

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype				Controlled for	
Cohort (Nested case-control)									
Hunter <i>et al.</i> (1997)	466/466	Never Former 1-14 c/day 15+ c/day	1.0 (ref) 1.3 (0.9-1.7) 1.3 (0.6-2.5) 1.6 (0.9-2.8)		Rapid 1.0 (ref) 1.2 (0.8-1.9) 1.1 (0.4-3.1) 1.2 (0.5-3.3)		Slow 0.8 (0.6-1.3) 1.1 (0.7-1.7) 1.1 (0.4-3.0) 1.5 (0.7-3.2)	Age at menarche, parity, age at first birth, BMI, family history of breast cancer, history of benign breast disease	
Egan <i>et al.</i> (2002)	791/797	Ever vs. Never	1.37 (1.12-1.69)	Rapid: 1.24 (0.91-1.70) Slow: 1.50 (1.11-2.02)				State, age, education, age at menarche, parity, age at first birth, benign breast disease, BMI, family history of breast cancer, menopausal status, age at menopause, alcohol	
Case-Control									
Ambrosone <i>et al.</i> (1996)	304/327	Pack-yrs Never ≤183 184-365 >365		Premenopausal Rapid 1.0 (ref) 1.8 (0.5-6.5) 2.5 (0.7-8.6) 2.1 (0.5-7.9)	Slow 1.0 (ref) 1.7 (0.5-5.1) 0.8 (0.3-2.4) 1.2 (0.4-3.8)		Postmenopausal Rapid 1.0 (ref) 0.4 (0.1-1.6) 1.5 (0.5-4.2) 0.9 (0.4-2.1)	Slow 1.0 (ref) 0.9 (0.3-3.0) 1.1 (0.4-2.7) 2.8 (1.4-5.5)	Age, education, age at menarche, age at first pregnancy, BMI, family history of breast cancer, age at menopause
Millikan <i>et al.</i> (1998)	498/473	Never Current Former	1.0 (ref) 1.0 (0.7-1.4) 1.3 (0.9-1.8)	Premenopausal Rapid 1.0 (ref) 1.1 (0.5-2.3) 1.1 (0.6-2.1)	Slow 1.0 (ref) 0.8 (0.4-1.6) 1.0 (0.5-1.9)		Postmenopausal Rapid 1.0 (ref) 1.4 (0.7-2.8) 1.6 (0.9-2.9)	Slow 1.0 (ref) 1.1 (0.6-2.2) 1.8 (1.0-3.3)	Age, race
Morabia <i>et al.</i> (2000)	177/170	Never Ever pass. Ever active Former Curr <20cpd Curr 20+cpd			Rapid 1.0 (ref) 1.9 (0.7-4.6) 2.7 (1.1-6.6) 2.8 (1.05-7.8) 3.7 (1.05-12.9) 1.6 (0.7-6.9)		Slow 1.0 (ref) 5.9 (2.0-17.4) 4.2 (1.5-12.0) 5.2 (1.5-18.0) 3.1 (0.7-12.7) 5.3 (1.4-20.5)		Age, education, family history of breast cancer
Delfino <i>et al.</i> (2000)	113/278	Never Passive Former Current	1.00 (ref) 1.32 (0.69-2.52) 0.94 (0.53-1.68) 0.55 (0.18-1.67)						Age, menopausal status, family history of breast cancer

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NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype		Controlled for
Krajcinovic <i>et al.</i> (2001)	149/207	Ever vs. Never		Rapid: 2.6 (0.8–8.2)		Age, age at menarche, BMI, family history of cancer, menopause, parity, breast feeding, HRT use, alcohol
