

SUPPLEMENTARY MATERIAL

Evolutionarily conserved long intergenic non-coding RNAs in the eye

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Table S1. Profile of 18 conserved lincRNAs in the eye across species. Data presented in each cell represent the total number of reads (after trimming) aligned to the listed transcript; the unique number of reads (after trimming) aligned to the transcript; the length of the transcript covered by the aligned reads; and the percentage of the transcript covered by the aligned reads. Thus for *EyeLinc1* in the rat eye, there were 206 total reads and 166 unique reads. The unique reads covered 1578 bases of the transcript, representing a 65% conservation of *EyeLinc1*.

	Rat Eye	Nile Rat Eye	Ground Squirrel Eye	Monkey Eye 1	Monkey Eye 2
<i>EyeLinc1</i>	206; 166; 1578; 0.65	1400; 1147; 1781; 0.73	1402; 707; 920; 0.38	732; 404; 889; 0.37	910; 448; 851; 0.35
<i>EyeLinc2</i>	22644; 1412; 926; 0.51	92086; 14333; 960; 0.53	5470; 1794; 720; 0.40	8077; 911; 573; 0.32	7471; 896; 644; 0.36
<i>EyeLinc3</i>	318; 243; 1458; 0.46	1087; 914; 1610; 0.50	88; 50; 507; 0.16	134; 86; 498; 0.16	98; 66; 441; 0.14
<i>EyeLinc4</i>	2938; 404; 426; 0.62	3667; 1800; 451; 0.66	147; 137; 305; 0.45	127; 124; 288; 0.42	165; 154; 336; 0.49
<i>EyeLinc5</i>	13067; 966; 652; 0.95	27310; 7132; 686; 1.00	1956; 740; 556; 0.81	293; 273; 437; 0.64	310; 291; 512; 0.75
<i>EyeLinc6</i>	3685; 1370; 1980; 0.87	3391; 2760; 2023; 0.88	14; 14; 251; 0.11	100; 83; 307; 0.13	63; 52; 298; 0.13
<i>EyeLinc7</i>	20691; 1390; 1308; 0.59	8713; 4384; 1438; 0.65	1026; 881; 1065; 0.48	673; 595; 968; 0.44	526; 471; 1050; 0.48
<i>EyeLinc8</i>	20802; 1394; 1337; 0.61	8459; 4279; 1394; 0.63	1053; 917; 1052; 0.48	673; 606; 975; 0.44	487; 443; 1062; 0.48
<i>EyeLinc9</i>	364; 135; 288; 0.47	509; 348; 337; 0.55	19; 18; 158; 0.26	7; 7; 90; 0.15	7; 7; 126; 0.20
<i>EyeLinc10</i>	199; 138; 512; 0.72	1050; 705; 642; 0.90	62; 32; 279; 0.39	41; 26; 197; 0.28	120; 45; 243; 0.34
<i>EyeLinc11</i>	2308; 250; 443; 0.66	7850; 2682; 480; 0.72	101; 96; 379; 0.57	65; 64; 295; 0.44	79; 76; 290; 0.43
<i>EyeLinc12</i>	1344; 747; 2128; 0.64	1086; 816; 1663; 0.50	16; 16; 361; 0.11	82; 60; 366; 0.11	138; 82; 365; 0.11
<i>EyeLinc13</i>	1718; 498; 697; 0.82	5607; 2486; 812; 0.96	3354; 434; 652; 0.77	2519; 356; 626; 0.74	3625; 422; 621; 0.73
<i>EyeLinc14</i>	8210; 949; 731; 0.29	66474; 10987; 971; 0.38	17614; 1643; 629; 0.25	10515; 778; 574; 0.23	14392; 871; 586; 0.23
<i>EyeLinc15</i>	1086; 729; 1973; 0.67	1649; 972; 1984; 0.68	658; 307; 910; 0.31	882; 356; 753; 0.26	1369; 419; 733; 0.25
<i>EyeLinc16</i>	328; 210; 830; 0.44	1125; 986; 979; 0.51	37; 36; 304; 0.16	35; 35; 354; 0.19	36; 36; 298; 0.16
<i>EyeLinc17</i>	40701; 2842; 1968; 0.97	89765; 21461; 2023; 1.00	2673; 1005; 1490; 0.74	620; 585; 1266; 0.62	830; 783; 1412; 0.70
<i>EyeLinc18</i>	5922; 650; 581; 0.54	11471; 3716; 585; 0.55	1089; 541; 489; 0.46	299; 281; 476; 0.44	364; 349; 544; 0.51

Table S2. Profile of 18 conserved lincRNAs in the retina across species. Data presented in each cell represent the total number of reads (after trimming) aligned to the listed transcript; the unique number of reads (after trimming) aligned to the transcript; the length of the transcript covered by the aligned reads; and the percentage of the transcript covered by the aligned reads. Thus for *EyeLinc1* in the rat eye, there were 593 total reads and 466 unique reads. The unique reads covered 1634 bases of the transcript, representing a 67% conservation of *EyeLinc1*. Although conserved in the eye, *EyeLinc6*, *EyeLinc9*, and *EyeLinc16* appear not to be conserved in the retina across species.

