Supplementary Materials for

Determination of Trunk Neural Crest Cell Fate and Susceptibility to Splicing Perturbation by the DLC1-SF3B1-PHF5A Splicing Complex

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The PDF file includes:

Figs. S1 to S8

Tables S1 to S12

Other Supplementary Materials for this manuscript include the following:

Dataset 1

Dataset 2

Dataset 3

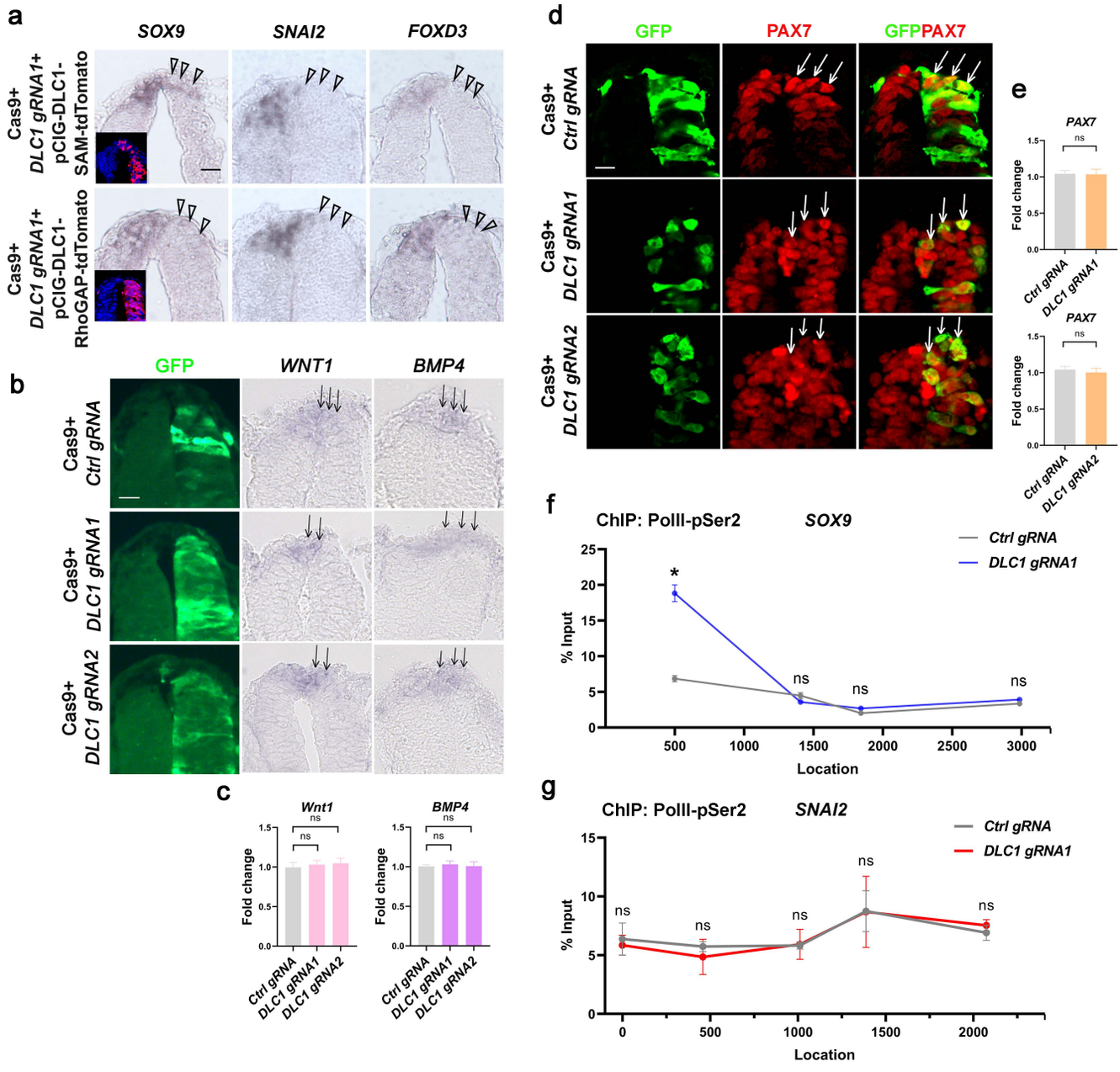
a
SOX9
SNAI2
FOXD3
Cas9+ DLC1 gRNA1+ pCIG-DLC1-SAM-tdTomato
Cas9+ DLC1 gRNA1+ pCIG-DLC1-RhoGAP-tdTomato
b
GFP
WNT1
BMP4
Cas9+ Ctrl gRNA
Cas9+ DLC1 gRNA1
Cas9+ DLC1 gRNA2
c
Wnt1
BMP4
ns
Fold change
Ctrl gRNA
DLC1 gRNA1
DLC1 gRNA2
d
GFP
PAX7
GFPPAX7
Cas9+ Ctrl gRNA
Cas9+ DLC1 gRNA1
Cas9+ DLC1 gRNA2
e
PAX7
ns
Fold change
Ctrl gRNA
DLC1 gRNA1
DLC1 gRNA2
f
ChIP: PolII-pSer2
SOX9
Ctrl gRNA
DLC1 gRNA1
% Input
Location
*
ns
g
ChIP: PolII-pSer2
SNAI2
Ctrl gRNA
DLC1 gRNA1
% Input
Location
ns

Figure S1. *DLC1 knockout* does not affect the expression levels of WNT1, BMP4, PAX7, and the transcriptional elongation activity of RNA PolII-pSer2.

a ISH shows that overexpression of SAM domain alone or RhoGAP domain alone was not able to restore the expression of *SOX9*, *SNAI2*, and *FOXD3* (open arrowheads) in *DLC1 gRNA1* transfected cells (n=5 per treatment). Insets show transfection of the indicated constructs (red) on the right side of the neural tube. **b** Overexpression of *DLC1 gRNA1* and *gRNA2* did not alter the expression patterns of *WNT1* and *BMP4* (black arrows) in *DLC1*-depleted cells compared to Ctrl gRNA (n=5 per treatment). **c** RT-qPCR analysis shows that the expression levels of *WNT1* and *BMP4* remained unaltered in *DLC1 gRNA* transfected cells compared to *Ctrl gRNA*. **d** Immunofluorescence (IF) reveals no alteration in the expression pattern of PAX7 (white arrows) in *DLC1*-ablated cells compared to Ctrl gRNA (n=3 per treatment). **e** The expression level of PAX7 remained unaltered in cells transfected with *DLC1 gRNA 1* or *gRNA2* (n=5 per treatment). **f** and **g** Chromatin immunoprecipitation-qPCR analysis revealed a higher enrichment of PolII-pSer2 at the 500 bp downstream of the *SOX9* transcriptional start site in cells transfected with *DLC1 gRNA*, compared to those transfected with Ctrl gRNA. However, the enrichment was reduced to a level similar to the Ctrl gRNA for the rest of the *SOX9* gene body. The transcriptional elongation activity for PolII-pSer2 at multiple sites along the SNAI2 gene remained unchanged in the absence of DLC1. Scale bars apply to all images, 50μm. *: $p < 0.05$, ns: no significant difference. Ten embryos per treatment were used for the RT-qPCR and ChIP-qPCR analysis.

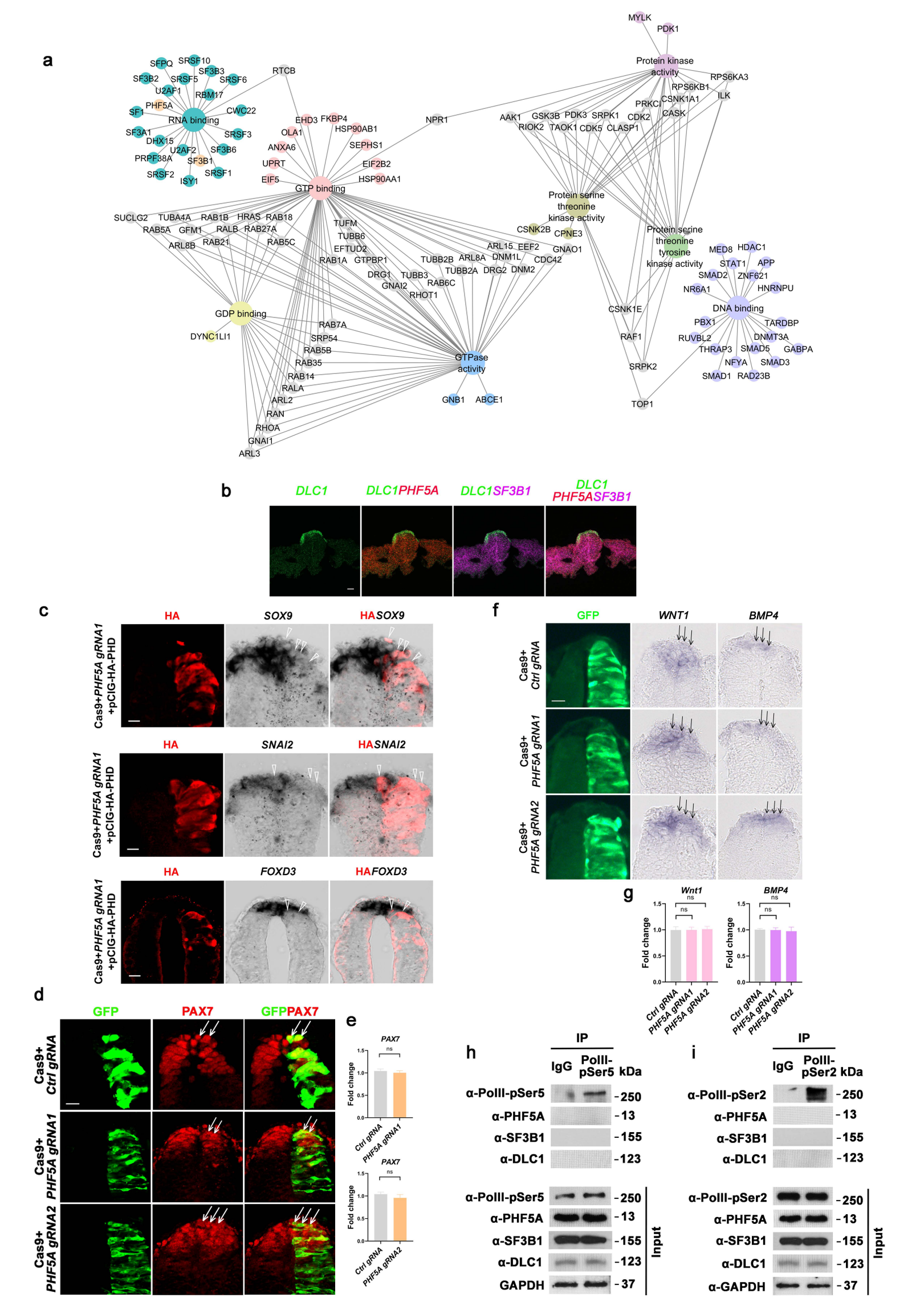
a
RNA binding
GTP binding
GDP binding
GTPase activity
Protein kinase activity
Protein serine threonine kinase activity
Protein serine threonine tyrosine kinase activity
DNA binding
b
DLC1
DLC1PHF5A
DLC1SF3B1
DLC1 PHF5ASF3B1
c
HA
SOX9
HASOX9
SNAI2
HASNAI2
FOXD3
HAFOXD3
Cas9+PHF5A gRNA1 +pCIG-HA-PHD
d
GFP
PAX7
GFPPAX7
Cas9+ Ctrl gRNA
Cas9+ PHF5A gRNA1
Cas9+ PHF5A gRNA2
e
PAX7
Fold change
Ctrl gRNA
PHF5A gRNA1
PHF5A gRNA2
f
GFP
WNT1
BMP4
Cas9+ Ctrl gRNA
Cas9+ PHF5A gRNA1
Cas9+ PHF5A gRNA2
g
Wnt1
BMP4
ns
Fold change
h
IP
IgG
PolII-pSer5
kDa
α-PolII-pSer5
α-PHF5A
α-SF3B1
α-DLC1
α-GAPDH
Input
i
IP
IgG
PolII-pSer2
kDa
α-PolII-pSer2
α-PHF5A
α-SF3B1
α-DLC1
α-GAPDH
Input

