Evidencia 1: Análisis Inicial

Ernesto López Villarreal - A01552124

22/4/2020

```r
install.packages("seqinr")
```

```
## Installing package into '/home/rstudio-user/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)
```

```r
install.packages("mgsub")
```

```
## Installing package into '/home/rstudio-user/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)
```

```r
library("seqinr")
library("mgsub")
```

1) Obtén las secuencias de las variantes mexicanas del virus (influenza) desde el NCBI o el buscador de virus del NCBI.

```r
influenzah1n1 <- read.fasta("h1n1.fasta")
head(influenzah1n1)
```

```
## $CY106568.1
##    [1] "a" "a" "a" "a" "g" "c" "a" "a" "c" "a" "a" "a" "a" "a" "t" "g" "a" "a"
##   [19] "g" "g" "c" "a" "a" "t" "a" "c" "t" "a" "g" "t" "a" "g" "t" "t" "c" "t"
##   [37] "g" "c" "t" "a" "t" "a" "t" "a" "c" "a" "t" "t" "t" "g" "c" "a" "a" "c"
##   [55] "c" "g" "c" "a" "a" "a" "t" "g" "c" "a" "g" "a" "c" "a" "c" "a" "t" "t"
##   [73] "a" "t" "g" "t" "a" "t" "a" "g" "g" "t" "t" "a" "t" "c" "a" "t" "g" "c"
##   [91] "g" "a" "a" "c" "a" "a" "t" "t" "c" "a" "a" "c" "a" "g" "a" "c" "a" "c"
##  [109] "t" "g" "t" "a" "g" "a" "c" "a" "c" "a" "g" "t" "a" "c" "t" "a" "g" "a"
##  [127] "a" "a" "a" "g" "a" "a" "t" "g" "t" "a" "a" "c" "a" "g" "t" "a" "a" "c"
##  [145] "a" "c" "a" "c" "t" "c" "t" "g" "t" "t" "a" "a" "c" "c" "t" "t" "c" "t"
##  [163] "a" "g" "a" "a" "g" "a" "c" "a" "a" "g" "c" "a" "t" "a" "a" "c" "g" "g"
##  [181] "g" "a" "a" "a" "c" "t" "a" "t" "g" "c" "a" "a" "a" "c" "t" "a" "a" "g"
##  [199] "a" "g" "g" "g" "g" "t" "a" "g" "c" "c" "c" "c" "a" "t" "t" "g" "c" "a"
##  [217] "t" "t" "t" "g" "g" "g" "t" "a" "a" "a" "t" "g" "t" "a" "a" "c" "a" "t"
##  [235] "t" "g" "c" "t" "g" "g" "c" "t" "g" "g" "a" "t" "c" "c" "t" "g" "g" "g"
##  [253] "a" "a" "a" "t" "c" "c" "a" "g" "a" "g" "t" "g" "t" "g" "a" "a" "t" "c"
##  [271] "a" "c" "t" "c" "t" "c" "c" "a" "c" "a" "g" "c" "a" "a" "g" "c" "t" "c"
##  [289] "a" "t" "g" "g" "t" "c" "c" "t" "a" "c" "a" "t" "t" "g" "t" "g" "g" "a"
##  [307] "a" "a" "c" "a" "t" "c" "t" "a" "g" "t" "t" "c" "a" "g" "a" "c" "a" "a"
##  [325] "t" "g" "g" "a" "a" "c" "g" "t" "g" "t" "t" "a" "c" "c" "c" "a" "g" "g"
##  [343] "a" "g" "a" "t" "t" "t" "c" "a" "t" "c" "g" "a" "t" "t" "a" "t" "g" "a"
##  [361] "g" "g" "a" "g" "c" "t" "a" "a" "g" "a" "g" "a" "g" "c" "a" "a" "t" "t"
##  [379] "g" "a" "g" "c" "t" "c" "a" "g" "t" "g" "t" "c" "a" "t" "c" "a" "t" "t"
##  [397] "t" "g" "a" "a" "a" "g" "g" "t" "t" "t" "g" "a" "g" "a" "t" "a" "t" "t"
##  [415] "c" "c" "c" "c" "a" "a" "g" "a" "c" "a" "a" "g" "t" "t" "c" "a" "t" "g"
##  [433] "g" "c" "c" "c" "a" "a" "t" "c" "a" "t" "g" "a" "c" "t" "c" "g" "a" "a"
```

```
##  [451] "c" "a" "a" "a" "g" "g" "t" "g" "t" "a" "a" "c" "g" "g" "c" "a" "g" "c"
##  [469] "a" "t" "g" "t" "c" "c" "t" "c" "a" "t" "g" "c" "t" "g" "g" "a" "g" "c"
##  [487] "a" "a" "a" "a" "a" "g" "c" "t" "t" "c" "t" "a" "c" "a" "a" "a" "a" "a"
##  [505] "t" "t" "t" "a" "a" "t" "a" "t" "g" "g" "c" "t" "a" "g" "t" "t" "a" "a"
##  [523] "a" "a" "a" "a" "g" "g" "g" "a" "a" "t" "t" "c" "a" "t" "a" "c" "c" "c"
##  [541] "a" "a" "a" "g" "c" "t" "c" "a" "g" "c" "a" "a" "a" "t" "c" "c" "t" "a"
##  [559] "c" "a" "t" "t" "a" "a" "t" "g" "a" "t" "a" "a" "a" "g" "g" "g" "a" "a"
##  [577] "a" "g" "a" "a" "g" "t" "c" "c" "t" "c" "g" "t" "g" "c" "t" "a" "t" "g"
##  [595] "g" "g" "g" "c" "a" "t" "t" "c" "a" "c" "c" "a" "t" "c" "c" "a" "t" "c"
##  [613] "t" "a" "c" "t" "a" "g" "t" "g" "c" "t" "g" "a" "c" "c" "a" "a" "c" "a"
##  [631] "a" "a" "g" "t" "c" "t" "c" "t" "a" "t" "c" "a" "g" "a" "a" "t" "g" "c"
##  [649] "a" "g" "a" "t" "g" "c" "a" "t" "a" "t" "g" "t" "t" "t" "t" "t" "g" "t"
##  [667] "g" "g" "g" "g" "a" "c" "a" "t" "c" "a" "a" "g" "a" "t" "a" "c" "a" "g"
##  [685] "c" "a" "a" "g" "a" "a" "g" "t" "t" "c" "a" "a" "g" "c" "c" "g" "g" "a"
##  [703] "a" "a" "t" "a" "g" "c" "a" "a" "t" "a" "a" "g" "a" "c" "c" "c" "a" "a"
##  [721] "a" "g" "t" "g" "a" "g" "g" "g" "a" "t" "c" "a" "a" "g" "a" "a" "g" "g"
##  [739] "g" "a" "g" "a" "a" "t" "g" "a" "a" "c" "t" "a" "t" "t" "a" "c" "t" "g"
##  [757] "g" "a" "c" "a" "c" "t" "a" "g" "t" "a" "g" "a" "g" "c" "c" "g" "g" "g"
##  [775] "a" "g" "a" "c" "a" "a" "a" "a" "t" "a" "a" "c" "a" "t" "t" "c" "g" "a"
##  [793] "a" "g" "c" "a" "a" "c" "t" "g" "g" "a" "a" "a" "t" "c" "t" "a" "g" "t"
##  [811] "g" "g" "t" "a" "c" "c" "g" "a" "g" "a" "t" "a" "t" "g" "c" "a" "t" "t"
##  [829] "c" "g" "c" "a" "a" "t" "g" "g" "a" "a" "a" "g" "a" "a" "a" "t" "g" "c"
##  [847] "t" "g" "g" "a" "t" "c" "t" "g" "g" "t" "a" "t" "t" "a" "t" "c" "a" "t"
##  [865] "t" "t" "c" "a" "g" "a" "t" "a" "c" "a" "c" "c" "a" "g" "t" "c" "c" "a"
##  [883] "c" "g" "a" "t" "t" "g" "c" "a" "a" "t" "a" "c" "a" "a" "c" "t" "t" "g"
##  [901] "t" "c" "a" "g" "a" "c" "a" "c" "c" "c" "a" "a" "g" "g" "g" "t" "g" "c"
##  [919] "t" "a" "t" "a" "a" "a" "c" "a" "c" "c" "a" "g" "c" "c" "t" "c" "c" "c"
##  [937] "a" "t" "t" "t" "c" "a" "g" "a" "a" "t" "a" "t" "a" "c" "a" "t" "c" "c"
##  [955] "g" "a" "t" "c" "a" "c" "a" "a" "t" "t" "g" "g" "a" "a" "a" "a" "t" "g"
##  [973] "t" "c" "c" "a" "a" "a" "a" "t" "a" "t" "g" "t" "a" "a" "a" "a" "a" "g"
##  [991] "c" "a" "c" "a" "a" "a" "a" "t" "t" "g" "a" "g" "a" "c" "t" "g" "g" "c"
## [1009] "c" "a" "c" "a" "g" "g" "a" "t" "t" "g" "a" "g" "g" "a" "a" "t" "g" "t"
## [1027] "c" "c" "c" "g" "t" "c" "t" "a" "t" "t" "c" "a" "a" "t" "c" "t" "a" "g"
## [1045] "a" "g" "g" "c" "c" "t" "a" "t" "t" "t" "g" "g" "g" "g" "c" "c" "a" "t"
## [1063] "t" "g" "c" "c" "g" "g" "t" "t" "t" "c" "a" "t" "t" "g" "a" "a" "g" "g"
## [1081] "g" "g" "g" "g" "t" "g" "g" "a" "c" "a" "g" "g" "g" "a" "t" "g" "g" "t"
## [1099] "a" "g" "a" "t" "g" "g" "a" "t" "g" "g" "t" "a" "c" "g" "g" "t" "t" "a"
## [1117] "t" "c" "a" "c" "c" "a" "t" "c" "a" "a" "a" "a" "t" "g" "a" "g" "c" "a"
## [1135] "g" "g" "g" "g" "t" "c" "a" "g" "g" "a" "t" "a" "t" "g" "c" "a" "g" "c"
## [1153] "c" "g" "a" "c" "c" "t" "g" "a" "a" "g" "a" "g" "c" "a" "c" "a" "c" "a"
## [1171] "g" "a" "a" "t" "g" "c" "c" "a" "t" "t" "g" "a" "c" "a" "a" "g" "a" "t"
## [1189] "t" "a" "c" "t" "a" "a" "c" "a" "a" "a" "g" "t" "a" "a" "a" "t" "t" "c"
## [1207] "t" "g" "t" "t" "a" "t" "t" "g" "a" "a" "a" "a" "g" "a" "t" "g" "a" "a"
## [1225] "t" "a" "c" "a" "c" "a" "g" "t" "t" "c" "a" "c" "a" "g" "c" "a" "g" "t"
## [1243] "a" "g" "g" "t" "a" "a" "a" "g" "a" "g" "t" "t" "c" "a" "a" "c" "c" "a"
## [1261] "c" "c" "t" "g" "g" "a" "a" "a" "a" "a" "a" "g" "a" "a" "t" "a" "g" "a"
## [1279] "g" "a" "a" "t" "t" "t" "a" "a" "a" "t" "a" "a" "a" "a" "a" "a" "g" "t"
## [1297] "t" "g" "a" "t" "g" "a" "t" "g" "g" "t" "t" "t" "c" "c" "t" "g" "g" "a"
## [1315] "c" "a" "t" "t" "t" "g" "g" "a" "c" "t" "t" "a" "c" "a" "a" "t" "g" "c"
## [1333] "c" "g" "a" "a" "c" "t" "g" "t" "t" "g" "g" "t" "t" "c" "t" "a" "t" "t"
## [1351] "g" "g" "a" "a" "a" "a" "t" "g" "a" "a" "a" "g" "a" "a" "c" "t" "t" "t"
## [1369] "g" "g" "a" "c" "t" "a" "c" "c" "a" "c" "g" "a" "t" "t" "c" "a" "a" "a"
## [1387] "t" "g" "t" "g" "a" "a" "g" "a" "a" "c" "t" "t" "a" "t" "a" "t" "g" "a"
## [1405] "a" "a" "a" "g" "g" "t" "a" "a" "g" "a" "a" "g" "c" "c" "a" "g" "t" "t"
```

2

```
