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Supplementary Material for

# Poly(alkylidenimine) dendrimers functionalized with the organometallic moiety $[Ru(\eta^5\text{-}C_5H_5)(PPh_3)_2]^+$ as promising drugs against *cisplatin*-resistant cancer cells and human mesenchymal stem cells

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**Abstract:** Here and for the first time, we show that the organometallic compound $[Ru(\eta^5\text{-}C_5H_5)(PPh_3)_2Cl]$ (RuCp) has potential to be used as a metallodrug in anticancer therapy, and further present a new approach for the cellular delivery of the $[Ru(\eta^5\text{-}C_5H_5)(PPh_3)_2]^+$ fragment via coordination on the periphery of low-generation poly(alkylidenimine) dendrimers through nitrile terminal groups. Importantly, both the RuCp and the dendrimers functionalized with $[Ru(\eta^5\text{-}C_5H_5)(PPh_3)_2]^+$ fragments present remarkable toxicity towards a wide set of cancer cells (Caco-2, MCF-7, CAL-72, and A2780 cells), including cisplatin-resistant human ovarian carcinoma cell lines (A2780*cis*R cells). Also, RuCp and the prepared metallodendrimers are active against human mesenchymal stem cells (hMSCs), which are often found in the tumor microenvironment where they seem to play a role in tumor progression and drug resistance.

**Keywords:** dendrimers; nanocarriers; metallodrugs; ruthenium; platinum; *cisplatin*; cancer treatment; hMSCs; toxicity, nanomedicine.

## 1. Spectroscopic data (NMR and MS spectra)

### 1.1. Compound $[\{(\eta^5\text{-}C_5H_5)(PPh_3)_2Ru\}_4(1)][CF_3SO_3]_4$ **(3)**

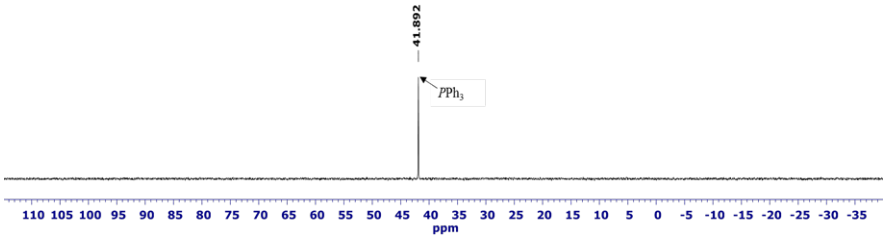



**Figure S1.** $^{31}P$ NMR spectrum of $[\{(\eta^5\text{-}C_5H_5)(PPh_3)_2Ru\}_4$(**1**)$][CF_3SO_3]_4$ (**3**), in $CDCl_3$.

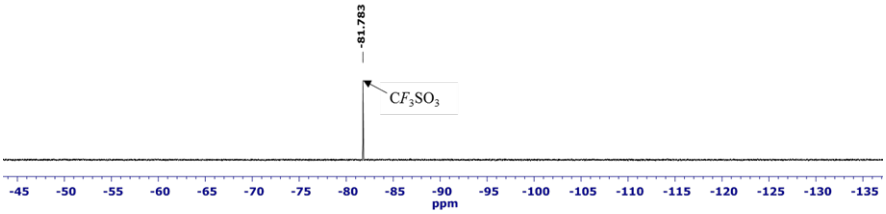



**Figure S2.** $^{19}F$ NMR spectrum of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**1**)][$CF_3SO_3$]$_4$ (**3**), in $CDCl_3$.

