) is one of the model animals for study of immunology. The dynamics of the adaptive immune system in zebrafish is similar to that in higher animals. In this work, we built a two-scale model to simulate the dynamics of B cells in primary and secondary immune reactions in zebrafish and to explain the reported correlation between VDJ usage of B cell repertoires in distinct zebrafish. The first scale of the model consists of a generalized NK model to simulate the B cell maturation process in the 10-day primary immune response. The second scale uses a delay ordinary differential equation system to model the immune responses in the 6-month lifespan of zebrafish. The generalized NK model shows that mature B cells specific to one antigen mostly possess a single VDJ recombination. The probability that mature B cells in two zebrafish have the same VDJ recombination increases with the B cell population size or the B cell selection intensity and decreases with the B cell hypermutation rate. The ODE model shows a distribution of correlation in the VDJ usage of the B cell repertoires in two six-month-old zebrafish that is highly similar to that from experiment. This work presents a simple theory to explain the experimentally observed correlation in VDJ usage of distinct zebrafish B cell repertoires after an immune response.

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