The aim of this study was to investigate electromagnetic radiation (EMR) transmitted by wireless devices (2.45 GHz), which may cause physiopathological or ultrastructural changes, in the testes of rats. We addressed if the supplemental gallic acid (GA) may reduce these adverse effects. Six-week-old male Sprague Dawley rats were used in this study. Forty-eight rats were equally divided into four groups, which were named: Sham, EMR only (EMR, 3 h day⁻¹ for 30 days), EMR + GA (30 mg/kg/daily), and GA (30 mg/kg/daily) groups. Malondialdehyde (MDA) and total oxidant status (TOS) levels increased (p = 0.001 for both) in EMR only group. TOS and oxidative stress index (OSI) levels decreased in GA treated group significantly (p = 0.001 and p = 0.045, respectively). Total antioxidant status (TAS) activities decreased in EMR only group and increased in GA treatment group (p = 0.001 and p = 0.029, respectively). Testosterone and vascular endothelial growth factor (VEGF) levels decreased in EMR only group, but this was not statistically significant. Testosterone and VEGF levels increased in EMR+GA group, compared with EMR only group (p = 0.002), and also increased in GA group compared with the control and EMR only group (p = 0.044 and p = 0.032, respectively). Prostaglandin E2 (PGE₂) and calcitonin gene related peptide (CGRP) staining increased in tubules of the testes in EMR only group (p < 0.001 for both) and decreased in tubules of the testes in EMR+GA group (p < 0.001 for all parameters). In EMR only group, most of the tubules contained less spermatozoa, and the spermatozoon counts decreased in tubules of the testes. All these findings and the regenerative reaction, characterized by mitotic activity, increased in seminiferous tubules cells of the testes in EMR+GA group (p < 0.001). Long term EMR exposure resulted in testicular physiopathology via oxidative damage and inflammation. GA may have ameliorative effects on the prepubertal rat testes physiopathology. © 2015 Wiley Periodicals, Inc. Environ Toxicol, 2015.