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Hydrological response of an afforested catchment in a Mediterranean humid mountain area: a comparative study with a natural forest

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DOI

[10.1002/hyp.10820](https://doi.org/10.1002/hyp.10820)

Publication date

2016

Document Version

Final published version

Published in

Hydrological Processes

License

Article 25fa Dutch Copyright Act

[Link to publication](#)

Citation for published version (APA):

Nadal-Romero, E., Cammeraat, E., Serrano-Muela, M. P., Lana-Renault, N., & Regüés, D. (2016). Hydrological response of an afforested catchment in a Mediterranean humid mountain area: a comparative study with a natural forest. *Hydrological Processes*, 30(15), 2717-2733. <https://doi.org/10.1002/hyp.10820>

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Supplementary webappendix

This webappendix formed part of the original submission and has been peer reviewed.
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Supplement to: Pitkänen A, Löscher W, Vezzani A, et al. Advances in the development of biomarkers for epilepsy. *Lancet Neurol* 2016; **15**: 843–56.

Supplementary Table 1. Comprehensive list of genes with allelic variants related to the increased susceptibility to develop epilepsy after acquired brain insults. The gene list was generated based on PubMed search in November 2015. **Abbreviations:** VNTR: variable number tandem repeats, DNP: Dinucleotide polymorphism, TBI: traumatic brain injury, PTS: Posttraumatic seizures, TLE: Temporal lobe epilepsy. MTLE-FS+: Mesial temporal lobe epilepsy with febrile seizures plus.

Gene	SNP or polymorphism	Function & Relevance
Post-traumatic epilepsy		
<i>ADORA1</i> , adenosine A1 receptor	rs3766553 rs10920573	Inhibitory neuromodulation, antiseizure properties; rs3766553 associated with latency to PTS, rs10920573 associated with late PTS occurrence. ¹
<i>APOE</i> , apolipoprotein E	ε4 status	Binding, internalization, and catabolism of lipoprotein particles; ε4 allele increases risk of posttraumatic seizures following TBI. ²
<i>GAD1</i> , glutamic acid decarboxylase	rs3828275 rs769391 rs3791878	Inhibitory neurotransmission, enzyme catalyzing of GABA production from L-glutamic acid; rs3828275 associated with risk of early (< 1 wk) PTS after TBI; rs769391 and rs3791878 associated with risk of PTS > 1 wk – 6 mo post TBI. ³
<i>IL-1β</i> , interleukin 1β	rs1143634	Proinflammatory cytokine; CT genotype associated with decreased serum <i>IL-1β</i> levels, higher IL-1β CSF/serum ratios, and increased risk of PTE after TBI. ⁴
<i>MTHFR</i> , methylene-tetrahydrofolate reductase	rs1801133	TT genotype is linked to increased plasma/serum levels of pro-convulsive homocysteine; predisposes for epilepsy following TBI in military personnel ⁵ .
Post-stroke epilepsy		
<i>CD40</i> , CD40 molecule, TNF receptor superfamily 5	rs1883832	Proinflammatory action; T allele associated with increased sCD40L plasma levels, CD40 mRNA expression in peripheral blood mononuclear cells and with increased PSE susceptibility ⁶ .
<i>ALDH2</i> , mitochondrial aldehyde dehydrogenase 2	rs671	Alcohol metabolism, protects against oxidative stress; A allele associated with higher plasma levels of oxidative stress marker 4-hydroxy-2-nonenal (4-HNE), and more frequent in PSE patients ⁷ .
Other (etiology non-specified)		
<i>AQP4</i> , aquaporin 4	ss119336753 ss119336753 rs1058424	Glial water channel; Combination of three SNPs in <i>AQP4</i> together with two SNPs in the <i>KCNJ10</i> gene associated with TLE ⁸ .
<i>ALDH5A1</i> , aldehyde dehydrogenase 5 family, member A1	rs1883415	Metabolism of GABA; C allele influencing Egr-3 binding to <i>ALDH5A1</i> promoter and resulting in higher <i>ALDH5A1</i> mRNA expression is more frequent in TLE patients. ⁹
<i>ASIC1a</i> , acid-sensing ion channel 1a	rs844347	Ligand-gated cation channel activated by extracellular H ⁺ enhancing neuronal excitability; A allele more frequent in TLE patients. ¹⁰
<i>BDNF</i> , brain-derived neurotrophic factor	Rs6265	Neurotrophin; Met66 allele frequency lower in TLE. ¹¹