Chang-Claude <i>et al.</i> (2002)	422/887	Never A/P Pass only Current Former		Rapid 1.0 (ref) 2.02 (0.99–4.10) 1.12 (0.56–2.22) 1.22 (0.59–2.54) 1.02 (0.49–2.13)	Slow 1.0 (ref) 1.19 (0.69–2.07) 1.40 (0.84–2.34) 1.67 (0.97–2.89) 1.16 (0.67–2.03)	Age, parity, breastfeeding, BMI, alcohol, menopausal status
van der Hel <i>et al.</i> (2003)	229/264	Never <15 yrs 15–30 yrs 30+ yrs	1.00 (ref) 1.22 (0.68–2.18) 1.37 (0.86–2.16) 1.55 (0.92–2.61)	Rapid 1.00 (ref) 1.22 (0.68–2.18) 1.37 (0.86–2.16) 1.55 (0.92–2.61)	Slow 0.97 (0.53–1.80) 1.01 (0.47–2.19) 1.61 (0.84–3.12) 1.66 (0.80–3.44)	Genotype study; didn't do current vs ever; just by duration and dose
Alberg <i>et al.</i> (2004)	110/113	Never Former Current	1.0 (ref) 1.1 (0.56–2.1) 0.66 (0.30–1.4)	Slow 1.0 (ref) 1.4 (0.59–3.6) 1.3 (0.42–3.7)	Int/Rapid 1.0 (ref) 0.77 (0.29–2.1) 0.36 (0.11–1.2)	Family history, passive smoking, age at first birth, age at menarche, BMI
Kocabaş <i>et al.</i> (2004)	84/103	Never Active Passive		Slow vs. Rapid: 0.66 (0.30–1.42) 0.77 (0.19–3.16) 0.99 (0.30–3.24)		Age at menarche, age at first term pregnancy, BMI
Sillanpää <i>et al.</i> (2005)	483/482	Never A/P Only Pass. Former Current	1.0 (ref) 0.85 (0.62–1.16) 0.87 (0.56–1.37) 1.34 (0.86–2.09)	Slow vs. Rapid: 1.39 (0.91–2.13) 1.22 (0.75–1.98) 1.18 (0.51–2.74) 2.14 (0.93–4.95)		Age, age at menarche, age at first term pregnancy, number of pregnancies, family history of breast cancer, history of benign breast disease, alcohol
Lilla <i>et al.</i> (2005)	419/884	Never A/P Pass only 1–10 p–y 11+ p–y		Rapid 1.0 (ref) 1.95 (0.97–3.91) 0.98 (0.48–1.98) 1.22 (0.59–2.54)	Slow 1.0 (ref) 1.25 (0.72–2.16) 1.24 (0.72–2.12) 1.85 (1.04–3.30)	Age, family history of breast cancer, breastfeeding, BMI, parity, alcohol, menopausal status, education

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype				Controlled for				
van der Hel <i>et al.</i> (2005)	676/669	Never Former Curr <10cpd 10–20 cpd >20 cpd	1.00 (ref) 1.29 (0.81–2.03) 1.01 (0.74–1.36) 1.03 (0.77–1.38) 1.28 (0.83–1.96)	Rapid 1.0 (ref) 1.25 (0.61–2.56) 0.66 (0.40–1.09) 0.92 (0.55–1.52) 1.31 (0.63–2.70)		Slow 0.85 (0.66–1.08) 1.24 (0.66–2.33) 1.19 (0.78–1.83) 0.89 (0.60–1.33) 1.08 (0.59–1.97)		Age, cohort				
Lissowska <i>et al.</i> (2006)	2386/ 2502	Never A/P Pass only Act only Act+Pass	1.00 (ref) 1.11 (0.85–1.46) 1.23 (0.83–1.83) 1.21 (0.93–1.59)	Rapid/intermediate Never: 1.0 (ref) Ever: 1.04 (0.85–1.29)		Slow Never: 0.89 (0.73–1.09) Ever: 1.12 (0.92–1.36)		Age, site, education, age at menarche, full–term births, age at first term birth, age at menopause, BMI, family breast cancer history, benign biopsy, mammography, OC use, HRT use				
