



1

Galton

1875 Francis

“ 973”



300
 SNP
 haplotype
 variable number of tandem repeats VNTR

10%

— gene set association analysis

SNP
 2 3 5
 24
TPH2 rs1487275 *SLC6A4* rs8076005 *HTR2C* rs2192371
HTR6 rs6658108 *HTR5A* rs732050

19%

genome-wide association study GWAS

SNP

CGAS

CGAS

GWAS

GWAS

GWAS

GWAS

SNP

copy number variation CNV

GWAS

GWAS

20% 30% ^{4 5}

GWAS

J. Ott 6 7

8 9

i- GSEA4GWAS ICSNPPathway GWAS

imaging genetics

10

11

2000

1

11-19

imaging MRI fMRI VBM DTI MRS

positron emission tomography PET

emission computed tomography SPECT magnetoencephalography MEG

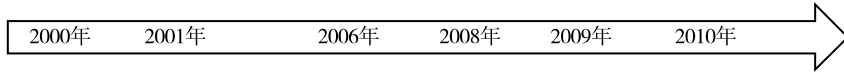
Lieber 3

D. R. Weinberger 10

GWAS

SNPs

fMRI和APOE (Bookheimer et al., 2001) /
COMT (Egan et al., 2001) /5-HTTLPR
(Hariri et al., 2002) ;
第一次基于MRI的神经影像遗传学



case- control study

family study

animal study

knockout

3

.

2001

Chinese National Twin Registry CNTR

Twin Registry in Southwestern China

20

TRiSC

The Beijing Twin Study BeTwiSt

21





generalist genes

22

FRA

FIE

CFE

23

24

25

BDNF Val66Met

26 27

SLEs

BDNF

Val

Met/Met

28

30%

50%

29

2

SEMA5A

SNP rs42352

RAPM

30

GABRB1

rs7435958

31

COMT DRD2 DRD3 NTSR1

BDNF

32-35

35

NTSR1 rs4334545

C

CT/TT

rs4334545

CC

表 2 国内认知能力的遗传基础研究的主要进展

30	SEMA5A 169 SNP	RAPM	SEMA5A SNP rs42352 SEMA5A rs42352 TT RAPM
31	GABRB1 49 SNP	WAIS-R	GABRB1 rs7435958 GG rs7435958GG GABRB1
32	COMT Val158Met rs4680 COMT		COMT Met Val 2-back COMT
33	NTSRI 5 SNP		2-back rs4334545 C rs6090453 G rs4334545 CT/TT CC
33	COMT Val158Met DRD1 140G/T -48A/G DRD2 TaqIA TaqIB DRD3 Ser9Gly DRD4 -C521T -G809A DAT1 VNIR		DRD2 TaqIA TaqIB DRD3 Ser9Gly DRD2 TaqIA
34	BDNF Val166Met rs6265		BDNF Val BDNF Met
42	DDC 7 DDC 5		DCC SNP rs3887825 rs7786398 rs10499695 rs6969081 rs7786398 rs10499695 rs6969081 SNP G

37	DBH - 1021C/T 19bp Ins/Del MAOA 30bp VNTR MAOB rs1799836		DBH - 19bp Ins/Del MAOA VNTR
40	MAOA VNTR A 5-		MAOA 4r/4r 3r/3r 3r/4r " "
39	ADRA2B		AAGG/AAGG SSRT Stop signal reaction time CCAC/AAGG CCAC/CCAC AAGG/AAGG
41	5-HTR2A 30 SNP 5 2A		rs1923888 rs1745837 rs9567739 rs3742279 rs655888 rs655854 and rs2296972
38	13		5- 5-HT6 T267C T267C TT CT TT BDNF COMT DBH DRD2 DRD3 DRD4 MAOA TPH2 5-HT2A GRM1 GRIN2B