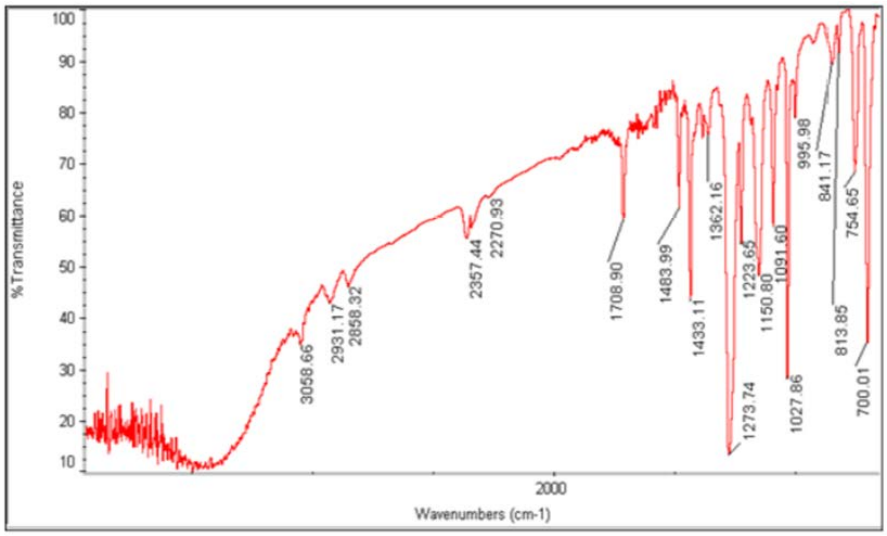
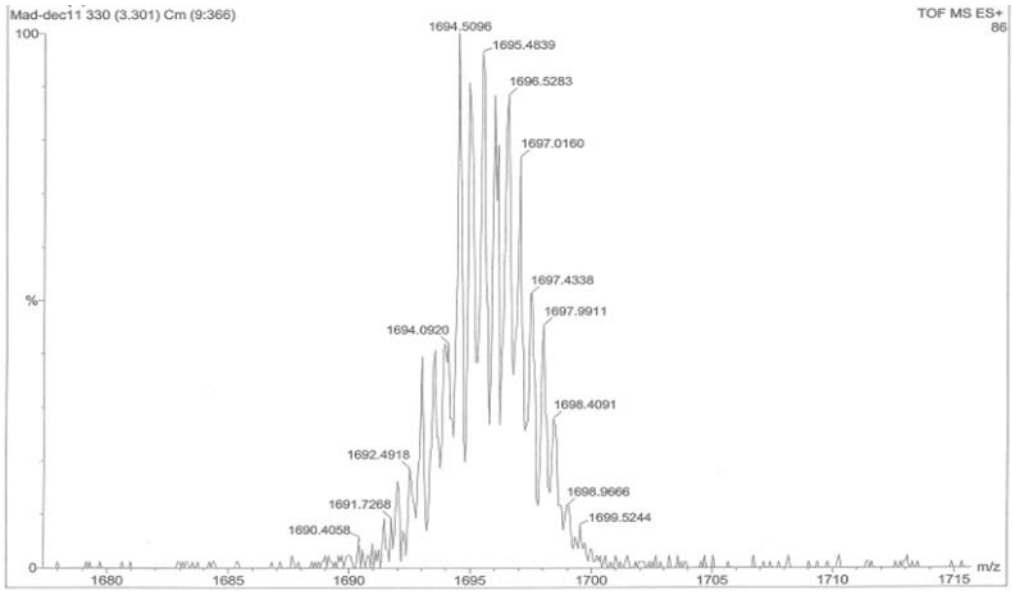



**Figure S3**. FTIR spectrum of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**1**)][$CF_3SO_3$]4 (**3**), in KBr.