NAT1												
Millikan <i>et al.</i> (1998)	498/473		See above	Premenopausal NAT1*10 1.0 (ref) 1.0 (0.5–2.1) 1.0 (0.5–1.9)		NAT1non*10 1.0 (ref) 0.9 (0.5–1.8) 1.2 (0.6–2.3)		Postmenopausal NAT1*10 1.0 (ref) 1.1 (0.6–2.2) 1.8 (1.0–3.1)	NAT1non*10 1.0 (ref) 1.2 (0.6–2.4) 1.4 (0.8–2.6)	Age, race		
Zheng <i>et al.</i> (1999)	154/330	Never Ever Quit >10yrs ≤14cpd <25 yr 15+cpd >25 yr	1.0 (ref) 1.14 (0.84–1.54) 1.40 (0.92–2.13) 0.88 (0.47–1.66) 1.07 (0.70–1.63)	NAT1*3/4 combo 1.0 (ref) 1.1 (0.7–2.0) 1.3 (0.6–2.8) 1.1 (0.4–3.1) 0.8 (0.3–1.6)		NAT1*10/any 1.2 (0.7–2.0) 1.4 (0.7–2.9) 2.2 (0.7–6.6) 5.0 (0.4–56.2) 0.6 (0.2–1.8)		NAT1*11/any 2.1 (0.6–6.7) 13.2 (1.5–116.0) N/A N/A N/A		Age, family history of breast cancer		
Millikan <i>et al.</i> (2000)	AA: 290/273 White: 199/192	Never Ever		African–American NAT1*3/4 1.0 (ref) 1.3 (0.6–3.0)		NAT1*10 0.7 (0.4–1.4) 1.0 (0.6–2.0)	NAT1*11 N/A N/A	White NAT1*3/4 1.0 (ref) 1.1 (0.7–1.8)		NAT1*10 1.0 (0.6–1.6) 1.1 (0.6–1.7)	NAT1*11 0.7 (0.2–2.7) 0.3 (0.1–1.7)	Age, family history of breast cancer
Krajinovic <i>et al.</i> (2001)	149/207	Ever vs Never	See above	NAT1*10: 0.4 (0.1–1.6)						Age, age at menarche, BMI, family history of cancer, menopause, parity, breast feeding, HRT use, alcohol		

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype				Controlled for
van der Hel <i>et al.</i> (2005)	676/669	Never Former Curr <10cpd 10–20 cpd >20 cpd	See above	NAT1*10 1.0 (ref) 1.48 (0.58–3.75) 0.73 (0.41–1.33) 0.94 (0.53–1.69) 1.24 (0.50–3.06)		Non–NAT1*10 1.12 (0.85–1.48) 1.40 (0.76–2.56) 1.14 (0.73–1.77) 1.10 (0.72–1.70) 1.54 (0.83–2.86)		Age, cohort
CYP1A1								
Ambrosone <i>et al.</i> (1995)	216/282	Nonsmokers <29 pack–yrs 29+ pack–yrs		CYP1A1 W/M vs. W/W (ref): 1.30 (0.62–2.70) 5.22 (1.16–23.56) 0.86 (0.24–3.09)				Age, age at menarche, age at first pregnancy, age at menopause, BMI, family history of breast cancer
Ishibe <i>et al.</i> (1998)	466/466	Never Former Current	1.0 (ref) 1.25 (0.93–1.67) 1.44 (0.90–2.32)	MspI WT 1.0 (ref) 1.21 (0.87–1.69) 1.24 (0.75–2.03)	MspI Variants 0.89 (0.54–1.46) 1.28 (0.75–2.20) 7.36 (1.39–39.0)	Exon 7 WT 1.0 (ref) 1.19 (0.86–1.59) 1.32 (0.78–2.22)	Exon 7 Variants 0.66 (0.35–1.26) 1.17 (0.64–2.11) 1.51 (0.55–4.13)	age, menopausal status, HRT use, month of blood return, time and fasting status of DNA collection, BMI, benign breast disease, age at menarche, parity, age at first birth, family history of breast cancer