	Rat Retina	Ground Squirrel Retina	Monkey Retina 1	Monkey Retina 2	Human Retina
<i>EyeLinc1</i>	593; 466; 1634; 0.67	4798; 1744; 1003; 0.41	621; 370; 848; 0.35	777; 406; 840; 0.35	536; 256; 841; 0.35
<i>EyeLinc2</i>	19251; 1604; 1035; 0.57	10557; 3959; 735; 0.41	5500; 844; 571; 0.32	5228; 540; 597; 0.33	214; 154; 707; 0.39
<i>EyeLinc3</i>	945; 605; 1612; 0.50	226; 179; 887; 0.28	147; 83; 454; 0.14	134; 66; 537; 0.17	19; 12; 355; 0.11
<i>EyeLinc4</i>	2152; 430; 453; 0.66	255; 229; 260; 0.38	135; 127; 244; 0.36	80; 77; 351; 0.51	55; 43; 334; 0.49
<i>EyeLinc5</i>	11455; 1132; 647; 0.94	2046; 1179; 462; 0.67	321; 293; 446; 0.65	195; 182; 520; 0.76	210; 177; 617; 0.90
<i>EyeLinc6</i>	18; 17; 457; 0.20	0	32; 28; 237; 0.10	0	7; 7; 229; 0.10
<i>EyeLinc7</i>	14840; 1491; 1341; 0.61	2103; 1551; 1017; 0.46	1341; 1080; 1026; 0.47	401; 369; 885; 0.40	127; 122; 620; 0.28
<i>EyeLinc8</i>	14845; 1481; 1340; 0.61	2219; 1651; 1051; 0.48	1329; 1082; 972; 0.44	401; 374; 799; 0.36	134; 130; 564; 0.26
<i>EyeLinc9</i>	310; 151; 290; 0.47	49; 47; 189; 0.31	0	0	0
<i>EyeLinc10</i>	174; 135; 513; 0.72	74; 41; 362; 0.51	51; 30; 170; 0.24	53; 31; 240; 0.34	7; 6; 173; 0.24
<i>EyeLinc11</i>	1843; 294; 477; 0.71	191; 180; 334; 0.50	55; 54; 249; 0.37	40; 40; 315; 0.47	22; 19; 278; 0.42
<i>EyeLinc12</i>	1133; 705; 2001; 0.60	38; 37; 492; 0.15	98; 65; 374; 0.11	121; 70; 357; 0.11	0
<i>EyeLinc13</i>	1963; 515; 724; 0.85	4165; 890; 662; 0.78	1343; 279; 636; 0.75	1885; 291; 576; 0.68	281; 117; 651; 0.77
<i>EyeLinc14</i>	7716; 995; 767; 0.30	20731; 2599; 726; 0.28	6189; 637; 558; 0.22	8126; 587; 577; 0.23	787; 187; 638; 0.25
<i>EyeLinc15</i>	1922; 1107; 2005; 0.69	592; 335; 998; 0.34	959; 380; 809; 0.28	994; 348; 748; 0.26	74; 49; 856; 0.29
<i>EyeLinc16</i>	761; 421; 1108; 0.58	81; 76; 328; 0.17	28; 28; 220; 0.12	0	28; 27; 192; 0.10
<i>EyeLinc17</i>	55865; 3937; 1978; 0.98	7086; 3757; 1597; 0.79	554; 536; 1278; 0.63	380; 370; 1187; 0.59	237; 168; 1720; 0.85
<i>EyeLinc18</i>	4086; 650; 594; 0.55	1381; 913; 520; 0.48	390; 367; 451; 0.42	212; 206; 483; 0.45	133; 106; 523; 0.49

Table S3. Profile of 18 conserved lincRNAs in 4 biological replicates of macaque macula tissue. Data presented in each cell represent the total number of reads (after trimming) aligned to the listed transcript; the unique number of reads (after trimming) aligned to the transcript; the length of the transcript covered by the aligned reads; and the percentage of the transcript covered by the aligned reads. In the monkey retina *EyeLinc6*, *EyeLinc9* (both not conserved in the human retina), and *EyeLinc16* are not conserved, and in the macula in addition to these three, *EyeLinc11* also is not conserved.

