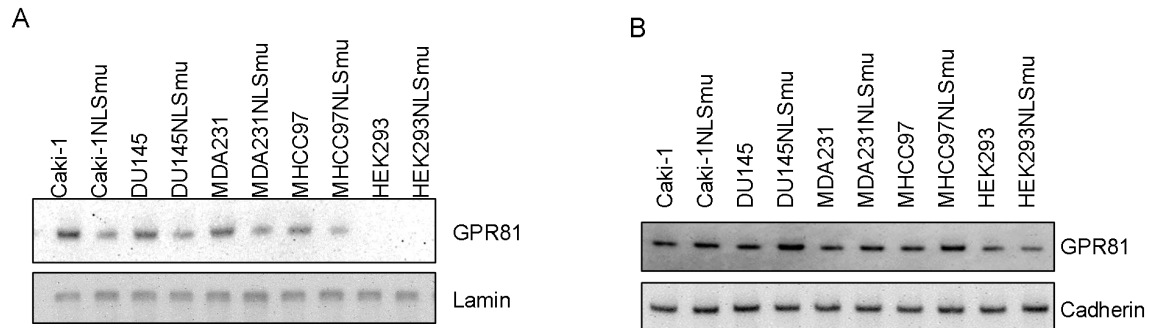
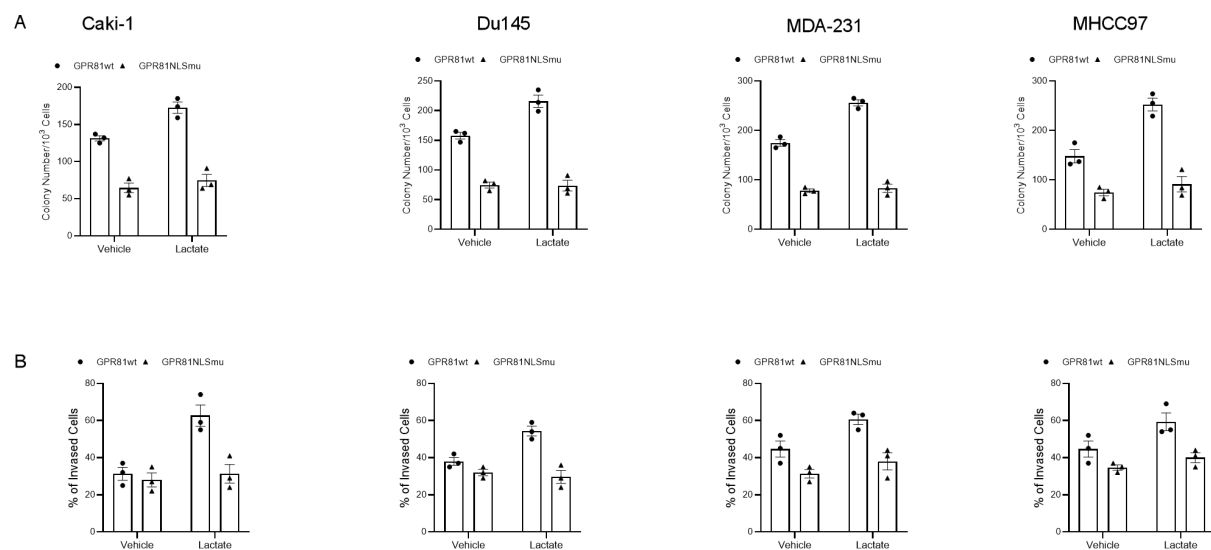


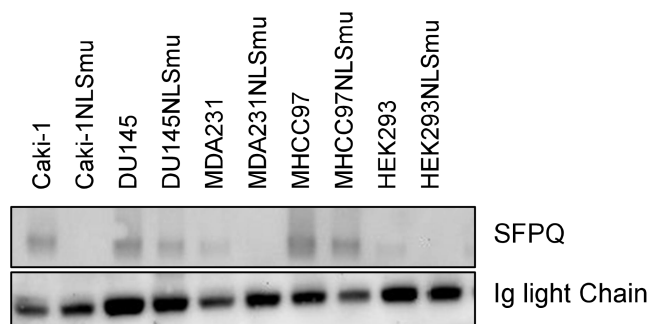
Supplemental Figures



Supplemental Figure 1 GPR81 Nuclear Localization Signal is essential in GPR81 nuclear transportation in cancer cells. Human cell lines from normal and solid cancers, kidney cancer cell Caki-1, kidney cell HEP293, prostate cancer cell Du145, breast cancer cell MDA-231 and liver cancer cell MHCC97 were used. Human cells were transduced with GPR81 wild type and GPR81 NLS mutant were cultured and the nuclear fraction were isolated. Western blot analysis was conducted with GPR81 antibody. **A.** nuclear fraction, Lamin as loading control; **B.** membrane fraction, cadherin as loading control.

