

Table 2.17. Prevalence of HPV DNA in case series of anal cancer

Reference, study location	Method of detection ^a (types included)	No. and type of lesions	Overall HPV positivity (%) ^a	Type-specific HPV positivity (%) ^b							Multiple infections (%) ^b	Comments
				6	11	16	18	31	33	Others (type)		
Löning <i>et al</i> (1988), Germany	ISH HPV 6b, 11, 16 & 18.	2 Verrucous SCC	N=2 (100%)	N=2 (100%)	N=1 (50%)	N=0 (0%)	N=0 (0%)	N/A	N/A	N/A	N=1 (50%) (HPV6&11)	Formalin-fixed paraffin-embedded tissue samples.
		8 SCC	N=2 (25%)	N=0 (0%)	N=0 (0%)	N=2 (100%)	N=1 (50%)	N/A	N/A	N/A	N=1 (50%) (HPV16&18)	
Crook <i>et al</i> (1991), UK	SB & E7 for HPV16&18	50	N=42 (84%)	N/A	N/A	N=38 (90.5%)	N=4 (9.5%)	N/A	N/A	N/A	N=1 (2.4%) (HPV16&18)	Fresh samples.
Scholefield <i>et al</i> (1991), UK	Alkaline hydrolysis, & PCR DNA probes for HPV16	252 SCC	N=93 (37%)	N/A	N/A	N=93 (100%)	N/A	N/A	N/A	N/A	N/A	Formalin-fixed paraffin-embedded tissue samples. Samples from UK (43% HPV16+), Brazil (47% HPV16+), India (3% HPV16+), Poland (19% HPV16+), South Africa (11% HPV16+) & Switzerland (19% HPV16+).
		5 Adenocarcinomas	N=0 (0%)			N=0 (0%)						
		6 Carcinoma <i>in situ</i>	N=2 (33.3%)			N=2 (100%)						
Palefsky <i>et al</i> (1991), USA	ISH and PCR primers for 6/11, 16, 18, 31, 33 & 35. FISH	13 SCC	N=11 (84.6%)	N=2 (18.2%)		N=10 (91.0%)	N=0 (0%)	N=3 (27.3%)	N=1 (9.0%)	N/A	N/A	Formalin-fixed paraffin-embedded tissue samples.
Zaki <i>et al</i> (1992), USA	ISH for 6/11, 16/18, 31/35/51 & PCR primers for 6, 11, 16, 18 & 33	11 SCC	N=8 (72.7%)	N=1 (12.5%)	N=1 (12.5%)	N=3 (37.5%)	N=1 (12.5%)	N/A	N=0 (0%)	N=3 (37.5%)	N=1 (12.5%) (HPV16&18)	Formalin-fixed paraffin-embedded tissue samples.
Ogunbiyi <i>et al.</i> (1994), UK	E6/E7 primers for HPV16	5	N=4 (80%)	N/A	N/A	N=4 (100%)	N/A	N/A	N/A	N/A	N/A	Formalin-fixed paraffin-embedded tissue samples.
Holm <i>et al</i> (1994), Norway	ISH and PCR primers for 6/11, 16, 18, 31 & 33	74 SCC in women	N=66 (89%)	N=0 (0%)		N=0 (0%)	N=62 (93.9%)	N=2 (3%)		N=8 (12.1%)	N=6 (9.1%)	Formalin-fixed paraffin-embedded tissue samples.
		25 SCC in men	N=14 (56%)	N=0 (0%)		N=0 (0%)	N=13 (92.9%)	N=0 (0%)		N=1 (7.1%)	N=0 (0%)	

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Noffsinger <i>et al</i> (1995), Canada, China & USA	ISH for 6/11, 16/18, 31/33/35 & PCR primers for HPV 6, 16, 18	5 SCC Well-differentiated 24 SCC moderately differentiated 12 SCC poorly differentiated 13 Basaloid SCC 2 In situ carcinomas	N=26 (46.4%)	N=3 (11.5%)		N=19 (13.1%) N=4 (15.4%) (HPV16/18)	N=2 (7.7%)	N=0 (0%)		N/A	N=1 (3.8%) (HPV6 & HPV16) N=1 (3.8%) (HPV16 & HPV18)	Formalin-fixed paraffin-embedded tissue samples. In 3 cases HPV DNA was detected by PCR but not by ISH and in 2 other cases HPV DNA was detected by ISH but not by PCR. 5 samples were not tested by PCR.
Shroyer <i>et al</i> (1995), USA	PCR MY09/11 and SBH (HPV6, 11, 16, 18, 31 & 33)	11 Basaloid SCC 16 Non-basaloid SCC	N=10 (90.9%) N=12 (75%)	N=0 (0%) N=2 (16.7%)		N=7 (70%) N=10 (83.3%)	N=1 (10%) N=2 (16.7%)	N=0 (0%) N=0 (0%)	N=1 (10%) N=0 (0%)	N=2 (20%) (HPV _x) N=0 (0%)	N=1 (10%) (HPV16&18) N=1 (18.3%) (HPV6/11&18) N=1 (18.3%) (HPV16&18)	Formalin-fixed paraffin-embedded tissue samples.
Williams <i>et al</i> (1996), UK	ISH for 6/11,16/18	8 margin anal carcinomas 27 canal anal carcinomas	N=2 (25%) N=22 (81.5%)	N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%)	N=2 (100%) N=22 (100%)	N=0 (0%) N=0 (0%)	N/A N/A	N/A N/A	N/A N/A	N/A N/A	Formalin-fixed paraffin-embedded tissue samples. There was no positive or negative correlation between HPV DNA expression and ductal differentiation or neutral mucin production. A correlation between HPV DNA and a mixed basaloid morphology vs purely SCC (20/24, 83.3% vs 6/11, 54.5%) was found.
Vincent-Salomon <i>et al</i> (1996), France	SBH for 6/11/42, 16/18/33, 31/35/39 and PCR specific for 6/11, 16, 18, 33	18 Keratinizing SCC 9 Basaloid SCC 1 in situ Carcioma 1 Paget's disease	N=12 (66.7%) N=8 (88.9%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=12 (100%) N=5 (62.5%) N=0 (0%) N=0 (0%)	N=0 (0%) N=2 (25%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=1 (12.5%) (HPV _x) N=0 (0%) N=0 (0%)	N=0 (0%)	Frozen sample of tumor tissue.

