

Epitope coding region

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Allele 1 (140) 1 :TGTATTTTTCTATTAATACCAGGCCCTGACTCGAAACCAATATTCTTCAAAAACGACGGAGATAAAATTTTACGTTTCGTAGGGTATCCAAAGGTTAAAGAAGAAATGCTAGAAATGGCTACAAAATTCA
Allele 10 (11) 1 :TGTATTTTTCTATTAATACCAGGCCCTGACTCGAAACCAATATTCTTCAAAAACGACGGAGATAAAATTTTACGTTTCGTAGGGTATCCAAAGGTTAAAGAAGAAATGCTAGAAATGGCTACAAAATTCA
Allele 43 (40) 1 :TGCTATTTTTCTATTAATACCAGGCCCTGACTCGAAACCTATATTCTTCAAAAACGACGGAGATAAAATTTTACGTTTCGTAGGGTATCCAAAGGTTAAAGAAGAAATGCTAGAAATGGCTACAAAATTCA
Allele 44 (22) 1 :TGTATTTTTCTATTAATACCAGGCCCTGACTCGAAACCAATATTCTTCAAAAACGACGGAGATAAAATTTTACGTTTCGTAGGGTATCCAAAGGTTAAAGAAGAAATGCTAGAAATGGCTACAAAATTCA
Allele 45 (7) 1 :TGCTATTTTTCTATTAATACCAGGCCCTGACTCGAAACCTATATTCTTCAAAAACGACGGAGATAAAATTTTACGTTTCGTAGGGTATCCAAAGGTTAAAGAAGAAATGCTAGAAATGGCTACAAAATTCA
Allele 46 (5) 1 :TGTATTTTTCTATTAATACCAGGCCCTGACTCGAAACCAATATTCTTCAAAAACGACGGAGATAAAATTTTACGTTTCGTAGGGTATCCAAAGGTTAAAGAAGAAATGCTAGAAATGGCTACAAAATTCA
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Allele 1 (140) 131 :ATAGACTACCAAAGGGCGTGGAATACCTGCACCTCCAGGAGTAAAACAGAGGCTCCACACCTACACCAACGACAATAACTCCTTCTGTACCTCCTACTATACCAACGCCAATAACTCCTTCTGCACC
Allele 10 (11) 131 :ATAGACTACCAAAGGGCGTGGAATACCTGCACCTCCAGGAGTAAAACAGAGGCTCCACACCTACACCAACGACAATAACTCCTTCTGTACCTCCTACTATACCAACGCCAATAACTCCTTCTGCACC
Allele 43 (40) 131 :ATAGACTACCAAAGGGCATGGAATACCTGCACCTCCAGGAGTAAAACAGAGGCTCCACACCTACACCAACGACAATAACTCCTTCTGTACCTCCTACTATACCAACTCCAATAACTCCTTCTGCACC
Allele 44 (22) 131 :ATAGACTACCAAAGGGCATGGAATACCTGCACCTCCAGGAGTAAAACAGAGGCTCCACACCTACACCAACGACAATAACTCCTTCTGTACCTCCTACTATACCAACGCCAATAACTCCTTCTGCACC
Allele 45 (7) 131 :ATAGACTACCAAAGGGCATGGAATACCTGCACCTCCAGGAGTAAAACAGAGGCTCCACACCTACACCAACGACAATAACTCCTTCTGTACCTCCTACTATACCAACGCCAATAACTCCTTCTGCACC
Allele 46 (5) 131 :ATAGACTACCAAAGGGCGTGGAATACCTGCACCTCCAGGAGTAAAACAGAGGCTCCACACCTACACCAACGACAATAACTCCTTCTGTACCTCCTACTATACCAACGCCAATAACTCCTTCTGCACC
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Allele 1 (140) 261 :TCCT-----ACTACACCACCTACGGGACTAAATTTTAACTTGACAGTTTTCAGAACAAATTCATGATAGGTTTCGCAAGAAGTTAAGTTAAATATAACTCACGAATACGAGGGTGTATAC
Allele 10 (11) 261 :TCCT-----ACTACACCACCTACGGGACTAAATTTTAACTTGACAGTTTTCAGAACAAATTCATGATAGGTTTCGCAAGAAGTTAAGTTAAATATAACTCACGAATACGATGGTGTATAC
Allele 43 (40) 261 :TCCTTCTGCACCTCCTACTACACCACCTAAGGGACTAAATTTTAACTTGACACTTCAGAACAAATTCATGATAGGTTTCGCAAGAAGTTAAGTTAAGTATAACTTACGAATACGATGGTGAATAC
Allele 44 (22) 261 :TCCT-----ACTACACCACCTACGGGACTAAATTTTAACTTGACAGTTTTCAGAACAAATTCATGATAGGTTTCGCAAGAAGTTAAGTTAAATATAACTCACGAATACGAGGGTGTATAC
Allele 45 (7) 261 :TCCTTCTGCACCTCCTACTACACCACCTACGGGACTAAATTTTAACTTGACACTTCAGAACAAATTCATGATAGGTTTCGCAAGAAGTTAAGTTAAGTATAACTTACGAATACGATGGTGAATAC
Allele 46 (5) 261 :TCCT-----ACTACACCACCTACGGGACTAAATTTTAACTTGACAGTTTTCAGAACAAATTCATGATAGGTTTCGCAAGAAGTTAAGTTAAATATAACTCACGAATACGAGGGTGTATAC
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deletions

Supplementary Figure 1: Multiple sequence alignment of Tp1 alleles obtained in this study from cattle from Malawi. The naming of the alleles follows the nomenclature by [27]. Alleles 1 and 5 were first described by [27]. The epitope coding region are boxed in red. The number in parenthesis is the number of sequences obtained in the allele.

