



Figure S1: A) The DSC thermograms of (a) 5-FU (b) folic acid (c) MSN-NH<sub>2</sub> (d) MSN-NH<sub>2</sub>-FA (e) MSN-NH<sub>2</sub>-5FU and (f) MSN-NH<sub>2</sub>-5FU-FA B).

**Table S1.** Statistical significance in cell viability between different treatment groups in SKOV-3

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

	3.12µg/ ml	6.25 µg/ml	12.5 µg/ml	25 µg/ml	50 µg/ml	100 µg/ml
Folic acid vs. MSN-NH2-FA	Ns	*	****	****	****	****
Folic acid vs. MSN-NH2	ns	ns	****	**	****	****
Folic acid vs. MSN-NH2-5-FU	ns	*	****	****	****	****
Folic acid vs. MSN-NH2-5FU-FA	*	****	****	****	****	****
Folic acid vs. 5FU	ns	***	****	****	****	****
MSN-NH2-FA vs. MSN-NH2	ns	**	****	****	****	****
MSN-NH2-FA vs. MSN-NH2-5FU	ns	ns	***	****	ns	ns
MSN-NH2-FA vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
MSN-NH2-FA vs. 5FU	ns	*	ns	****	****	****
MSN-NH2 vs. MSN-NH2-5FU	ns	***	****	****	****	****
MSN-NH2 vs. . MSN-NH2-5FU-FA	ns	****	****	****	****	****
MSN-NH2 vs. 5FU	ns	****	****	****	****	****
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
MSN-NH2-5FU vs. 5FU	ns	ns	**	ns	****	****
MSN-NH2-5FU-FA vs. 5FU	ns	***	****	****	****	****

**Table S2.** Statistical significance in cell viability between different treatment groups in HeLa cells.

	3.125µg/ ml	6.25 µg/ml	12.5 µg/ml	25 µg/ml	50 µg/ml	100 µg/m
Folic acid vs. MSN-NH2-FA	ns	ns	****	****	****	**
Folic acid vs. MSN-NH2	ns	ns	ns	****	****	**
Folic acid vs. MSN-NH2-5-FU	ns	ns	ns	***	****	ns
Folic acid vs. MSN-NH2-5FU-FA	ns	*	***	****	****	***
Folic acid vs. 5FU	*	ns	***	****	****	*
MSN-NH2-FA vs. MSN-NH2	ns	ns	***	****	****	****
MSN-NH2-FA vs. MSN-NH2-5-FU	ns	ns	****	*	****	ns
MSN-NH2-FA vs. MSN-NH2-5FU-FA	ns	ns	ns	*	*	ns
MSN-NH2-FA vs. 5FU	ns	ns	ns	ns	**	ns
MSN-NH2 vs. MSN-NH2-5-FU	ns	ns	ns	****	****	****
MSN-NH2 vs. . MSN-NH2-5FU-FA	ns	*	***	****	****	****
MSN-NH2 vs. 5FU	ns	ns	***	****	****	****
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	*	**	****	****	****	*
MSN-NH2-5FU vs. 5FU	**	ns	***	ns	****	ns
MSN-NH2-5FU-FA vs. 5FU	ns	ns	ns	***	ns	ns

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S3.** Statistical significance in cell viability between different treatment groups in Ca-Ski cells.

	3.125µg/ ml	6.25 µg/ml	12.5 µg/ml	25 µg/ml	50 µg/ml	100 µg/m
Folic acid vs. MSN-NH2-FA	*	*	****	****	****	****
Folic acid vs. MSN-NH2	****	****	*	****	****	****
Folic acid vs. MSN-NH2-5-FU	***	****	****	**	****	****
Folic acid vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
Folic acid vs. 5FU	ns	****	****	****	***	***
MSN-NH2-FA vs. MSN-NH2	***	*	****	****	****	****
MSN-NH2-FA vs. MSN-NH2-5-FU	ns	****	ns	****	****	****
MSN-NH2-FA vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
MSN-NH2-FA vs. 5FU	ns	***	*	***	****	****
MSN-NH2 vs. MSN-NH2-5-FU	**	***	****	****	****	****
MSN-NH2 vs. . MSN-NH2-5FU-FA	****	****	****	****	****	****
MSN-NH2 vs. 5FU	****	ns	****	**	****	****
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
MSN-NH2-5FU vs. 5FU	**	*	*	****	****	****
MSN-NH2-5FU-FA vs. 5FU	ns	****	****	****	****	****

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S4.** Statistical significance in cell viability between different treatment groups in C-33 A cells.

