

SUPPLEMENTAL INFORMATION

The Transcriptional Complex Between the *BCL2* i-Motif and hnRNP LL Is a Molecular Switch for Control of Gene Expression that can be Modulated by Small Molecules

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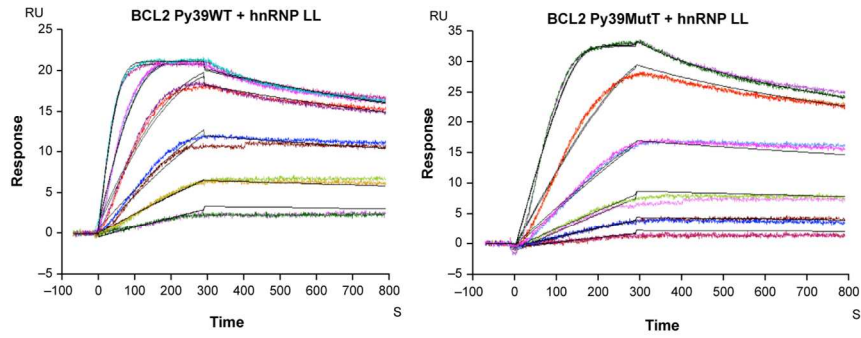
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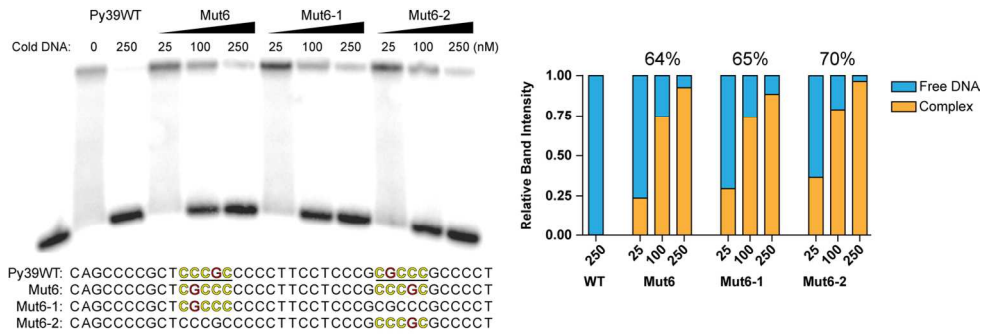
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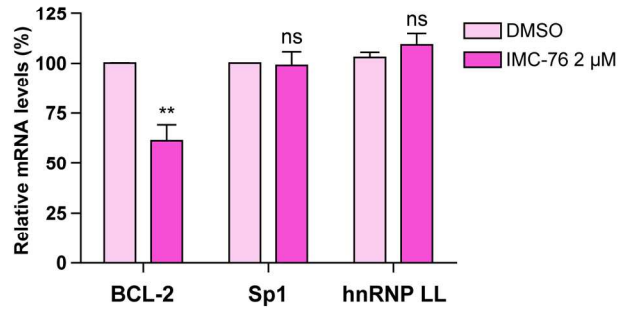
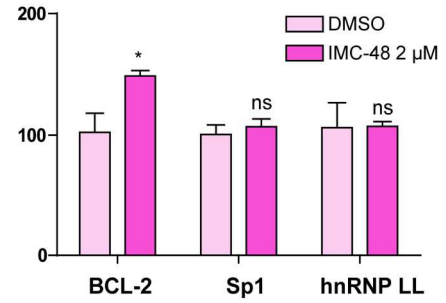
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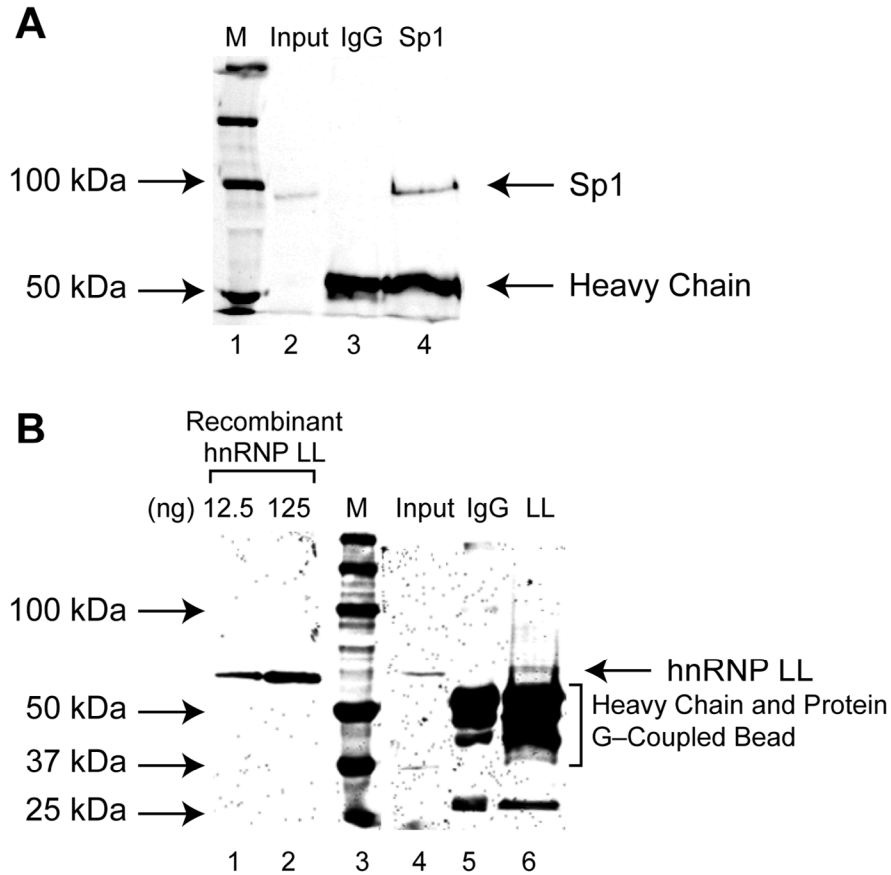
Supplemental Figure 1. SPR sensorgrams for binding of increasing concentrations of hnRNP LL to Py39WT (left) and Py39MutT (right). The pH of the sensorgram is 6.8.