Figure S2. *PHF5A* knockout does not affect the expression levels of WNT1, BMP4, and PAX7.

a Interactome of DLC1 showing different functional categories of partner factors. **b** HCR analysis showed the co-expression of endogenous DLC1, PHF5A, and SF3B1 in emigrating NCCs. **c** IF and ISH showed that overexpression of the HA-PHD domain alone was not able to rescue the loss of *SOX9*, *SNAI2*, and *FOXD3* (open arrowheads) in *PHF5A gRNA1* transfected embryos. **d** Electroporation of *PHF5A gRNA1* and *gRNA2* did not alter the PAX7 expression pattern in the dorsal neural tubes (white arrows). **e** Expression level of *PAX7* remained unchanged in *PHF5A*-ablated cells compared to Ctrl gRNA. **f** Expression patterns of *WNT1* and *BMP4* remained unchanged in cells transfected with *PHF5A gRNA*1 and *gRNA2* (black arrows). **g** RT-qPCR confirmed unaltered expression levels of *WNT1* and *BMP4* in *PHF5A*-depleted cells. **h** and **i** Immunoprecipitation (IP) showed no interaction between PolII-pSer5 (**h**) or PolII-pSer2 (**i**) and PHF5A, SF3B1 or DLC1. Scale bars apply to all images: 50 μm, ns: no significant difference. 6 embryos per treatment were used for imaging. 10 embryos per treatment were used for the RT-qPCR analysis. 30 embryos per treatment were used for the IP.

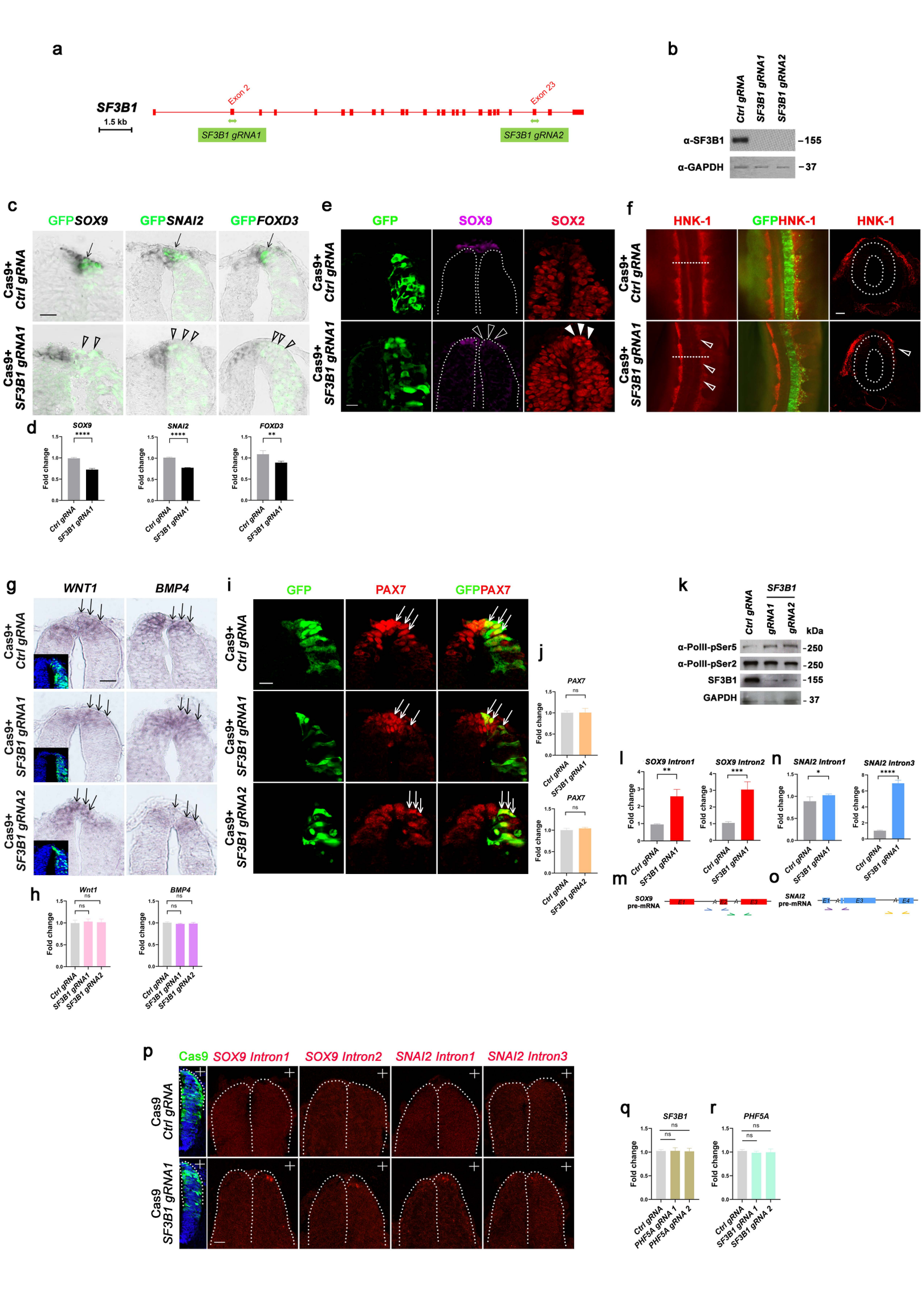
a
SF3B1
1.5 kb
Exon 2
Exon 23
SF3B1 gRNA1
SF3B1 gRNA2
b
Ctrl gRNA
SF3B1 gRNA1
SF3B1 gRNA2
α-SF3B1
-155
α-GAPDH
-37
c
GFPSOX9
GFPSNAI2
GFPFOXD3
Cas9+ Ctrl gRNA
Cas9+ SF3B1 gRNA1
d
SOX9
SNAI2
FOXD3
****
**
Fold change
Ctrl gRNA
SF3B1 gRNA1
e
GFP
SOX9
SOX2
f
HNK-1
GFPHNK-1
g
WNT1
BMP4
h
Wnt1
ns
SF3B1 gRNA2
i
PAX7
GFPPAX7
j
k
SF3B1
gRNA1
gRNA2
kDa
α-PolII-pSer5
-250
α-PolII-pSer2
SF3B1
GAPDH
-37
l
SOX9 Intron1
SOX9 Intron2
***
n
SNAI2 Intron1
SNAI2 Intron3
*
m
SOX9 pre-mRNA
E1
E2
E3
o
SNAI2 pre-mRNA
E4
p
Cas9
SOX9 Intron1
SOX9 Intron2
SNAI2 Intron1
SNAI2 Intron3
q
PHF5A gRNA 1
PHF5A gRNA 2
r

Figure S3. *SF3B1* knockout does not affect the expression levels of WNT1, BMP4, PAX7, and transcriptional machinery.

