

## Supplemental Information

**Movie S1: 15x15 Lines neonate cardiomyocyte muscular thin film contractility, baseline.**

Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz, no isoproterenol treatment.

**Movie S2: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-10</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-10</sup> M concentration of isoproterenol.

**Movie S3: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-9</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-9</sup> M concentration of isoproterenol.

**Movie S4: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-8</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-8</sup> M concentration of isoproterenol.

**Movie S5: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-7</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-7</sup> M concentration of isoproterenol.

**Movie S6: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-6</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-6</sup> M concentration of isoproterenol.

**Movie S7: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-5</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-5</sup> M concentration of isoproterenol.

**Movie S8: 15x15 Lines neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-4</sup> M.** Contractility measurement of 15x15 lines of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-4</sup> M concentration of isoproterenol.

**Movie S9: 15x2 Aniso neonate cardiomyocyte muscular thin film contractility, baseline.**

Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz, no isoproterenol treatment.

**Movie S10: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,**

**1e<sup>-10</sup> M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a 1e<sup>-10</sup> M concentration of isoproterenol.

**Movie S11: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,  $1e^{-9}$  M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a  $1e^{-9}$  M concentration of isoproterenol.

**Movie S12: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,  $1e^{-8}$  M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a  $1e^{-8}$  M concentration of isoproterenol.

**Movie S13: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,  $1e^{-7}$  M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a  $1e^{-7}$  M concentration of isoproterenol.

**Movie S14: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,  $1e^{-6}$  M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a  $1e^{-6}$  M concentration of isoproterenol.

**Movie S15: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,  $1e^{-5}$  M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a  $1e^{-5}$  M concentration of isoproterenol.

**Movie S16: 15x2 Aniso neonate muscular thin film isoproterenol concentration response,  $1e^{-4}$  M.** Contractility measurement of 15x2 anisotropic monolayers of neonatal rat ventricular myocytes paced at 2 Hz exposed to a  $1e^{-4}$  M concentration of isoproterenol.

**Table S1. Custom RT-qPCR array gene list**

Gene Symbol	Refseq #	Gene Description
<i>Hey2</i>	NM_130417	Hairy/enhancer-of-split related with YRPW motif 2
<i>Irx4</i>	NM_001107330	Iroquois homeobox 4
<i>Mef2c</i>	XM_574821	Myocyte enhancer factor 2C
<i>Gata4</i>	NM_144730	GATA binding protein 4
<i>Myocd</i>	NM_182667	Myocardin
<i>Nkx2-5</i>	NM_053651	NK2 transcription factor related, locus 5 (Drosophila)
<i>Tbx5</i>	NM_001009964	T-box 5
<i>Nppa</i>	NM_012612	Natriuretic peptide precursor A
<i>Nppb</i>	NM_031545	Natriuretic peptide precursor B
<i>Acta1</i>	NM_019212	Actin, alpha 1, skeletal muscle
<i>Adra1b</i>	NM_016991	Adrenergic, alpha-1B-, receptor
<i>Adra1d</i>	NM_024483	Adrenergic, alpha-1D-, receptor
<i>Adra2a</i>	NM_012739	Adrenergic, alpha-2A-, receptor
<i>Actc1</i>	NM_019183	Actin, alpha, cardiac muscle 1
<i>Actn1</i>	NM_031005	Actinin, alpha 1
<i>Actn2</i>	NM_001170325	Actinin alpha 2
<i>Pln</i>	NM_022707	Phospholamban
<i>Tnni3</i>	NM_017144	Troponin I type 3 (cardiac)