	Monkey Macula 1	Monkey Macula 2	Monkey Macula 3	Monkey Macula 4
<i>EyeLinc1</i>	333; 235; 936; 0.39	1162; 487; 969; 0.40	793; 368; 954; 0.39	660; 354; 954; 0.39
<i>EyeLinc2</i>	4014; 139; 361; 0.20	13510; 165; 426; 0.24	11480; 164; 388; 0.22	14567; 158; 397; 0.22
<i>EyeLinc3</i>	178; 120; 523; 0.16	380; 155; 575; 0.18	306; 125; 535; 0.17	428; 163; 527; 0.16
<i>EyeLinc4</i>	25; 17; 117; 0.17	51; 26; 115; 0.17	88; 31; 116; 0.17	80; 32; 212; 0.31
<i>EyeLinc5</i>	329; 32; 183; 0.27	1440; 68; 353; 0.51	1494; 56; 305; 0.44	1069; 46; 304; 0.44
<i>EyeLinc6</i>	0	0	0	0
<i>EyeLinc7</i>	1251; 38; 343; 0.16	2301; 37; 248; 0.11	2833; 42; 267; 0.12	2775; 44; 312; 0.14
<i>EyeLinc8</i>	1251; 38; 343; 0.16	2301; 37; 248; 0.11	2833; 42; 267; 0.12	2775; 44; 312; 0.14
<i>EyeLinc9</i>	0	0	0	0
<i>EyeLinc10</i>	23; 21; 169; 0.24	117; 69; 174; 0.24	64; 41; 170; 0.24	65; 51; 176; 0.25
<i>EyeLinc11</i>	0	0	0	0
<i>EyeLinc12</i>	94; 68; 382; 0.11	173; 101; 514; 0.15	183; 73; 392; 0.12	134; 82; 384; 0.12
<i>EyeLinc13</i>	1124; 247; 557; 0.66	3821; 268; 560; 0.66	2962; 264; 557; 0.66	2772; 263; 561; 0.66
<i>EyeLinc14</i>	3189; 320; 498; 0.20	9711; 332; 499; 0.20	8754; 337; 498; 0.20	7520; 323; 500; 0.20
<i>EyeLinc15</i>	306; 186; 544; 0.19	1022; 326; 635; 0.22	787; 285; 598; 0.20	676; 261; 598; 0.20
<i>EyeLinc16</i>	0	0	0	0
<i>EyeLinc17</i>	3521; 99; 398; 0.20	9897; 110; 577; 0.28	7958; 112; 630; 0.31	9995; 108; 630; 0.31
<i>EyeLinc18</i>	268; 58; 240; 0.22	638; 79; 302; 0.28	801; 77; 292; 0.27	779; 73; 271; 0.25

Table S4. Semi-quantitative RT-PCR of conserved lincRNAs in organs and eye compartments of 1 month old C57BL/6 mice. Experiments were optimized for expression of each listed transcript in the eye. Bands detected at the established optimized cycle in other tissues are denoted with a “+”; a “-” indicates that no band was detected. For three targets, namely *EyeLinc9*, *EyeLinc12* and *EyeLinc18*, we failed to detect expression in any tissues, even after using two different sets of custom designed primers. ND signifies ‘not detected’.

	Organs					Eye Compartments		
	Eye	Brain	Heart	Liver	Lung	Lens/Cornea	Retina	RPE/Choroid
<i>EyeLinc1</i>	+	-	+	-	-	+	+	+
<i>EyeLinc2</i>	+	+	+	+	+	-	+	+
<i>EyeLinc3</i>	+	+	+	+	+	+	+	+
<i>EyeLinc4</i>	+	+	-	-	-	-	+	-
<i>EyeLinc5</i>	+	+	+	+	+	+	+	+
<i>EyeLinc6</i>	+	-	+	+	-	-	+	+
<i>EyeLinc7</i>	+	-	+	+	-	-	+	+
<i>EyeLinc8</i>	+	-	+	+	-	-	+	+
<i>EyeLinc9</i>	ND	ND	ND	ND	ND	ND	ND	ND
<i>EyeLinc10</i>	+	+	+	-	+	+	+	+
<i>EyeLinc11</i>	+	+	-	-	-	+	+	-
<i>EyeLinc12</i>	ND	ND	ND	ND	ND	ND	ND	ND
<i>EyeLinc13</i>	+	+	+	+	+	+	+	+
<i>EyeLinc14</i>	+	-	-	-	-	-	+	+
<i>EyeLinc15</i>	+	+	+	+	+	+	+	+
<i>EyeLinc16</i>	+	+	+	+	+	-	+	+
<i>EyeLinc17</i>	+	+	+	+	+	+	+	+
<i>EyeLinc18</i>	ND	ND	ND	ND	ND	ND	ND	ND

Table S5. Semi-quantitative RT-PCR of conserved lincRNAs in mice with different retinal environments. Experiments were optimized for the expression of each transcript in the B6 eye. Bands detected at this established optimized cycle in eyes of mice with other genotypes are denoted with a “+”. A“-” indicates that no band was detected.