## [1423] "a" "a" "a" "a" "a" "a" "c" "a" "a" "t" "g" "c" "c" "a" "a" "g" "g" "a"
## [1441] "a" "a" "t" "t" "g" "g" "a" "a" "a" "c" "g" "g" "c" "t" "g" "c" "t" "t"
## [1459] "t" "g" "a" "a" "t" "t" "t" "t" "a" "c" "c" "a" "c" "a" "a" "a" "t" "g"
## [1477] "c" "g" "a" "t" "a" "a" "c" "a" "c" "g" "t" "g" "c" "a" "t" "g" "g" "a"
## [1495] "a" "a" "g" "t" "g" "t" "c" "a" "a" "a" "a" "a" "t" "g" "g" "g" "a" "c"
## [1513] "t" "t" "a" "t" "g" "a" "c" "t" "a" "c" "c" "c" "a" "a" "a" "a" "t" "a"
## [1531] "c" "t" "c" "a" "g" "a" "g" "g" "a" "a" "g" "c" "a" "a" "a" "a" "t" "t"
## [1549] "a" "a" "a" "c" "a" "g" "a" "g" "a" "a" "g" "a" "a" "a" "t" "a" "g" "a"
## [1567] "t" "g" "g" "g" "g" "t" "a" "a" "a" "g" "c" "t" "g" "g" "a" "a" "t" "c"
## [1585] "a" "a" "c" "a" "a" "g" "g" "a" "t" "t" "t" "a" "c" "c" "a" "g" "a" "t"
## [1603] "t" "t" "t" "g" "g" "c" "g" "a" "t" "c" "t" "a" "t" "t" "c" "a" "a" "c"
## [1621] "t" "g" "t" "c" "g" "c" "c" "a" "g" "t" "t" "c" "a" "t" "t" "g" "g" "t"
## [1639] "a" "c" "t" "g" "g" "t" "a" "g" "t" "c" "t" "c" "c" "c" "t" "g" "g" "g"
## [1657] "g" "g" "c" "a" "a" "t" "c" "a" "g" "t" "t" "t" "c" "t" "g" "g" "a" "t"
## [1675] "g" "t" "g" "c" "t" "c" "t" "a" "a" "t" "g" "g" "g" "t" "c" "t" "c" "t"
## [1693] "a" "c" "a" "g" "t" "g" "t" "a" "g" "a" "a" "t" "a" "t" "g" "t" "a" "t"
## [1711] "t" "t" "a" "a" "c" "a" "t" "t" "a" "g" "g" "a" "t" "t" "t" "c" "a" "g"
## [1729] "a" "a" "g" "c" "a" "t"
## attr(,"name")
## [1] "CY106568.1"
## attr(,"Annot")
## [1] ">CY106568.1 Influenza A virus (A/Merida/2189-CIR/2009(H1N1)) hemagglutinin (HA) gene, complete
## attr(,"class")
## [1] "SeqFastadna"
```

```
influenzah3n2 <- read.fasta("h3n2.fasta")
head(influenzah3n2)
```

```
## $EU502537.1
##   [1] "c" "a" "a" "a" "a" "a" "c" "t" "t" "c" "c" "c" "g" "g" "a" "a" "a" "t"
##  [19] "g" "a" "c" "a" "a" "c" "a" "g" "c" "a" "c" "g" "g" "c" "a" "a" "c" "g"
##  [37] "c" "t" "g" "t" "g" "c" "c" "t" "t" "g" "g" "g" "c" "a" "c" "c" "a" "t"
##  [55] "g" "c" "a" "g" "t" "a" "c" "c" "a" "a" "a" "c" "g" "g" "a" "a" "c" "g"
##  [73] "a" "t" "a" "g" "t" "g" "a" "a" "a" "a" "c" "a" "a" "t" "c" "a" "c" "g"
##  [91] "a" "a" "t" "g" "a" "c" "c" "a" "a" "a" "t" "t" "g" "a" "a" "g" "t" "t"
## [109] "a" "c" "t" "a" "a" "t" "g" "c" "t" "a" "c" "t" "g" "a" "g" "c" "t" "g"
## [127] "g" "t" "t" "c" "a" "g" "a" "g" "t" "t" "c" "c" "t" "c" "a" "a" "c" "a"
## [145] "g" "g" "t" "g" "a" "a" "a" "t" "a" "t" "g" "c" "g" "a" "c" "a" "g" "t"
## [163] "c" "c" "t" "c" "a" "t" "c" "a" "g" "a" "t" "c" "c" "t" "t" "g" "a" "t"
## [181] "g" "g" "a" "g" "a" "a" "a" "a" "c" "t" "g" "c" "a" "c" "a" "c" "t" "a"
## [199] "a" "t" "a" "g" "a" "t" "g" "c" "t" "c" "t" "a" "t" "t" "g" "g" "g" "a"
## [217] "g" "a" "c" "c" "c" "t" "c" "a" "g" "t" "g" "t" "g" "a" "t" "g" "g" "c"
## [235] "t" "t" "c" "c" "a" "a" "a" "a" "t" "a" "a" "g" "a" "a" "a" "t" "g" "g"
## [253] "g" "a" "c" "c" "t" "t" "t" "t" "t" "g" "t" "t" "g" "a" "a" "c" "g" "c"
## [271] "a" "g" "c" "a" "a" "a" "g" "c" "c" "t" "a" "c" "a" "g" "c" "a" "a" "c"
## [289] "t" "g" "t" "t" "a" "c" "c" "c" "t" "t" "a" "t" "g" "a" "t" "g" "t" "g"
## [307] "c" "c" "g" "g" "a" "t" "t" "a" "t" "g" "c" "c" "t" "c" "c" "c" "t" "t"
## [325] "a" "g" "g" "t" "c" "a" "c" "t" "a" "g" "t" "t" "g" "c" "c" "t" "c" "a"
## [343] "t" "c" "c" "g" "g" "c" "a" "c" "a" "c" "t" "g" "g" "a" "g" "t" "t" "t"
## [361] "a" "a" "c" "a" "a" "t" "g" "a" "a" "a" "g" "c" "t" "t" "c" "a" "a" "t"
## [379] "t" "g" "g" "a" "c" "t" "g" "g" "a" "g" "t" "c" "a" "c" "c" "c" "a" "a"
## [397] "a" "a" "t" "g" "g" "a" "a" "c" "a" "a" "g" "c" "t" "c" "t" "g" "c" "t"
## [415] "t" "g" "c" "a" "a" "a" "a" "g" "g" "a" "g" "a" "t" "c" "t" "a" "a" "t"
## [433] "a" "a" "c" "a" "g" "t" "t" "t" "c" "t" "t" "t" "a" "g" "t" "a" "g" "a"
## [451] "t" "t" "g" "a" "a" "t" "t" "g" "g" "t" "t" "g" "a" "c" "c" "c" "a" "c"
```