<i>CALHM1, Ca²⁺ homeostasis modulator 1</i>	rs11191692	Ca ²⁺ channel involved in Ca ²⁺ homeostasis and processing of APP; A allele frequency increased in TLE patients. ¹²
<i>CAMSAP1L1, calmodulin regulated spectrin-associated protein family 2</i>	rs6660197	Cytoskeletal protein regulating organization of cellular organelles; associated with susceptibility to epilepsy in Chinese population. ¹³
<i>C3, complement complement C3</i>	DNP: GF100472	Complement activation, participates in synapse elimination during development and adult neurogenesis, increased expression in TLE; associated with susceptibility to MTLE-FS+. ¹⁴
<i>GABRB1, GABA_Areceptor, Beta 1</i>	G1465A	GABA _A receptor subunit; associated with TLE, A-allele increases risk of mTLE. ¹⁵⁻¹⁷
<i>GABRB2, GABA_Areceptor, Beta 2</i>	rs967932	GABA _A receptor subunit; A allele increases risk of mTLE. ¹⁸
<i>GABRB3, GABA_Areceptor, Beta 3</i>	rs4906902	GABA _A receptor subunit; G allele influencing MEF-2 binding to GABRB3 promoter overrepresented in mTLE patients with depression. ⁹
<i>GABRG2, GABA_A receptor, Gamma 2</i>	rs211037 rs210987	GABA _A receptor subunit; rs211037 associated with occurrence of symptomatic epilepsy and partial seizures and rs210987 associated with symptomatic epilepsy in Chinese population. ^{19,20}
<i>SLC6A4, serotonin transporter</i>	VNTR in 2nd intron	Serotonin transporter; association of frequency of the 10 repeat in TLE patients (conflicting results). ^{21,22}
<i>HTR1B, serotonin receptor 1B</i>	rs6296	Serotonin receptor; G allele overrepresented in TLE patients. ²³
<i>SESN3, sestrin 3</i>	rs10501829	Stress responsive protein; rs10501829 in the vicinity of SESN3. SESN3 expression correlates with transcription module relevant for TLE. ²⁴
<i>IL1A (IL-1α), interleukin 1α</i>	rs1800587	Proinflammatory cytokine; associated with hippocampal sclerosis in TLE patients. ²⁵
<i>IL1B (IL-1β), interleukin 1β</i>	rs16944	Proinflammatory cytokine; associated with hippocampal sclerosis in TLE patients. ^{26,27}
<i>IL-1RA, IL-1 receptoragonist</i>	VNTR in exon 2	Differences between controls and TLE-HS- patients. ²⁵
<i>KCNJ10 (Kir4.1), inwardly rectifying K⁺ channel</i>	rs1130183	ATP-sensitive inward rectifier K ⁺ channel 10; missense variation in KCNJ10 or a variation in close vicinity is related to general seizure susceptibility. ²⁸
<i>NRG1, neuregulin 1</i>	rs35753505	Membrane glycoprotein mediating cell-cell signaling; associated with TLE in males. ²⁹
<i>NFE2L2, Nuclear Factor, Erythroid 2-Like 2 (Nrf2)</i>	rs7557529– rs35652124– rs6706649– rs6721961– rs2886161– rs1806649– rs2001350–	Transcription factor regulating the expression of many genes in antioxidant pathway; the haplotype AAGC AGAGG was associated with an increased risk of TLE. ³⁰