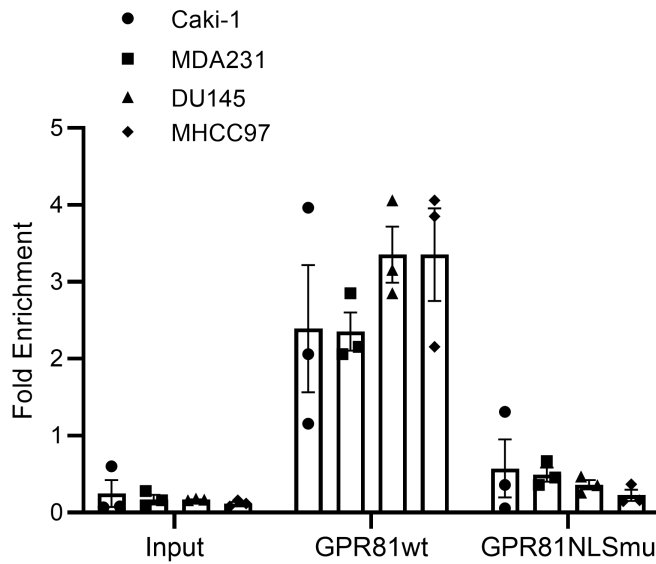


Supplemental Figure 2 Inhibition of GPR81 nuclear translocation reduces cancer cell self-renewal and invasion. Cancer cell lines from solid cancers, kidney cancer cell Caki-1, prostate cancer cell Du145, breast cancer cell MDA-231 and liver cancer cell MHCC97 were used. Human cells were transduced with GPR81wild type and GPR81 NLS mutant were cultured with vehicle and 5 M lactate overnight and the used in the assays.. **A.** Cancer cell self-renewal was assessed in the colony forming assay. **B.** Cancer cells invasion was assessed.



Supplemental Figure 3 Lactate promotes GPR81/SFPQ complex forming in cancer cells.

Human cell lines from normal and solid cancers, kidney cancer cell Caki-1, kidney cell HEP293, prostate cancer cell Du145, breast cancer cell MDA-231 and liver cancer cell MHCC97 were used. Human cells were transduced with empty vector and GPR81 NLS mutant were cultured and the nuclear fraction were isolated. Immunoprecipitation and Western blot analysis with GPR81 bound proteins were conducted. The nuclear fraction from cells was used in immunoprecipitation with GPR81 antibody. Then SFPQ antibody were used in Western blot analysis with GPR81 pull down portion of cell nuclear fraction.



Supplemental Figure 4. GPR81 interacts with genes and change gene expression in cancer cells Human cell lines from normal and solid cancers, kidney cancer cell Caki-1, kidney cell HEP293, prostate cancer cell Du145, breast cancer cell MDA-231 and liver cancer cell MHCC97 were used. Human cells were transduced with GPR81 wild type and GPR81 NLS mutant were cultured and the chromatin were isolated. ChIP assays were performed on cross linked chromatin from cancer cells using GPR81 antibody.

Supplemental Table 1: Nuclear GPR81 Interacting Proteins

ACAP3	EFCAB13	MAPKAPK3	SRRM2
ADAR	ESPL1	METTTL16	SUGP2
AHNAK	EXOSC10	MGA	SUGT1
ALPK2	FANCC	MTOR	SYNE1
APC	FANCI	MYOF	SYNE2
ARHGAP35	GAR1	NCAPD3	TDRD5
ARID4A	GLE1	NOP14	TESK2
ARID5A	HECTD4	NUMA1	TET1
ASH1L	HIF3A	POLR3B	TNKS1BP1
ASPM	HIST1H1C	PSMC2	TOP3B
ATOH8	HIST1H1E	PTMA	TRANK1
BRCA1	HLTF	RAD54L2	TRRAP
BRCA1	HNRNPM	RBL1	ZFAT
BRCA2	HNRNPUL1	RBM27	ZNF140
BTA1F1	HOXA6	RBMX	ZNF227
BUD13	INTS6	RNF20	ZNF235
C2orf42	JMJD1C	RRP36	ZNF318
CAMTA2	KCTD1	RSF1	ZNF541
CBX4	KDM4B	SDAD1	ZNF559
CDK13	KNL1	SETD3	ZNF595
CHD1	KNTC1	SF3B3	ZNF646
CKAP5	KNTC1	SLC8A2	ZRANB2
CTDSP1	LCORL	SMARCA4	
CTR9	LMNA	SPTY2D1	
DDX17	MAMSTR	SRRM2	

Proteins Identified by Mass Spectrometry bound with GPR81 Immunoprecipitation proteins with GPR81 antibody. Each ID was decided with one or more unique peptide at 99% confidence.