3

```
## [469] "t" "t" "a" "a" "a" "a" "t" "t" "c" "a" "a" "a" "t" "a" "c" "c" "c" "a"
## [487] "g" "c" "a" "t" "t" "g" "a" "a" "c" "g" "t" "g" "a" "c" "t" "a" "t" "g"
## [505] "c" "c" "a" "a" "a" "c" "a" "a" "t" "g" "a" "a" "a" "a" "a" "t" "t" "t"
## [523] "g" "a" "c" "a" "a" "a" "t" "t" "g" "t" "a" "c" "a" "t" "t" "t" "g" "g"
## [541] "g" "g" "g" "g" "t" "t" "c" "a" "c" "c" "a" "c" "c" "c" "g" "g" "g" "t"
## [559] "a" "c" "g" "g" "a" "c" "a" "t" "g" "a" "c" "c" "a" "a" "a" "t" "c"
## [577] "t" "t" "c" "c" "t" "g" "c" "a" "t" "g" "c" "t" "c" "a" "a" "g" "c" "a"
## [595] "t" "c" "a" "g" "g" "a" "a" "g" "a" "a" "t" "c" "a" "c" "a" "g" "t" "c"
## [613] "t" "c" "t" "a" "c" "c" "a" "a" "a" "a" "g" "a" "a" "g" "c" "c" "a" "a"
## [631] "c" "a" "a" "a" "c" "t" "g" "t" "a" "a" "t" "c" "c" "c" "g" "a" "a" "t"
## [649] "a" "t" "c" "g" "g" "a" "t" "c" "t" "a" "g" "a" "c" "c" "c" "a" "g" "a"
## [667] "g" "t" "a" "a" "g" "g" "a" "a" "t" "a" "t" "c" "c" "c" "c" "a" "g" "c"
## [685] "a" "g" "a" "a" "t" "a" "a" "g" "c" "a" "t" "c" "t" "a" "t" "t" "g" "g"
## [703] "a" "c" "a" "a" "t" "a" "g" "t" "a" "a" "a" "a" "c" "c" "g" "g" "g" "a"
## [721] "g" "a" "c" "a" "t" "a" "c" "t" "t" "t" "t" "g" "a" "t" "t" "a" "a" "c"
## [739] "a" "g" "c" "a" "c" "a" "g" "g" "g" "a" "a" "t" "c" "t" "a" "a" "t" "t"
## [757] "g" "c" "t" "c" "c" "t" "a" "g" "a" "g" "g" "t" "t" "a" "c" "t" "t" "c"
## [775] "a" "a" "a" "a" "t" "a" "c" "g" "a" "a" "g" "t" "g" "g" "g" "a" "a" "a"
## [793] "a" "g" "c" "t" "c" "a" "a" "t" "a" "a" "t" "g" "a" "g" "a" "t" "c" "a"
## [811] "g" "a" "t" "g" "c" "a" "c" "c" "c" "a" "t" "t" "g" "g" "c" "a" "a" "a"
## [829] "t" "g" "c" "a" "a" "t" "t" "c" "t" "g" "a" "a" "t" "g" "c" "a" "t" "c"
## [847] "a" "c" "t" "c" "c" "a" "a" "a" "t" "g" "g" "a" "a" "g" "c" "a" "t" "t"
## [865] "c" "c" "c" "a" "a" "t" "g" "a" "c" "a" "a" "a" "c" "c" "a" "t" "t" "t"
## [883] "c" "a" "a" "a" "a" "t" "g" "t" "a" "a" "a" "c" "a" "g" "a" "a" "t" "c"
## [901] "a" "c" "a" "t" "a" "t" "g" "g" "g" "g" "c" "c" "t" "g" "t" "c" "c" "c"
## [919] "a" "g" "a" "t" "a" "t" "g" "t" "t" "a" "a" "g" "c" "a" "a" "a" "a" "c"
## [937] "a" "c" "t" "c" "t" "g" "a" "a" "a" "t" "t" "g" "g" "c" "a" "a" "c" "a"
## [955] "g" "g" "g" "a" "t" "g" "a" "g" "a" "a" "a" "t" "g" "t" "a" "c" "c" "a"
## [973] "g" "a" "g" "a" "a" "a" "c" "a" "a" "a" "c" "t" "a" "g" "a"
## attr(,"name")
## [1] "EU502537.1"
## attr(,"Annot")
## [1] ">EU502537.1 Influenza A virus (A/MEXICO/2519/2006(H3N2)) segment 4 hemagglutinin (HA) gene, par
## attr(,"class")
## [1] "SeqFastadna"
```

```r
influenzah7n3 <- read.fasta("h7n3.fasta")
head(influenzah7n3)
```

```
## $CY125728.1
##    [1] "a" "g" "c" "a" "a" "a" "a" "g" "c" "a" "g" "g" "g" "g" "a" "t" "a" "c"
##   [19] "a" "a" "a" "a" "t" "g" "a" "a" "c" "a" "c" "t" "c" "a" "a" "a" "t" "t"
##   [37] "t" "t" "g" "g" "c" "a" "c" "t" "c" "a" "t" "t" "g" "c" "t" "t" "g" "t"
##   [55] "a" "t" "g" "c" "t" "g" "a" "t" "t" "g" "g" "a" "g" "c" "t" "a" "a" "a"
##   [73] "g" "g" "a" "g" "a" "t" "a" "a" "a" "a" "t" "a" "t" "g" "t" "c" "t" "t"
##   [91] "g" "g" "g" "c" "a" "c" "c" "a" "t" "g" "c" "t" "g" "t" "g" "g" "c" "a"
##  [109] "a" "a" "t" "g" "g" "a" "a" "c" "a" "a" "a" "a" "g" "t" "g" "a" "a" "c"
##  [127] "a" "c" "a" "t" "t" "a" "a" "c" "a" "g" "a" "g" "a" "g" "a" "g" "g" "a"
##  [145] "a" "t" "c" "g" "a" "a" "g" "t" "a" "g" "t" "a" "a" "a" "t" "g" "c" "c"
##  [163] "a" "c" "a" "g" "a" "a" "a" "c" "g" "g" "t" "g" "g" "a" "g" "a" "c" "t"
##  [181] "g" "c" "a" "a" "a" "t" "a" "c" "t" "a" "a" "g" "a" "a" "a" "a" "t" "a"
##  [199] "t" "g" "c" "a" "c" "t" "c" "a" "g" "g" "g" "g" "a" "a" "a" "a" "g" "a"
##  [217] "c" "c" "a" "a" "c" "a" "g" "a" "t" "c" "t" "g" "g" "g" "a" "c" "a" "a"
##  [235] "t" "g" "c" "g" "g" "a" "c" "t" "t" "c" "t" "a" "g" "g" "a" "a" "c" "c"
##  [253] "c" "t" "a" "a" "t" "a" "g" "g" "a" "c" "c" "t" "c" "c" "c" "c" "a" "a"
```