a Schematic diagram shows *gRNA1* and *gRNA2* oligos targeting *exon 2* and *exon 23* of *SF3B1* respectively. **b** Western blot shows depletion of SF3B1 in lysates extracted from embryos electroporated with *SF3B1 gRNA1* and *gRNA2* compared to *Ctrl gRNA*. **c** Expression of *SOX9*, *SNAI2* and *FOXD3* was reduced in *SF3B1*-depleted cells (open arrowheads) compared to *Ctrl gRNA*. Black arrows indicate unaltered expression of NC specifier genes in cells transfected with *Ctrl gRNA*. **d** RT-qPCR confirmed reduced expression levels of *SOX9*, *SNAI2,* and *FOXD3* in cells transfected with *SF3B1 gRNA1* compared to cells transfected with *Ctrl gRNA*. **e** Electroporation of *SF3B1 gRNA1* led to a reduction of SOX9 expression (open arrowheads) in the dorsal neural tube where SOX2 expression was upregulated (white arrowheads). Dotted lines outline the neural tube. **f** Whole Mount IF and the transverse section revealed reduced expression of HNK-1 (open arrowheads) in the *SF3B1 gRNA1* transfected side. White dotted lines in the whole mount IF indicate the level of cross-sectioned. **g** Expression patterns of *WNT1* and *BMP4* remained unchanged (black arrows) in embryos treated with *SF3B1 gRNA1* and *gRNA2*. **h** RT-qPCR confirmed no change in the expression levels of *WNT1* and *BMP4* in *SF3B1*-depleted cells. **i** Electroporation of *SF3B1 gRNA1* and *gRNA 2* did not alter the expression pattern (white arrows) and levels of PAX7 (**j**). **k** Western blot shows unaltered expression levels of PolII-pSer5 and PolII-pSer2 in embryos treated with *SF3B1 gRNA1* and *gRNA2*. **l** Expression levels of *SOX9 introns 1/2* and (**n**) *SNAI2 introns 1/3* were increased in embryos treated with *SF3B1 gRNA1* compared to *Ctrl gRNA*. **m**, **o** Schematic diagram shows intron-retained *SOX9* and *SNAI2* pre-mRNA in *SF3B1*-depleted cells. Arrows indicate primer pairs flanking the branch point adenosine (A) in each intron for qPCR analysis. **p** HCR showing the detection of retained introns 1 and 2 of *SOX9* and introns 1 and 3 of *SNAI2* in the dorsal neural tubes transfected with *SF3B1 gRNA*, while no signal was detected in *Ctrl gRNA*. Dotted lines outline the transverse neural tubes where the "+" indicates the transfected side. **q** and **r** RT-qPCR shows that *PHF5A gRNA* and *SF3B1 gRNA* did not affect the expression level of *SF3B1* and *PHF5A*, respectively. Scale bars apply to all images: 50 μm. Mean ± SD. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$, ns: no significant difference. 6 embryos per treatment were used for ISH and IF analyses. Ten embryos per treatment were used for the RT-qPCR, IR-qPCR, and Western blot analysis.

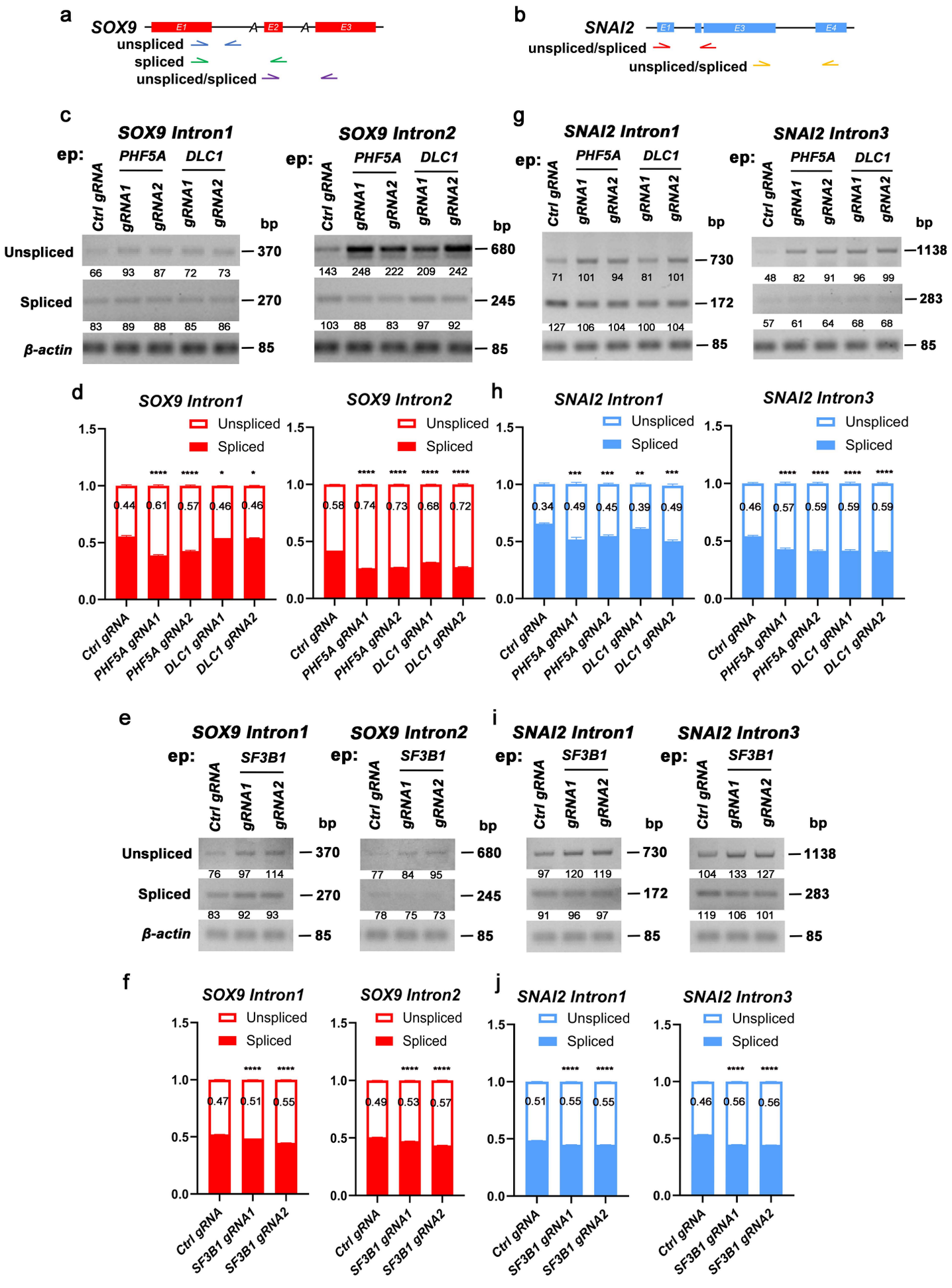
a
SOX9
E1
E2
E3
unspliced
spliced
unspliced/spliced
b
SNAI2
E1
E3
E4
unspliced/spliced
unspliced/spliced
c
SOX9 Intron1
SOX9 Intron2
ep:
PHF5A
DLC1
Ctrl gRNA
gRNA1
gRNA2
gRNA1
gRNA2
bp
Unspliced
Spliced
β-actin
370
270
85
66 93 87 72 73
83 89 88 85 86
680
245
85
143 248 222 209 242
103 88 83 97 92
g
SNAI2 Intron1
SNAI2 Intron3
730
172
85
71 101 94 81 101
127 106 104 100 104
1138
283
85
48 82 91 96 99
57 61 64 68 68
d
SOX9 Intron1
SOX9 Intron2
Unspliced
Spliced
1.5
1.0
0.5
0.0
0.44 0.61 0.57 0.46 0.46
0.58 0.74 0.73 0.68 0.72
Ctrl gRNA
PHF5A gRNA1
PHF5A gRNA2
DLC1 gRNA1
DLC1 gRNA2
h
SNAI2 Intron1
SNAI2 Intron3
0.34 0.49 0.45 0.39 0.49
0.46 0.57 0.59 0.59 0.59
e
SOX9 Intron1
SOX9 Intron2
SF3B1
370
270
85
76 97 114
83 92 93
680
245
85
77 84 95
78 75 73
i
SNAI2 Intron1
SNAI2 Intron3
730
172
85
97 120 119
91 96 97
1138
283
85
104 133 127
119 106 101
f
SOX9 Intron1
SOX9 Intron2
0.47 0.51 0.55
0.49 0.53 0.57
Ctrl gRNA
SF3B1 gRNA1
SF3B1 gRNA2
j
SNAI2 Intron1
SNAI2 Intron3
0.51 0.55 0.55
0.46 0.56 0.56

Figure S4. Perturbation in the expression of *DLC1*, *PHF5A*, or *SF3B1* augments the ratio of unspliced transcripts of *SOX9* and *SNAI2*.

a and **b** Schematic diagram showing primer pairs used for detection of unspliced and spliced transcripts of *SOX9* (**a**) and *SNAI2* (*b*). RT-PCR (**c**, **e**) and stacking bar graphs (**d**, **f**) show increased levels of unspliced *SOX9 intron 1* and *intron 2* in all gRNA-mediated *PHF5A*, *DLC1,* and *SF3B1* KO compared to *Ctrl gRNA*. RT-PCR (**g**, **i**) and stacking bar graphs (**h, j**) show increased levels of unspliced *SNAI2 intron 1* and *intron 3* all gRNA-mediated *PHF5A*, *DLC1,* and *SF3B1* KO compared to *Ctrl gRNA*. The band intensity for each transcript is shown below the gel images. Mean ± SD. *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$, ****: $p < 0.0001$. 10 embryos per treatment were used for the RT-PCR analysis.