Supplemental Table 2 GPR81 ChIPseq gene list

Peak.Name	LC1	LC2	LC3	LC4	EnsemblID
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MSPC_Peak_103	4.57040323	5.85346972	4.57040323	6.64309446	ENSG00000112851
MSPC_Peak_106	5.56320289	6.97657812	4.57040323	6.22015868	ENSG00000082074
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MSPC_Peak_113	5.56320289	4.57040323	4.57040323	5.6192687	ENSG00000285733
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MSPC_Peak_27	6.5595892	5.85346972	4.57040323	7.6548614	ENSG00000227240
MSPC_Peak_270	5.56320289	5.85346972	4.57040323	6.22015868	ENSG00000165029
MSPC_Peak_271	5.56320289	6.97657812	6.13603553	4.57040323	ENSG00000148123
MSPC_Peak_272	7.36539262	5.85346972	4.57040323	4.57040323	ENSG00000251349
MSPC_Peak_273	5.56320289	6.52166043	4.57040323	4.57040323	ENSG00000260995
MSPC_Peak_274	5.56320289	4.57040323	7.35285713	4.57040323	ENSG00000119125
MSPC_Peak_275	4.57040323	8.03440463	4.57040323	8.11748559	ENSG00000260691
MSPC_Peak_277	6.14575727	6.52166043	4.57040323	4.57040323	ENSG00000173068
MSPC_Peak_278	5.56320289	4.57040323	4.57040323	5.6192687	ENSG00000175893
MSPC_Peak_279	6.14575727	4.57040323	4.57040323	7.46054119	ENSG00000107077
MSPC_Peak_280	6.88079347	5.85346972	4.57040323	6.22015868	ENSG00000107077
MSPC_Peak_280	6.88079347	5.85346972	4.57040323	6.22015868	ENSG00000224972
MSPC_Peak_281	6.88079347	6.97657812	4.57040323	5.6192687	ENSG00000107249
MSPC_Peak_282	6.14575727	5.85346972	6.13603553	5.6192687	ENSG00000066739
MSPC_Peak_283	6.88079347	5.85346972	4.57040323	6.22015868	ENSG00000258927
MSPC_Peak_285	5.56320289	6.52166043	4.57040323	6.22015868	ENSG00000133962
MSPC_Peak_286	6.5595892	6.97657812	4.57040323	6.22015868	ENSG00000042317
MSPC_Peak_287	5.56320289	4.57040323	6.13603553	5.6192687	ENSG00000258733
MSPC_Peak_288	7.87934473	6.52166043	4.57040323	10.4196974	ENSG00000100629
MSPC_Peak_289	6.5595892	4.57040323	4.57040323	6.64309446	ENSG00000063761
MSPC_Peak_29	5.56320289	4.57040323	4.57040323	4.57040323	ENSG00000121446
MSPC_Peak_290	4.57040323	5.85346972	4.57040323	6.64309446	ENSG00000119711
MSPC_Peak_290	4.57040323	5.85346972	4.57040323	6.64309446	ENSG00000205659
MSPC_Peak_291	6.14575727	4.57040323	4.57040323	6.22015868	ENSG00000198732
MSPC_Peak_292	7.36539262	5.85346972	4.57040323	4.57040323	ENSG00000182185
MSPC_Peak_293	6.88079347	7.32191569	7.35285713	4.57040323	ENSG00000165410
MSPC_Peak_294	16.3175218	16.0784723	16.0124874	17.0521086	ENSG00000259002
MSPC_Peak_295	4.57040323	5.85346972	4.57040323	4.57040323	ENSG00000184304
MSPC_Peak_297	6.14575727	6.97657812	4.57040323	5.6192687	ENSG00000198805
MSPC_Peak_298	5.56320289	4.57040323	6.13603553	5.6192687	ENSG00000255545
MSPC_Peak_3	5.56320289	5.85346972	4.57040323	4.57040323	ENSG00000286780
MSPC_Peak_30	7.72750268	6.97657812	4.57040323	4.57040323	ENSG00000116183
MSPC_Peak_300	4.57040323	6.52166043	6.13603553	4.57040323	ENSG00000273415
MSPC_Peak_303	6.5595892	4.57040323	4.57040323	5.6192687	ENSG00000149972
MSPC_Peak_305	6.14575727	6.52166043	4.57040323	6.22015868	ENSG00000087053
MSPC_Peak_305	6.14575727	6.52166043	4.57040323	6.22015868	ENSG00000166037
MSPC_Peak_306	6.14575727	6.52166043	4.57040323	6.22015868	ENSG00000168959