36-42

3

5-

5-

19%

3

18%

43

5-HTTLPR

44-45

OXTR

5-HT1A

表 3 国内情绪及社会行为的遗传基础研究的主要进展

3	127 SNP 2 VNIR 5		8 5- TPH2 MAOA MAOB SLC6A4 HTR2A HTR2C HTR5A HTR6 12 SNP HTR6 rs6658108 HTR5A rs732050 TPH2 rs1487275 SLC6A4 rs8076005 HTR2C rs2192371 19%
45	5- 5-HTTLPR 5-		5-HTTLPR M s/s
44	5- 5-HTTLPR 5-		5-HTTLPR M s/s HA 5-HTTLPR HA
57	5- 5-HTTLPR 5-	5-	M s/s 5-
46	OXTR rs53576		OXTR rs53576 A OXTR rs53576 OXTR rs53576



47	<i>OXTR</i>	rs53576	A/A	G/G G/G
48	<i>OXTR</i>	rs53576	A/A	G A/A
43	2	96 SNP		18%
58	5- <i>5-HTTLPR</i>	5-	5- <i>HTTLPR</i>	<i>IGT</i> LAT s <i>IGT</i> 40
59	<i>COMT</i>	Val158Met rs4680		

50	5-HT1A C- 1019G rs6295 5- 1A		5-HT1A CG/GG CC
49	DBH - 1021C/T 19bp Ins/Del		DBH - 1021C/T CC DBH CT/TT 1.4% 2.3%
61	OXTR 10	IRI	OXTR rs2254298 rs2268491 rs13316193 rs4686302 IRI
62	COMT 7 SNP COMT		COMT rs2020917 and rs737865 SNP rs5993883 SNP

3.4.1 注意缺陷多动障碍

attention-deficit hyperactivity disorder ADHD

76%
ADHD
5- 23 245 SNP ADHD
ADHD MAOA DDC ADRA2C
COMT MAOA ADHD
66 BDNF MAOA DRD4 SLC6A2 ADRA2A
ADHD 67 ADHD-HI 68 ADHD 69
ADHD 70 5
DRD1-5 ADHD 71

3.4.2 重度抑郁症

major depression disorder MDD
MDD 40% 72 MDD

73 74

BDNF

BDNF Val66Met

BDNF Val Val/Val Val/Met Met/Met

28 75 76

rs6782799 *BDNF* Val66Met *GSK3B*

MDD

BDNF *CRHR1* MDD *BDNF* *NTRK2*

MDD 77, 78

5- SSRI

20 29 5- HTTLPR *HTR1A* rs6295

MDD 79 5- HTTLPR

S 80 5- HTTLPR

81, 82 44 45

83 fMRI 5- HTTLPR

2 TPH2

5- TPH2 rs4570625

MDD TPH2 84

MAOA DRD DBH COMT MDD

3.4.3 焦虑症

anxiety disorders

32% 48% 85 86

2 86 87

5- HTTLPR L S

88 S/S L

S/S

-

3.4.4 双相情感障碍

bipolar disorder BPD manic-depressive

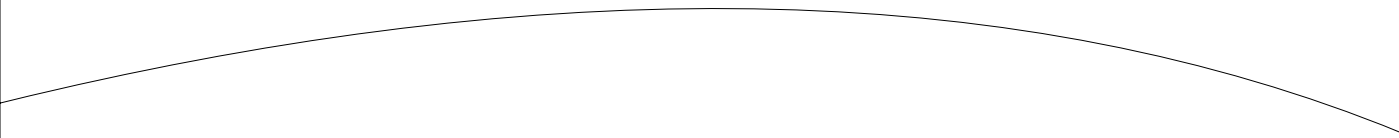
insanity

57% 14% 89

BDNF BPD

BDNF Val166Met rs6265 BPD Met

Val BPD-I BPD-II





4

22

90

138

139

W. S. Kremen

140 141

J. L. Stein

GWAS

142

80%

GWAS

143-145

GWAS

GWAS

ENIGMA CHARGE IMAGEN

146

5

1

5 10

2
GWAS

GWAS

3

GWAS

4 - - -

147

5

5 10

部分生物学专业名词解释

genetic material	RNA DNA
heritability	
gene polymorphism	2
allele	
genotype	
haplotype	
copy number variation CNV	1 kb
variable number of tandem repeats VNTR	DNA DNA 10 10 1000
linkage	
phenotype	
gene frequency	
susceptibility	

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