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Ramanujam <i>et al</i> (1996), USA	ISH HPV 6,11,16,18,31, 33,35	26 anal SC	N=8 (30.7%)	N=0 (0%)		N=8 (100%)		N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	Formalin-fixed paraffin-embedded tissue samples.
		27 perianal SC	N=10 (37%)	N=6 (60%)		N=4 (40%)						
Frisch <i>et al</i> (1997), Denmark & Sweden	PCR GP5+/6+ and specific genotyping for HPV6, 11, 16, 18, 31 & 33	324 (262 SCC and 62 <i>in situ</i> SCC in women)	N=282/304 (92.7%)	N=3 (1.1%)	N=0 (0%)	N=235 (83.3%)	N=18 (6.4%)	N=3 (1.1%)	N=20 (7.1%)	N=8 (2.8%) (HPV40, 42, 43 & 44)	N/A	Formalin-fixed paraffin-embedded tissue samples.
		93 (87 SCC and 6 <i>in situ</i> SCC in men)	N=58/84 (69%)	N=2 (3.4%)	N=0 (0%)	N=48 (82.7%)	N=4 (6.9%)	N=0 (0%)	N=3 (5.2%)	N=3 (5.2%) (HPV40, 42, 43 & 44)	N/A	
Poletti <i>et al.</i> (1998), Switzerland	PU-1M (Fujinaga 91) for HR 16, 18, 31, 33, 52 & 58. PU-31B (Fujinaga 91) for LR 6 & 11	33	N=13 (39.4%)	N=1 (7.69%)		N=12 (92.3%) (HPV16/18/31/33/52/58)						Formalin-fixed paraffin-embedded tissue samples. 10 of these patients (26.3%) had also cervical lesions (some cervical carcinomas) associated with HPV.
Lai <i>et al.</i> (1998), China	PCR MY09/11 and DBH (HPV6, 11, 16, 18 & 33)	19 SCC	N=1 (5%)	N=0 (0%)	N=0 (0%)	N=1 (100%)	N=0 (0%)	N/A	N=0 (0%)	N/A	N=0 (0%)	Formalin-fixed paraffin-embedded tissue samples. 23 rectal adenocarcinomas also tested.
		8 Cloagenic SCC	N=0 (0%)			N=0 (0%)						
		23 Adenocarcinoma	N=0 (0%)			N=0 (0%)						
		6 Adenosquamous Carcinoma	N=0 (0%)			N=0 (0%)						
		16 Other types of Carcinoma	N=0 (0%)			N=0 (0%)						

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Frisch <i>et al.</i> (1999), Denmark & Sweden	PCR GP5+/6+ (HR HPV16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 & 68) and (LR HPV6, 11, 40, 42, 43 & 44). HPV-typing for HPV16, 18, 31 & 33	253 Women & anal canal and perianal skin cancer	N=228 (90%)	N=0 (0%)	N=0 (0%)	N=241 (87%)	N=19 (7%)	N=3 (1%)	N=16 (6%)	N=5 (2%)	N=3 (1%) (HPV16&18) N=4 (1.4%) (HPV18%33)	Formalin-fixed paraffin-embedded tissue samples.
		67 Heterosexual men & anal canal and perianal skin cancer	N=38 (58%)									
		11 Homosexual men & anal canal and perianal skin cancer	N=11 (100%)									
		(*) N=56/222 Women perianal skin cancer (25%)	N=45 (80%)									
		(*) N=25/54 Heterosexual men perianal skin cancer (46%)	N=7 (28%)									
Indinnimeo <i>et al.</i> (1999), Italy	PCR for HPV6/11, 16, 18, 31/33	7 SCC	N=5 (71.4%)	N=0 (0%)	N=0 (0%)	N=2 (40%)	N=0 (0%)	N=3 (60%)		N=0 (0%)	N=0 (0%)	Fresh samples. Women and heterosexual men.
		7 Cloacogenic SCC	N=4 (57.1%)			N=4 (100%)		N=0 (0%)				