	rs10183914– rs2706110	
<i>PRNP, prion protein</i>	rs1799990	Cu ²⁺ -binding membrane sialoglycoprotein involved in protection against oxidative stress, cell adhesion, differentiation, and survival in the CNS; V allele overrepresented in women with moderate TLE. ³¹
<i>PDYN, prodynorphin</i>	VNTR in the promoter	Anticonvulsant peptide; low expression allele associated with increased risk of TLE in patients with family history of seizures. ³²
<i>SCN1A, Na_v1.1 Na⁺ channel alpha subunit</i>	rs6732655	Voltage-gated Na ⁺ channel; mutations reported in a range of paroxysmal neurological disorders including familial hemiplegic migraine and rarely in focal epilepsies; locus relates to an all-epilepsy group. ³³
<i>PCDH7, protocadherin 7</i>	rs28498976	Integral membrane protein with putative function in cell-cell recognition and adhesion; mutations in other protocadherins, i.e. PCDH19, cause epilepsy and mental retardation; locus relates to an all-epilepsy group. ³³
<i>RORA, RAR-related orphan receptor A</i>	rs12912233	Nuclear hormone receptor; rs12912233 alone associated with epilepsy in Malaysians and having synergistic effect with RORA rs880626 and SCN1A rs3812718. ³⁴
<i>TIMP4, tissue inhibitor of metallo-proteinase 4</i>	rs3755724	Inflammation-induced factor; associated with susceptibility to focal epilepsy in Malaysian population. ³⁵

References

1. Wagner AK, Miller MA, Scanlon J, Ren D, Kochanek PM, Conley YP. Adenosine A1 receptor gene variants associated with post-traumatic seizures after severe TBI. *Epilepsy Res* 2010; **90**: 259-72.
2. Diaz-Arrastia R, Gong Y, Fair S, Scott KD, Garcia MC, Carlile MC, Agostini MA, Van Ness PC. Increased risk of late posttraumatic seizures associated with inheritance of APOE epsilon4 allele. *Arch Neurol* 2003; **60**: 818-822.
3. Darrah SD, Miller MA, Ren D, Hoh NZ, Scanlon JM, Conley YP, Wagner AK. Genetic variability in glutamic acid decarboxylase genes: associations with post-traumatic seizures after severe TBI. *Epilepsy Res* 2013; **103**: 180-194
4. Diamond ML, Ritter AC, Failla MD, Boles JA, Conley YP, Kochanek PM, Wagner AK. IL-1 β associations with posttraumatic epilepsy development: A genetics and biomarker cohort study. *Epilepsia* 2015; **56**: 991-1001
5. Scher AI, Wu H, Tsao JW, Blom HJ, Feit P, Nevin RL, Schwab KA. MTHFR C677T genotype as a risk factor for epilepsy including post-traumatic epilepsy in a representative military cohort. *J Neurotrauma* 2011; **28**: 1739-1745.
6. Zhang B, Chen M, Yang H, Wu T, Song C, Guo R. Evidence for involvement of the CD40/CD40L system in post-stroke epilepsy. *Neurosci Lett* 2014; **567**: 6-10.
7. Yang H, Song Z, Yang GP, Zhang BK, Chen M, Wu T, Guo R. The ALDH2 rs671 polymorphism affects post-stroke epilepsy susceptibility and plasma 4-HNE levels. *PLoSOne* 2014; **9**: e109634.
8. Heuser K, Nagelhus EA, Tauboll E, Indahl U, Berg PR, Lien S, Nakken S, Gjerstad L, Ottersen OP. Variants of the genes encoding AQP4 and Kir4.1 are associated with subgroups of patients with temporal lobe epilepsy. *Epilepsy Res* 2010; **88**: 55-64.