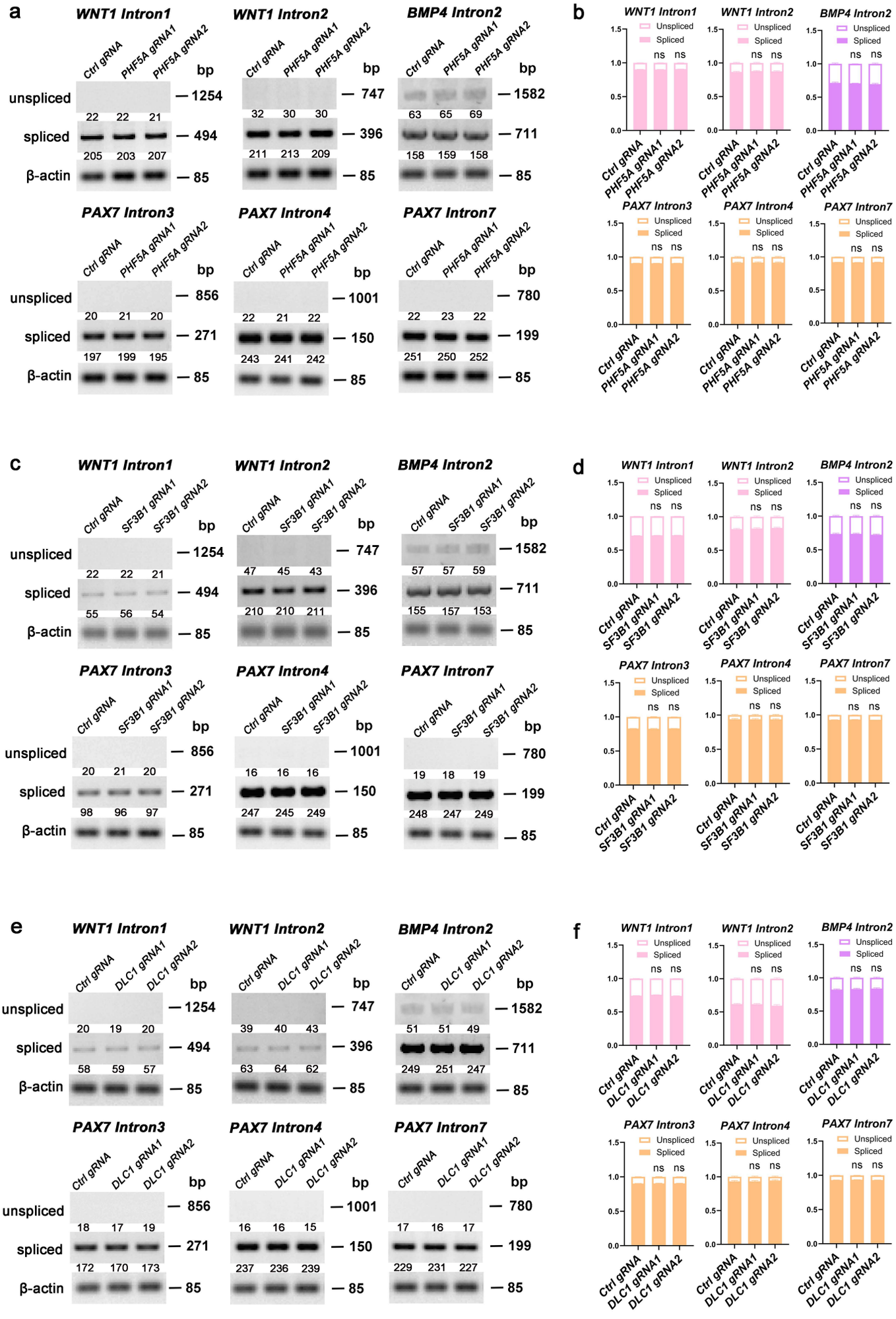
a
WNT1 Intron1
WNT1 Intron2
BMP4 Intron2
PAX7 Intron3
PAX7 Intron4
PAX7 Intron7
Ctrl gRNA
PHF5A gRNA1
PHF5A gRNA2
SF3B1 gRNA1
SF3B1 gRNA2
DLC1 gRNA1
DLC1 gRNA2
bp
unspliced
spliced
β-actin
b
c
d
e
f
Unspliced
Spliced
ns

Figure S5. Perturbation in the expression of DLC1, PHF5A, or SF3B1 does not affect the splicing of *WNT1*, *BMP4,* and *PAX7* pre-mRNA.

a, **c**, and **e** RT-PCR analysis revealed minimal levels of unspliced *WNT1 intron 1*, *WNT1 intron 2*, *PAX7 intron 3*, *PAX7 intron 4*, and *PAX7 intron 7* in the absence of *PHF5A* (**a**), *SF3B1* (**c**) or *DLC1* (**e**). However, there was no significant difference in the levels of unspliced *BMP2 intron 2* between gRNA treatment for each gene and *Ctrl gRNA*. **b**, **d**, and **f** Stacking bar graphs indicated that the ratio of unspliced transcripts of *WNT1 intron 1*, *WNT intron 3*, *PAX7 intron 3*, *PAX7 intron 4*, *PAX7 intron 7,* and *BMP4 intron 2* remained unchanged compared to *Ctrl gRNA*. The band intensity for each transcript is displayed below the gel images. Mean ± SD. ns: no significant difference. 10 embryos per treatment were used for the RT-PCR analysis.

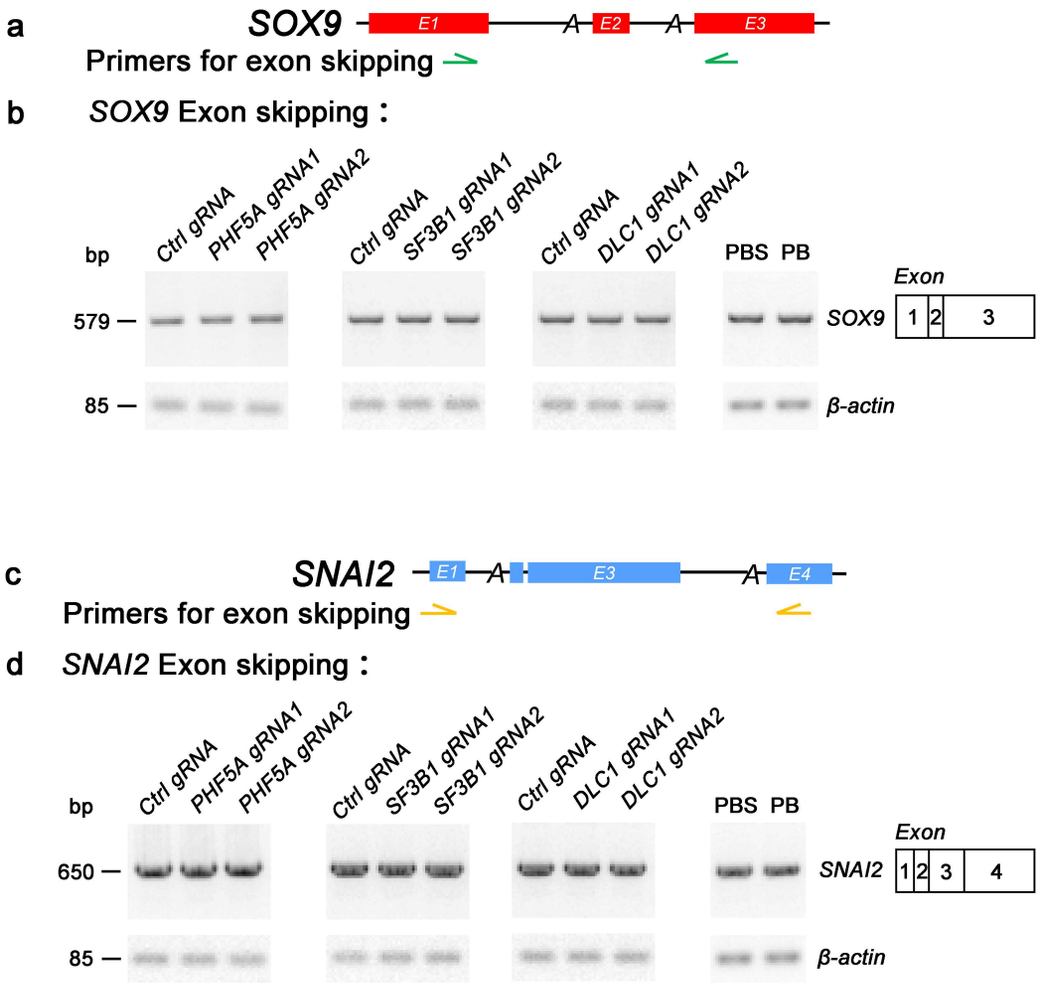
a
SOX9
E1
E2
E3
Primers for exon skipping
b
SOX9 Exon skipping :
bp
Ctrl gRNA
PHF5A gRNA1
PHF5A gRNA2
Ctrl gRNA
SF3B1 gRNA1
SF3B1 gRNA2
Ctrl gRNA
DLC1 gRNA1
DLC1 gRNA2
PBS
PB
579
85
SOX9
β-actin
Exon
1
2
3
c
SNAI2
E1
E3
E4
Primers for exon skipping
d
SNAI2 Exon skipping :
bp
Ctrl gRNA
PHF5A gRNA1
PHF5A gRNA2
Ctrl gRNA
SF3B1 gRNA1
SF3B1 gRNA2
Ctrl gRNA
DLC1 gRNA1
DLC1 gRNA2
PBS
PB
650
85
SNAI2
β-actin
Exon
1
2
3
4

Figure S6. Perturbation in the expression of DLC1, PHF5A, or SF3B1 does not lead to exon skipping of *SOX9* and *SNAI2*.

a and **c** Schematic diagrams illustrate the primer pairs utilized for detecting exon skipping in *SOX9* (**a**) and *SNAI2* (**c**). **b** and **d** RT-PCR analysis demonstrated no evidence of exon skipping in *SOX9* and *SNAI2* in the absence of *PHF5A*, *SF3B1*, or *DLC1* or after PB treatment when compared to the Ctrl gRNA or PBS Ctrl respectively. Ten embryos per treatment were used for the RT-PCR analysis.

