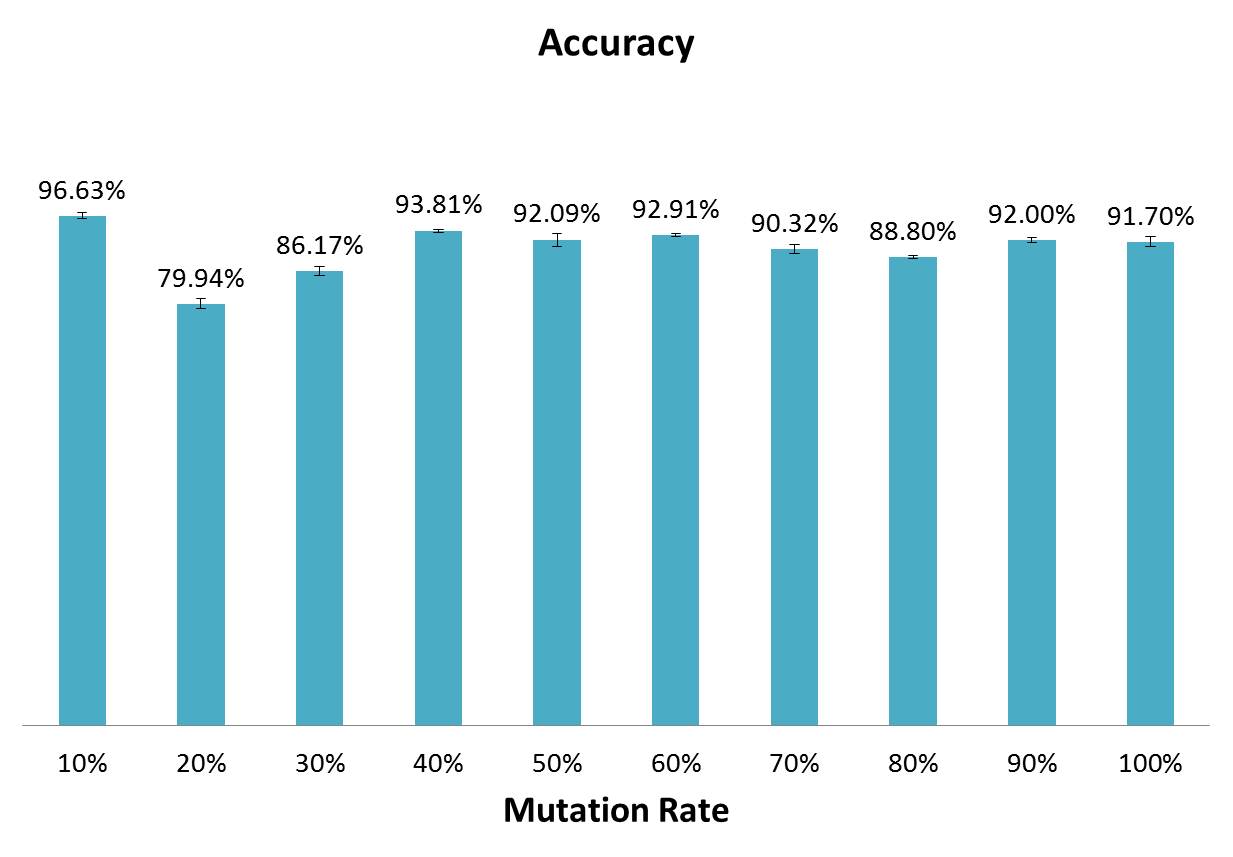
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**Fig. S1** The performance of DSab-origin as somatic hyper-mutation rates increase. To evaluate the performance of DSab-origin degrade as somatic hyper-mutation rates increase, we generated 10% to 100% mutation rates with a step of 10% using IgSimulator.