Denitrification is often considered to be an anaerobic (or anoxic) process by many microbiologists, soil scientists and other researchers interested in the nitrogen cycle. At the same time there are many occurrences in the literature of “aerobic denitrification.” So is denitrification an aerobic or anaerobic process or somewhere in between? Using *Rhodobacter sphaeroides* 2.4.3 and *Agrobacterium tumefaciens* we have assessed oxygen dependent profiles for expression of the nitrate, nitrite and nitric oxide reductases. *R. sphaeroides* has two periplasmic nitrate reductases one of which is expressed under oxic conditions while the other is expressed during denitrification conditions. The role of each in cell physiology will be discussed. *Agrobacterium tumefaciens* has one periplasmic nitrate reductase that is expressed under both oxic and anoxic conditions. The role of this enzyme will be discussed as well. In both bacteria the genes encoding the nitrite and nitric oxide reductases are only expressed in low oxygen conditions. The regulation of these genes is complex and appears to involve several different oxygen interacting regulators. These results suggest that at least one piece of the denitrification pathway is truly aerobic and this may account for the instances of aerobic denitrification. Nitrite and nitric oxide reduction is not aerobic though but it is not strictly anaerobic either.