<b>Tnnt2</b>	NM_012676	Troponin T type 2 (cardiac)
<b>Ttn</b>	XM_001065955	Titin
<b>Myh3</b>	NM_012604	Myosin, heavy chain 3, skeletal muscle, embryonic
<b>Myh6</b>	NM_017239	Myosin, heavy chain 6, cardiac muscle, alpha
<b>Myh7</b>	NM_017240	Myosin, heavy chain 7, cardiac muscle, beta
<b>MyI2</b>	NM_001035252	Myosin, light polypeptide 2, regulatory, cardiac, slow
<b>MyI3</b>	NM_012606	Myosin, light chain 3, alkali; ventricular, skeletal, slow
<b>MyI4</b>	NM_001109495	Myosin, light chain 4
<b>MyI7</b>	NM_001106017	Myosin, light chain 7, regulatory
<b>Cacna1c</b>	NM_012517	Calcium channel, voltage-dependent, L type, alpha 1C subunit
<b>Cacna1d</b>	NM_017298	Calcium channel, voltage-dependent, L type, alpha 1D subunit
<b>Cacna1g</b>	NM_031601	Calcium channel, voltage-dependent, T type, alpha 1G subunit
<b>Cacna1h</b>	NM_153814	Calcium channel, voltage-dependent, T type, alpha 1H subunit
<b>Cacna1s</b>	NM_053873	Calcium channel, voltage-dependent, L type, alpha 1S subunit
<b>Kcna5</b>	NM_012972	Potassium voltage-gated channel, shaker-related subfamily, member 5
<b>Kcne1</b>	NM_012973	Potassium voltage-gated channel, Isk-related family, member 1
<b>Kcne2</b>	NM_133603	Potassium voltage-gated channel, Isk-related family, member 2
<b>Kcnd2</b>	NM_031730	Potassium voltage-gated channel, Shal-related subfamily, member 2
<b>Kcnd3</b>	NM_031739	Potassium voltage-gated channel, Shal-related subfamily, member 3
<b>Kcnh2</b>	NM_053949	Potassium voltage-gated channel, subfamily H (eag-related), member 2
<b>Kcnj2</b>	NM_017296	Potassium inwardly-rectifying channel, subfamily J, member 2
<b>Kcnj3</b>	NM_031610	Potassium inwardly-rectifying channel, subfamily J, member 3
<b>Kcnj11</b>	NM_031358	Potassium inwardly rectifying channel, subfamily J, member 11
<b>Kcnj12</b>	NM_053981	Potassium inwardly-rectifying channel, subfamily J, member 12
<b>Kcnj14</b>	NM_170718	Potassium inwardly-rectifying channel, subfamily J, member 14
<b>Kcnq1</b>	NM_032073	Potassium voltage-gated channel, KQT-like subfamily, member 1
<b>Scn5a</b>	NM_013125	Sodium channel, voltage-gated, type V, alpha subunit
<b>Slc2a1</b>	NM_138827	Solute carrier family 2 (facilitated glucose transporter), member 1
<b>Slc2a2</b>	NM_012879	Solute carrier family 2 (facilitated glucose transporter), member 2
<b>Slc8a1</b>	NM_019268	Solute carrier family 8 (sodium/calcium exchanger), member 1
<b>Hcn1</b>	NM_053375	Hyperpolarization-activated cyclic nucleotide-gated potassium channel 1
<b>Hcn3</b>	NM_053685	Hyperpolarization-activated cyclic nucleotide-gated potassium channel 3
<b>Hcn4</b>	NM_021658	Hyperpolarization activated cyclic nucleotide-gated potassium channel 4
<b>Gja1</b>	NM_012567	Gap junction protein, alpha 1
<b>Gja5</b>	NM_019280	Gap junction protein, alpha 5
<b>Atp1a2</b>	NM_012505	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, alpha 2 polypeptide
<b>Atp1a3</b>	NM_012506	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, alpha 3 polypeptide
<b>Atp2a1</b>	NM_058213	ATPase, Ca <sup>++</sup> transporting, cardiac muscle, fast twitch 1
<b>Atp2a2</b>	NM_001110139	ATPase, Ca <sup>++</sup> transporting, cardiac muscle, slow twitch 2
<b>Ryr2</b>	NM_001191043	Ryanodine receptor 2, cardiac
<b>Ckm</b>	NM_012530	Creatine kinase, muscle
<b>AcsI5</b>	NM_053607	Acyl-CoA synthetase long-chain family member 5
<b>Ptk2</b>	NM_013081	PTK2 protein tyrosine kinase 2
<b>Iik</b>	NM_133409	Integrin-linked kinase
<b>Ctgf</b>	NM_022266	Connective tissue growth factor
<b>Itga1</b>	NM_030994	Integrin, alpha 1

<b><i>Itga2</i></b>	XM_345156	Integrin, alpha 2
<b><i>Itga4</i></b>	NM_001107737	Integrin, alpha 4
<b><i>Itga5</i></b>	NM_001108118	Integrin, alpha 5 (fibronectin receptor, alpha polypeptide)
<b><i>Itga6</i></b>	XM_215984	Integrin, alpha 6
<b><i>Itgav</i></b>	NM_001106549	Integrin, alpha V
<b><i>Itgb1</i></b>	NM_017022	Integrin, beta 1
<b><i>Itgb3</i></b>	NM_153720	Integrin, beta 3
<b><i>Abra</i></b>	NM_175844	Actin-binding Rho activating protein
<b><i>Rhoa</i></b>	NM_057132	Ras homolog gene family, member A
<b><i>Cdc42</i></b>	NM_171994	Cell division cycle 42 (GTP binding protein)
<b><i>Rac1</i></b>	NM_134366	Ras-related C3 botulinum toxin substrate 1
<b><i>Rock1</i></b>	NM_031098	Rho-associated coiled-coil containing protein kinase 1
<b><i>Rock2</i></b>	NM_013022	Rho-associated coiled-coil containing protein kinase 2
<b><i>Rnd1</i></b>	NM_001013222	Rho family GTPase 1
<b><i>Vcl</i></b>	NM_001107248	Vinculin
<b><i>Ctnnb1</i></b>	NM_053357	Catenin (cadherin associated protein), beta 1
<b><i>Vegfa</i></b>	NM_031836	Vascular endothelial growth factor A
<b><i>Ctf1</i></b>	NM_017129	Cardiotrophin 1
<b><i>Itpr2</i></b>	NM_031046	Inositol 1,4,5-triphosphate receptor, type 2
<b><i>Tgfb2</i></b>	NM_031131	Transforming growth factor, beta 2
<b><i>Mylk3</i></b>	NM_001110810	Myosin light chain kinase 3
<b><i>Camk2d</i></b>	NM_012519	Calcium/calmodulin-dependent protein kinase II delta
<b><i>Gapdh</i></b>	NM_017008	Glyceraldehyde-3-phosphate dehydrogenase
<b><i>Rplp1</i></b>	NM_001007604	Ribosomal protein, large, P1
<b><i>Actb</i></b>	NM_031144	Actin, beta