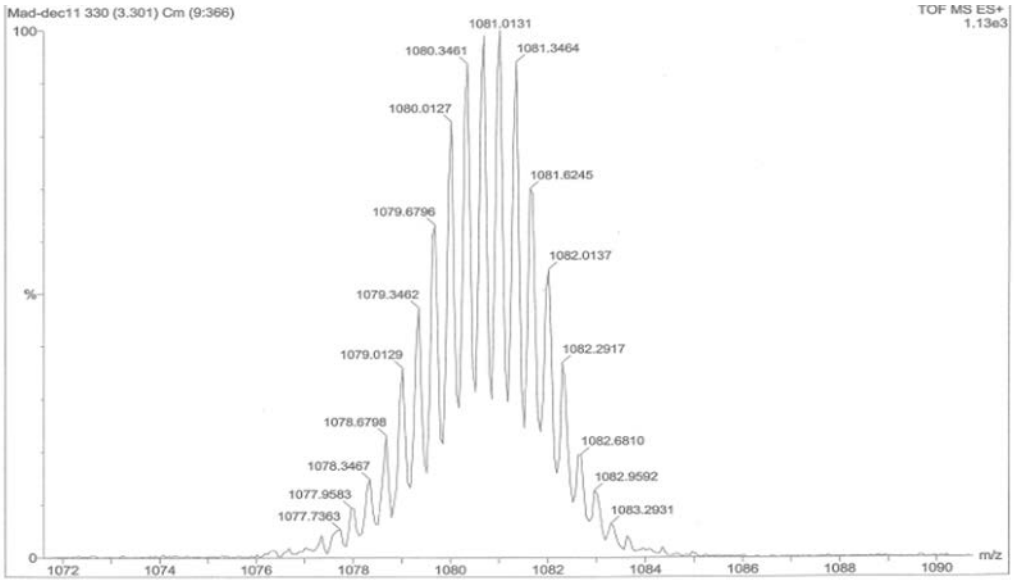



**Figure S4.** MS spectra of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**1**)][$CF_3SO_3$]$_4$ (**3**).

1.2. Compound [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(2)][$CF_3SO_3$]$_4$ **(4)**

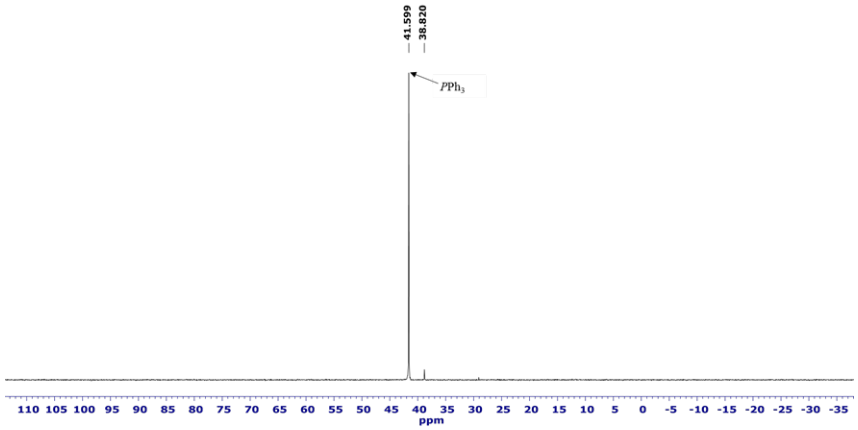



**Figure S5.** $^{31}$P NMR spectrum of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**2**)][$CF_3SO_3$]$_4$ (**4**), in $CDCl_3$.

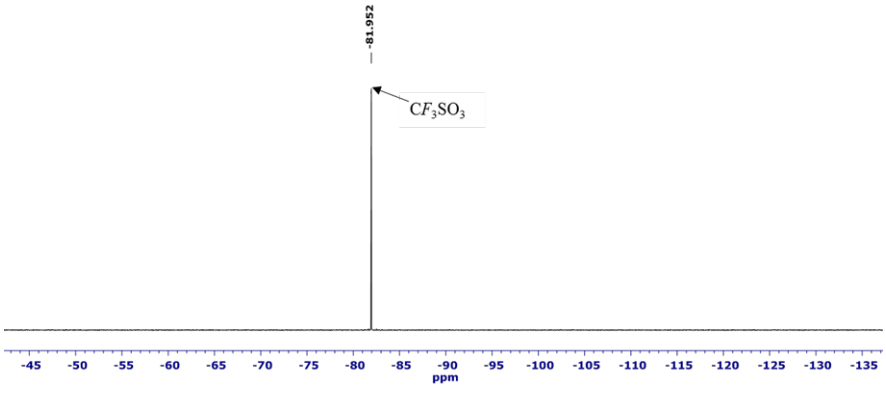



**Figure S6.** $^{19}$F NMR spectrum of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**2**)][$CF_3SO_3$]$_4$ (**4**), in $CDCl_3$.