MSPC_Peak_307	5.56320289	6.52166043	4.57040323	6.22015868	ENSG00000021300
MSPC_Peak_308	6.5595892	6.52166043	4.57040323	4.57040323	ENSG00000235855
MSPC_Peak_310	5.56320289	5.85346972	4.57040323	6.22015868	ENSG00000030066
MSPC_Peak_311	6.88079347	5.85346972	4.57040323	6.64309446	ENSG00000148948
MSPC_Peak_313	4.57040323	4.57040323	4.57040323	5.6192687	ENSG00000183242
MSPC_Peak_314	5.56320289	6.52166043	4.57040323	4.57040323	ENSG00000245573
MSPC_Peak_316	5.56320289	6.52166043	4.57040323	5.6192687	ENSG00000166833
MSPC_Peak_317	6.14575727	5.85346972	4.57040323	6.22015868	ENSG00000110693
MSPC_Peak_319	6.14575727	4.57040323	4.57040323	6.22015868	ENSG00000130751
MSPC_Peak_320	7.72750268	4.57040323	4.57040323	5.6192687	ENSG00000125746
MSPC_Peak_321	5.56320289	4.57040323	4.57040323	6.96974085	ENSG00000120784
MSPC_Peak_322	6.88079347	8.367625	4.57040323	6.22015868	ENSG00000267120
MSPC_Peak_322	6.88079347	8.367625	4.57040323	6.22015868	ENSG00000161265
MSPC_Peak_322	6.88079347	8.367625	4.57040323	6.22015868	ENSG00000205155
MSPC_Peak_322	6.88079347	8.367625	4.57040323	6.22015868	ENSG00000188223
MSPC_Peak_323	4.57040323	6.52166043	4.57040323	6.64309446	ENSG00000198597
MSPC_Peak_324	5.56320289	4.57040323	4.57040323	4.57040323	ENSG00000161082
MSPC_Peak_325	4.57040323	4.57040323	6.13603553	6.64309446	ENSG00000176533
MSPC_Peak_326	6.5595892	6.52166043	4.57040323	6.64309446	ENSG00000167632
MSPC_Peak_328	6.5595892	7.32191569	4.57040323	4.57040323	ENSG00000066827
MSPC_Peak_33	4.57040323	5.85346972	4.57040323	5.6192687	ENSG00000233712
MSPC_Peak_330	6.88079347	5.85346972	4.57040323	6.22015868	ENSG00000288067
MSPC_Peak_331	6.14575727	5.85346972	4.57040323	5.6192687	ENSG00000254275
MSPC_Peak_332	6.14575727	4.57040323	4.57040323	6.22015868	ENSG00000248690
MSPC_Peak_333	6.14575727	6.52166043	4.57040323	4.57040323	ENSG00000244642
MSPC_Peak_334	6.5595892	4.57040323	4.57040323	4.57040323	ENSG00000253434
MSPC_Peak_335	6.14575727	6.97657812	4.57040323	6.64309446	ENSG00000253580
MSPC_Peak_335	6.14575727	6.97657812	4.57040323	6.64309446	ENSG00000164841
MSPC_Peak_336	4.57040323	4.57040323	4.57040323	6.22015868	ENSG00000147647
MSPC_Peak_337	5.56320289	4.57040323	4.57040323	5.6192687	ENSG00000176406
MSPC_Peak_338	5.56320289	5.85346972	4.57040323	6.96974085	ENSG00000104517
MSPC_Peak_339	6.88079347	4.57040323	4.57040323	4.57040323	ENSG00000132549
MSPC_Peak_34	5.56320289	5.85346972	4.57040323	5.6192687	ENSG00000143614
MSPC_Peak_340	4.57040323	4.57040323	4.57040323	6.22015868	ENSG00000253773
MSPC_Peak_341	5.56320289	6.52166043	6.13603553	6.22015868	ENSG00000253901
MSPC_Peak_343	6.5595892	5.85346972	4.57040323	4.57040323	ENSG00000254394
MSPC_Peak_346	6.14575727	4.57040323	4.57040323	5.6192687	ENSG00000169122
MSPC_Peak_347	4.57040323	4.57040323	4.57040323	6.22015868	ENSG00000147485
MSPC_Peak_348	5.56320289	4.57040323	6.86910381	5.6192687	ENSG00000253664
MSPC_Peak_35	6.88079347	6.52166043	4.57040323	6.22015868	ENSG00000237975
MSPC_Peak_35	6.88079347	6.52166043	4.57040323	6.22015868	ENSG00000143631

