

Diseases associated with AR CAG tract length variation

Direct association	CAG tract	Androgen sensitivity	Gain of function - possible causes	Symptoms	Reference
SBMA	≥ 38	Reduced	1-Misfolding 2-Truncation 3-Aggregation 4-Sequestration of AR protein / transcription factors 5-Proteosome inhibition 6-Mitochondrial dysfunction 7-Ligand driven 8-Impairment of autophagy 9-Interruption of axonal transport	1-Adult onset motor neuropathy of proximal muscles of hip and shoulder 2-Hypogonadism results in gynecomastia and testicular atrophy	Beitel et al. (2005) Neurotox Res 7:219-230
Indirect association			Associated risk factors	Comments	
1. Cancers					
Prostate	^a Shorter length	Increased	1-Ethnicity 2-Family history	Inconclusive studies - possible somatic alterations	Rajender et al. (2007) Asian J Urology 9: 147-179
Ovarian	^a Shorter length	Increased	BRCA mutation carriers ?	Inconclusive studies- possible somatic alterations	Rajender et al. (2007) Asian J Urology 9: 147-179
Endometrial	^a Longer length	Reduced		Inconclusive studies- possible somatic alterations	Rajender et al. (2007) Asian J Urology 9: 147-179
Female breast	^a Longer & shorter length	Reduced & increased	BRCA1 mutation carriers ?	Inconclusive and confusing studies - possible somatic alterations	Rajender et al. (2007) Asian J Urology 9: 147-179 Sircar et al. (2005) Cancer Res
Colorectal	^a Shorter length	Increased		Selective growth advantage - somatic alterations & somatic mosaicism	Ferro et al., (2002) Mol. Cell. Endocr. 193: 109-120 Di Fabio et al., (2009) J Surg Res 154:38-44.
Esophageal	^a Shorter Length	Increased	Ethnicity	Inconclusive studies- except in African males	Dietzch et al., (2003) Int. J. Cancer. 107: 38-45
Head & Neck	^a Longer length	Increased			dos Santos et al. (2004) Oral Oncol 40: 177-182
2. Other diseases, & abnormal traits					
Male infertility	^a Longer length	Reduced	Ethnicity	Many studies inconclusive- 1 study (Japanese) - shorter length significant	Rajender et al. (2007) Asian J Urology 9: 147-179
Bone & Mineral Density	^a Longer & shorter length	Reduced	Gender	Inconclusive studies- possible gender differences	Rajender et al. (2007) Asian J Urology 9: 147-179

Endometriosis & uterine leiomyoma	^a Shorter length	Increased		Asian Indian population	Shaik et al. (2009) Hematol Oncol Stem Cell Ther 2:289-293
Acne, hirsutism and alopecia	^a Shorter length	Increased		Found in both men & women	Sawaya et al. (1998) J Cutan Med Surg 3:9-15
Alzheimer's Disease	^a Shorter length	Increased	Gender	No association seen in women	Lehmann et al. (2003) Neurosci Lett 340:87-90
Arthritis	^a Shorter length	Increased	Gender	Associated with younger age of onset	Kawasaki et al. (1999) Ann Rheum Dis 58:500-502
Platelet reactivity	^a Longer length	Reduced		Eastern European population	Kukiezkowski et al. (2009) Thrombosis Res
Hypertension	^a Shorter length	Increased	Gender	Hypertension due to higher modulation of vasomotor tone	Pausova et al. (2010) Hypertension 55: 706 - 714.
Muscle & adipose tissue changes	Shorter length	Increased	Gender	Increase in thigh & lower back muscle. Decrease in adipose tissues	Neilsen et al. (2010) Eur J Endocrinol
Autism	^a Shorter length	Increased	Gender	Increased disease in females only	Henningsson et al. (2009) Psychoneuroendocrin 34:752-761.
Personailty traits	^a Shorter length	Increased	Gender	Associated with neuroticism and extraversion	Westberg et al. (2009) J Psychiatry Neurosci 34:205-13
Violent criminal behaviour	^a Shorter length	Increased	Gender	Associated with both rape and murder	Rajender et al. (2008) Int J Legal Med 122:367-372

^aShorter and longer length CAG repeats are significantly shorter and longer than the average control CAG repeat lengths values (between 21-22).