Li <i>et al.</i> (2004)	688/702	Never Former Current		M1/herterozygote 1.0 (ref) 1.7 (1.1–2.8) 1.1 (0.6–1.8)		WT 1.0 (ref) 1.2 (0.9–1.6) 0.8 (0.6–1.2)		Age, race, sampling fractions
GST								
Ambrosone <i>et al.</i> (1995)	See above	Nonsmokers <29 pack–yrs 29+ pack–yrs		M1–Present 1.0 (ref) 1.0 (ref) 1.0 (ref)		M1–Null 1.09 (0.61–1.98) 0.82 (0.31–2.16) 1.08 (0.43–2.72)		See above
Garcia-Closas <i>et al.</i> (1999)	466/466	Never <20 pack–yrs 20+ pack–yrs		T1–present 1.0 (ref) 1.07 (0.75–1.51) 1.18 (0.84–1.66)		T1–deleted 0.61 (0.35–1.06) 0.81 (0.40–1.64) 1.47 (0.83–2.63)		Age, HRT use, time of blood collection, month of blood return

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NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype						Controlled for
Millikan (2000)	688/633	Never Current Former		M1 Null 1.0 (ref) 1.2 (0.7–1.9) 1.2 (0.7–1.8)	M1 Present 1.0 (ref) 0.7 (0.4–1.0) 1.4 (0.9–2.0)	T1–Null 1.0 (ref) 0.3 (0.1–0.9) 1.5 (0.7–3.0)	T1–Present 1.0 (ref) 0.9 (0.6–1.3) 1.2 (0.9–1.7)	P1–Ile/Val or Val/Val 1.0 (ref) 0.8 (0.6–1.3) 1.1 (0.8–1.5)	P1–Ile/Ile 1.0 (ref) 0.7 (0.4–1.2) 1.7 (1.0–2.7)	Age, race, menopausal status, age at first term pregnancy/parity, breastfeeding, family history of breast cancer, biopsy, alcohol
Mitrunen <i>et al.</i> (2001a)	483/482	Never Ever		M1 Null <i>Premenopausal</i> 1.05 (0.59–1.85) 0.85 (0.41–1.77)	M3 A/B B/B 1.74 (0.90–3.36) 1.12 (0.43–2.93)	P1 Ile/Val 0.74 (0.39–1.39) 1.01 (0.48–2.16)	P1 Val/Val 0.58 (0.17–1.98) 1.98 (0.37–10.6)	T1 null 2.04 (0.90–4.59) 0.78 (0.24–2.56)		Age, age at menarche, age at first term pregnancy, parity, family history of breast cancer, history of benign breast disease
		Never Ever		<i>Postmenopausal</i> 1.72 (1.14–2.58) 0.65 (0.24–1.82)	0.69 (0.43–1.10) 1.31 (0.49–3.45)	0.96 (0.64–1.45) 0.37 (0.13–1.09)	0.52 (0.20–1.37) 0.12 (0.01–1.58)	1.05 (0.59–1.88) 1.54 (0.41–5.82)		
Zheng <i>et al.</i> (2002)	338/345	Never Current Former	1.0 (ref) 1.0 (0.6–1.6) 1.1 (0.8–1.6)	M1–A 1.0 (ref) 0.5 (0.2–1.3) 1.2 (0.7–2.3)	M1–B 1.0 (ref) 1.4 (0.3–6.2) 1.0 (0.4–2.7)	M1–null 1.0 (ref) 1.5 (0.8–2.9) 1.1 (0.7–1.8)	T1–positive 1.0 (ref) 1.1 (0.6–1.9) 1.0 (0.7–1.5)	T1–null 1.0 (ref) 1.1 (0.4–2.7) 1.3 (0.6–2.6)		Age, BMI, age at first term pregnancy, breastfeeding, family history, menopausal status
van der Hel <i>et al.</i> (2003)	See above	Never <15 yrs 15–30 yrs 30+ yrs	See above	M1–Present 1.0 (ref) 1.58 (0.67–3.72) 1.57 (0.82–3.01) 1.51 (0.67–3.40)			M1–Null 1.65 (0.90–3.05) 1.70 (0.76–3.82) 2.40 (1.17–4.92) 2.53 (1.24–5.16)			See above