	3.125µg/ ml	6.25 µg/ml	12.5 µg/ml	25 µg/ml	50 µg/ml	100 µg/m
Folic acid vs. MSN-NH2-FA	ns	****	****	****	****	****
Folic acid vs. MSN-NH2	ns	ns	**	***	ns	****
Folic acid vs. MSN-NH2-5-FU	ns	****	****	****	****	****
Folic acid vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
Folic acid vs. 5FU	ns	***	ns	****	*	***
MSN-NH2-FA vs. MSN-NH2	ns	****	****	****	****	****
MSN-NH2-FA vs. MSN-NH2-5-FU	ns	****	**	***	ns	****
MSN-NH2-FA vs. MSN-NH2-5FU-FA	ns	***	****	****	*	****
MSN-NH2-FA vs. 5FU	ns	****	****	****	***	****
MSN-NH2 vs. MSN-NH2-5-FU	ns	****	****	****	****	****
MSN-NH2 vs. MSN-NH2-5FU-FA	ns	****	****	****	****	****
MSN-NH2 vs. 5FU	ns	ns	***	****	***	****
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	ns	ns	***	****	ns	****
MSN-NH2-5FU vs. 5FU	ns	****	****	****	****	****
MSN-NH2-5FU-FA vs. 5FU	ns	****	****	****	****	****

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S5.** Statistical significance of Intracellular uptake of 5-FU using HPLC between different treatment groups in SKOV-3 cells

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH2-5FU vs. 5FU	***	ns	ns	ns	ns
MSN-NH2-5FU-FA vs. 5FU	****	****	****	ns	ns
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	***	****	****	ns	ns

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S6.** Statistical significance of Intracellular uptake of 5-FU using HPLC between different treatment groups in HeLa cells

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH2-5FU vs. 5FU	***	****	ns	ns	ns
MSN-NH2-5FU-FA vs. 5FU	****	****	****	ns	****
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	****	****	****	ns	****

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S7.** Statistical significance of Intracellular uptake of 5-FU using HPLC between different treatment groups in Ca-Ski cells

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH2-5FU vs. 5FU	****	ns	****	****	****
MSN-NH2-5FU-FA vs. 5FU	****	****	****	**	ns
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	****	****	****	****	****

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S8.** Statistical significance of Intracellular uptake of 5-FU using HPLC between different treatment groups in C-33 A cells

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH2-5FU vs. 5FU	*	ns	***	****	***
MSN-NH2-5FU-FA vs. 5FU	****	****	****	****	***
MSN-NH2-5FU vs. MSN-NH2-5FU-FA	****	****	****	****	ns

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S9.** Statistical significance of Intracellular uptake of 5-FU using ICP-MS between different treatment groups in SKOV-3

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH <sub>2</sub> -5FU vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	***	****	ns
5FU PBS vs. MSN-NH <sub>2</sub> -5-FU	ns	ns	ns	ns	ns
5FU PBS vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	***	****	ns

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S10.** Statistical significance of Intracellular uptake using ICP-MS between different treatment groups in HeLa

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH <sub>2</sub> -5FU vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	****	**	*
5FU PBS vs. MSN-NH <sub>2</sub> -5-FU	****	****	****	****	***
5FU PBS vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	****	**	**

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S11.** Statistical significance of Intracellular uptake using ICP-MS between different treatment groups in Ca-Ski

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH <sub>2</sub> -5FU vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	****	****	**
5FU PBS vs. MSN-NH <sub>2</sub> -5-FU	****	**	ns	**	ns
5FU PBS vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	****	****	***

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .

**Table S12.** Statistical significance of Intracellular uptake using ICP-MS between different treatment groups in C-33 A

	0.5 h	1 h	2 h	4 h	8 h
MSN-NH <sub>2</sub> -5FU vs. MSN-NH <sub>2</sub> -5FU-FA	****	****	****	****	**
MSN-NH <sub>2</sub> -5FU vs. 5FU PBS	****	**	ns	**	ns
MSN-NH <sub>2</sub> -5FU-FA vs. 5FU PBS	****	****	****	****	***

Statistical significance was obtained with p-values  $\leq 0.05$ , where \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$ , and \*\*\*\*  $p < 0.0001$ .