MSPC_Peak_351	5.56320289	6.52166043	4.57040323	6.22015868	ENSG000000156395
MSPC_Peak_352	6.5595892	4.57040323	6.86910381	6.96974085	ENSG000000155229
MSPC_Peak_353	5.56320289	5.85346972	7.35285713	6.22015868	ENSG000000138193
MSPC_Peak_354	6.14575727	4.57040323	6.13603553	6.64309446	ENSG000000138190
MSPC_Peak_355	6.5595892	4.57040323	4.57040323	6.22015868	ENSG000000107864
MSPC_Peak_356	6.14575727	6.52166043	4.57040323	5.6192687	ENSG000000095564
MSPC_Peak_358	4.57040323	4.57040323	6.13603553	4.57040323	ENSG000000107771
MSPC_Peak_359	6.5595892	6.97657812	4.57040323	5.6192687	ENSG000000156110
MSPC_Peak_36	6.14575727	5.85346972	4.57040323	6.22015868	ENSG000000143458
MSPC_Peak_360	5.56320289	6.97657812	4.57040323	5.6192687	ENSG000000138279
MSPC_Peak_361	6.14575727	4.57040323	4.57040323	4.57040323	ENSG000000273360
MSPC_Peak_361	6.14575727	4.57040323	4.57040323	4.57040323	ENSG000000183230
MSPC_Peak_362	5.56320289	5.85346972	4.57040323	6.22015868	ENSG000000183230
MSPC_Peak_363	4.57040323	4.57040323	4.57040323	4.57040323	ENSG000000232706
MSPC_Peak_365	6.5595892	4.57040323	8.00341077	5.6192687	ENSG000000227345
MSPC_Peak_366	7.14334512	5.85346972	9.58659434	6.96974085	ENSG000000189014
MSPC_Peak_368	5.56320289	4.57040323	4.57040323	5.6192687	ENSG000000291065
MSPC_Peak_371	6.5595892	4.57040323	6.13603553	6.22015868	ENSG000000225418
MSPC_Peak_372	4.57040323	5.85346972	4.57040323	4.57040323	ENSG000000289828
MSPC_Peak_373	6.5595892	5.85346972	4.57040323	6.22015868	ENSG000000173950
MSPC_Peak_375	6.5595892	6.52166043	4.57040323	5.6192687	ENSG000000114279
MSPC_Peak_377	5.56320289	4.57040323	4.57040323	6.22015868	ENSG000000228221
MSPC_Peak_378	6.14575727	4.57040323	4.57040323	4.57040323	ENSG000000144959
MSPC_Peak_379	5.56320289	5.85346972	4.57040323	6.22015868	ENSG000000242536
MSPC_Peak_380	6.14575727	4.57040323	4.57040323	5.6192687	ENSG000000243944
MSPC_Peak_383	7.36539262	4.57040323	4.57040323	8.56721056	ENSG000000121578
MSPC_Peak_383	7.36539262	4.57040323	4.57040323	8.56721056	ENSG000000240254
MSPC_Peak_384	10.2841606	12.4001386	11.3359905	10.2793438	ENSG000000218754
MSPC_Peak_385	5.56320289	6.97657812	6.13603553	6.64309446	ENSG000000283434
MSPC_Peak_386	5.56320289	5.85346972	4.57040323	5.6192687	ENSG000000145041
MSPC_Peak_387	4.57040323	4.57040323	4.57040323	6.22015868	ENSG000000047849
MSPC_Peak_388	4.57040323	4.57040323	4.57040323	4.57040323	ENSG000000188846
MSPC_Peak_389	5.56320289	4.57040323	4.57040323	5.6192687	ENSG000000232167
MSPC_Peak_390	6.5595892	4.57040323	4.57040323	4.57040323	ENSG000000132170
MSPC_Peak_391	4.57040323	4.57040323	4.57040323	4.57040323	ENSG000000196220
MSPC_Peak_392	5.56320289	6.97657812	4.57040323	6.64309446	ENSG000000177885
MSPC_Peak_393	7.36539262	5.85346972	6.13603553	5.6192687	ENSG000000108370
MSPC_Peak_394	5.56320289	4.57040323	4.57040323	6.64309446	ENSG000000170832
MSPC_Peak_395	6.88079347	5.85346972	4.57040323	6.22015868	ENSG000000249870
MSPC_Peak_395	6.88079347	5.85346972	4.57040323	6.22015868	ENSG000000008294
MSPC_Peak_396	6.5595892	7.83363918	4.57040323	7.23591224	ENSG000000121067