4

```
##  [271] "t" "g" "c" "g" "a" "t" "c" "a" "a" "t" "t" "t" "c" "t" "g" "g" "a" "a"
##  [289] "t" "t" "t" "g" "a" "c" "g" "c" "t" "g" "a" "t" "t" "t" "a" "a" "t" "a"
##  [307] "a" "t" "t" "g" "a" "a" "c" "g" "a" "a" "g" "a" "g" "a" "a" "g" "g" "a"
##  [325] "a" "c" "c" "g" "a" "t" "g" "t" "g" "t" "g" "t" "t" "a" "t" "c" "c" "c"
##  [343] "g" "g" "g" "a" "a" "g" "t" "t" "c" "a" "c" "a" "a" "a" "t" "g" "a" "a"
##  [361] "g" "a" "a" "t" "c" "a" "c" "t" "g" "a" "g" "g" "c" "a" "a" "a" "t" "c"
##  [379] "c" "t" "t" "c" "g" "a" "g" "g" "g" "t" "c" "a" "g" "g" "a" "g" "g" "a"
##  [397] "a" "t" "t" "g" "a" "t" "a" "a" "a" "g" "a" "g" "t" "c" "a" "a" "t" "g"
##  [415] "g" "g" "t" "t" "t" "c" "a" "c" "c" "t" "a" "t" "a" "g" "t" "g" "g" "a"
##  [433] "a" "t" "a" "a" "g" "a" "a" "c" "c" "a" "a" "t" "g" "g" "g" "g" "c" "g"
##  [451] "a" "c" "a" "a" "g" "t" "g" "c" "t" "t" "g" "c" "a" "g" "a" "a" "g" "a"
##  [469] "t" "c" "a" "g" "g" "t" "t" "c" "t" "t" "c" "c" "t" "t" "c" "t" "a" "t"
##  [487] "g" "c" "g" "g" "a" "g" "a" "t" "g" "a" "a" "g" "t" "g" "g" "t" "t" "a"
##  [505] "c" "t" "g" "t" "c" "g" "a" "a" "t" "t" "c" "a" "g" "a" "c" "a" "a" "t"
##  [523] "g" "c" "g" "g" "c" "t" "t" "t" "t" "c" "c" "c" "c" "a" "a" "a" "t" "g"
##  [541] "a" "c" "t" "a" "a" "g" "t" "c" "g" "t" "a" "c" "a" "g" "a" "a" "a" "t"
##  [559] "c" "c" "c" "a" "g" "g" "a" "a" "c" "a" "a" "a" "c" "c" "a" "g" "c" "t"
##  [577] "c" "t" "g" "a" "t" "a" "a" "t" "t" "t" "g" "g" "g" "g" "a" "g" "t" "g"
##  [595] "c" "a" "t" "c" "a" "t" "t" "c" "t" "g" "g" "a" "t" "c" "g" "g" "c" "t"
##  [613] "a" "c" "t" "g" "a" "g" "c" "a" "g" "a" "c" "c" "a" "a" "a" "c" "t" "c"
##  [631] "t" "a" "t" "g" "g" "g" "a" "g" "t" "g" "g" "a" "a" "a" "c" "a" "a" "g"
##  [649] "t" "t" "g" "a" "t" "a" "a" "c" "a" "g" "t" "a" "g" "g" "a" "a" "g" "c"
##  [667] "t" "c" "g" "a" "a" "a" "t" "a" "c" "c" "a" "g" "c" "a" "g" "t" "c" "a"
##  [685] "t" "t" "c" "a" "c" "c" "c" "c" "a" "a" "g" "c" "c" "c" "g" "g" "g" "g"
##  [703] "g" "c" "a" "c" "g" "a" "c" "c" "a" "c" "a" "g" "g" "t" "g" "a" "a" "t"
##  [721] "g" "g" "g" "c" "a" "a" "t" "c" "a" "g" "g" "a" "a" "g" "g" "a" "t" "t"
##  [739] "g" "a" "c" "t" "t" "t" "c" "a" "c" "t" "g" "g" "c" "t" "a" "c" "t" "c"
##  [757] "c" "t" "t" "g" "a" "t" "c" "c" "c" "a" "a" "t" "g" "a" "c" "a" "c" "a"
##  [775] "g" "t" "g" "a" "c" "c" "t" "t" "c" "a" "c" "a" "t" "t" "c" "a" "a" "t"
##  [793] "g" "g" "g" "g" "c" "a" "t" "t" "c" "a" "t" "a" "g" "c" "t" "c" "c" "t"
##  [811] "g" "a" "c" "a" "g" "a" "g" "c" "a" "a" "g" "t" "t" "t" "c" "t" "t" "t"
##  [829] "a" "g" "a" "g" "g" "a" "g" "a" "g" "t" "c" "a" "a" "t" "a" "g" "g" "a"
##  [847] "g" "t" "t" "c" "a" "g" "a" "g" "t" "g" "a" "t" "g" "t" "t" "c" "c" "t"
##  [865] "t" "t" "g" "g" "a" "t" "t" "c" "t" "g" "g" "t" "t" "g" "t" "g" "a" "g"
##  [883] "g" "g" "g" "g" "a" "t" "t" "g" "c" "t" "t" "c" "c" "a" "c" "a" "a" "t"
##  [901] "g" "g" "g" "g" "g" "t" "a" "c" "g" "a" "t" "a" "g" "t" "g" "a" "g" "t"
##  [919] "t" "c" "c" "c" "t" "g" "c" "c" "a" "t" "t" "c" "c" "a" "g" "a" "a" "c"
##  [937] "a" "t" "c" "a" "a" "c" "c" "c" "t" "a" "g" "a" "a" "c" "a" "g" "t" "g"
##  [955] "g" "g" "a" "a" "a" "a" "t" "g" "c" "c" "c" "t" "c" "g" "a" "t" "a" "t"