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Youk <i>et al.</i> (2001), Korea	MY09/11, L1C1/L1C2 and Type specific for HPV16&18	15 SCC 6 Cloacogenic	N=21 (100%)	N/A	N/A	N=21 (100%)	N=0 (0%)	N/A	N/A	N/A	N/A	Formalin-fixed paraffin-embedded tissue samples. 14 heterosexual male, 7 female. 34 control samples, all HPV negative.
Daling <i>et al.</i> (2004), USA	MY09/11 for 6/11, 16, 18/45, 31	81 SCC in men (45.25%)	N=75 (92.6%)	N/A	N/A	N=63 (84%)	N=6 (8%)	N/A	N/A	N/A	N/A	Formalin-fixed paraffin-embedded tissue samples. Only data for HPV16 and HPV18 shown. 13 samples were from the rectum (N=10 (77%) HPV+), 73 samples were from the anal canal (N=67 (91.8%) HPV+), 19 samples were from the anus NOS (N=16 (84.2%) HPV+), 73 samples were from the Anorectum (N=64 (87.7%) HPV+) and 70 samples were from the skin (N=61 (87.1%) HPV+).
		98 SCC in women (54.75%)	N=90 (91.8%)			N=73 (81.1%)	N=10 (11.1%)					
		6 Cloacogenic/Basaloid SCC in men (14.6%)	N=6 (100%)	N=0 (0%)	N=0 (0%)	N=6 (100%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	
		35 Cloacogenic/Basaloid SCC in women (85.4%)	N=34 (97.1%)	N/A	N/A	N=33 (97%)	N=0 (0%)	N/A	N/A	N/A	N/A	
		8 Adenocarcinoma in men (40%)	N=2 (25%)	N=0 (0%)	N=0 (0%)	N=1 (50%)	N=1 (50%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	
		12 Adenocarcinoma in women (60%)	N=6 (50%)	N/A	N/A	N=2 (33.3%)	N=0 (0%)	N/A	N/A	N/A	N/A	
		3 Basal cell Carcinoma in men (73%)	N=2 (66.7%)	N/A	N/A	N=1 (50%)	N=0 (0%)	N/A	N/A	N/A	N/A	
Daling <i>et al.</i> (2004), USA	MY09/11 for 6/11, 16, 18/45, 31	1 Basal cell Carcinoma in woman (25%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	
		1 Melanoma (Man)	N=1 (100%)	N/A	N/A	N=0 (0%)	N=0 (0%)	N/A	N/A	N/A	N/A	
		2 Kaposi Sarcoma (Men)	N=2 (100%)	N=0 (0%)	N=0 (0%)	N=2 (100%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	
		1 Sarcoma (Man)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	N=0 (0%)	

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Varnai <i>et al.</i> (2006), Germany	PCR GP5+/6+ and MY09/11	13 Male Anal SCC 34 Female Anal SCC	N=38 (80.9%)	N=0 (0%)	N=0 (0%)	N=35 (92.1%)	N=1 (2.6%)	N=1 (2.6%)	N=3 (7.9%)	N=1 (2.6%) (HPV45)	N=1 (2.6%) (HPV16&31) N=1 (2.6%) (HPV16&33) N=1 (2.6%) (HPV18&45)	Formalin-fixed paraffin-embedded tissue samples.
Kagawa <i>et al.</i> (2006), Japan.	PCR and genotyping for HPV6, 11, 16, 18, 31, 33, 42, 52 & 58. ISH	3 SCC in men 5 SCC in women	N=3 (100%) N=4 (80%)	N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%)	N=3 (100%) N=4 (80%)	N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%)	Formalin-fixed paraffin-embedded tissue samples. Initially were 20 samples (9 men and 11 women)
Tachezy <i>et al.</i> (2007), Czech Republic	PCR GP5+/6+ and type-specific genotyping	10 SCC 8 Basaloid SCC 4 Basaloid & Squamous mix SCC 5 Tubulary Adenocarcinoma	N=8 (80%) N=6 (75%) N=4 (100%) N=1 (20%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=8 (100%) N=6 (100%) N=4 (100%) N=1 (100%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	N=0 (0%) N=0 (0%) N=0 (0%) N=0 (0%)	Formalin-fixed paraffin-embedded tissue samples.
Laytragoon-Lewin <i>et al.</i> (2007), Sweden	PCR MY09/11 & GP5+/6+	56 female anal SCC 16 male anal SCC	N=65 (90.3%)	N=0 (0%)	N=0 (0%)	N=50 (77%)	N=25 (38.5%)	N=0 (0%)	N=2 (3%)	N=0 (0%)	N=12 (18.5%) (HPV16&18)	Formalin-fixed paraffin-embedded tissue samples.

a. percentages given are percentages of HPV positives among all samples.

b. percentages given are percentages of HPV types among HPV positives cases.