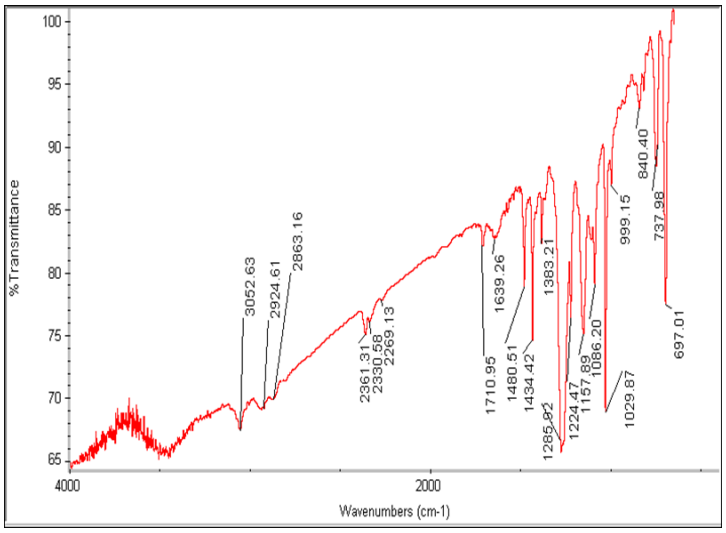



**Figure S7.** FTIR spectrum of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**2**)][$CF_3SO_3$]$_4$ (**4**), in KBr.

