

4C-seq revealed long-range interactions of a functional enhancer at the 8q24 prostate cancer risk locus

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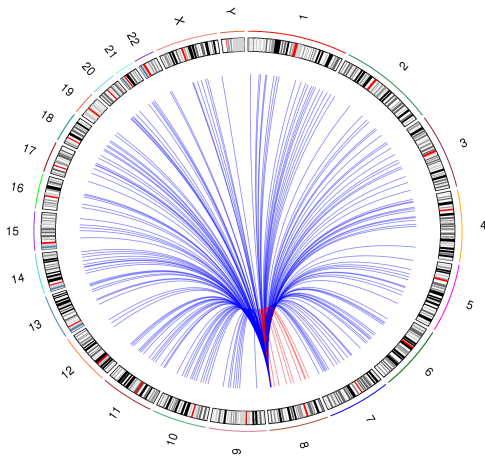
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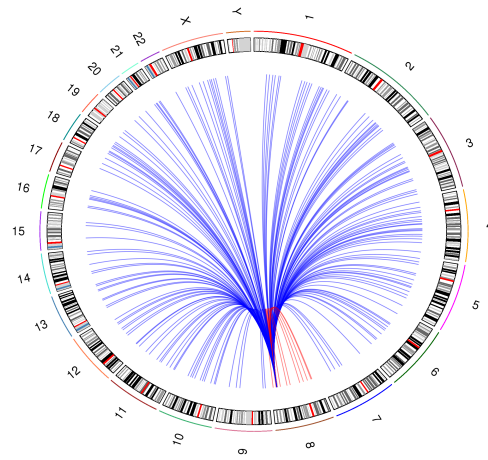
Supplementary information

Figure S1

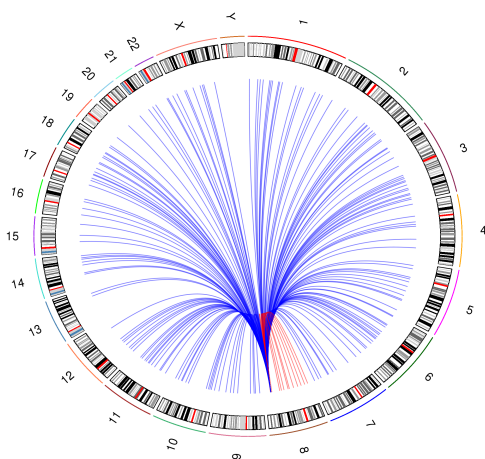
Circos plots showing the genome-wide interacting partners with the enhancer bait in two biological replicates (BRs) of LNCaP and C4-2B. Inter-chromosomal interactions (*trans*) are shown in blue, while intra-chromosomal (*cis*) interactions are shown in red.



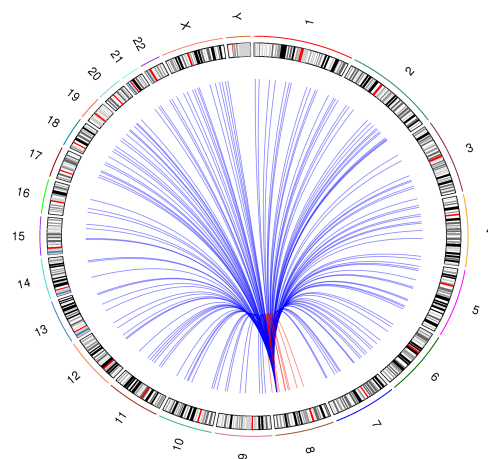
LNCaP_BR1



LNCaP_BR2



C4-2B_BR1



C4-2B_BR2

Table S1

Table of independent associations with prostate cancer, revealed by GWAS. Index-SNPs, nearby genes, distance to 4C sites in LNCaP and C4-2B are shown.