1^٤ 2^٤

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Allele 1 (118) 1 :TAC TT TATTATTACATTTTACATTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 2 (22) 1 :TAC TT TATTATTATTACATTTTACATTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 3 (3) 1 :TAC TT TATTATTATTATTACATTTTACATTTCCCTCAGTCTTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 64 (24) 1 :TAC TT TATTATTATTATTACATTTTACATTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 65 (5) 1 :TAC TT TATTATTATTATTATTACATTTTACATTTCCCTCAGTCTTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 66 (3) 1 :TCCTTTATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGTATGGTGAATTTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 67 (3) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 68 (2) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 69 (2) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 70 (2) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 71 (2) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 72 (2) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
Allele 73 (2) 1 :TAC TT TATTATTATTATTATTATTACATTTTCCCCAGTGTCTGGGAGGTAATTGTAGTCATGAAGAACTAAAAAAATTTGGGAATGCTAGAGGCGATGGTTTCGACAGGGGATGCATTGTTCAATCA
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3٤
Allele 1 (118) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 2 (22) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 3 (3) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTATTAGAACTCTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 64 (24) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 65 (5) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTATTAGAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 66 (3) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 67 (3) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 68 (2) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTATTAGAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 69 (2) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTATTAGAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 70 (2) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 71 (2) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 72 (2) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
Allele 73 (2) 121 :FCACATGGTATGGGAAAGGTAGGAAAAAGSTATGGTCTTAAAACTACTCCAAAAGTAGATAAAGTCTTAGCAGATCTTGAAACACTGTTTGGAAAAACACGGTCTTGGTGGTATTAGTAAA
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4٤ 5٤
Allele 1 (118) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 2 (22) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 3 (3) 241 :AAGTGCTCGAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 64 (24) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 65 (5) 241 :AAGTGCTCGAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 66 (3) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 67 (3) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 68 (2) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 69 (2) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 70 (2) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 71 (2) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 72 (2) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
Allele 73 (2) 241 :GATTGCTTAAATTTTTCGCAAAAGCCTAGTGTGCGTATTAATGAATGTAGAGGAGCATGTCTCAAAGGACCATTGTACTGACGACTGCCAAAATTGCTTTGATAGAACTGTAAATCT
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6٤
Allele 1 (118) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 2 (22) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 3 (3) 361 :GGATTGCTGGAATGATTGSGAAACCCAGTGTTCCAAACCCCTTGATTGGGAAGATGCTTATCTAAATTCAACTTCTGAAACAGATGAGGACGAATCTACGA
Allele 64 (24) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 65 (5) 361 :GGATTGCTGGAATGATTGSGAAACCCAGTGTTCCAAACCCCTTGATTGGGAAGATGCTTATCTAAATTCAACTTCTGAAACAGATGAGGACGAATCTACGA
Allele 66 (3) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 67 (3) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 68 (2) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 69 (2) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 70 (2) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 71 (2) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 72 (2) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCCAAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
Allele 73 (2) 361 :GCATTGCTGGAATGCATTGSGAAAAACAAGTATTCTCAATCCATGTAATGGGAAGAAGATTATCTAAAAATACAAATTTCTGAAACAGATGAGGACGAATCTACGA
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Supplementary Figure 2: Multiple sequence alignment of Tp2 alleles obtained in this study from cattle from Malawi. The naming of the alleles follows the nomenclature by [27]. Alleles 1 and 2 and 3 were first described by [27]. The epitope coding region are boxed in red. The number in parenthesis is the number of sequences obtained in the allele.

Supplementary Table 1: Tpl Analysis of molecular variation (AMOVA)

Source of variation	d.f	Sum of squares	Variance components		Percentage of variation
Among groups	1	49.554	4.13637	Va	43.03
Among populations within groups	2	93.706	0.62209	Vb	6.47
Within populations	224	1087.612	4.85541	Vc	50.50
Totals	227	1230.873	9.61387		
Fixed indices					
FSC: 0.11357					
FST: 0.49496					
FCT: 0.43025					

Supplementary Table 2: Tp2Analysis of molecular variation (AMOVA)

Source of variation	d.f	Sum of squares	Variance components		Percentage of variation
Among groups	1	39.384	1.90318	Va	20.06
Among populations within groups	2	40.925	0.26387	Vb	2.78
Within populations	183	1339.381	7.31902	Vc	77.16
Totals	186	1419.690	9.48607		
Fixed indices					
FSC: 0.03480					
FST: 0.22845					
FCT: 0.20063					