	B6 Eye	<i>ConeDTA</i> Eye	<i>Nrl</i>^{-/-} Eye	<i>P23H</i> Eye
<i>EyeLinc1</i>	+	-	+	+
<i>EyeLinc2</i>	+	+	-	+
<i>EyeLinc3</i>	+	+	+	+
<i>EyeLinc4</i>	+	-	-	-
<i>EyeLinc5</i>	+	+	+	+
<i>EyeLinc6</i>	+	+	+	+
<i>EyeLinc7</i>	+	+	-	-
<i>EyeLinc8</i>	+	+	-	-
<i>EyeLinc10</i>	+	+	+	+
<i>EyeLinc11</i>	+	-	-	-
<i>EyeLinc13</i>	+	+	+	+
<i>EyeLinc14</i>	+	+	+	+
<i>EyeLinc15</i>	+	+	+	+
<i>EyeLinc16</i>	+	+	+	+
<i>EyeLinc17</i>	+	+	+	+

Table S6. *In silico* promoter analysis of conserved lincRNAs reveals binding sites for transcription factors that drive retinal processes. Results of motif searches that returned statistically significant P values ($p \leq 0.05$) for each 5k promoter sequence of the 18 conserved lincRNA transcripts are shown after analysis with the JASPAR CORE 2009 database. Numbers in parentheses next to each promoter motif indicate the number of occurrences of that motif.

	Promoter Motif
<i>EyeLinc1</i>	EWSR1-FLI1(1),Foxd3(1),RREB1(9),RTG3(1),SP1(1)
<i>EyeLinc2</i>	EWSR1-FLI1(1),HMG-I/Y(2),RREB1(8),SP1(2),Trl(1)
<i>EyeLinc3</i>	CTCF(2),PPARG::RXRA(1),Pax4(1),RREB1(6),SP1(13),Trl(1)
<i>EyeLinc4</i>	CTCF(2),EWSR1-FLI1(2),FKH1(1),RREB1(13),SP1(1),squamosa(1)
<i>EyeLinc5</i>	EWSR1-FLI1(1),HMG-I/Y(1),RREB1(2),Trl(3)
<i>EyeLinc6</i>	CTCF(2),EWSR1-FLI1(1),PHD1(1),PLAG1(1),RREB1(41),SP1(12),Trl(1)
<i>EyeLinc7</i>	EWSR1-FLI1(1),FKH1(1),Foxd3(1),HMG-I/Y(3),Pax4(1),RREB1(25),SP1(3),Trl(41),fkh(2)
<i>EyeLinc8</i>	EWSR1-FLI1(1),FKH1(1),Foxd3(1),HMG-I/Y(3),Pax4(1),RREB1(27),SP1(3),Trl(44),fkh(2)
<i>EyeLinc9</i>	FKH1(1),Pax4(1),RREB1(24),SP1(10)
<i>EyeLinc10</i>	EWSR1-FLI1(2),SP1(1)
<i>EyeLinc11</i>	CTCF(1),EWSR1-FLI1(36),RREB1(9),SP1(8),Trl(6)
<i>EyeLinc12</i>	EWSR1-FLI1(2),RREB1(4),SP1(1)
<i>EyeLinc13</i>	EWSR1-FLI1(18),Foxd3(1),NHP6B(2),RREB1(19),SP1(14),Trl(19)
<i>EyeLinc14</i>	CTCF(1),EWSR1-FLI1(3),RREB1(25),SP1(4)
<i>EyeLinc15</i>	EWSR1-FLI1(2),FKH1(1),Foxd3(2),HMG-I/Y(1),PHD1(1),PPARG::RXRA(1),Pax4(3),RREB1(29),SP1(4),Trl(1)
<i>EyeLinc16</i>	CTCF(1),EWSR1-FLI1(2),HMG-I/Y(1),PHD1(1),RREB1(5),SP1(6)
<i>EyeLinc17</i>	NHP6B(1),PPARG::RXRA(1),Pax4(1),RREB1(3),SP1(5)
<i>EyeLinc18</i>	EWSR1-FLI1(4),HMG-I/Y(1),Pax4(1),RREB1(8),SP1(1),nub(1)