#	Loci	SNP	Gene	distance (bp) to 4C sites	
				LNCaP	C42B
1	1p35	rs636291	<i>PEX14</i>	310044	997082
2	1q21	rs17599629	<i>GOLPH3L</i>	1711394	837052
3	1q32	rs1775148	<i>SLC41A1</i>	126163	627348
4	1q32.1	rs4245739	<i>MDM4</i>	1112814	575268
5	2p25	rs9287719	<i>NOL10</i>	456039	592563
6	2p24.1	rs13385191	<i>C2orf43</i>	1394299	155596
7	2p21	rs1465618	<i>THADA</i>	287592	6140457
8	2p15	rs6545977	<i>EHBPI</i>	489345	2483152
9	2p15	rs721048	<i>EHBPI, OTX1</i>	319912	2652585
10	2p11.2	rs10187424	<i>GGCX</i>	420743	1357183
11	2q31.1	rs12621278	<i>ITGA6</i>	2075987	281819
12	2q37.3	rs2292884	<i>MPLH</i>	2497161	3657768
		rs7584330	<i>MPLH</i>	2441163	3713766
13	3p22.2	rs9311171	<i>CTDSPL</i>	1302230	1134408
14	3p12.1-2	rs17181170	<i>CHMP2B</i>	1028922	7346458
15	3p12.1-2	rs2660753	<i>CHMP2B</i>	966272	7283808
		rs9284813	<i>CHMP2B</i>	1007767	7325303
16	3p12.1-2	rs7629490	<i>CHMP2B</i>	1097095	7414631
17	3q21.3	rs10934853	<i>GATA2</i>	955135	504408
18	3q23	rs6763931	<i>ZBTB38</i>	1398966	1187267
19	3q24	rs345013	<i>PLOD2</i>	464188	2342232
20	3q26.2	rs10936632	<i>CLDN11, SKIL</i>	368319	1739541
21	4q13	rs10009409	<i>COX18</i>	537144	1156742
22	4q22.3	rs17021918	<i>PDLIM5</i>	239550	1841827
23	4q22.3	rs12500426	<i>PDLIM5</i>	191282	1890095
24	4q24	rs7679673	<i>TET2</i>	1597460	2524355
25	5p15.33	rs2242652	<i>TERT</i>	971319	1375285
26	5p15.33	rs12653946	<i>LPCAT1</i>	355518	759484
27	5p12	rs2121875	<i>FGF10</i>	624378	2958808
28	5q14.3	rs4466137	<i>HAPLN1</i>	464022	2003639
29	5q23.1	rs37181	<i>COMMD10</i>	313759	544806
30	6p24	rs4713266	<i>NEDD9</i>	214340	119101
31	6p22	rs115457135	<i>TRIM31</i>	2725875	4054106
32	6p21	rs115306967	<i>HLA-DRB6</i>	1334532	3504907
33	6p21.1	rs1983891	<i>FOXP4</i>	1039928	53652
34	6p12.2	rs10498792	<i>PKHD1</i>	155463	1037820