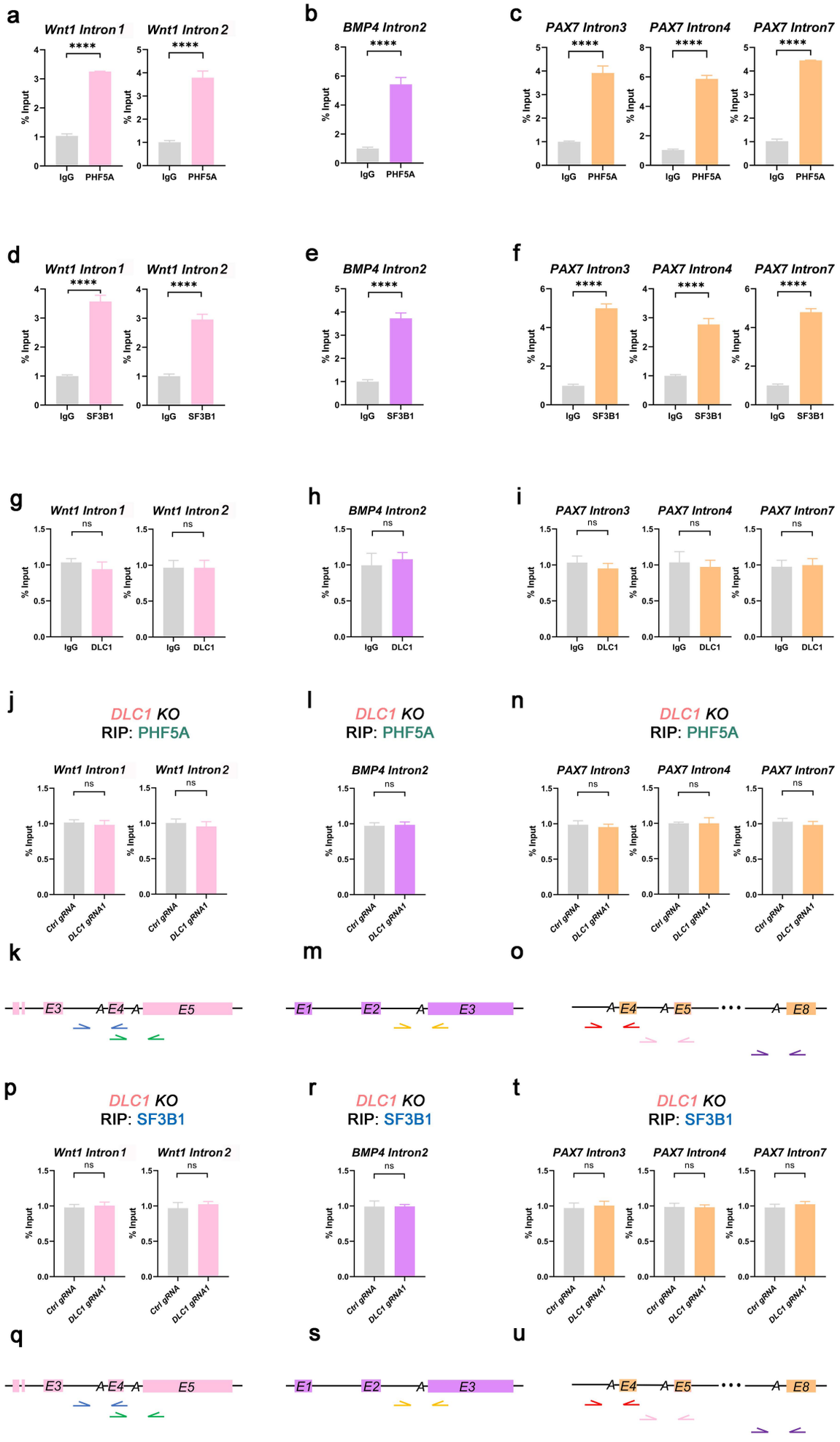
a
Wnt1 Intron1
Wnt1 Intron2
****
% Input
IgG
PHF5A
b
BMP4 Intron2
c
PAX7 Intron3
PAX7 Intron4
PAX7 Intron7
d
SF3B1
e
f
g
ns
DLC1
h
i
j
DLC1 KO
RIP: PHF5A
Ctrl gRNA
DLC1 gRNA1
l
n
k
E3
E4
E5
m
E1
E2
o
E8
p
DLC1 KO
RIP: SF3B1
r
t
q
s
u

Figure S7. PHF5A and SF3B1 splicing factors but not DLC1 bind to introns of *WNT1*, *BMP4,* and *PAX7.*

a to **f** RNA immunoprecipitation-qPCR (RIP-qPCR) analysis indicated that PHF5A and SF3B1 exhibited the capability to bind to the introns of *WNT1* (**a**, **d**), *BMP4* (**b**, **e**) and *PAX7* (**c**, **f**). **g** to **i** However, DLC1 did not show any binding affinity towards any of the introns. The knockout of *DLC1* did not affect the binding capacity of PHF5A (**j**, **l, n**) and SF3B1 (**p**, **r**, **t**) to the introns of *WNT1*, *BMP4*, and *PAX7*. **k**, **m**, **o**, **q**, **s**, **u** Schematic diagram illustrated the primer pairs used for the RIP-qPCR analysis. Mean ± SD. ****: $p < 0.0001$, ns: no significant difference. 30 embryos per treatment were used for the RIP-qPCR analysis.

a

ep in somite:

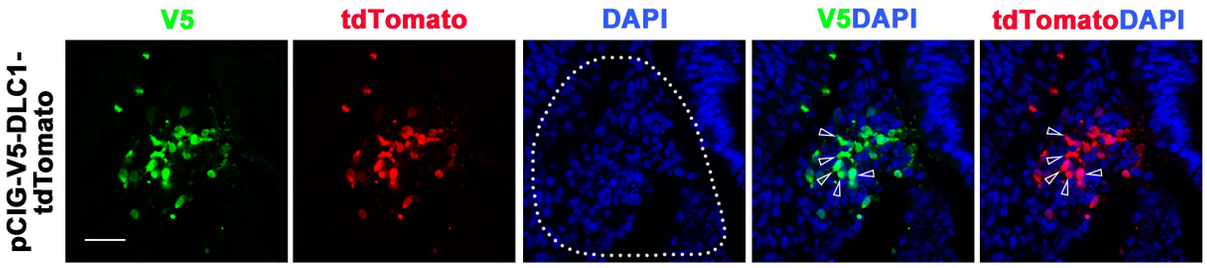

Figure S8. Nuclear localization of ectopic DLC1 in somite.

a IF staining for V5 revealed that the ectopic DLC1 fused with a V5-tagged exhibited nuclear localization in somites (n=3). Dotted ring outlines the somite. Open arrowheads indicate co-localization of ectopic DLC1 with tdTomato and DAPI, which stained the nuclei. Scale bar: 50 μm.

No.	*gRNA* oligos	Orientation of oligos	Sequence of oligos
1	*PHF5A gRNA1*	Forward	GGATGGGTGCACTCCTTGCAGTAGT
2		Reverse	AAACACTACTGCAAGGAGTGCACCC
3	*PHF5A gRNA2*	Forward	GGATGGATCTGTCTTGGA ACTGCCA
4		Reverse	AAACTGGCAGTTCCA AGA CAGATCC
5	*SF3B1 gRNA1*	Forward	GGATGGGAGTAGGCCTCGACTCCAC
6		Reverse	AAACGTGGAGTCGAGGCCTACTCCC
7	*SF3B1 gRNA2*	Forward	GGATGGTCTTCAAGCAATGGCGTAA
8		Reverse	AAACTTACGCCATTGCTTGAAGACC
9	*DLC1 gRNA1*	Forward	GCCTGGAGACGCTGATCCTT
10		Reverse	CAGCCCTGTCACGCGCACAC
11	*DLC1 gRNA2*	Forward	GATGACACCAACAAACCTGG
12		Reverse	GGCACAGGCTGAGGTGGCAC

Table S1.
gRNA oligos used for CRISPR/Cas9 *KO*

No.	Primers	Orientation of primers	Sequence of primers
1	*SOX9 Intron 1*	Forward	GCACTCAGGTAGGTGTCACA
2	*SOX9 Intron 1*	Reverse	TCTCCAACATCGAAACCTTC
3	*SOX9 Intron 2*	Forward	CCACGAGAAACGCAAAGCTG
4	*SOX9 Intron 2*	Reverse	CTGCGACTGCCCTGAAAG
5	*SNAI2 Intron 1*	Forward	GTCTTTAGCCATCAGTATGT
6	*SNAI2 Intron 1*	Reverse	GGTATGGGGATATAATCACT
7	*SNAI2 Intron 3*	Forward	CTGAAAGCTGTTGTATCTGT
8	*SNAI2 Intron 3*	Reverse	CGGTTTCTCTCCTAAAAAGG

Table S2.
Primers used for RIP-qPCR and intron retention analysis

No.	Primers	Orientation of primers	Sequence of primers
1	*SOX9 unspliced Intron1_1*	Forward	GGTGCTCAAGGGCTACGACT
2	*SOX9 unspliced Intron1_1*	Reverse	TAT TCC GCC GAA CAA CTT TG
3	*SOX9 spliced Intron1_2*	Forward	GGTGCTCAAGGGCTACGACT
4	*SOX9 spliced Intron1_2*	Reverse	TGGTCCTTCTTGTGCTGCAC
5	*SOX9 unspliced Intron2*	Forward	AAGAAGGACCACCCCGACTACAA
6	*SOX9 unspliced Intron2*	Reverse	TGCTGAGCGTCCGTTTTG
7	*SNAI2 unspliced Intron1*	Forward	GAACTGGACACTCATACAG
8	*SNAI2 unspliced Intron1*	Reverse	CAGAAAGCGGAGAGAGGTC
9	*SNAI2 unspliced Intron2*	Forward	GACCTATTCCACTTTCTCTG
10	*SNAI2 unspliced Intron2*	Reverse	CCTCAGATTGGATCTGTCT
11	*WNT1 unspliced Intron3*	Forward	CAT CAT CAA CGT GGC CTC ATC

12	*WNT1 unspliced Intron3*	Reverse	GTA GGT TCA TCA GGA AGC GCA
13	*WNT1 unspliced Intron4*	Forward	TCG ATT TCG GGA GGC TCT TC
14	*WNT1 unspliced Intron4*	Reverse	CCA TCT TCC CGC TGT AGG TG
15	*BMP4 unspliced Intron2*	Forward	CCA AGT CCT GCT GGG AGG TA
16	*BMP4 unspliced Intron2*	Reverse	ACG TGT TTG CCC TGA TGA GT
17	*PAX7 unspliced Intron3*	Forward	GGT GAA CCA ACT CGG AGG G
18	*PAX7 unspliced Intron3*	Reverse	CCC AGG GTT CTC CCT CTT GTA
19	*PAX7 unspliced Intron4*	Forward	ACT CCC GAC GTG GAG AAG AAA
20	*PAX7 unspliced Intron4*	Reverse	GAT GCG TAG CAC ACG GCT AAT
21	*PAX7 unspliced Intron7*	Forward	TAC CCA ACC ACC ACC ATT TCC
22	*PAX7 unspliced Intron7*	Reverse	GAT TCA TGT GGT TGG CAG GAG
23	*SOX9 Exon2 skipping*	Forward	ATC CAG CAA GAA CAA ACC CC
24	*SOX9 Exon2 skipping*	Reverse	GGT TTC GAT GTT GGA GAT GAC G
25	*SNAI2 Exon2/3 skipping*	Forward	GCC TTC AAA ATG CCA CGC TC
26	*SNAI2 Exon2/3 skipping*	Reverse	GAA AGC CCT GTT GCA GTG AG

Table S3.
Primers used for semi-quantitative RT-PCR.