##  [973] "g" "t" "c" "a" "a" "a" "c" "a" "g" "a" "c" "a" "a" "g" "c" "c" "t" "c"
##  [991] "c" "t" "t" "t" "t" "g" "g" "c" "t" "a" "c" "a" "g" "g" "g" "a" "t" "g"
## [1009] "a" "g" "a" "a" "a" "c" "g" "t" "c" "c" "c" "a" "g" "a" "g" "a" "a" "c"
## [1027] "c" "c" "c" "a" "a" "g" "g" "a" "t" "a" "g" "g" "a" "a" "g" "a" "g" "c"
## [1045] "c" "g" "a" "c" "a" "t" "c" "g" "a" "a" "g" "g" "a" "c" "c" "a" "g" "a"
## [1063] "g" "g" "c" "c" "t" "t" "t" "t" "t" "g" "g" "a" "g" "c" "g" "a" "t" "t"
## [1081] "g" "c" "t" "g" "g" "a" "t" "t" "c" "a" "t" "a" "g" "a" "g" "a" "a" "t"
## [1099] "g" "g" "a" "t" "g" "g" "g" "a" "a" "g" "g" "t" "c" "t" "c" "a" "t" "t"
## [1117] "g" "a" "t" "g" "g" "a" "t" "g" "g" "t" "a" "t" "g" "g" "t" "t" "t" "c"
## [1135] "a" "g" "a" "c" "a" "t" "c" "a" "a" "a" "a" "t" "g" "c" "a" "c" "a" "a"
## [1153] "g" "g" "a" "g" "a" "a" "g" "g" "a" "a" "c" "t" "g" "c" "a" "g" "c" "t"
## [1171] "g" "a" "t" "t" "a" "c" "a" "a" "a" "a" "g" "c" "a" "c" "t" "c" "a" "a"
## [1189] "t" "c" "t" "g" "c" "g" "a" "t" "a" "g" "a" "t" "c" "a" "g" "a" "t" "c"
## [1207] "a" "c" "a" "g" "g" "c" "a" "a" "a" "t" "t" "g" "a" "a" "t" "c" "g" "t"
## [1225] "c" "t" "a" "a" "t" "t" "g" "a" "c" "a" "a" "a" "a" "c" "a" "a" "a" "t"
```

```
## [1243] "c" "a" "g" "c" "a" "g" "t" "t" "t" "g" "a" "a" "c" "t" "g" "a" "t" "a"
## [1261] "g" "a" "c" "a" "a" "c" "g" "a" "a" "t" "t" "c" "a" "g" "t" "g" "a" "a"
## [1279] "a" "t" "a" "g" "a" "a" "c" "a" "a" "c" "a" "a" "a" "t" "t" "g" "g" "g"
## [1297] "a" "a" "t" "g" "t" "c" "a" "t" "t" "a" "a" "c" "t" "g" "g" "a" "c" "a"
## [1315] "c" "g" "a" "g" "a" "t" "t" "c" "a" "a" "t" "g" "a" "c" "t" "g" "a" "g"
## [1333] "g" "t" "a" "t" "g" "g" "t" "c" "g" "t" "a" "c" "a" "a" "t" "g" "c" "t"
## [1351] "g" "a" "a" "t" "t" "g" "c" "t" "g" "g" "t" "a" "g" "c" "t" "a" "t" "g"
## [1369] "g" "a" "a" "a" "a" "t" "c" "a" "g" "c" "a" "c" "a" "c" "a" "a" "t" "a"
## [1387] "g" "a" "t" "c" "t" "t" "g" "c" "a" "g" "a" "c" "t" "c" "a" "g" "a" "a"
## [1405] "a" "t" "g" "a" "a" "c" "a" "a" "a" "c" "t" "t" "t" "a" "t" "g" "a" "g"
## [1423] "c" "g" "t" "g" "t" "a" "a" "g" "g" "a" "a" "a" "c" "a" "a" "c" "t" "g"
## [1441] "a" "g" "g" "g" "a" "g" "a" "a" "t" "g" "c" "t" "g" "a" "a" "g" "a" "g"
## [1459] "g" "a" "t" "g" "g" "g" "a" "c" "t" "g" "g" "a" "t" "g" "c" "t" "t" "t"
## [1477] "g" "a" "a" "a" "t" "a" "t" "t" "t" "c" "a" "t" "a" "a" "g" "t" "g" "t"
## [1495] "g" "a" "t" "g" "a" "t" "c" "a" "g" "t" "g" "c" "a" "t" "g" "g" "a" "g"
## [1513] "a" "g" "c" "a" "t" "c" "a" "g" "g" "a" "a" "c" "a" "a" "c" "a" "c" "t"
## [1531] "t" "a" "t" "g" "a" "c" "c" "a" "t" "a" "c" "t" "c" "a" "a" "t" "a" "c"
## [1549] "a" "g" "a" "g" "c" "g" "g" "a" "g" "t" "c" "a" "t" "t" "g" "c" "a" "g"
## [1567] "a" "a" "t" "a" "g" "a" "a" "t" "a" "c" "a" "g" "a" "t" "a" "g" "a" "c"
## [1585] "c" "c" "a" "g" "t" "g" "a" "a" "a" "t" "t" "g" "a" "g" "t" "a" "g" "t"
## [1603] "g" "g" "a" "t" "a" "c" "a" "a" "a" "g" "a" "c" "a" "t" "a" "a" "t" "c"
## [1621] "t" "t" "a" "t" "g" "g" "t" "t" "t" "a" "g" "c" "t" "t" "c" "g" "g" "g"
## [1639] "g" "c" "a" "t" "c" "a" "t" "g" "t" "t" "t" "t" "c" "t" "t" "c" "t" "t"
## [1657] "c" "t" "a" "g" "c" "c" "a" "t" "t" "g" "c" "a" "a" "t" "g" "g" "g" "a"
## [1675] "t" "t" "g" "g" "t" "t" "t" "t" "c" "a" "t" "t" "t" "g" "c" "a" "t" "a"
## [1693] "a" "a" "g" "a" "a" "t" "g" "g" "a" "a" "a" "c" "a" "t" "g" "c" "g" "g"
## [1711] "t" "g" "c" "a" "c" "t" "a" "t" "t" "t" "g" "t" "a" "t" "a" "t" "a" "g"
## [1729] "t" "t" "t" "g" "a" "g" "a" "a" "a" "a" "a" "a" "a" "c" "a" "c" "c" "c"
## [1747] "t" "t" "g" "t" "t" "t" "c" "t" "a" "c" "t"
## attr(,"name")
## [1] "CY125728.1"
## attr(,"Annot")
## [1] ">CY125728.1 Influenza A virus (A/Mexico/InDRE7218/2012(H7N3)) hemagglutinin (HA) gene, complete
## attr(,"class")
## [1] "SeqFastadna"
```