35	6q14	rs9443189	<i>MYO6</i>	2099055	1655131
36	6q22.2	rs339331	<i>RFX6</i>	188930	3965316
37	6q25.3	rs651164	<i>IGF2R</i>	1135518	1365600
38	6q25.3	rs9364554	<i>SLC22A3</i>	883228	1617890
39	7p15.3	rs12155172	<i>RPL23P8</i>	100986	1126916
40	7p15.2	rs10486567	<i>JAZF1</i>	497289	248562
41	7p12	rs56232506	<i>TNS3</i>	221719	1081958
42	7q21.3	rs6465657	<i>LMTK2</i>	1241326	959941
43	8p21.2	rs1512268	<i>NKX3-1</i>	222633	629826
44	8q24.21	rs12543663	<i>LOC727677, MYC</i>	20668	28124
45	8q24.21	rs10086908	<i>POU5F1B, MYC</i>	42405	25033
46	8q24.21	rs1016343	<i>POU5F1B, MYC</i>	36460	29396
47	8q24.21	rs13252298	<i>PCATI, MYC</i>	34601	31255
48	8q24.21	rs1456315	<i>PCATI, MYC</i>	25820	40036
		rs13254738	<i>PCATI, MYC</i>	25414	40442
49	8q24.21	rs6983561	<i>PCATI, MYC</i>	22877	42979
50	8q24.21	rs188140481	<i>PCATI, MYC</i>	8851	16940
51	8q24.21	rs16902094	<i>PCATI, MYC</i>	15931	13759
52	8q24.21	rs445114	<i>PCATI, MYC</i>	13096	10924
53	8q24.21	rs6983267	<i>PCATI, MYC</i>	3497	3497
54	8q24.21	rs7000448	<i>LOC727677, MYC</i>	2361	14526
55	8q24.21	rs1447295	<i>POU5F1B, MYC</i>	2766	1044
		rs4242382	<i>POU5F1B, MYC</i>	185	3021
		rs4242384	<i>POU5F1B, MYC</i>	1166	4002
		rs7837688	<i>POU5F1B, MYC</i>	8771	8771
56	9p21	rs17694493	<i>CDKN2B-AS1</i>	799273	657023
57	9q31.2	rs817826	<i>KLF4</i>	39701	3869987
58	9q33.2	rs1571801	<i>DAB2IP</i>	237755	1871944
59	10q11	rs76934034	<i>MARCH8</i>	331021	187871
60	10q11.23	rs10993994	<i>NCOA4</i>	1170352	5654380
		rs3123078	<i>NCOA4</i>	1145827	5629855
61	10q26.12	rs11199874	<i>FGFR2</i>	62928	139096
62	10q26.13	rs4962416	<i>CTBP2</i>	313181	2092329
63	11p15.5	rs7127900	<i>IGF2</i>	1468702	982779
64	11q13.2	rs10896449	<i>CCND1</i>	327389	810062
		rs7931342	<i>CCND1</i>	327559	809892
65	11q13.2	rs12418451	<i>CCND1</i>	386637	750814

66	11q13.2	rs11228565	<i>CCND1</i>	343476	793975
		rs7130881	<i>CCND1</i>	326098	811353
67	11q23	rs11214775	<i>HTR3B</i>	810046	1596593
68	12q13	rs80130819	<i>RPI-228P16.4</i>	402683	137657
69	12q13.12	rs731236	<i>VDR</i>	221822	43199
70	12q13.13	rs10875943	<i>TUBA1C</i>	1368181	1394049
71	12q13.2	rs902774	<i>KRT8</i>	22319	1737763
72	12q21.31	rs12827748	<i>PAWR</i>	614987	1877260
73	13q22.1	rs9600079	<i>KLF5</i>	230010	1821369
74	13q33.2	rs1529276	<i>MIR548AS</i>	120103	1555014
75	14q23	rs7153648	<i>SIX1</i>	964273	3182251
76	14q24	rs8014671	<i>TTC9</i>	75	70518
77	15q21.1	rs4775302	<i>SQRDL</i>	1417417	1935283
78	16q22	rs12051443	<i>PHLPP2</i>	2601204	1394237
79	17p13.3	rs684232	<i>VPS53</i>	4597918	11369793
80	17q21.2	rs7501939	<i>HNF1B</i>	2150905	491126
		rs4430796	<i>HNF1B</i>	2147789	488010
81	17q21.2	rs11649743	<i>HNF1B</i>	2124728	464949
82	17q21.33	rs138213197	<i>HOXB13</i>	1589507	1354511
83	17q21.33	rs11650494	<i>ZNF652</i>	2128988	815030
84	17q21.33	rs7210100	<i>ZNF652</i>	2186070	723467
85	17q25.1	rs1859962	<i>BC039327</i>	114025	1856982
86	19q13.4	rs103294	<i>LILRA3</i>	101827	2972421
87	19q13.11	rs8102476	<i>SPINT2</i>	3055381	13089809
88	19q13.12	rs887391	<i>LOC100505495</i>	194625	9839798
89	19q13.32	rs2735839	<i>KLK3</i>	1614289	460799
90	20q13	rs12480328	<i>ADNP</i>	47254	1181529
91	21q22	rs1041449	<i>TMPRSS2</i>	478838	2591338
92	22q11	rs2238776	<i>TBX1</i>	3346645	1811536
93	22q13.1	rs9623117	<i>TNRC6B</i>	216549	1830151
94	22q13.2	rs742134	<i>PACSLN2</i>	1825421	1236000
95	22q13.2	rs5759167	<i>BIK</i>	1807358	1217937
96	Xp11	rs2807031	<i>XAGE3</i>	1780960	9017210
97	Xp11.22	rs5945572	<i>NUDT11</i>	3448226	10684476
		rs5945619	<i>NUDT11</i>	3436237	10672487
		rs1327301	<i>NUDT11</i>	3467852	10704102
98	Xq12	rs5919432	<i>AR</i>	699867	1560291
99	Xq13	rs6625711	<i>SLC7A</i>	1752304	1277068
100	Xq13	rs4844289	<i>NLGN3-BCYRN1</i>	1484171	1008935

