Boundary lubrication of articular cartilage is mediated, at least in part, by proteoglycan 4 (PRG4) molecules at the articular surface. We hypothesized that PRG4 binding at the articular surface depends on PRG4 concentrations of the surrounding fluid ([PRG4]_bath), and on PRG4 interactions with other molecules. Experimental studies to test this hypothesis showed that PRG4 content of cartilage samples was similarly high under all [PRG4]_bath conditions. In addition, results indicated that PRG4 can be removed and repleted with PRG4 from synovial fluid by certain treatments. These findings provide insight into the molecular mechanisms by which PRG4 molecules maintain articular surface lubrication.