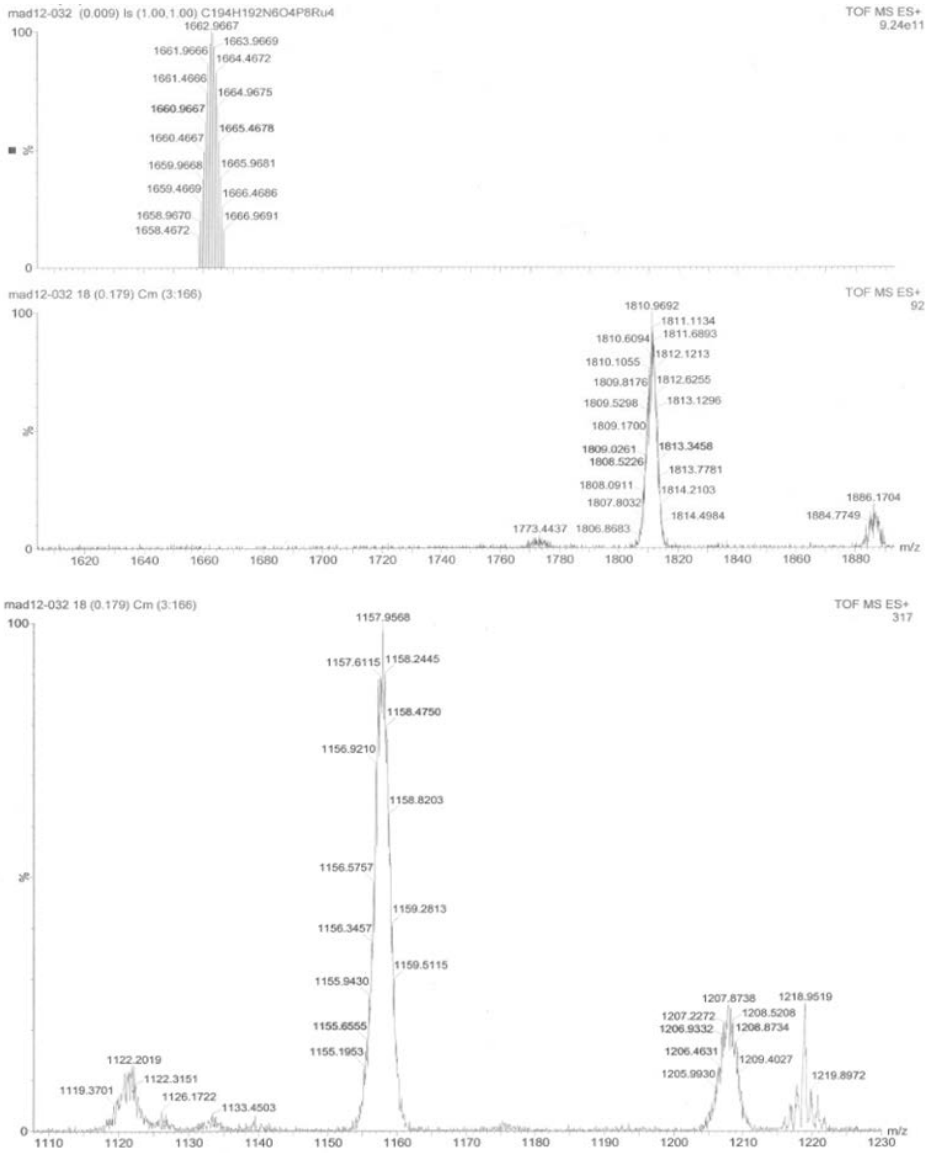
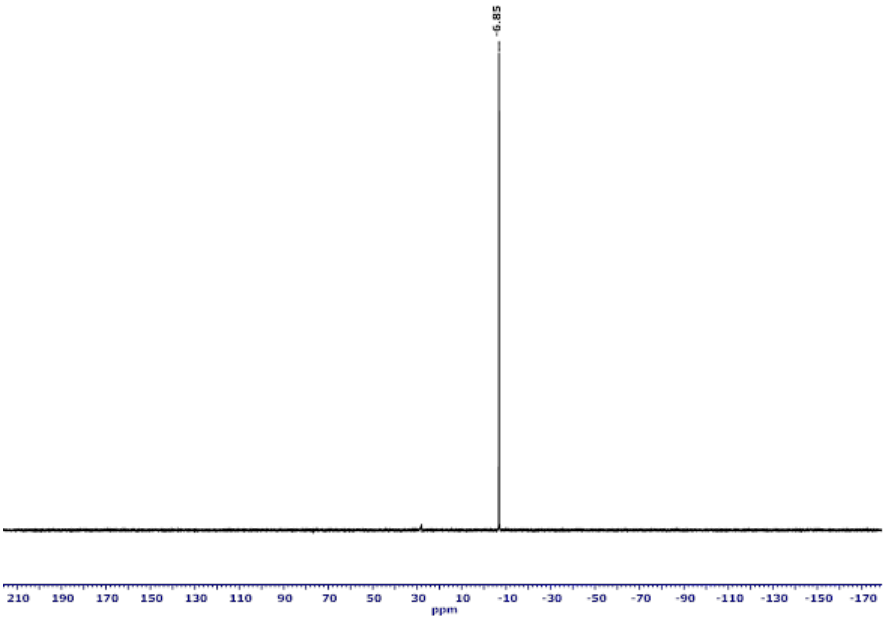



**Figure S8.** MS spectra of [{($\eta^5$-$C_5H_5$)($PPh_3$)$_2$Ru}$_4$(**2**)][$CF_3SO_3$]$_4$ (**4**).

62 1.3. $PPh_3$ compound

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64 **Figure S9.** $^{31}P$ NMR spectrum of $PPh_3$ in a mixture of DMSO-$d_6$/$D_2O$.

