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Supplemental Information

Combinatorial Signal Perception in the BMP Pathway

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Table S1. BMP ligands and survey concentrations. Related to Figure 2.

Ligand	Cat. Number (R&D)	Survey Concentration (ng/ml)	**Source**
BMP2	355BM	200	CHO
BMP3	113BP	30,000	E. coli
BMP4	5020BP	40	CHO
BMP5	6176BM	1,200	CHO
BMP6	6325BM	400	CHO
BMP7	5666BP	500	CHO
BMP8a	7540BP	1,200	CHO
BMP9	5566BP	1.6	CHO
BMP10	6038BP	75	CHO
BMP15	5096BM	10	CHO
GDF5	853G5	1,200	E. coli
GDF6	855G6	16,000	E. coli
GDF7	779G7	1,250	E. coli
GDF10	1543BP	1,000	E. coli
GDF11	1958GD	8	E. coli

Table S2. BMP related protein expression levels in NMuMG. Related to Figure 3.

Gene	FPKM
Chrd	0.324582
Nog	0.118268
Bmper	0.553763
Gpc3	0
Gpc5	0
Bambi	0.348911
Twsg1	67.70005
Fst	4.072033
Rgma	0.249711
Rgmb	5.807905
Rgmc	0

Table S3. siRNA used for BMP knock-down. Lifetech siRNA ID number is indicated. Related to Figures 3 and 6.

Gene Name	siRNA #1 ID number	siRNA #2 ID number
Bmpr1a	S201096	S201097
Bmpr2	S63047	S63048
Acvr1	S61924	S61925
Acvr2a	S61931	S61932
Acvr2b	S61933	S61934
Twsg	S82416	S82417
Fst	S66250	S201361
Rgmb	S87097	S87095
Smad6	S69503	S69505

Table S4. qPCR probes. Related to Figures 2, 3 and 6.

Gene	Forward Primer	Reverse Primer	Probe	Supermix
Bmpr1a	GAGTGGATCTGG ATTGCCTTTA	CGCCATTTACCCATC CATACT	/56-FAM/ATTCAGATG/ZEN/GTTCG GCAGGTTGGT/3IABkFQ/	SsoAdvanced Universal probes
Bmpr1b	GCTTGGCTGTCA AGTTCATTAG	CAGCACTTCTGGAG GCATATAG	/56-FAM/ATGAGGTTG/ZEN/ACATC CCACCCAACA/3IABkFQ/	SsoAdvanced Universal probes
Bmpr2	GCAATCTCCCACC GAGATTTA	ACCAGCCGATTTCCA GTTAG	/56-FAM/AGAATGACG/ZEN/GCGCG TGTGTTATCA/3IABkFQ/	SsoAdvanced Universal probes
Acvr1	CACCTGGAAGTT GGCCTTAT	GCTCTTGATTGCGTC TCTTAAAC	/56-FAM/AGCTTGCAT/ZEN/CCTTGG AGTTGCTCT/3IABkFQ/	SsoAdvanced Universal probes
Alk1	TCTGCTTAGACAC GACAACATC	GTTCATGGTAGTGG GTGATGAG	/56-FAM/TTCATCGCC/ZEN/TCCGAC ATGACTTCG/3IABkFQ/	SsoAdvanced Universal probes
Acvr2a	CGTTCGCCGTCTT TCTTATCT	GTCTGGTTGGTTCTG TCTCTTT	/56-FAM/TGCTCTTCA/ZEN/GGTGCT ATACTTGGCAG/3IABkFQ/	SsoAdvanced Universal probes
Acvr2b	ATGAGTACATGC TGCCCTTC	CTTAATCGTGGGCCT CATCTT	/56-FAM/AGCTTCAGG/ZEN/AGGTG GTTGTCCAC/3IABkFQ/	SsoAdvanced Universal probes

Fst	AGTACAGTACCA GGGCAAATG	CAGGTCACACAGTA GGCATTAT	/56-FAM/CAGCTCCAC/ZEN/TTGTGT GGTGGATCA/3IABkFQ/	SsoAdvanced Universal probes
Rgmb	CAATCGTGTGTCT TCGACCT	TGCCAGCGTTCCTTT CTT	/56-FAM/ACAGTGCCT/ZEN/TGGAG GATGTGGAAG/3IABkFQ/	SsoAdvanced Universal probes
Twsg	GTATGTGCAACC CTCGGAATTA	GAAGGAGACGATGT TCCAGTTC	/56-FAM/TGAACAGGG/ZEN/ACGGA ATGGGCTC/3IABkFQ/	SsoAdvanced Universal probes
Smad6	CACTGGATCTGTC CGATTCTAC	GACATGCTGGCATCT GAGAA	/56-FAM/TTACACTGA/Zen/AACCGA GGCCACCAA/3IABkFQ/	SsoAdvanced Universal probes
Sdha	GGATTGCTTCTGT TTGCTTGG	AGTGGGCTGTCTTCC TTAAC	/56-FAM/TGGGCATGT/ZEN/CTCTG AGGGATTGG/3IABkFQ/	SsoAdvanced Universal probes
Citrine	TTCAAGATCCGCC ACAACAT	CTTCTCGTTGGGGTC TTTGC	None	IQ SYBR Green
Id1	CTGAACTCGGAG TCTGAAGTC	CAGCGACACAAGAT GCGAT	None	IQ SYBR Green
Smad6	CAACCCCTACCAC TTCAGC	GTAAGACAATGTAG AATCGGACAGA	None	IQ SYBR Green
Klf10	CCAACCATGCTCA ACTTCG	TCAAAGTCACTCTGC TCAGC	None	IQ SYBR Green

JunB	ACGACTACAAAC TCCTGAAACC	GATCCCTGACCCGAA AAGTAG	None	IQ SYBR Green
Tbp	ACATCTCAGCAAC CCACACA	GTGAAGGGTACAAG GGGGTG	None	IQ SYBR Green
Sdha	AGTGGGCTGTCT TCCTTAAC	GGATTGCTTCTGTTT GCTTGG	None	IQ SYBR Green

Table S5. Versatile and non-versatile biochemical parameters. Related to Figure 6.

	Versatile	Non-versatile
K_{11}^{D}	0.0515	0.4431
K_{21}^{D}	0.9484	0.5569
K_{12}^{D}	0.7684	0.1752
K_{22}^{D}	0.2316	0.8248
K_{111}^{T}	0.0891	0.1709
K_{211}^{T}	0.0120	0.0327
K_{121}^{T}	0.1922	0.0837
K_{221}^{T}	0.2975	0.0524
K_{112}^{T}	0.2070	0.0595
K_{212}^{T}	0.1145	0.2671
K_{122}^{T}	0.0474	0.0313
K_{222}^{T}	0.0404	0.3024
ε_{111}^{T}	0.2254	0.2690
ε_{211}^{T}	0.1059	0.2907
ε_{121}^{T}	0.0512	0.0567
ε_{221}^{T}	0.0707	0.0628
ε_{112}^{T}	0.0566	0.0353
ε_{212}^{T}	0.2275	0.2303
ε_{122}^{T}	0.1681	0.0146
ε_{222}^{T}	0.0945	0.0406