**SUPPLEMENTAL FIGURE LEGENDS**

**Supplemental Figure 1: Cytotoxicity by combined WEE1 and PARP inhibition.** Cells treated for 24 h with AZD1775 alone or AZD1775 plus either 300 nmol/L or 1 μmol/L olaparib were assayed for drug-induced cytotoxicity by clonogenic assay as previously described (21, 29).

**Supplemental Figure 2: The effects of AZD1775 and olaparib on the radiation-induced G2 checkpoint.** Histograms from a representative experiment showing pHistoneH3 staining in Calu-6 cells collected 16 h post-RT (A). Cells were analyzed either 6 (B) or 16 (C) hours post-RT (6 Gy) for pHistoneH3 and DNA content by flow cytometry. The percentages of both normal and premature mitotic cells are plotted. Data are from either a single experiment (B) or are the mean percentage of pHistoneH3 positive cells ± standard deviation of *n* = 2 independent experiments (C).

**Supplemental Figure 3: The effects of AZD1775 and olaparib on RT-mediated** γ**H2AX-staining in lung cancer cells.** Irradiated cells treated with AZD1775 and/or olaparib were collected 0.5, 2, 6, 16 or 24 h post-RT and assayed for γH2AX by flow cytometry (A – D). Total γH2AX staining (A, B) or high intensity γH2AX staining (C, D) were analyzed by flow cytometry at the indicated times post-RT. Data are the mean ± standard error from 2-3 independent experiments.

**Supplemental Figure 4: Exogenous nucleosides attenuate AZD1775-induced high-intensity** γ**H2AX staining but do not rescue AZD1775-mediated inhibition of RAD51 focus formation.** Total γH2AX staining (A) and high intensity γH2AX staining (B) were analyzed by flow cytometry in Calu-6 cells collected 16 h post-RT. Data are the mean ± standard error from 3-6 independent experiments. Statistically significant differences with nucleosides are indicated (\*P < 0.05, paired *t* test). Alternatively, RAD51 foci were scored 16 h post-RT ± AZD1775 in the absence or presence of nucleosides (C). Data are the mean ± standard deviation of at least 100 cells from 1-2 independent experiments.

**Supplemental Figure 5: Relative levels of chromatin-bound PARP1 in Calu-6 cells treated with radiation (6 Gy), AZD1775 and either olaparib or veliparib.** Representative western blot images of both total cellular and chromatin-bound PAR and PARP1 in irradiated Calu-6 cells treated with either 1 mol/L olaparib or 1 mol/L veliparib +/- 150 nmol/L AZD1775.

**Supplemental Table 1: The effects of AZD1775 and olaparib on radiosensitization of Calu-6-derived tumor xenografts.** Athymic nude mice bearing bilateral Calu-6 xenografts were treated for 5 consecutive days with olaparib (50 mg/kg), AZD1775 (120 mg/kg), and radiation (2 Gy/fraction). The median time required for tumor volume doubling with lower and upper limits in parentheses, and statistical difference are illustrated. Data were obtained from 12-18 tumors (6-9 mice) per treatment condition. Statistical significance is indicated (*P < 0.05* vs control\*, RT¥, or olaparib+RTφ.