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2. Metabolic activity data

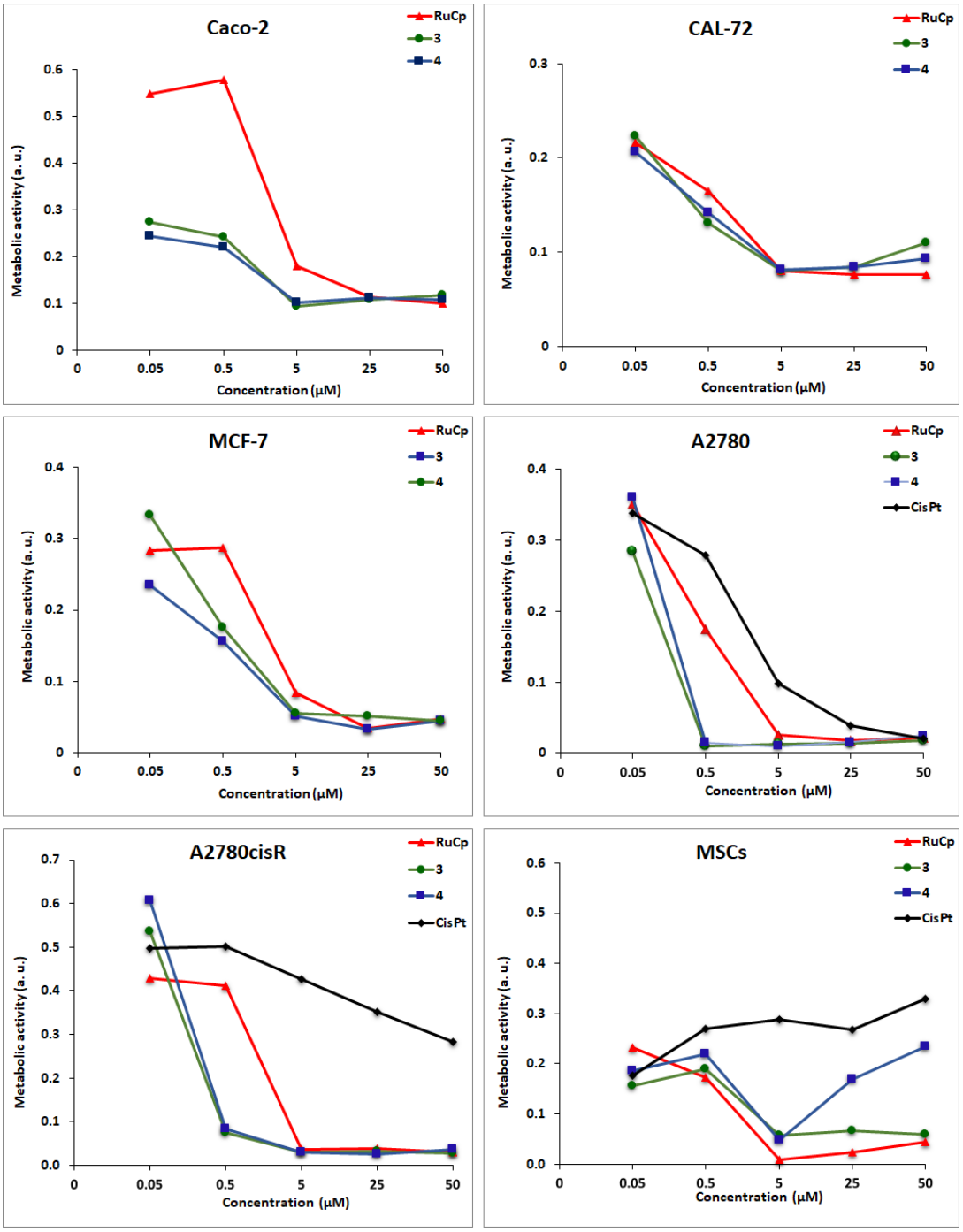


**Figure S10.** Effect of RuCp, metallodendrimers **3** and **4** and *cis*Pt on the metabolic activity (an indirect measure of cellular viability) of Caco-2, CAL-72, MCF-7, A2780, A2780*cis*R tumor cell lines, and on hMSCs.