MSPC_Peak_397	5.56320289	6.52166043	6.13603553	4.57040323	ENSG000000186868
MSPC_Peak_398	6.14575727	4.57040323	6.13603553	6.22015868	ENSG000000067596
MSPC_Peak_399	6.88079347	5.85346972	6.13603553	6.22015868	ENSG000000171475
MSPC_Peak_400	6.14575727	6.97657812	6.13603553	5.6192687	ENSG000000236088
MSPC_Peak_401	6.14575727	4.57040323	4.57040323	6.22015868	ENSG000000132359
MSPC_Peak_402	5.56320289	4.57040323	4.57040323	6.22015868	ENSG000000075240
MSPC_Peak_403	6.14575727	4.57040323	4.57040323	5.6192687	ENSG000000075275
MSPC_Peak_404	5.56320289	4.57040323	4.57040323	5.6192687	ENSG000000100347
MSPC_Peak_405	6.88079347	4.57040323	6.86910381	6.22015868	ENSG000000100320
MSPC_Peak_406	6.5595892	6.52166043	4.57040323	5.6192687	ENSG000000186716
MSPC_Peak_408	6.5595892	5.85346972	8.45015844	4.57040323	ENSG000000283023
MSPC_Peak_41	6.88079347	4.57040323	4.57040323	5.6192687	ENSG000000162631
MSPC_Peak_410	5.56320289	6.52166043	4.57040323	6.96974085	ENSG000000009694
MSPC_Peak_412	5.56320289	5.85346972	4.57040323	5.6192687	ENSG000000133135
MSPC_Peak_413	4.57040323	7.32191569	4.57040323	5.6192687	ENSG000000147202
MSPC_Peak_414	4.57040323	5.85346972	4.57040323	5.6192687	ENSG000000280870
MSPC_Peak_418	6.14575727	4.57040323	4.57040323	5.6192687	ENSG000000169306
MSPC_Peak_419	6.14575727	4.57040323	4.57040323	4.57040323	ENSG000000169891
MSPC_Peak_42	4.57040323	4.57040323	4.57040323	5.6192687	ENSG000000230768
MSPC_Peak_421	5.56320289	4.57040323	4.57040323	5.6192687	ENSG000000183943
MSPC_Peak_422	5.56320289	6.97657812	4.57040323	4.57040323	ENSG000000054793
MSPC_Peak_423	4.57040323	4.57040323	4.57040323	6.22015868	ENSG000000171222
MSPC_Peak_423	4.57040323	4.57040323	4.57040323	6.22015868	ENSG000000149646
MSPC_Peak_424	6.14575727	4.57040323	4.57040323	7.46054119	ENSG000000131061
MSPC_Peak_424	6.14575727	4.57040323	4.57040323	7.46054119	ENSG000000230753
MSPC_Peak_425	4.57040323	6.97657812	4.57040323	5.6192687	ENSG000000289492
MSPC_Peak_425	4.57040323	6.97657812	4.57040323	5.6192687	ENSG000000088325
MSPC_Peak_426	5.56320289	5.85346972	4.57040323	5.6192687	ENSG000000089123
MSPC_Peak_427	6.14575727	6.52166043	4.57040323	5.6192687	ENSG000000227906
MSPC_Peak_428	6.14575727	4.57040323	4.57040323	4.57040323	ENSG000000286235
MSPC_Peak_428	6.14575727	4.57040323	4.57040323	4.57040323	ENSG000000088766
MSPC_Peak_429	6.5595892	4.57040323	4.57040323	4.57040323	ENSG000000223400
MSPC_Peak_429	6.5595892	4.57040323	4.57040323	4.57040323	ENSG000000286027
MSPC_Peak_43	6.14575727	5.85346972	4.57040323	5.6192687	ENSG000000215869
MSPC_Peak_430	6.14575727	4.57040323	4.57040323	6.64309446	ENSG000000288711
MSPC_Peak_430	6.14575727	4.57040323	4.57040323	6.64309446	ENSG000000159200
MSPC_Peak_44	6.14575727	4.57040323	4.57040323	5.6192687	ENSG000000117598
MSPC_Peak_44	6.14575727	4.57040323	4.57040323	5.6192687	ENSG000000232825
MSPC_Peak_46	6.5595892	4.57040323	4.57040323	4.57040323	ENSG000000142867
MSPC_Peak_47	6.5595892	4.57040323	6.13603553	5.6192687	ENSG000000137941
MSPC_Peak_48	6.5595892	4.57040323	4.57040323	4.57040323	ENSG000000142856