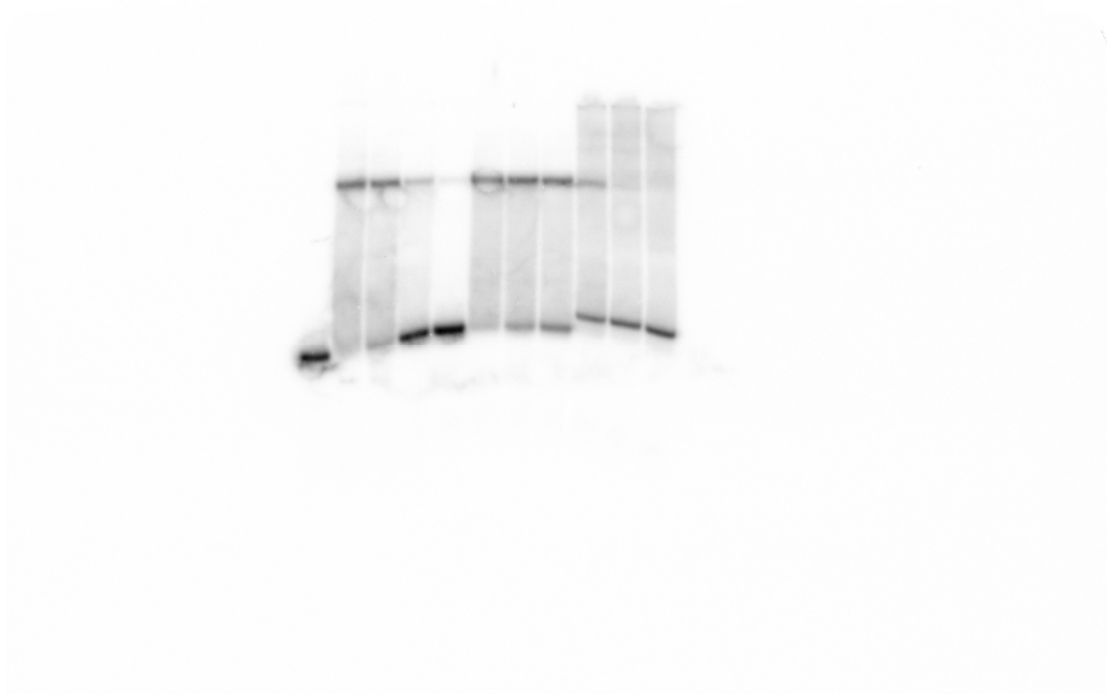
Supplemental Figure 2. Competition EMSA showing selective binding of hnRNP LL to the two lateral loops of Py39WT with an 8:5:7 loop folding pattern. Four different mutant sequences were used: Mut5',3'L has mutations in two lateral loops, and Mut5'L and Mut3'L have mutations in the 5' loop and 3' loop, respectively. MutCL has mutations in the central loop. The percentages above the sets of histograms for Mut5',3'L, Mut5'L, Mut3'L, and MutCL are the addition of free DNA (%) for each concentration of cold oligomers divided by three.