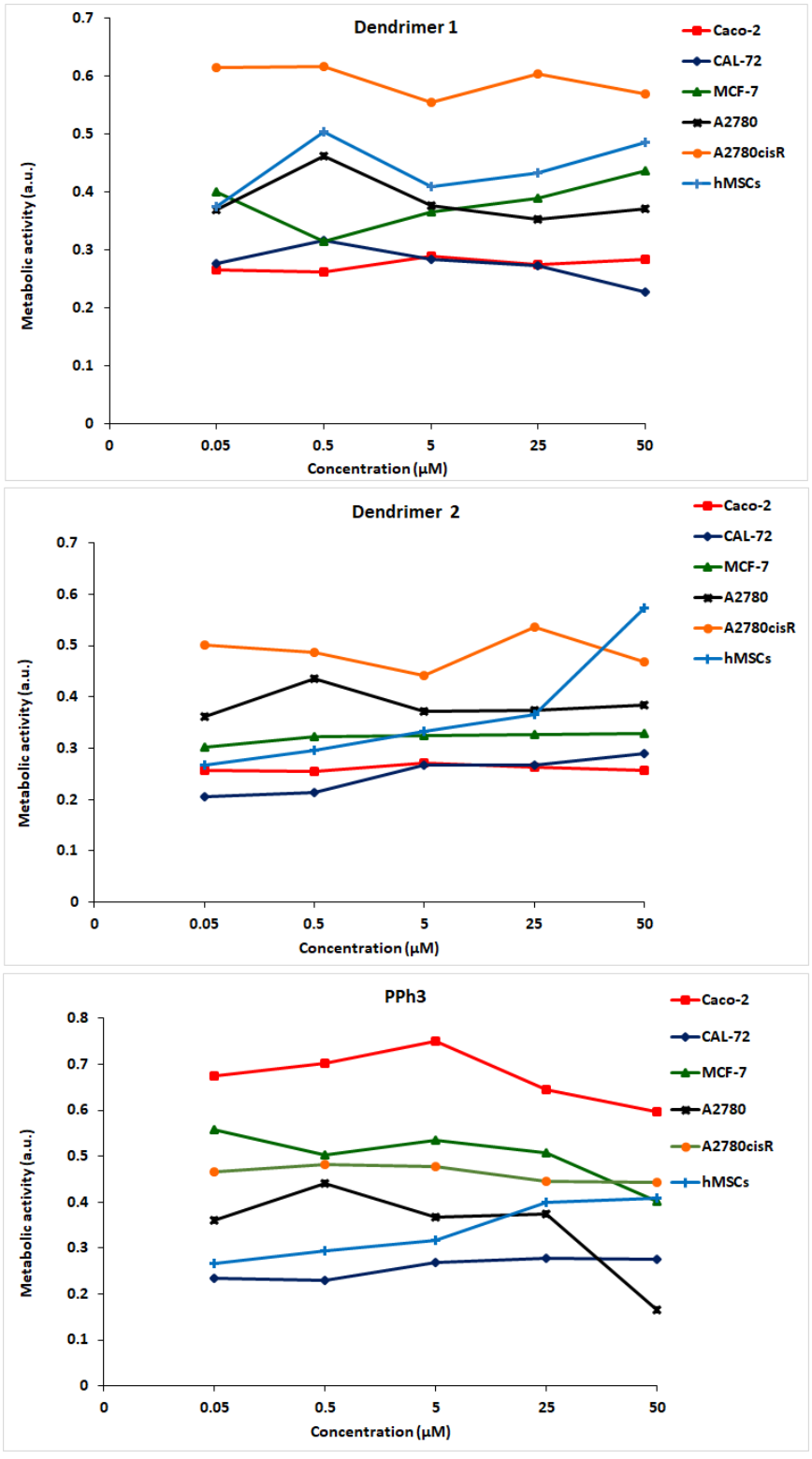


**Figure S11.** Effect of dendrimers **1** and **2** and $PPh_3$ on the metabolic activity (an indirect measure of cellular viability) of Caco-2, CAL-72, MCF-7, A2780, A2780*cis*R and hMSC cells.