No.	Primers	Orientation of primers	Sequence of primers
1	*SOX9*	Forward	CGG ATC CAG CAA GAA CAA A
2	*SOX9*	Reverse	GGT ACT GGT CAG CCA GCT TC
3	*SNAI2*	Forward	CCTGGCTACTTCAAGGGCA
4	*SNAI2*	Reverse	AGATTGGATCTGTCTGCGAAAG
5	*FOXD3*	Forward	GCGAGTTCATCAGCAACCG
6	*FOXD3*	Reverse	GGGGGATCTTCACGAAGCAG
7	*β-actin*	Forward	GAGTCCTGTGGTATCCATGAAACT
8	*β-actin*	Reverse	GGCTGTGATCTCCTTCTGCA
9	*BMP4*	Forward	TTT TGT GTC TCA CCT CTC AGG G
10	*BMP4*	Reverse	AGC AGC TGA CTC TCC AGT GA
11	*WNT1*	Forward	TGT TTG GGG GTC TCT TTG CC
12	*WNT1*	Reverse	TGC AGC GAA GCT TTG TTC AT
13	*PAX7*	Forward	GAATCCTGTTAGCAATGGC
14	*PAX7*	Reverse	AGAGATGGAGTTGGTGGTG

Table S4.
Primers used for RT-qPCR.

No.	Primers	Orientation of primers	Sequence of primers
1	*SOX9 gene body_1*	Forward	CGCTTTCTCGCATGAATCT
2	*SOX9 gene body_1*	Reverse	TTCTCTTGAGGTCGGGTGTT
3	*SOX9 gene body_2*	Forward	AAACCAGGAGGCAAGTGAGT
4	*SOX9 gene body_2*	Reverse	CCAAACGAGAGGTGTGAGAG

5	*SOX9 gene body_3*	Forward	AAGTCGGTGAAGAACGGG
6	*SOX9 gene body_3*	Reverse	TCGCTGATGCTGGAGGA
7	*SOX9 gene body_4*	Forward	CCGCTCGCAGTACGATTA
8	*SOX9 gene body_4*	Reverse	GGGTTCATGTAGGTGAAGGTG
9	*SNAI2 gene body_1*	Forward	AAA TGC CAC GCT CCT TCC
10	*SNAI2 gene body_1*	Reverse	CCT ACC GCC AAG CCA CAA A
11	*SNAI2 gene body_2*	Forward	TGT TCC AGG GCA CTG TCT TTA
12	*SNAI2 gene body_2*	Reverse	CCA AAC GCT CAG AAT GTT CAT C
13	*SNAI2 gene body_3*	Forward	TGA TGC CCA GTC TAG GAA ATC G
14	*SNAI2 gene body_3*	Reverse	GCA GAC GCA AGG TAG CGT GT
15	*SNAI2 gene body_4*	Forward	GAA GGC GTT GCT TTA AGG ATT
16	*SNAI2 gene body_4*	Reverse	GCT TTG GTG ATG AAG TGT TTC TAA C
17	*SNAI2 gene body_5*	Forward	GGC TTT CGC AGA CAG ATC CA
18	*SNAI2 gene body_5*	Reverse	CTC ATG TTT GTG CAG AAG AGA CAT T

Table S5.
Primers used for ChIP-qPCR.

No.	Sequences of *DLC1* probes
1	CCTCGTAAATCCTCATCAaaCAGCAGCTCGCAGCCAGTCACAAGC
2	CATAGAGCTGTGCATACTGCGGGAAaaATCATCCAGTAAACCGCC
3	CCTCGTAAATCCTCATCAaaTTCATCACTGCACATTTGTTTAAAG
4	CTTTTCCTGTGGGGACTGATTTCTAaaATCATCCAGTAAACCGCC
5	CCTCGTAAATCCTCATCAaaTGGATCTGCTTTGGGGAGGAAGGAC
6	GTTGTTCGATCATTATCTACATCAAaaATCATCCAGTAAACCGCC
7	CCTCGTAAATCCTCATCAaaTCACTCGTACTGGAATACAGGATTG
8	ATGTCTTCATTTTCAAGATCAGCCAaaATCATCCAGTAAACCGCC
9	CCTCGTAAATCCTCATCAaaCGGCTACTCAATGAGCTAGCGGAAT
10	CCTGGCACATTGTCGTAAATGCTCAaaATCATCCAGTAAACCGCC
11	CCTCGTAAATCCTCATCAaaCTGTCCTCCAGTTCACAGAAGCATT
12	TGAGATGGCCATGTCCATGGAAACTaaATCATCCAGTAAACCGCC
13	CCTCGTAAATCCTCATCAaaAAGGCTGATGTGATTGCCATTGAGG
14	CCTCGTAAATCCTCATCAaaAAGGCTGATGTGATTGCCATTGAGG
15	CCTCGTAAATCCTCATCAaaAAGCTTTGAAGGAGCTTTGTTCTTG
16	CAGGATGGGACCACTAATAATAAGGaaATCATCCAGTAAACCGCC
17	CCTCGTAAATCCTCATCAaaGAGAATAGAGGCCACCTCCTGTCGC
18	CTGGTGGCTGCTGGTGCTGCTGGTAaaATCATCCAGTAAACCGCC
19	CCTCGTAAATCCTCATCAaaGCTGGCTGCATTTGGGAGGAGAGGA
20	GCTGAGGTCGGTGAGCACGCTCTCGaaATCATCCAGTAAACCGCC
21	CCTCGTAAATCCTCATCAaaTGGCTTTGGAGGGAACACATCGAAC
22	CTCTGGGGAGGAGGAGGTGTTAACAaaATCATCCAGTAAACCGCC
23	CCTCGTAAATCCTCATCAaaGGCCGGTGAGAGCTCTGGAAGCTGT
24	CCTCGTAAATCCTCATCAaaGGCCGGTGAGAGCTCTGGAAGCTGT
25	CCTCGTAAATCCTCATCAaaGTTTAAATGGAAGAGGGAAGGTGCT
26	TGGGGAGGAATTCTCTCTTTTGAGAaaATCATCCAGTAAACCGCC
27	CCTCGTAAATCCTCATCAaaAGGACCTCCCTGTTCTCGTCAGGTA

28	TCACTCAGGAAATAGAGAAGAATCTaaATCATCCAGTAAACCGCC
29	CCTCGTAAATCCTCATCAaaTCAATGGTAGTTTTCCATAACCGGA
30	AAAACTTCTTCTGGTGCAGCAGCAAaaATCATCCAGTAAACCGCC
31	CCTCGTAAATCCTCATCAaaAGTTTAGATTTTCCTGACCCGCAGG
32	CTTAAATCAATTCTGCACATGTAGGaaATCATCCAGTAAACCGCC
33	CCTCGTAAATCCTCATCAaaCCACCCTTCTCTCTGCCCCCAACCA
34	AAAGCAAATAAAACCCAAGACAAAAaaATCATCCAGTAAACCGCC
35	CCTCGTAAATCCTCATCAaaTGGATAAGGAGTGAACAGTAGCCAG
36	AATTGCTTTCACTCCCAAAAGATCAaaATCATCCAGTAAACCGCC
37	CCTCGTAAATCCTCATCAaaTAATCTCTGTGCAGACCTTTCTCTG
38	CAACCATCAATACACTCATTCACTCaaATCATCCAGTAAACCGCC
39	CCTCGTAAATCCTCATCAaaAACTATTCCAGTGGATACATAAGTC
40	CTCAGTGAGAACACTTTGAAGAGTAaaATCATCCAGTAAACCGCC

Table S6.
DLC1 probes used for HCR.

No.	Sequences of *PHF5A* probes
1	GAGGAGGGCAGCAAACGGaaCTTCTACCCCGGGAACACCCGTACC
2	TTCAAACTCAGTCTGTCTCGCCGCTtaGAAGAGTCTTCCTTTACG
3	GAGGAGGGCAGCAAACGGaaGGGTGGTGCTTCGCCATGGCGCCGT
4	GCCTGCTTGCGGCAGAAGATGAGATtaGAAGAGTCTTCCTTTACG
5	GAGGAGGGCAGCAAACGGaaAGTAGTAGGCATCAGACACCCCTGG
6	CTTTTTCCTGGATGGTGCACTCCTTtaGAAGAGTCTTCCTTTACG
7	GAGGAGGGCAGCAAACGGaaACGAGCCGTAGTTACACTCATCACA
8	CCCCGCAGATGACGCAGCGCCCTTGtaGAAGAGTCTTCCTTTACG
9	GAGGAGGGCAGCAAACGGaaACGAGTCACAGATCACACATTTGCC
10	TGCGCACGAGGGTGCAGGGCCGCACtaGAAGAGTCTTCCTTTACG
11	GAGGAGGGCAGCAAACGGaaATCCTACAGGAGTGGTTACAGAAAG
12	ACAAGAGAAGAAGCTTTATTGGTATtaGAAGAGTCTTCCTTTACG
13	GAGGAGGGCAGCAAACGGaaAACAGCTGAGCTCTCCCTAGGAAAG