MSPC_Peak_48	6.5595892	4.57040323	4.57040323	4.57040323	ENSG00000203965
MSPC_Peak_49	7.14334512	4.57040323	6.13603553	6.96974085	ENSG00000224209
MSPC_Peak_50	5.56320289	5.85346972	4.57040323	5.6192687	ENSG00000162599
MSPC_Peak_51	4.57040323	4.57040323	6.13603553	4.57040323	ENSG00000173406
MSPC_Peak_52	5.56320289	5.85346972	4.57040323	6.22015868	ENSG00000234810
MSPC_Peak_53	4.57040323	5.85346972	4.57040323	6.22015868	ENSG00000162402
MSPC_Peak_54	6.88079347	4.57040323	4.57040323	5.6192687	ENSG00000157077
MSPC_Peak_55	6.14575727	5.85346972	6.13603553	4.57040323	ENSG00000117859
MSPC_Peak_56	6.14575727	5.85346972	4.57040323	5.6192687	ENSG00000065978
MSPC_Peak_57	5.56320289	5.85346972	4.57040323	6.96974085	ENSG00000142687
MSPC_Peak_59	6.5595892	5.85346972	4.57040323	6.96974085	ENSG00000260063
MSPC_Peak_59	6.5595892	5.85346972	4.57040323	6.96974085	ENSG00000117713
MSPC_Peak_6	5.56320289	4.57040323	4.57040323	6.96974085	ENSG00000134900
MSPC_Peak_60	5.56320289	5.85346972	4.57040323	5.6192687	ENSG00000117643
MSPC_Peak_62	15.1409384	14.6110091	14.5979752	16.0102383	ENSG00000142677
MSPC_Peak_64	6.14575727	4.57040323	4.57040323	4.57040323	ENSG00000160075
MSPC_Peak_64	6.14575727	4.57040323	4.57040323	4.57040323	ENSG00000215014
MSPC_Peak_66	4.57040323	5.85346972	4.57040323	6.64309446	ENSG00000287907
MSPC_Peak_68	6.5595892	6.97657812	6.86910381	6.22015868	ENSG00000081138
MSPC_Peak_7	6.14575727	6.52166043	4.57040323	4.57040323	ENSG00000102452
MSPC_Peak_71	7.14334512	6.52166043	4.57040323	4.57040323	ENSG00000267764
MSPC_Peak_71	7.14334512	6.52166043	4.57040323	4.57040323	ENSG00000134030
MSPC_Peak_75	12.9780735	12.3255147	12.3679879	14.0392579	ENSG00000174705
MSPC_Peak_76	7.14334512	4.57040323	6.13603553	6.22015868	ENSG00000168246
MSPC_Peak_77	5.56320289	6.97657812	4.57040323	6.22015868	ENSG00000184347
MSPC_Peak_78	6.14575727	5.85346972	6.13603553	5.6192687	ENSG00000253693
MSPC_Peak_79	6.14575727	5.85346972	4.57040323	6.64309446	ENSG00000113327
MSPC_Peak_80	6.5595892	6.52166043	4.57040323	6.22015868	ENSG00000286749
MSPC_Peak_80	6.5595892	6.52166043	4.57040323	6.22015868	ENSG00000249484
MSPC_Peak_81	5.56320289	5.85346972	4.57040323	5.6192687	ENSG00000145901
MSPC_Peak_82	5.56320289	6.52166043	4.57040323	5.6192687	ENSG00000171992
MSPC_Peak_83	5.56320289	7.32191569	6.13603553	6.64309446	ENSG00000156475
MSPC_Peak_84	5.56320289	5.85346972	6.13603553	6.22015868	ENSG00000156463
MSPC_Peak_85	6.88079347	5.85346972	4.57040323	4.57040323	ENSG00000131504
MSPC_Peak_86	6.14575727	5.85346972	4.57040323	6.22015868	ENSG00000044115
MSPC_Peak_87	7.55777895	4.57040323	4.57040323	4.57040323	ENSG00000044115
MSPC_Peak_88	6.14575727	6.52166043	4.57040323	5.6192687	ENSG00000152377
MSPC_Peak_89	6.5595892	4.57040323	4.57040323	7.46054119	ENSG00000249803
MSPC_Peak_9	5.56320289	5.85346972	4.57040323	5.6192687	ENSG00000286746
MSPC_Peak_91	6.14575727	6.52166043	4.57040323	4.57040323	ENSG00000248752
MSPC_Peak_92	5.56320289	5.85346972	4.57040323	5.6192687	ENSG00000172869

MSPC_Peak_93	6.14575727	5.85346972	4.57040323	5.6192687	ENSG00000172901
MSPC_Peak_94	4.57040323	4.57040323	6.13603553	7.23591224	ENSG00000145730
MSPC_Peak_95	6.14575727	4.57040323	4.57040323	5.6192687	ENSG00000248901
MSPC_Peak_96	4.57040323	4.57040323	4.57040323	5.6192687	ENSG00000248202
MSPC_Peak_97	5.56320289	7.32191569	4.57040323	5.6192687	ENSG00000113391
MSPC_Peak_98	6.14575727	5.85346972	4.57040323	6.22015868	ENSG00000164199
MSPC_Peak_99	6.14575727	4.57040323	4.57040323	4.57040323	ENSG00000247828

Gene identification and quantification was described in Methods; Listed genes are different quantitatively over the control group, $p < 0.05$. Numbers are bound quantity of each sample over its paired control sample.