9. Pernhorst K, Raabe A, Niehusmann P, van Loo KM, Grote A, Hoffmann P, Cichon S, Sander T, Schoch S, Becker AJ. Promoter variants determine gamma-aminobutyric acid homeostasis-related gene transcription in human epileptic hippocampi. *J Neuropathol Exp Neurol* 2011; **70**: 1080-1088.
10. Lv RJ, He JS, Fu YH, Zhang YQ, Shao XQ, Wu LW, Lu Q, Jin LR, Liu H. ASIC1a polymorphism is associated with temporal lobe epilepsy. *Epilepsy Res* 2011; **96**: 74-80.
11. Shen N, Zhu X, Lin H, Li J, Li L, Niu F, Liu A, Wu X, Wang Y, Liu Y. Role of BDNF Val66Met functional polymorphism in temporal lobe epilepsy. *Int J Neurosci* 2016; **126**: 436-41.
12. Lv RJ, He JS, Fu YH, Shao XQ, Wu LW, Lu Q, Jin LR, Liu H. A polymorphism in CALHM1 is associated with temporal lobe epilepsy. *Epilepsy Behav* 2011; **20**: 681-685.
13. Guo Y, Baum LW, Sham PC, Wong V, Ng PW, Lui CH, Sin NC, Tsoi TH, Tang CS, Kwan JS, Yip BH, Xiao SM, Thomas GN, Lau YL, Yang W, Cherny SS, Kwan P. Two-stage genome-wide association study identifies variants in CAMSAP1L1 as susceptibility loci for epilepsy in Chinese. *Hum Mol Genet* 2012; **21**: 1184-9.
14. Jamali S, Salzmann A, Perroud N, Ponsole-Lenfant M, Cillario J, Roll P, Roedel-Trevisiol N, Crespel A, Balzar J, Schlachter K, Gruber-Sedlmayr U, Pataraia E, Baumgartner C, Zimprich A, Zimprich F, Malafosse A, Szepietowski P. Functional variant in complement C3 gene promoter and genetic susceptibility to temporal lobe epilepsy and febrile seizures. *PLoSOne*. 2010; **5**: e12740.
15. Kauffman MA, Levy EM, Consalvo D, Mordoh J, Kochen S. GABABR1 (G1465A) gene variation and temporal lobe epilepsy controversy: new evidence. *Seizure* 2008; **17**: 567-571.
16. Xi B, Chen J, Yang L, Wang W, Fu M, Wang C. GABBR1 gene polymorphism(G1465A) is associated with temporal lobe epilepsy. *Epilepsy Res* 2011; **96**: 58-63.
17. Gambardella A, Manna I, Labate A, Chifari R, La RA, Serra P, Cittadella R, Bonavita S, Andreoli V, Lepiane E, Sasanelli F, Di CA, Zappia M, Tedeschi G, Aguglia U, Quattrone A. GABA(B) receptor 1 polymorphism (G1465A) is associated with temporal lobe epilepsy. *Neurology* 2003; **60**: 560-563.
18. Wang X, Sun W, Zhu X, Li L, Wu X, Lin H, Zhu S, Liu A, Du T, Liu Y, Niu N, Wang Y, Liu Y. Association between the gamma-aminobutyric acid type B receptor 1 and 2 gene polymorphisms and mesial temporal lobe epilepsy in a Han Chinese population. *Epilepsy Res* 2008; **81**: 198-203.
19. Haerian BS, Baum L, Kwan P, Cherny SS, Shin JG, Kim SE, Han BG, Tan HJ, Raymond AA, Tan CT, Mohamed Z. Contribution of GABRG2 Polymorphisms to Risk of Epilepsy and Febrile Seizure: a Multicenter Cohort Study and Meta-analysis. *Mol Neurobiol* 2015; DOI: 10.1007/s12035-015-9457-y
20. Balan S, Sathyan S, Radha SK, Joseph V, Radhakrishnan K, Banerjee M. GABRG2, rs211037 is associated with epilepsy susceptibility, but not with antiepileptic drug resistance and febrile seizures. *Pharmacogenet Genomics* 2013; **23**: 605-610.
21. Manna I, Labate A, Gambardella A, Forabosco P, La RA, Le PE, Aguglia U, Quattrone A. Serotonin transporter gene (5-Htt): association analysis with temporal lobe epilepsy. *Neurosci Lett* 2007; **421**: 52-56.
22. Li J, Lin H, Zhu X, Li L, Wang X, Sun W, Wu X, Liu A, Niu F, Wang Y, Liu Y. Association study of functional polymorphisms in serotonin transporter gene with temporal lobe epilepsy in Han Chinese population. *Eur J Neurol* 2012; **19**: 351-353.
23. Stefulj J, Bordukalo-Niksic T, Hecimovic H, Demarin V, Jernej B. Epilepsy and serotonin (5HT): variations of 5HT-related genes in temporal lobe epilepsy. *Neurosci Lett* 2010; **478**: 29-31.