14	TGGATTAATCTGTCAAAGAAAACATtaGAAGAGTCTTCCTTTACG
15	GAGGAGGGCAGCAAACGGaaGCAGTATGGAAATATACTGGAGGAA
16	ATGGTGCTAGCTTTTTCACAGAACAtaGAAGAGTCTTCCTTTACG
17	GAGGAGGGCAGCAAACGGaaCCTCTGCGCTTCGGTACCAACGTGC
18	GACAGGGAGCAGACACACAAGACTCtaGAAGAGTCTTCCTTTACG
19	GAGGAGGGCAGCAAACGGaaTGGTAAGAAGGGAAGCACAGCTTTT
20	GTGATTTCTAACAGCTGAGAGGAGAtaGAAGAGTCTTCCTTTACG
21	GAGGAGGGCAGCAAACGGaaGAGCCAGTCTCTCCTCCATATGCAA
22	CGCCAGCAACGGCACTTGGTTTTTAtaGAAGAGTCTTCCTTTACG
23	GAGGAGGGCAGCAAACGGaaAGTTGAGACAGCTACTAGCAAAGCT
24	GATTGCCCACCAGGATATTTCTGAGtaGAAGAGTCTTCCTTTACG
25	GAGGAGGGCAGCAAACGGaaCATTCTGATAGTCAGTTCCAGTCAG
26	AAAAACATGAGCCAGTCCACATTTAtaGAAGAGTCTTCCTTTACG
27	GAGGAGGGCAGCAAACGGaaCAAGTCCAGAGATGTTCCAAGACCC
28	CATAGTCATCTGGTTTTCAGTAATAtaGAAGAGTCTTCCTTTACG
29	GAGGAGGGCAGCAAACGGaaGAACAGATAGGATCACCTCTTCTTG
30	TGCCAACCTGACAGGAGGTGTAGCTtaGAAGAGTCTTCCTTTACG

Table S7.
PHF5A probes used for HCR.

No.	Sequences of *SF3B1* probes
1	GTCCCTGCCTCTATATCTttAGTTACGTATCCAGCAAACCTGCTG
2	GTCTTCCAATTCAGTTGCTGCAATGttCCACTCAACTTTAACCCG
3	GTCCCTGCCTCTATATCTttTATCCGGTGGAGTCGAGGCCTACTC
4	CTGCCGCCATAAATCTCTTGATCATttCCACTCAACTTTAACCCG
5	GTCCCTGCCTCTATATCTttCTTGAATTTCTCGGATCTGTGCTTC
6	GTGCTTCATCGAGGGCAGGCTTTTTttCCACTCAACTTTAACCCG
7	GTCCCTGCCTCTATATCTttGCAGTGCCACTGGAGCATGGTACCC
8	GTTCAGTTGACTGCGGTATGTCATTttCCACTCAACTTTAACCCG
9	GTCCCTGCCTCTATATCTttGGGAAATTATCATCATCCGCCTGTG

10	CATCTGCAAAAGGATCAAGACGCTCttCCACTCAACTTTAACCCG
11	GTCCCTGCCTCTATATCTttTCTTTTGAGGACGGTGTTCTGCAAA
12	TTTTGTACTCATCTTCCCGATCTGCttCCACTCAACTTTAACCCG
13	GTCCCTGCCTCTATATCTttTTTTGTCCAGCGCGAACAACGCCGA
14	CTTCGTGGGTCTTGGCAATCTTCGCttCCACTCAACTTTAACCCG
15	GTCCCTGCCTCTATATCTttCATTCATTTTAGGGTCTGGTGTCTT
16	CACGCATAACATCCATGTATGTTCTttCCACTCAACTTTAACCCG
17	GTCCCTGCCTCTATATCTttGTGTTGCACCAGGAGTCTGATCAGC
18	CTTGATCCCAACTGGATAACTTTTTttCCACTCAACTTTAACCCG
19	GTCCCTGCCTCTATATCTttTGGTGGCTGAGATGCGGCTCCATTG
20	TTGATCCCAACGCCGCTTGCGTTTTttCCACTCAACTTTAACCCG
21	GTCCCTGCCTCTATATCTttATCGATTTTTACGTGCGCTGGAAGT
22	CTCTTTCTGTTTTAGGAGTTTCATCttCCACTCAACTTTAACCCG
23	GTCCCTGCCTCTATATCTttCAGGTGTGTCCCGTCCAGGTGTTGC
24	CACCTCCATGGCCTGGTGTTGCATGttCCACTCAACTTTAACCCG
25	GTCCCTGCCTCTATATCTttGATCCCATATCTTTGAGCCAGGGGT
26	CTCCTGCTGGCGTGTGACTGGGAGTttCCACTCAACTTTAACCCG
27	GTCCCTGCCTCTATATCTttGGCCTGGAGTTTCATCCCATCGCAG
28	CACCGGGAGTTTCGCTACCCTTTGCttCCACTCAACTTTAACCCG
29	GTCCCTGCCTCTATATCTttCTGGTGTACCAATGGGTGTTTTGCC
30	CTGGCGTAGGAGTTGCCATGTTCATttCCACTCAACTTTAACCCG
31	GTCCCTGCCTCTATATCTttTCTGGCTAGCAGGTGTTTCATCCCA
32	GTGTCAAAACAGGAGTGCTGCCACCttCCACTCAACTTTAACCCG
33	GTCCCTGCCTCTATATCTttTTGGTGTCTCACCAATGGAATCACC
34	GGGACTTTCTTTTACTTGCTCCTGGttCCACTCAACTTTAACCCG
35	GTCCCTGCCTCTATATCTttTCAGAAAGTGGTCTGTTTCTCTCAT
36	TCTGGGAACATAGCATCCAATTCTTttCCACTCAACTTTAACCCG

Table S8.
SF3B1 probes used for HCR.

No.	Sequences of *SOX9* probes
1	GAGGAGGGCAGCAAACGGaaTCGGCGTTGTGCAGATGCGGGTACT
2	CACAGCTTGCCCAGCGTCTTGCTGAtaGAAGAGTCTTCCTTTACG
3	GAGGAGGGCAGCAAACGGaaATCCGTTCACCCGCACGGGCATGGG
4	GCTTCACGTGGGGTTTGTTCTTGCTtaGAAGAGTCTTCCTTTACG
5	GAGGAGGGCAGCAAACGGaaTGGCTCACGGCCTCGCGGATGCACA
6	AGGGTCCAGTCGTAGCCCTTGAGCAtaGAAGAGTCTTCCTTTACG
7	GAGGAGGGCAGCAAACGGaaTCAGGTCCGGGTCGCCTTTGGGGAA
8	GGAATTTGTCCTCGTCGCTCTCCTTtaGAAGAGTCTTCCTTTACG
9	GAGGAGGGCAGCAAACGGaaTGTCCGAGCCGGATCCGGAGGGGCA
10	TGTTCTCTTGAGGTCGGGTGTTCTCtaGAAGAGTCTTCCTTTACG
11	GAGGAGGGCAGCAAACGGaaGGGCGGCTGAGGGGCGGGGAAGGGT
12	GAGAAAACGGAGAGAAAAAAAACAAtaGAAGAGTCTTCCTTTACG
13	GAGGAGGGCAGCAAACGGaaTCCTCCTGCTCCGACTGCCCGTTCT
14	GGGGAGATGTGGGTCTGCTCGGAGCtaGAAGAGTCTTCCTTTACG
15	GAGGAGGGCAGCAAACGGaaAAGGGACGCTTCTCGCTCTCATTCA
16	ACCCGCAGCCGCTCGGCCTCCTCCAtaGAAGAGTCTTCCTTTACG
17	GAGGAGGGCAGCAAACGGaaGAAGAGCGCGAGTTTGTACAAACCC
18	GTTTCTCCTTAAGAAAGAAAAATAAtaGAAGAGTCTTCCTTTACG
19	GAGGAGGGCAGCAAACGGaaCACCGTTACCTTCCCAACAACGCTC
20	TTACAGTTCTGACCATAATTTAACAtaGAAGAGTCTTCCTTTACG
21	GAGGAGGGCAGCAAACGGaaAGAGCGTCGGTTATTTTTTTTTTTG
22	AGCGCAGGGCTGCTTTAAGGCTTTGtaGAAGAGTCTTCCTTTACG
23	GAGGAGGGCAGCAAACGGaaACTGAGCTTTCTCTTTTTCTCCCCC
24	AAAATAGAGAATTTTTCCTCACAGAtaGAAGAGTCTTCCTTTACG
25	GAGGAGGGCAGCAAACGGaaAACTTGTAACCAAAGTCCAGCAAAC
26	AAACCCAAACAAACCCTTAAGAAACtaGAAGAGTCTTCCTTTACG
27	GAGGAGGGCAGCAAACGGaaCTGACAGAAGTCCTCCACTCTCACT
28	TCATTTCGATTTGTAAGAAAGGAAAtaGAAGAGTCTTCCTTTACG

29	GAGGAGGGCAGCAAACGGaaCTTCACGTGGCTTTAAGGCCGGGTG
30	GATTGGTTTGTTTATTTATTTATTTtaGAAGAGTCTTCCTTTACG
31	GAGGAGGGCAGCAAACGGaaAGGAGCCGGAGTTCTGGTGCTCGGT
32	CGCTCTGCCCGGCGGCGTGGCTGTAtaGAAGAGTCTTCCTTTACG
33	GAGGAGGGCAGCAAACGGaaGCTGCTGCTGCTCGCTGTAGTGGCT
34	GCTGCTGCTGCTGCTGCTGCGGGGAtaGAAGAGTCTTCCTTTACG
35	GAGGAGGGCAGCAAACGGaaGCCGCTGCTGTGCCGGACCCTGCTC
36	GGCTCAGCTGCTCTGTTTTGATGTGtaGAAGAGTCTTCCTTTACG
37	GAGGAGGGCAGCAAACGGaaTGATGCCGTAGGTACCGCTGTAGGT
38	CGCCCGCCGGAGAGCTGGCCGAGCTtaGAAGAGTCTTCCTTTACG
39	GAGGAGGGCAGCAAACGGaaTCGAAGGTTTCGATGTTGGAGATGA
40	GGCAGGTATTGGTCGAACTCGTTGAtaGAAGAGTCTTCCTTTACG

Table S9.
SOX9 probes used for HCR.

