Detailed information on Holocene paleoclimate can be obtained from lake sediments through rock magnetic study. However, the coexistence of biogenic and detrital magnetic minerals in lake sediments increases the difficulty of applying environmental magnetism to lakes sediments, due to dissimilar mechanisms controlling these two magnetic components. Magnetic parameters of lake sediments should thus be interpreted with caution when extracting paleoclimate information. In this study, we have carried out systematic rock magnetic studies on an 8.5 m sediment core from Dali Lake (43°15.68′ N, 116°36.26′ E), which spans the Holocene. The core can be divided into three units based on distinctive magnetic behavior. Magnetic measurements in combination with transmission electron microscopy analyses reveal that the magnetic minerals in Unit 2 (9.8-5.7 ka, 7.63-6.33 m) are dominated by biogenic magnetite likely produced by magnetotactic bacteria (i.e., magnetofossils). The abundance of magnetofossils is interpreted as a result of a larger oxic-anoxic transition zone, together with high amounts of bioavailable iron and increased organic carbon into the lake, which enhanced the biomineralization of magnetotactic bacteria during the Holocene Optimum. In contrast, Unit 1 (11.5-9.8 ka, 8.50-7.63 m) and Unit 3 (5.7-0 ka, 6.33-0 m) are magnetically dominated by detrital input. Magnetic minerals in Unit 3 may have origined from erosion of soils in the catchment. Spectral analysis of the magnetic properties of Unit 3 suggests a periodicity of 500-800 years, which in good accordance with solar activity. This can be explained by varying degree of pedogenesis driven by monsoonal precipitation during the Late Holocene. This study provides the first biogenic magnetic records of the Holocene Optimum in arid areas in North China. The biomagnetic signals are characteristic with an abrupt decrease to nearly zero at around 5.7 ka BP, which may reflect the widespread drought event due to weakening monsoon. Our results highlight the importance of distinguishing different sources of magnetic components in lake sediments, which is a necessary precursor to paleoclimatic interpretation