```r
influenzab <- read.fasta("influenzab.fasta")
head(influenzab)
```

```
## $CY099329.1
##   [1] "a" "c" "t" "g" "t" "c" "t" "c" "a" "a" "c" "t" "g" "t" "a" "c" "a" "g"
##  [19] "a" "t" "c" "t" "g" "g" "a" "t" "g" "t" "g" "g" "c" "c" "t" "t" "g" "g"
##  [37] "g" "c" "a" "g" "g" "c" "c" "a" "a" "t" "g" "t" "g" "t" "g" "t" "g" "g"
##  [55] "g" "g" "a" "c" "c" "a" "c" "a" "c" "c" "t" "t" "c" "t" "g" "c" "t" "a"
##  [73] "a" "a" "g" "c" "t" "t" "c" "a" "a" "t" "a" "c" "t" "c" "c" "a" "c" "g"
##  [91] "a" "a" "g" "t" "c" "a" "g" "a" "c" "c" "t" "g" "t" "t" "a" "c" "a" "t"
## [109] "c" "c" "g" "g" "g" "t" "g" "c" "t" "t" "t" "c" "c" "t" "a" "t" "a" "a"
## [127] "t" "g" "c" "a" "c" "g" "a" "c" "a" "g" "a" "a" "c" "a" "a" "a" "a" "a"
## [145] "t" "c" "a" "g" "g" "c" "a" "a" "c" "t" "a" "c" "c" "c" "a" "a" "t" "c"
## [163] "t" "t" "c" "t" "c" "a" "g" "a" "g" "g" "a" "t" "a" "t" "g" "a" "a" "a"
## [181] "a" "t" "a" "t" "c" "a" "g" "g" "t" "t" "a" "t" "c" "a" "a" "c" "c" "c"
## [199] "a" "g" "a" "a" "c" "g" "t" "t" "a" "t" "c" "g" "a" "t" "g" "c" "a" "g"
## [217] "a" "a" "a" "a" "a" "g" "c" "a" "c" "c" "a" "g" "g" "a" "g" "g" "a" "c"
## [235] "c" "c" "t" "a" "c" "a" "g" "a" "c" "t" "t" "g" "g" "a" "a" "c" "c" "t"
## [253] "c" "a" "g" "g" "a" "t" "c" "t" "t" "g" "c" "c" "c" "t" "a" "a" "t" "g"
```

6

```
## [271] "c" "t" "a" "c" "c" "a" "g" "t" "a" "a" "a" "a" "t" "c" "g" "g" "a" "t"
## [289] "t" "t" "t" "t" "c" "g" "c" "a" "a" "c" "a" "a" "t" "g" "g" "c" "t" "t"
## [307] "g" "g" "g" "c" "t" "g" "t" "c" "c" "c" "a" "a" "a" "g" "g" "a" "c" "a"
## [325] "a" "c" "t" "a" "c" "a" "a" "a" "a" "a" "t" "g" "c" "a" "a" "c" "g" "a"
## [343] "a" "c" "c" "c" "a" "c" "t" "a" "a" "c" "a" "g" "t" "a" "g" "a" "a" "g"
## [361] "t" "a" "c" "c" "a" "t" "a" "c" "a" "t" "t" "t" "g" "t" "a" "c" "a" "g"
## [379] "a" "a" "g" "g" "g" "g" "a" "a" "g" "a" "c" "c" "a" "a" "a" "t" "t" "a"
## [397] "c" "t" "g" "t" "t" "t" "g" "g" "g" "g" "g" "t" "t" "c" "c" "a" "t" "t"
## [415] "c" "a" "g" "a" "t" "a" "a" "c" "a" "a" "a" "a" "c" "c" "c" "a" "a" "a"
## [433] "t" "g" "a" "a" "g" "a" "a" "c" "c" "t" "c" "t" "a" "t" "g" "g" "a" "g"
## [451] "a" "c" "t" "c" "a" "a" "a" "t" "c" "c" "t" "c" "a" "a" "a" "a" "g" "t"
## [469] "t" "c" "a" "c" "c" "t" "c" "a" "t" "c" "t" "g" "c" "t" "a" "a" "t" "g"
## [487] "g" "a" "g" "t" "a" "a" "c" "c" "a" "c" "a" "c" "a" "t" "t" "a" "t" "g"
## [505] "t" "t" "t" "c" "t" "c" "a" "g" "a" "t" "t" "g" "g" "c" "g" "a" "c" "t"
## [523] "t" "c" "c" "c" "a" "g" "a" "t" "c" "a" "a" "a" "c" "a" "g" "a" "a" "g"
## [541] "a" "c" "g" "g" "a" "g" "g" "a" "c" "t" "a" "c" "c" "a" "c" "a" "a" "a"
## [559] "g" "c" "g" "g" "c" "a" "g" "a" "a" "t" "t" "g" "t" "t" "g" "t" "t" "g"
## [577] "a" "t" "t" "a" "c" "a" "t" "g" "a" "t" "g" "c" "a" "a" "a" "a" "a" "c"
## [595] "c" "t" "g" "g" "g" "a" "a" "a" "a" "c" "a" "g" "g" "a" "a" "c" "a" "a"
## [613] "t" "t" "g" "t" "c" "t" "a" "t" "c" "a" "a" "a" "g" "a" "g" "g" "t" "g"
## [631] "t" "t" "t" "t" "g" "t" "t" "g" "c" "c" "t" "c" "a" "a" "a" "a" "g" "g"
## [649] "t" "g" "t" "g" "g" "t" "g" "t" "g" "c" "g" "a" "g" "t" "g" "g" "c" "a"
## [667] "g" "g" "a" "g" "c" "a" "a" "a" "g"
## attr(,"name")
## [1] "CY099329.1"
## attr(,"Annot")
## [1] ">CY099329.1 Influenza B virus (B/Mexico/InDRE26124/2009) hemagglutinin (HA) gene, partial cds"
## attr(,"class")
## [1] "SeqFastadna"
```

2) Calcula el número de bases de cada variante.

