

```
$hyphy ~/hyphy-analyses/FitMG94/FitMG94.bf --lrt Yes --alignment data/WestNileVirus_NS3.fas
```

```
Analysis Description
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Fit an MG94xREV model with several selectable options frequency  
estimator and report the fit results including dN/dS ratios, and  
synonymous and non-synonymous branch lengths. v0.2 adds LRT test for  
dN/dS != 1
```

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- __Requirements__: in-frame codon alignment and a phylogenetic tree
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- __Written by__: Sergei L Kosakovsky Pond
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- __Contact Information__: spond@temple.edu
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- __Analysis Version__: 0.2
```

```
rooted: No
```

```
>code -> Universal
```

```
>Loaded a multiple sequence alignment with **19** sequences, **619** codons, and **1** partitions from `/Users/sergei/Dropbox/Talks/VEME-2021/data/WestNileVirus_NS3.fas`
```

```
>type -> global
```

```
>frequencies -> CF3x4
```

```
>lrt -> Yes
```

```
### Obtaining branch lengths and nucleotide substitution biases under the nucleotide GTR model
```

```
>kill-zero-lengths -> Yes
```

Deleted 2 zero-length internal branches: `Node1, Node2`
* Log(L) = -7745.48, AIC-c = 15577.06 (43 estimated parameters)
* 1 partition. Total tree length by partition (subs/site) 0.672

Fitting Standard MG94
* Log(L) = -6413.46, AIC-c = 12923.31 (48 estimated parameters)
* **non-synonymous/synonymous rate ratio = 0.0086 (95% profile CI 0.0068– 0.0106)**

Running the likelihood ratio tests for dN/dS=1

>Testing _non-synonymous/synonymous rate ratio_ == 1

Likelihood ratio test for _non-synonymous/synonymous rate ratio == 1_, **p = 0.0000.**

Synonymous tree
(HNY1999:0.001081256453028512,NY99_EQHS:0.00106649816840513,NY99_FLAMINGO:0,(((((((RABENSBURG_ISOLATE:1.029888927913287,(WNFCG:0.009422232735390165,SPU116_89:0.006497252142983255)Node11:0.497317793054674)Node9:0.5663849238543818,KUNCG:0.08579616334765416)Node8:0.06828112532356265,(ETHAN4766:0.02340594686858863,(CHIN_01:0.0118388155978261,EG101:0.01478394721830331)Node17:0.007544440407300843)Node15:0.003379513965204242)Node7:0.01817281158535988((((ITALY_1998_EQUINE:0.00887303413005913,PAAN001:0.007729652361011649)Node22:0.002644276626382983,(R097_50:0.001612279279163659,VLG_4:0.001062750677413841)Node25:0.002742110200748272)Node21:0.0007107517172592428,KN3829:0.003002207398871611)Node20:0.010777674817076de6:0.009122506962674462,AST99:0.01648683046482152)Node5:0.006360440965550713,PAH001:0.009764197227613279)Node4:0.01061342075646687,IS_98:0.00219787558408969)Node3:0.4759833708216,MEX03:0.003214366196457822)

Non-synonymous tree
(HNY1999:2.022605013917642e-05,NY99_EQHS:1.994998075348657e-05,NY99_FLAMINGO:0,(((((((RABENSBURG_ISOLATE:0.01926516603476631,(WNFCG:0.0001762528687761419,SPU116_89:0.0001215380007608477)Node11:0.009302857420415459)Node9:0.01059483144434955,KUNCG:0.001604908342288399)Node8:0.0012772709568442,(ETHAN4766:0.0004378330909313789,(CHIN_01:0.0002214576173852258,EG101:0.0002765494317789341)Node17:0.0001411267692532066)Node15:6.321739742205773e-05)Node7:0.0003399417383968234,((((ITALY_1998_EQUINE:0.0001659795256699084,PAAN001:0.0001445913555237784)Node22:4.946400225152157e-05,(R097_50:3.015939599470718e-05,VLG_4:1.987987995503712e-05)Node25:5.129408314941099e-05)Node21:1.329536561795865e-05,KN3829:5.615947743729441e-05)Node20:0.00020160785319)Node6:0.0001706461799189597,AST99:0.0003084036711952811)Node5:0.0001189788024073028,PAH001:0.0001826496777349691)Node4:0.0001985353056318952,IS_98:4.11135967225505)Node3:1.916922088107983e-05,MEX03:6.012813303738528e-05)

Combined tree
(HNY1999:0.001101482503167688,NY99_EQHS:0.001086448149158617,NY99_FLAMINGO:0,(((((((RABENSBURG_ISOLATE:1.049154093948055,(WNFCG:0.009598485604166309,SPU116_89:0.006618790143744096)Node11:0.5066206504750898)Node9:0.5769797552987309,KUNCG:0.08740107168994253)Node8:0.06955839628040685,(ETHAN4766:0.02384377995952001,(CHIN_01:0.01206027321521132,EG101:0.01506049665008225)Node17:0.007685567176554043)Node15:0.003442731362626298)Node7:0.0185127533237567((((ITALY_1998_EQUINE:0.009039013655729039,PAAN001:0.007874243716535429)Node22:0.002693740628634505,(R097_50:0.001642438675158366,VLG_4:0.001082630557368879)Node25:0.002793404283897683)Node21:0.0007240470828772018,KN3829:0.003058366876308903)Node20:0.010979282669332de6:0.00929315314259342,AST99:0.01679523413601681)Node5:0.006479419767958014,PAH001:0.009946846905348252)Node4:0.01081195606209877,IS_98:0.002238989180812242)Node3:0.3929054589295,MEX03:0.003274494329495206)

Writing detailed analysis report to `/Users/sergei/Dropbox/Talks/VEME-current/data/WestNileVirus_NS3.fas.FITTER.json'