A**B**

Supplemental Figure 3. Determination of the effect of IMC-76 and IMC-48 on the mRNA level of *SP1* and *hnRNP LL*. MCF-7 cells (A) and BJAB cells (B) were treated with DMSO and 2 μM of IMC-76 or IMC-48 for 24 h. The qPCR with gene-specific TaqMan probes were used to obtain C_t values for analysis (**P < 0.01; *P < 0.1; ns: not significant).



Supplemental Figure 4. Immunoprecipitation (IP) results for Sp1 (A) and hnRNP LL (B) to verify the antibody specificity with MCF-7 cells used for the ChIP assay. Polyclonal antibodies of Sp1 and hnRNP LL specifically captured Sp1 and hnRNP LL, respectively. (A) Nuclear extract (1 $\mu\text{g}/\mu\text{L}$) of MCF-7 cells for Sp1 (~90 kDa) were immunoprecipitated with Sp1 antibody. After IP, 6% SDS-PAGE and western blot were conducted to ascertain the IP result. (B) Because the endogenous level of hnRNP LL (61 kDa) was too low, less than 12.5 ng per 72.5 μg (Input), whole cell lysate (12.5 $\mu\text{g}/\mu\text{L}$) for hnRNP LL was used for immunoprecipitation with the hnRNP LL antibody. As a negative control, IgG was used. After IP, 8% SDS-PAGE and western blot were conducted. Because the same antibodies were used for IPs and western blots, heavy and light chains were also detected.



Supplemental Figure 5. Original, uncut gels for Figure 2C and Figure 3B.

Supplemental Table 1. Proteins purified using Py39WT *BCL2* i-motif biotinylated oligomer–streptavidin bead complex and identified by LC/MS/MS.