24. Johnson MR, Behmoaras J, Bottolo L, Krishnan ML, Pernhorst K, Santoscoy PL, Rossetti T, Speed D, Srivastava PK, Chadeau-Hyam M, Hajji N, Dabrowska A, Rotival M, Razzaghi B, Kovac S, Wanisch K, Grillo FW, Slaviero A, Langley SR, Shkura K, Roncon P, De T, Mattheisen M, Niehusmann P, O'Brien TJ, Petrovski S, von Lehe M, Hoffmann P, Eriksson J, Coffey AJ, Cichon S, Walker M, Simonato M, Danis B, Mazzuferi M, Foerch P, Schoch S, De Paola V, Kaminski RM, Cunliffe VT, Becker AJ, Petretto E. Systems genetics identifies Sestrin 3 as a regulator of a proconvulsant gene network in human epileptic hippocampus. *Nat Commun* 2015; **6**: 6031
25. Salzmänn A, Perroud N, Crespel A, Lambercy C, Malafosse A. Candidate genes for temporal lobe epilepsy: a replication study. *Neurol Sci* 2008; **29**: 397-403.
26. Kanemoto K, Kawasaki J, Yuasa S, Kumaki T, Tomohiro O, Kaji R, Nishimura M. Increased frequency of interleukin-1 β -511T allele in patients with temporal lobe epilepsy, hippocampal sclerosis, and prolonged febrile convulsion. *Epilepsia* 2003; **44**: 796-799.
27. Kanemoto K, Kawasaki J, Miyamoto T, Obayashi H, Nishimura M. Interleukin (IL)1 β , IL-1 α , and IL-1 receptor antagonist gene polymorphisms in patients with temporal lobe epilepsy. *Ann Neurol* 2000; **47**: 571-574.
28. Buono RJ, Lohoff FW, Sander T, Sperling MR, O'Connor MJ, Dlugos DJ, Ryan SG, Golden GT, Zhao H, Scattergood TM, Berrettini WH, Ferraro TN. Association between variation in the human KCNJ10 potassium ion channel gene and seizure susceptibility. *Epilepsy Res* 2004; **58**: 175-183.
29. Zhu WY, Jiang P, He X, Cao LJ, Zhang LH, Dang RL, Tang MM, Xue Y, Li H. Contribution of NRG1 Gene Polymorphisms in Temporal Lobe Epilepsy. *J Child Neurol* 2016; **31**: 271-76.
30. Liu Z, Yin X, Liu L, Tao H, Zhou H, Ma G, Cui L, Li Y, Zhang S, Xu Z, Yao L, Cai Z, Zhao B, Li K. Association of KEAP1 and NFE2L2 polymorphisms with temporal lobe epilepsy and drug resistant epilepsy. *Gene* 2015; **571**: 231-236.
31. Labate A, Manna I, Gambardella A, Le PE, La RA, Condino F, Cittadella R, Aguglia U, Quattrone A. Association between the M129V variant allele of PRNP gene and mild temporal lobe epilepsy in women. *Neurosci Lett* 2007; **421**: 1-4.
32. Stogmann E, Zimprich A, Baumgartner C, Aull-Watschinger S, Holtt V, Zimprich F. A functional polymorphism in the prodynorphin gene promoter is associated with temporal lobe epilepsy. *Ann Neurol* 2002; **51**: 260-263.
33. International League Against Epilepsy Consortium on Complex Epilepsies. Genetic determinants of common epilepsies: a meta-analysis of genome-wide association studies. *Lancet Neurol* 2014; **13**: 893-903.
34. Haerian BS, Sha'ari HM, Tan HJ, Fong CY, Wong SW, Ong LC, Raymond AA, Tan CT, Mohamed Z. RORA gene rs12912233 and rs880626 polymorphisms and their interaction with SCN1A rs3812718 in the risk of epilepsy: a case-control study in Malaysia. *Genomics* 2015; **105**: 229-36
35. Haerian BS, Sha'ari HM, Fong CY, Tan HJ, Wong SW, Ong LC, Raymond AA, Tan CT, Mohamed Z. Contribution of TIMP4 rs3755724 polymorphism to susceptibility to focal epilepsy in Malaysian Chinese. *J Neuroimmunol* 2015; **278**: 137-43.