van der Hel <i>et al.</i> (2005)	676/669	Never Former Curr <10cpd 10–20 cpd >20 cpd	See above	M1–Present 1.0 (ref) 0.92 (0.42–2.01) 0.94 (0.43–2.05) 1.08 (0.68–1.72) 0.96 (0.60–1.54)	M1–Null 1.17 (0.90–1.52) 1.99 (0.99–3.97) 0.87 (0.52–1.46) 1.13 (0.68–1.86) 1.30 (0.60–2.80)		T1–Present 1.0 (ref) 1.10 (0.57–2.11) 1.03 (0.68–1.55) 0.95 (0.61–1.46) 1.97 (0.99–3.94)	T1–Null 1.43 (1.07–1.89) 2.55 (1.10–5.90) 1.02 (0.57–1.82) 1.29 (0.76–2.20) 1.06 (0.51–2.18)		Age, cohort
NOS3										
Yang <i>et al.</i> (2007)	502/505	Never Ever		GG 1.0 (ref) 1.0 (ref)	GT 0.65 (0.43–0.97) 1.49 (0.96–2.31)	TT 0.78 (0.37–1.63) 2.06 (1.01–4.18)	GT and TT 0.67 (0.45–0.99) 1.59 (1.05–2.41)			Age, race, BMI, family history of breast cancer, age at menarche, parity, age at menopause, HRT use, fruit and vegetable consumption

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype				Controlled for
MPO								
Yang <i>et al.</i> (2007)	See above	Never Ever		GG 1.0 (ref) 1.0 (ref)	GA 0.98 (0.65–1.49) 1.35 (0.85–2.14)	AA 1.65 (0.62–4.37) 2.84 (0.73–11.1)	GG and AA 1.04 (0.70–1.55) 1.44 (0.92–2.24)	See above
MnSOD2								
Mitrunen <i>et al.</i> (2001b)	483/482	Never Ever		Val/Val 1.0 (ref) 1.0 (ref)	Val/Ala 1.6 (1.0–2.5) 4.0 (1.4–11.2)	Ala/Ala 1.2 (0.7–2.1) 3.2 (0.9–11.0)	Val/Ala or Ala/Ala 1.5 (1.0–2.3) 3.7 (1.4–9.9)	Age
Millikan <i>et al.</i> (2004)	2025/ 1812	Never A/P Passive only ≤10 years >10 to 20 >20 years		Val/Val or Val/Ala 1.0 (ref) 1.0 (0.8–1.3) 0.9 (0.7–1.3) 1.0 (0.8–1.4) 1.2 (0.9–1.5)		Ala/Ala 0.8 (0.6–1.2) 1.0 (0.7–1.3) 0.9 (0.6–1.3) 0.8 (0.6–1.4) 1.5 (1.0–2.2)		Age, race, family history, age at menarche, age at first term pregnancy/parity, alcohol
Tamimi <i>et al.</i> (2004)	968/1205	Never Former Current		Val/Val 1.0 (ref) 1.06 (0.74–1.53) 0.41 (0.21–0.81)	Val/Ala 0.79 (0.58–1.09) 0.94 (0.68–1.29) 0.83 (0.52–1.35)	Ala/Ala 0.84 (0.58–1.20) 0.95 (0.65–1.39) 1.41 (0.77–2.60)		Age, menopausal status, postmenopausal hormone use, date of blood draw, time of blood draw, fasting status, BMI weight gain, age at menarche, benign breast disease, family history of breast cancer, age at first birth/parity, age at menopause, alcohol
Gaudet <i>et al.</i> (2005)	1034/ 1084	Never Former Current		Val/Val 1.0 (ref) 1.02 (0.69–1.51) 1.30 (0.81–2.07)		Ala carrier 1.09 (1.10–1.28) 0.97 (0.72–1.31) 1.11 (0.79–1.56)		Age