Supplemental Table 3 Overlapped GPR81 ChIPseq genes with Cancer related proteins in Atlas.Proteins

Gene stable ID	GO term accession
ENSG00000196526	Actin filament associated protein 1
ENSG00000150401	Defective in cullin neddylation 1 domain containing 2
ENSG00000095564	B-TFIID TATA-box binding protein associated factor 1
ENSG00000111335	2'-5'-oligoadenylate synthetase 2
ENSG00000109536	FSHD region gene 1
ENSG00000075275	Cadherin EGF LAG seven-pass G-type receptor 1
ENSG00000177119	Anoctamin 6
ENSG00000049618	AT-rich interaction domain 1B
ENSG00000143614	GATA zinc finger domain containing 2B
ENSG00000135678	Carboxypeptidase M
ENSG00000169122	Family with sequence similarity 110 member B
ENSG00000166037	Centrosomal protein 57
ENSG00000203965	EF-hand calcium binding domain 7
ENSG00000153046	Chromodomain Y like
ENSG00000156110	Adenosine kinase
ENSG00000117713	AT-rich interaction domain 1A
ENSG00000121578	Beta-1,4-galactosyltransferase 4
ENSG00000142867	BCL10 immune signaling adaptor
ENSG00000177981	Ankyrin repeat and SOCS box containing 8
ENSG00000138279	Annexin A7
ENSG00000054793	ATPase phospholipid transporting 9A
ENSG00000186716	BCR activator of RhoGEF and GTPase
ENSG00000134030	Cap binding complex dependent translation initiation factor
ENSG00000169031	Collagen type IV alpha 3 chain
ENSG00000172869	Dmx like 1
ENSG00000115137	DnaJ heat shock protein family (Hsp40) member C27
ENSG00000116016	Endothelial PAS domain protein 1
ENSG00000138190	Exocyst complex component 6
ENSG00000119711	Aldehyde dehydrogenase 6 family member A1
ENSG00000044115	Catenin alpha 1
ENSG00000131504	Diaphanous related formin 1
ENSG00000063761	AarF domain containing kinase 1
ENSG00000144218	AF4/FMR2 family member 3
ENSG00000157766	Aggrecan
ENSG00000133773	Coiled-coil domain containing 59
ENSG00000082074	FYN binding protein 1
ENSG00000104064	GA binding protein transcription factor subunit beta 1
ENSG00000113327	Gamma-aminobutyric acid type A receptor subunit gamma2

ENSG00000146143	DNA primase subunit 2
ENSG00000088766	Cardiolipin synthase 1
ENSG00000165410	Cofilin 2
ENSG00000164199	Adhesion G protein-coupled receptor V1
ENSG00000115239	Ankyrin repeat and SOCS box containing 3
ENSG00000260691	Ankyrin repeat domain 20 family member A1
ENSG00000165029	ATP binding cassette subfamily A member 1
ENSG00000066739	Autophagy related 2B
ENSG00000145734	B double prime 1, subunit of RNA polymerase III transcription initiation factor IIIB
ENSG00000173068	Basonuclin 2
ENSG00000183643	C15orf32
ENSG00000081138	Cadherin 7
ENSG00000128536	Cadherin related family member 3
ENSG00000066032	Catenin alpha 2
ENSG00000183230	Catenin alpha 3
ENSG00000133962	Cation channel sperm associated auxiliary subunit beta
ENSG00000125107	CCR4-NOT transcription complex subunit 1
ENSG00000100629	Centrosomal protein 128
ENSG00000197826	Cilia and flagella associated protein 299
ENSG00000184305	Coiled-coil serine rich protein 1
ENSG00000107771	Coiled-coil serine rich protein 2
ENSG00000149972	Contactin 5
ENSG00000174469	Contactin associated protein 2
ENSG00000161082	CUGBP Elav-like family member 5
ENSG00000149646	Cyclic nucleotide binding domain containing 2
ENSG00000173406	DAB adaptor protein 1
ENSG00000067596	DEAH-box helicase 8
ENSG00000136267	Diacylglycerol kinase beta
ENSG00000147647	Dihydropyrimidinase
ENSG00000130226	Dipeptidyl peptidase like 6
ENSG00000120658	Ecto-NOX disulfide-thiol exchanger 1
ENSG00000125746	EMAP like 2
ENSG00000112851	ErbB2 interacting protein
ENSG00000178568	Erb-b2 receptor tyrosine kinase 4
ENSG00000113391	Family with sequence similarity 172 member A
ENSG00000174989	F-box and WD repeat domain containing 8
ENSG00000114279	Fibroblast growth factor 12
ENSG00000143458	GA binding protein transcription factor subunit beta 2
ENSG00000107249	GLIS family zinc finger 3
ENSG00000152208	Glutamate ionotropic receptor delta type subunit 2

GPR81 IP ChIP sequencing genes were used to screen cancer related proteins in Atlas Proteins. The proteins overlapped with ChIPseq genes states as cancer markers (<https://www.proteinatlas.org>) were selected present in this list.