**Figure and Table Legends**

**Figure 1. Growth and metabolism of *N. aromaticivorans* DSM12444, Δ*sacB* strain during growth on G-diketone and glucose.** (Panel A) Increases in *N. aromaticivorans* cell density as monitored by Klett colorimeter units. (Panel B) Extracellular concentrations of G-diketone, GP-1, and threo-GD identified and quantified via HPLC-MS and HPLC-UV (Figure S1, see text).

**Figure 2. Changes in transcript abundance for indicated genes when cells are grown in the presence of G-type aromatics.** Each plot displays the log2-fold change in reads per kilobase million (RPKM) compared to glucose-grown *N. aromaticivorans* cells showing genes identified as encoding enzymes involved in aromatic metabolism. Black stars above a transcript with a significant change in levels (\*p < 0.05, \*\*p<0.01, \*\*\*p<0.001) compared to cells grown in the presence of glucose alone. Bars in each panel are colored to denote steps in aromatic metabolism that gene products are known to function (dimer degradation, aromatic ring processing, side chain processing/demethylation).

**Figure 3. Time-dependent loss of G-diketone *in vitro* when incubated with recombinant LigL, LigN, and LigD,** **with and without NADH.**

**Figure 4. GC-MS analysis of derivatized aromatic substrates and *in vitro* reaction products of individual LigLND dehydrogenases with G-diketone and GP-1.** GC-MS analysis of derivatized aromatic substrates and enzyme reaction products after indicated Lig dehydrogenases were incubated for 24 hours with the G-diketone and NADH (Panel A, C) or GP-1 and NADH (Panel B, D).

**Figure 5. Kinetic parameters of LigL, LigN and LigD dehydrogenases with indicated aromatic substrates.** Shown are the measured Kcat and apparent Km using recombinant LigL, LigN, and LigD enzymes with the indicated aromatic substrates and either NADH (G-diketone) or NAD+ (GGE, GD) as a cofactor.

**Figure 6. Model for G-diketone metabolism by *N. aromaticivorans.*** We hypothesize that the indicated Lig dehydrogenases initiate degradation of G-diketone, reducing the Cα ketone to GP-2. GP-2 and GP-1, as Hibberts ketones, can spontaneously interconvert; the question marks indicate that we cannot rule out the existence of enzymes that produce GP-1. The figure also indicates that the LigL dehydrogenase reduced GP-2 to 1-(4-hydroxy-3-methoxyphenyl)propane-1,2-diol (GD). In this model, one or more unknown enzymes, indicated by the question mark, are used to produce vanillin from GP-1 or GD.