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NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype				Controlled for	
DNA repair Genes									
Nucleotide Excision Repair Genes									
Mechanic <i>et al.</i> (2006)	2311/ 2022	Never A/P Passive only Former Current	African Americans					Offsets, age, age at menarche, age at first full-term pregnancy/parity composite, family history and alcohol	
			0–1 at risk genotype		2–3 at risk genotypes		≥4 at risk genotypes		
			1.0 (ref)		1.0 (ref)		1.0 (ref)		
			0.5 (0.2–1.4)		1.5 (1.0–2.2)		1.6 (0.9–2.9)		
			0.5 (0.2–1.5)		1.8 (1.1–2.9)		2.4 (1.2–4.6)		
			1.2 (0.3–3.9)		0.9 (0.6–1.5)		2.1 (1.0–2.4)		
			White						
			0–1 at risk genotype		2–3 at risk genotypes		≥4 at risk genotypes		
		Never A/P Passive only Former Current	1.0 (ref)		1.0 (ref)		1.0 (ref)		
			0.7 (0.4–1.3)		0.9 (0.6–1.3)		1.2 (0.7–2.1)		
			1.0 (0.6–1.7)		1.0 (0.7–1.5)		1.2 (0.7–2.0)		
			0.9 (0.5–1.7)		0.7 (0.4–1.0)		0.9 (0.5–1.5)		
MGMT									
Shen <i>et al.</i> (2005b)	1067/ 1110	Never Ever	Codon 84		Codon 143		Age		
			CC		CT/TT			AA	
			1.0 (ref)		1.1 (0.8–1.4)			1.0 (ref)	
			1.0 (0.8–1.2)		1.1 (0.9–1.3)		0.9 (0.7–1.1)		
XRCC1									
Duell <i>et al.</i> (2001)	AA: 253/266 White: 386/381	Never Former Current	Codon 399, African Americans				Codon 399, Whites		Age
			Arg/Gln or Gln/Gln		Arg/Arg		Arg/Gln or Gln/Gln		
			1.0 (ref)		1.0 (ref)		1.0 (ref)		
			1.4 (0.6–3.2)		2.2 (1.3–3.6)		1.0 (0.7–1.6)		
			0.4 (0.2–0.9)		1.4 (0.8–2.4)		0.9 (0.5–1.4)		
							0.9 (0.5–1.6)		
Patel <i>et al.</i> (2005)	502/502	Never Ever	Codon 194		Codon 399			BMI, age at menopause, age at menarche, alcohol, education, parity, age at first live birth, physical activity, history of breast cysts, family history of breast cancer, HRT use	
			Arg/Arg		Arg/Trp or Trp/Trp		Arg/Arg		
			1.0 (ref)		0.78 (0.43–1.40)		1.0 (ref)		
			1.0 (ref)		0.47 (0.24–0.94)		1.0 (ref)		
							Arg/Gln		
							0.91 (0.57–1.43)		
							1.06 (0.66–1.72)		
							Gln/Gln		
							0.64 (0.33–1.26)		
							2.76 (1.36–5.63)		
Shen <i>et al.</i> (2005a)	1067/ 1110	Never Ever	Did not understand results						

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype						Controlled for	
Pachkowski <i>et al.</i> (2006)	2077/ 1818	Never A/P Passive only Former Current		Codon 194		Codon 280		Codon 399		Age, race, age at menarche, age at first term pregnancy/parity, family history, alcohol	
				<i>Arg/Arg</i>	<i>Any Trp</i>	<i>Arg/Arg</i>	<i>Any His</i>	<i>Arg/Arg</i>	<i>Any Gln</i>		