No.	Sequences of *SNAI2* probes
1	GTCCCTGCCTCTATATCTttGTAGCCAGGGTCTGGAGAAAGCCTT
2	CAGTGTGGGTTCTGATGTGCCCTTGttCCACTCAACTTTAACCCG
3	GTCCCTGCCTCTATATCTttTGTGGGTCCTGATGTGCATCTTAAG
4	CGCAGATCTTGCAGACGCAAGGTAGttCCACTCAACTTTAACCCG
5	GTCCCTGCCTCTATATCTttAGTACTTGCAGCTGAACGATTTCCT
6	CTCCCAGGCTGACATACTCCTTGTCttCCACTCAACTTTAACCCG
7	GTCCCTGCCTCTATATCTttCCAACCCAGAGAAAGTGGAATAGGT
8	CATCACAGTGCAGCTGCTTGTGTTTttCCACTCAACTTTAACCCG
9	GTCCCTGCCTCTATATCTttGCTTCGATGGCATGAGGGTCTGAAA
10	TTGCATAAACCGCACTGAAACTTTTttCCACTCAACTTTAACCCG
11	GTCCCTGCCTCTATATCTttGGTGGGCTGACCCTTCCCAAAGATG
12	TCTTTGGAGGAGGTGTCGGATGGTGttCCACTCAACTTTAACCCG
13	GTCCCTGCCTCTATATCTttTTGGGTAGAGGAGATGGTAGCAGCC
14	GGGTATCCAGAAAGCGGAGAGAGGTttCCACTCAACTTTAACCCG

15	GTCCCTGCCTCTATATCTttGCTACAGAGCTCAGGATCTCTGGCT
16	GTAGTCCACACAGTAATGGGGTTGTttCCACTCAACTTTAACCCG
17	GTCCCTGCCTCTATATCTttGTCCCCTCTCTTGCACTTATTCCCG
18	AAAAAAATAATTGTCAAACTCCCATttCCACTCAACTTTAACCCG
19	GTCCCTGCCTCTATATCTttATGTTAGAAGATGGTCAGGCATGCA
20	AATAGCAAAGTTTAGAGGAACGATTttCCACTCAACTTTAACCCG
21	GTCCCTGCCTCTATATCTttAGGAATGTATTAGTAACTTTGCAGC
22	CTGTTTCTTTGGTTGAAATGGCTTGttCCACTCAACTTTAACCCG
23	GTCCCTGCCTCTATATCTttATCTACTTGAAATGTCATGCATGGC
24	GAAAGCTGATAACGCTTCTTCGTTTttCCACTCAACTTTAACCCG
25	GTCCCTGCCTCTATATCTttGAACGTGAATGTGTGACTAAACAGA
26	TCCCCATATCTCAGAGTTCACACTTttCCACTCAACTTTAACCCG
27	GTCCCTGCCTCTATATCTttGCAGCCAGATTCCTCATGTTTGTGC
28	TGACTGCATGACTCAGTGTGCTACGttCCACTCAACTTTAACCCG
29	GTCCCTGCCTCTATATCTttGAAAGCCCTGTTGCAGTGAGGACAG
30	ATGAGCCCTCAGATTGGATCTGTCTttCCACTCAACTTTAACCCG
31	GTCCCTGCCTCTATATCTttGGCAGGCTTTCTCCTTCTTGCAGAT
32	GACCAGGAAGGAGCGTGGCATTTTGttCCACTCAACTTTAACCCG
33	GTCCCTGCCTCTATATCTttCACACGCGCACACTATCACTGCGAG
34	TCCTTTTGGGTCGGCGCAGCGGTGCttCCACTCAACTTTAACCCG
35	GTCCCTGCCTCTATATCTttATGCACTCCGCTGTGTAGTGGCACT
36	ATCGGTCCCTATCGCATTGTCTGCTttCCACTCAACTTTAACCCG
37	GTCCCTGCCTCTATATCTttCTTCTGGATGTTCTCAAGCACTTTT
38	GGGAAGGGTTTTCTGCTCCTCCAATttCCACTCAACTTTAACCCG
39	GTCCCTGCCTCTATATCTttTCGCAGGACGGACCCAATCCCTGCT
40	AACAGGCTGTTTTTCTGGGAGGGCTttCCACTCAACTTTAACCCG

Table S10.
SNAI2 probes used for HCR.

No.	Sequences of *SNAI2 Intron1* probes
1	GAGGAGGGCAGCAAACGGaaTGAGTTCTCTTTTTTTGGCTTCCCG
2	GATAAGAGGTCAGTTTACTGATTCAtaGAAGAGTCTTCCTTTACG
3	GAGGAGGGCAGCAAACGGaaATGGGACACACTGCCCGCTAAGGGC
4	TTCCAGATGTTTGATAAAAGAATTAtaGAAGAGTCTTCCTTTACG
5	GAGGAGGGCAGCAAACGGaaGGCAGAGCGAGGCTCGGAGCAGGCT
6	GGGGACATTGCAAGAGAGATGTTATtaGAAGAGTCTTCCTTTACG
7	GAGGAGGGCAGCAAACGGaaGCGCTCAGGAAATGCTGCGGACGAG
8	TCTGCCTGGGAGCTGCCTTTGAAATtaGAAGAGTCTTCCTTTACG
9	GAGGAGGGCAGCAAACGGaaTGCTGGCGAGCCCAGGCTGAGGGAG
10	TTCCAGGCACAGCGGCCAGCGAGATtaGAAGAGTCTTCCTTTACG
11	GAGGAGGGCAGCAAACGGaaATACTGGTTCAGACAAGCTGTTCTT
12	GATAGTTTTGATGTGCCGTACAAATtaGAAGAGTCTTCCTTTACG
13	GAGGAGGGCAGCAAACGGaaTTTCCCTCCTTGGGAATTACTGTGT
14	AATCTTACAAAATGCAAAACTCCGAtaGAAGAGTCTTCCTTTACG
15	GAGGAGGGCAGCAAACGGaaGCCAAGGGAATTTTCCTAATTACCC
16	CTCTTTTGCCTGTCCTCTTACAGCAtaGAAGAGTCTTCCTTTACG
17	GAGGAGGGCAGCAAACGGaaTCCCCCCCCCCAAATTACAGACTGAG
18	AGTTCAAAGATGCACAGATAAACAAtaGAAGAGTCTTCCTTTACG
19	GAGGAGGGCAGCAAACGGaaGCCACAGAACGTTCTGGTTATCTAG
20	CATTTAGGATGAAAGTTTCTCAAATtaGAAGAGTCTTCCTTTACG
21	GAGGAGGGCAGCAAACGGaaAGACAGCTGAGCGCTGCTGGATTTC
22	TTTCAAACGTTTGCATTTTGAAAATtaGAAGAGTCTTCCTTTACG
23	GAGGAGGGCAGCAAACGGaaTCCCTCCCCACCGCTCTCCCCCCTT
24	CGGACCACACTGACTGTCTCCCATTtaGAAGAGTCTTCCTTTACG
25	GAGGAGGGCAGCAAACGGaaTATGCTGTGCGGTGTGCCGCTAGGG
26	AACTCCACCTGCCCAGGCACATATTtaGAAGAGTCTTCCTTTACG
27	GAGGAGGGCAGCAAACGGaaCAGCCCATTTTTTTTTTGCAGCAGG
28	GTGTCCTGTGTTCTACAGAGCCCACtaGAAGAGTCTTCCTTTACG

29	GAGGAGGGCAGCAAACGGaaGTTAAGACACGTCAGAACAAAGTGC
30	AGAAAAAGAAAAAGCCCCTCTGGTTtaGAAGAGTCTTCCTTTACG
31	GAGGAGGGCAGCAAACGGaaGGGATGCCAGAACAAGTGCAGAGAA
32	GTCAAGCTGCATGGCTTCTTAATCTtaGAAGAGTCTTCCTTTACG
33	GAGGAGGGCAGCAAACGGaaTTTAGCCGCTCAATGTCTCCCTTGT
34	GCCATTTTCAAGAACTGATTAAAAAtaGAAGAGTCTTCCTTTACG

Table S11.
SNAI2 Intron1 probes used for HCR.

No.	Sequences of *SNAI2 Intron3* probes
1	GTCCCTGCCTCTATATCTttGGCCACAGATACAACAGCTTTCAGC
2	AAAACATGCACATCACAAAGTTAATttCCACTCAACTTTAACCCG
3	GTCCCTGCCTCTATATCTttTTTGCAGCATCTGCTAATAAGTGCA
4	TGTGGATTGCACTTGCAGAACTCAGttCCACTCAACTTTAACCCG
5	GTCCCTGCCTCTATATCTttATGTACAGGTGCAGACAGTATTCCT
6	TGAAGACAAGGTGCTGACACCTTCTttCCACTCAACTTTAACCCG
7	GTCCCTGCCTCTATATCTttCAGAGTGTCTTCCTGCTTAGCTCCG
8	TCCTCCCAATATTTTCACATATTTTttCCACTCAACTTTAACCCG
9	GTCCCTGCCTCTATATCTttTTAGAAGTGGCAAACAGCTGTACAG
10	TGAATGACTTGGGACGAGGGCTTTGttCCACTCAACTTTAACCCG
11	GTCCCTGCCTCTATATCTttCTCTTGAGGACTTGAGAGAGTGCAT
12	AATGCTTTGGTGATGAAGTGTTTCTttCCACTCAACTTTAACCCG
13	GTCCCTGCCTCTATATCTttGAGATAAGCCTCTCATGCATTGCCT
14	AAAACTTGCCAATTGCTTAAGGGGTttCCACTCAACTTTAACCCG
15	GTCCCTGCCTCTATATCTttTCCTTAAAGCAACGCCTTCAGCTAG
16	TTTCCAAGCCTGAAAGTTAACGTAAttCCACTCAACTTTAACCCG
17	GTCCCTGCCTCTATATCTttCCCACAGCTATGCTCCCCTCCCACC
18	GAAAGAGGTGATCAGAACAGAATCTttCCACTCAACTTTAACCCG

Table S12.
SNAI2 Intron3 probes used for HCR.