Table S2

Enriched MSigDB Perturbation terms related with cancer and reported by GREAT.
The results of LNCaP and C4-2B are shown in (A) and (B) respectively.

A

LNCaP		
MSigDB Perturbation terms	p-value	genes
Genes bound by ESR1 [GeneID=2099] and down-regulated by estradiol [PubChemID=5757] in MCF-7 cells (breast cancer) expressing constitutively active form of AKT1 [GeneID=207]	3.266e-11	CDYL2, CPEB4, DLL1, EDN2, ESR1, FAM84B, GABBR2, GPD2, IL1R1, LMBRD1, MKX, NPAS3, PPAP2B, PSD3, S1PR3, SEMA3E, SHROOM3, ST8SIA4, SYTL2, TGFB2, TLE1, UBE2H, YPEL2, ZDHHC7, ZMYND8
Genes up-regulated in A549 cells (lung cancer) expressing MIRLET7A3 [GeneID=406883] microRNA off a plasmid vector	6.439e-11	ADCK2, ARHGAP26, BCHE, BTG1, CHGB, COX7C, CPEB4, CTH, DKK1, EHBP1, ETNK1, FAM84B, FAT1, FGL1, FOXA1, FOXC1, GJA1, GLIS3, GLRX, KLF4, LYST, MAGEA6, PLA2G4A, PTPN12, REG3G, SLC38A2, TFPI, THSD4, THSD7A, USP32
Genes present but differentially expressed between Hep3B cells (hepatocellular carcinoma, HCC) with RNAi knockdown of SDHB [GeneID=6390] and control cells	1.390e-9	A2M, AGTR1, CDH6, CTBP2, CYB561, FAM84B, FLRT2, GJA1, GPRC5B, GULP1, HDAC9, HS3ST3B1, ISX, ITPR2, MICAL2, NUA1, PAG1, PKHD1, PRRX1, SERPINE2, SH3BGRL, SIPA1L2, STEAP1, TFAP2A, TGFB2, THBS4, TNFRSF19, TNFSF4, TTR, VGLL3
Genes bound by ESR1 [GeneID=2099] and down-regulated by estradiol [PubChemID=5757] in MCF-7 cells (breast cancer)	2.602e-9	ANK3, CDYL2, CHRM3, CPEB4, DLL1, EDN2, ESR1, EXT1, FAM84B, FRMD6, GATA3, KCTD18, NPAS3, PBX1, PSD3, PTPRK, RERE, S1PR3, SEMA3E, SHROOM3, SLITRK6, SMAD3, SYTL2, TGFB2, TLE1, TNFRSF19, TNS3, TRAM2, UBE2H, YPEL2

B

C4-2B		
MSigDB Perturbation terms	p-value	genes
Genes within amplicon 8q23-q24 identified in a copy number alterations study of 191 breast tumor samples	2.261e-27	COL14A1, ENPP2, FAM84B, FER1L6, GML, HAS2, LY6D, MAL2, MED30, MRPL13, MTSS1, MYC, NOV, PTP4A3, RAD21, SLC30A8, SLURP1, THEM6, TMEM65, TMEM74, TRIB1, TRPS1, TSNARE1, UTP23, ZHX2, ZNF572
Genes bound by ESR1 [GeneID=2099] and down-regulated by estradiol [PubChemID=5757] in MCF-7 cells (breast cancer) expressing constitutively active form of AKT1 [GeneID=207]	2.638e-11	ARID5B, CGN, EPS8, FAM84B, GABBR2, GALNT10, GRHL1, KLF9, MKX, NPAS3, PPAP2B, PSD3, SLC22A23, TGFB2, ZNF277