				1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)		
				1.1 (0.9–1.3)	1.2 (0.7–2.0)	1.0 (0.8–1.2)	2.8 (1.4–5.7)	1.2 (0.9–1.5)	1.2 (0.9–1.3)		
				1.4 (1.1–1.7)	1.0 (0.5–1.7)	1.2 (1.0–1.5)	3.0 (1.4–6.2)	1.5 (1.1–2.0)	1.2 (0.9–1.6)		
			1.0 (0.8–1.2)	0.6 (0.3–1.1)	0.9 (0.7–1.1)	2.0 (0.9–4.6)	1.1 (0.8–1.6)	0.7 (0.5–1.0)			
Metsola <i>et al.</i> (2005)	483/482	Never A/P Passive only Ever active		Codon 280		Codon 399				Age, age at menarche, age at first term pregnancy, parity, history of benign breast disease, family history of breast cancer, waist–hip ratio, alcohol	
				<i>Arg/Arg</i>	<i>Arg/His+2His</i>	<i>Arg/Arg</i>	<i>Arg/Gln</i>	<i>Gln/Gln</i>	<i>Arg/Gln+Gln/Gln</i>		
				1.0 (ref)	1.09 (0.6–2.0)	1.0 (ref)	0.8 (0.5–1.3)	0.7 (0.3–1.6)	0.8 (0.5–1.3)		
				0.78 (0.58–1.06)	1.0 (ref)	1.11 (0.6–2.1)	1.0 (ref)	1.4 (0.8–2.3)	1.6 (0.6–4.2)		1.4 (0.9–2.3)
				0.91 (0.65–1.28)	1.0 (ref)	1.41 (0.7–3.1)	1.0 (ref)	2.1 (1.2–4.0)	3.3 (1.3–8.6)		2.3 (1.3–4.2)
XPD											
Terry <i>et al.</i> (2004)	1053/ 1102	Never Former Current		AA		AC		CC			
				1.0 (ref)		0.89 (0.67–1.19)	0.87 (0.57–1.32)				
				1.0 (ref)		1.56 (1.12–2.16)	1.16 (0.75–1.81)				
				1.0 (ref)		1.25 (0.80–1.97)	1.97 (1.02–3.81)				
Metsola <i>et al.</i> (2005)	See above	Never Passive only Active	See above	Lys/Lys	Lys/Gln	Gln/Gln	Lys/Lys+ Lys/Gln	Gln/Gln	See above		
				1.0 (ref)	1.03 (0.63–1.66)	0.78 (0.40–1.49)	1.0 (ref)	0.77 (0.43–1.39)			
				1.0 (ref)	1.35 (0.78–2.34)	0.84 (0.41–1.69)	1.0 (ref)	0.70 (0.38–1.29)			
				1.0 (ref)	0.68 (0.35–1.33)	1.96 (0.89–4.32)	1.0 (ref)	2.52 (1.27–5.03)			
XPC											
Shore <i>et al.</i> (2008)	612/612	Never Ever		XPC–PAT Wild Type/Heterozygote			XPC–PAT Homozygous variant			Race, age at menarche, ln(BMI), ln(height), family history of breast cancer, parity/age at first birth, history of bilateral oophorectomy	
				1.0 (ref)				1.02 (0.62–1.67)			
				0.85 (0.62–1.16)			1.56 (0.95–2.58)				
IGHMBP2											
Shen <i>et al.</i> (2006)	1067/ 1110	Never Current Former		AA genotype			AG+GG genotypes			Age	
				1.0 (ref)				1.1 (0.9–1.4)			
				0.2 (0.9–1.7)				1.1 (0.8–1.5)			
				0.9 (0.7–1.2)				1.1 (0.8–1.4)			

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype		Controlled for
BRCA Carriers						
Brunet <i>et al.</i> (1998)	186/186	Never Ever	1.00(ref) 1.54 (0.34–0.84)			Parity, age at first birth, age at last birth, residence
Ghadirian et al. (2004)	1097/ 1097	Never Ever	1.0 (ref) 1.05 (0.88–1.25)			none