PROTEIN SYMBOL	PROTEIN IDENTIFICATION	ACCESSION NUMBER
	<i>Transcription-Related</i>	
HMG-I	Isoform HMG-I of high-mobility group protein HMGI/HMG-Y	IPI00179700
hnRNP UL2	Heterogeneous nuclear ribonucleoprotein U-like protein 2	IPI00456887
hnRNP LL	Isoform 1 of heterogeneous nuclear ribonucleoprotein L-like	IPI00103247
GEMIN5	Gem-associated protein 5	IPI00291783
HDGF	Hepatoma-derived growth factor	IPI00020956
HMGN1	Nucleosome-binding protein 1	IPI00006157
DDX21	Isoform 1 of nucleolar RNA helicase 2	IPI00015953
RBBP4	Histone-binding protein RBBP4	IPI00328319
RBBP7	Histone-binding protein RBBP7	IPI00395865
	<i>Translation or Protein Folding-Related</i>	
eEF2	Elongation factor 2	IPI00186290
eEF1G-like	cDNA FLJ56389, highly similar to elongation factor 1-γ	IPI00000875
EIF3A	Eukaryotic translation initiation factor 3 subunit A	IPI00029012
CPSF5	Cleavage and polyadenylation specificity factor subunit 5	IPI00646917
HSPA5	Heat Shock A5 protein	IPI00003362
HSP70-4	Heat shock 70 kDa protein 4	IPI00002966
	<i>Energy Metabolism or other Enzymatic-Related</i>	
GAPDH	Glyceraldehyde-3-phosphate dehydrogenase	IPI00219018
SHMT	Isoform 1 of serine hydroxymethyltransferase, cytosolic	IPI00002519
ALDOA	Fructose-bisphosphate aldolase A	IPI00465439
TrxR	Isoform 5 of thioredoxin reductase 1, cytoplasmic	IPI00554786
NMT-1	Isoform short of glycylopeptide N-tetradecanoyltransferase 1	IPI00218830
ArgRS	Isoform complexed of arginyl-tRNA synthetase, cytoplasmic	IPI00004860
LARS	Leucyl-tRNA synthetase, cytoplasmic	IPI00103994
CKB	Creatine kinase B-type	IPI00022977
TPI-2	Isoform 2 of triosephosphate isomerase	IPI00451401
DTD	D-tyrosyl-tRNA(Tyr) deacylase 1	IPI00152692
S100-A7	Protein S100-A7	IPI00219806
S100-A8	Protein S100-A8	IPI00007047
S100-A9	Protein S100-A9	IPI00027462
	<i>Cell Surface Adhesion, Migration, or Organization-Related</i>	
EZR	Ezrin	IPI00843975
CK5	Keratin, type II cytoskeletal 5	IPI00009867
CK14	Keratin, type I cytoskeletal 14	IPI00384444

CaBP3	Calreticulin	IPI00020599
DERP12	Dermal papilla-derived protein 12	IPI00382990
BUB3	Mitotic checkpoint protein BUB3	IPI00013468
JUP	Junction plakoglobin	IPI00554711

Supplemental Table 2. Proteins purified using a Py39MutT *BCL2* i-motif biotinylated oligomer–streptavidin bead complex and identified by LC/MS/MS.

PROTEIN SYMBOL	PROTEIN IDENTIFICATION	ACCESSION NUMBER
	<i>Transcription-Related</i>	
hnRNP K	Isoform 1 heterogeneous nuclear ribonucleoprotein K	IPI00216049
hnRNP D0	Isoform 1 heterogeneous nuclear ribonucleoprotein D0	IPI00028888
hnRNP C1/C2	Isoform C1 heterogeneous nuclear ribonucleoproteins C1/C2	IPI00216592
HMGI-10	High-mobility group protein 1-like 10	IPI00018755
FUSE	Isoform 1 of far upstream element-binding protein 1	IPI00375441
PC4	Activated RNA polymerase II transcriptional coactivator p15	IPI00221222
NCL	Nucleolin protein	IPI00183526
RECQ1	ATP-dependent DNA helicase Q1	IPI00178431
	<i>Translation or DNA Replication-Related</i>	
Pcpb1	Poly(rC)-binding protein 1	IPI00016610
Pcpb2b	poly(rC) binding protein 2 isoform b	IPI00012066
SRSF3	Splicing factor, arginine/serine-rich 3	IPI00010204
NSEP1	Nuclease-sensitive element-binding protein 1	IPI00031812
RPA	Replication protein A 70 kDa DNA-binding subunit	IPI00020127
FEN1	Flap endonuclease 1	IPI00026215
	<i>Energy Metabolism</i>	
ENO1	Isoform α -enolase of α -enolase	IPI00465248
PC	Pyruvate carboxylase, mitochondrial	IPI00299402
	<i>Cell Surface Adhesion, Migration, or Organization-Related</i>	
ALB	Putative uncharacterized protein ALB	IPI00022434
CK16	Keratin, type I cytoskeletal 16	IPI00217963
TUBB	Tubulin β chain	IPI00011654
TUBA1C	Tubulin α -1C chain	IPI00166768

Supplemental Table 3. Proteins purified that bound both the Py39WT and Py39MutT *BCL2* i-motif biotinylated oligomer–streptavidin bead complex and identified by LC/MS/MS.