Gronwald <i>et al.</i> (2006)	591/743	Never Ever	1.0 (ref) 1.1 (0.8–1.5)			
Colilla <i>et al.</i> (2006)	176/140	Never Ever	1.0 (ref) 0.63 (0.47–0.87)			
BCFR (2008)	195/302 128/179	Never Current Former	1.0 (ref) 1.67 (1.26–2.22) 2.08 (1.41–3.06)	BRCA1 carriers 1.0 (ref) 1.44 (0.96–2.17) 2.02 (1.31–3.10)	BRCA2 carriers 1.0 (ref) 2.02 (1.37–2.96) 2.35 (1.25–4.43)	Age, site, parity, alcohol, family history of breast or ovarian cancer
Ginsburg <i>et al.</i> (2009)	2538/ 2538	Never Ever	1.0 (ref) 1.02 (0.61–1.15)	BRCA1 carriers 1.0 (ref) 1.09 (0.95–1.24)	BRCA2 carriers 1.0 (ref) 1.09 (0.95–1.24)	OC use, parity
A–T						
Swift & Lukin (2008)			No RR’s; not a case–control			
p53						
Gammon <i>et al.</i> (1999)	378/462	Never Former Current		p53+ 1.00 (ref) 1.66 (1.02–2.70) 1.29 (0.79–2.11)	p53- 1.00 (ref) 1.18 (0.77–1.84) 0.66 (0.41–1.06)	Age, race, education, alcohol, BMI, age at first birth, parity, age at menarche, family history, prior breast biopsy, caloric intake, electric blanket/pad use
mEH						
de Assis <i>et al.</i> (2002)	267/293		Premenopausal (compared to wild–type)		Postmenopausal	Age, education, age at menarche, age at first pregnancy, BMI, family history of breast cancer, age at menopause
			Exon 3	Exon 4	Exon 3	Exon 4
		Never	YY: 1.0 (ref)	HH: 1.0 (ref)	YY: 1.0 (ref)	HH: 1.0 (ref)
		Ever	YH/HH: 1.1 (0.5–2.7)	HA/AA: 0.8 (0.3–2.0)	YH/HH: 1.1 (0.6–2.2)	HA/AA: 1.0 (0.5–1.9)
			YH/HH: 1.5 (0.7–3.3)	HA/AA: 1.6 (0.7–3.7)	YH/HH: 0.8 (0.4–1.5)	HA/AA: 1.0 (0.6–2.0)

Table 2.63. Studies of smoking and breast cancer risk by genetic subtype

NAT2	Cases/ Controls	Smoking	Study RR	RR by Genotype				Controlled for
AIB1								
Colilla <i>et al.</i> (2006)	176/140	Never Ever	See Above	No 28 allele 1.0 (ref) 0.57 (0.35–0.92)		At least one 28 allele 0.63 (0.40–1.00) 0.31 (0.25–0.58)		Year of birth, parity, height, menopausal status, OC use, Jewish ancestry
Case-only								
Basham <i>et al.</i> (2001)	3821/ 2067	Never <10 p-yrs 10–19 p-yrs 20+ p-yrs		Ile462Val 1.0 (ref) 1.1 (0.7–1.8) 1.6 (1.0–2.7) 0.7 (0.4–1.2)		Thr461Asp 1.0 (ref) 1.5 (1.0–2.2) 1.2 (0.8–2.0) 1.0 (0.6–1.6)		
ER/PR								
Yoo <i>et al.</i> (1997)	1154/ 21714	Never Ever	1.00 (ref) 1.25 (1.06–1.47)	ER+ 1.00 (ref) 1.42 (1.04–1.94)	ER- 1.00 (ref) 1.33 (0.87–2.02)	PR+ (ref) 1.73 (1.22–2.45)	PR- 1.00 (ref) 1.06 (0.73–1.54)	Age, occupation, family history, age at menarche, menstrual regularity, age at menopause, age at first term pregnancy, number of term pregnancies, average months of breast feeding, alcohol