PROTEIN SYMBOL	PROTEIN IDENTIFICATION	ACCESSION NUMBER
	<i>Transcription-Related</i>	
NCL-like	cDNA FLJ45706 fis, highly similar to Nucleolin	IPI00444262
hnRNP A2/B1	Putative uncharacterized protein HNRNPA2B1	IPI00386854
hnRNP A1	Isoform A1-B of heterogeneous nuclear ribonucleoprotein A1	IPI00215965
hnRNP R	Heterogeneous nuclear ribonucleoprotein R	IPI00012074
hnRNP G	Heterogeneous nuclear ribonucleoprotein G	IPI00304692
hnRNP A3	Isoform 1 of heterogeneous nuclear ribonucleoprotein A3	IPI00419373
FUS	Isoform short of RNA-binding protein FUS	IPI00221354
NM23-H1	Isoform 1 of nucleoside diphosphate kinase A	IPI00012048
HMG-B2	High-mobility group protein B2	IPI00219097
HMG-B3	High-mobility group protein B3	IPI00217477
ILF-2	Interleukin enhancer-binding factor 2	IPI00005198
ILF-3	Isoform 5 interleukin enhancer-binding factor 3	IPI00219330
ELAV-like	cDNA FLJ60076, highly similar to ELAV-like protein 1	IPI00301936
	<i>Translation or Protein Folding-Related</i>	
eEF1-A	Elongation factor 1- α	IPI00025447
DDBP1	DNA damage-binding protein 1	IPI00293464
DDBP2	Isoform 1 DNA damage-binding protein 2	IPI00021518
HSP70-1	Heat shock 70 kDa protein 1	IPI00304925
HSC71	Isoform 1 of heat shock cognate 71 kDa protein	IPI00003865
PPIase A	Peptidyl-prolyl cis-trans isomerase A	IPI00419585
PPIase B	Peptidyl-prolyl cis-trans isomerase B	IPI00646304
PDIA3	Protein disulfide-isomerase A3	IPI00025252
PDI	Protein disulfide-isomerase	IPI00010796
PA2G4	Proliferation-associated protein 2G4	IPI00299000
SDN1	Staphylococcal nuclease domain-containing protein 1	IPI00140420
	<i>Energy and Purine Metabolism</i>	
PGK1	Phosphoglycerate kinase 1	IPI00169383
ACLY	ATP-citrate synthase	IPI00021290
GPI	Glucose-6-phosphate isomerase	IPI00027497
PURH	Bifunctional purine biosynthesis protein PURH	IPI00289499
	<i>Cell Surface Adhesion, Migration, or Organization-Related</i>	
RCC2	Regulator of chromosome condensation 2	IPI00465044

CK6B	Keratin, type II cytoskeletal 6B	IPI00293665
CK1	Keratin, type II cytoskeletal 1	IPI00220327
CK10	Keratin, type I cytoskeletal 10	IPI00009865
CK9	Keratin, type I cytoskeletal 9	IPI00019359
CK2	Keratin, type II cytoskeletal 2 epidermal	IPI00021304
CLF-1	Cofilin-1	IPI00012011
ACTA1	Actin, cytoplasmic 1	IPI00021439
FSCN1	Fascin	IPI00163187
	Isoform 2 of 4F2 cell-surface antigen heavy chain	IPI00027493
	32 kDa protein	IPI00176692
RKIP	Phosphatidylethanolamine-binding protein 1	IPI00219446