```
print("Influenza A-H1N1")
```

```
## [1] "Influenza A-H1N1"
```

```
count(influenzah1n1[[1]],1)
```

```
##
##   a   c   g   t
## 617 319 384 414
```

```
print("Influenza A-H3N2")
```

```
## [1] "Influenza A-H3N2"
```

```
count(influenzah3n2[[1]],1)
```

```
##
##   a   c   g   t
## 346 218 199 224
```

```
print("Influenza A-H7N3")
```

```
## [1] "Influenza A-H7N3"
```

```
count(influenzah7n3[[1]],1)
```

```
##
```

7

```
##   a   c   g   t
## 583 325 435 414
```

```
print("Influenza tipo B")
```
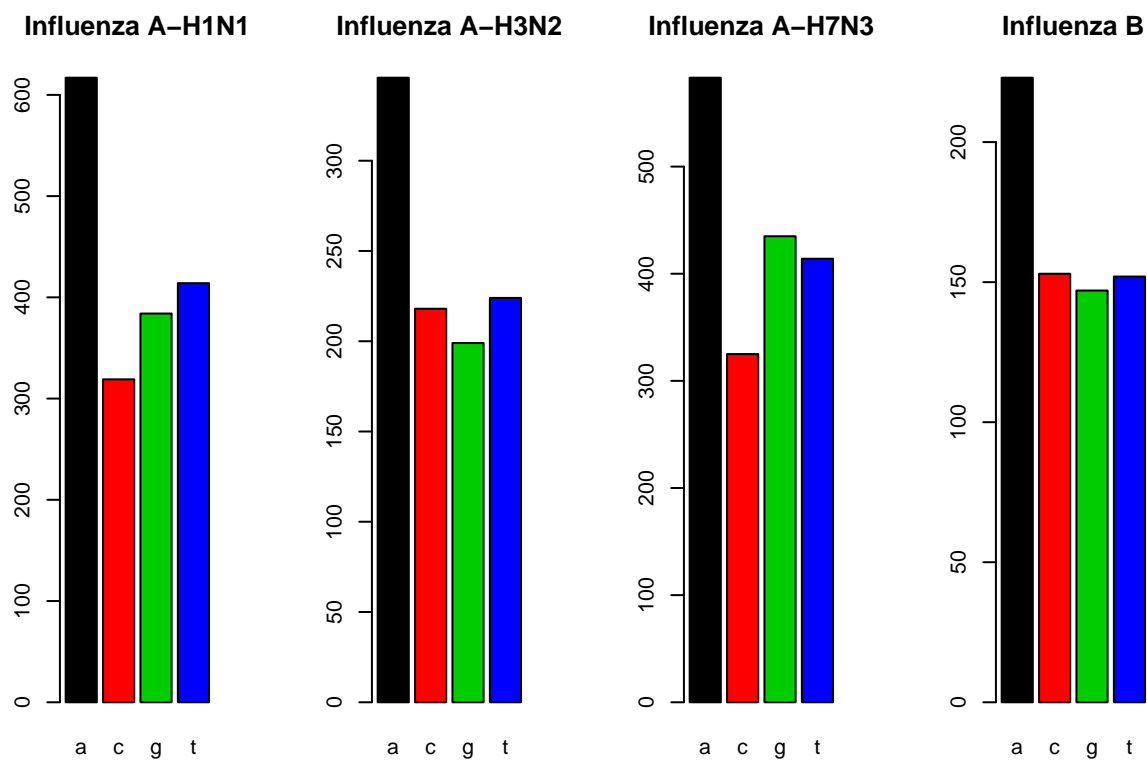
```
## [1] "Influenza tipo B"
```

```
count(influenzab[[1]],1)
```

```
##
##   a   c   g   t
## 223 153 147 152
```

3) Crea una gráfica donde compares todas las variantes del virus y las bases de ADN que las componen.

```
compara <- function(seq1, seq2, seq3, seq4){
 par(mfrow=c(1,4))
 barplot(table(influenzah1n1), col = 1:4, main = "Influenza A-H1N1")
 barplot(table(influenzah3n2), col = 1:4, main = "Influenza A-H3N2")
 barplot(table(influenzah7n3), col = 1:4, main = "Influenza A-H7N3")
 barplot(table(influenzab), col = 1:4, main = "Influenza B")
}
compara(influenzah1n1, influenzah3n2, influenzah7n3, influenzab)
```


4) ¿Cuál es la composición de GC de cada variante?

```
# Composición de GC de la influenza A-H1N1
print(GC(influenzah1n1[[1]]))
```

```
## [1] 0.405421
```

```
# Composición de GC de la influenza A-H3N2
print(GC(influenzah3n2[[1]]))
```

```
## [1] 0.4224924
```

```
# Composición de GC de la influenza A-H7N3
print(GC(influenzah7n3[[1]]))
```

```
## [1] 0.4325555
```

```
# Composición de GC de la influenza tipo B
print(GC(influenzab[[1]]))
```

```
## [1] 0.4444444
```

5) Crea las secuencias contrasentido (complementarias) de cada variante.

```
secuencia.complemento <- function(original){
  comp = original
  comp = mgsub(comp[[1]],c("a","g","t","c","A","G","T","C"),c("t","c","a","g","T","C","A","G"))
  comp = list(comp)
  return(comp)
}
```

```
# Secuencia complementaria de la influenza A-H1N1
secuencia.complemento(influenzah1n1)
```

```
## [[1]]
##     [1] "t" "t" "t" "t" "c" "g" "t" "t" "g" "t" "t" "t" "t" "t" "a" "c" "t" "t"
##    [19] "c" "c" "g" "t" "t" "a" "t" "g" "a" "t" "c" "a" "t" "c" "a" "a" "g" "a"
##    [37] "c" "g" "a" "t" "a" "t" "a" "t" "g" "t" "a" "a" "a" "c" "g" "t" "t" "g"
##    [55] "g" "c" "g" "t" "t" "t" "a" "c" "g" "t" "c" "t" "g" "t" "g" "t" "a" "a"
##    [73] "t" "a" "c" "a" "t" "a" "t" "c" "c" "a" "a" "t" "a" "g" "t" "a" "c" "g"
##    [91] "c" "t" "t" "g" "t" "t" "a" "a" "g" "t" "t" "g" "t" "c" "t" "g" "t" "g"
##   [109] "a" "c" "a" "t" "c" "t" "g" "t" "g" "t" "c" "a" "t" "g" "a" "t" "c" "t"
##   [127] "t" "t" "t" "c" "t" "t" "a" "c" "a" "t" "t" "g" "t" "c" "a" "t" "t" "g"
##   [145] "t" "g" "t" "g" "a" "g" "a" "c" "a" "a" "t" "t" "g" "g" "a" "a" "g" "a"
##   [163] "t" "c" "t" "t" "c" "t" "g" "t" "t" "c" "g" "t" "a" "t" "t" "g" "c" "c"
##   [181] "c" "t" "t" "t" "g" "a" "t" "a" "c" "g" "t" "t" "t" "g" "a" "t" "t" "c"
##   [199] "t" "c" "c" "c" "c" "a" "t" "c" "g" "g" "g" "g" "t" "a" "a" "c" "g" "t"
##   [217] "a" "a" "a" "c" "c" "c" "a" "t" "t" "t" "a" "c" "a" "t" "t" "g" "t" "a"
##   [235] "a" "c" "g" "a" "c" "c" "g" "a" "c" "c" "t" "a" "g" "g" "a" "c" "c" "c"
##   [253] "t" "t" "t" "a" "g" "g" "t" "c" "t" "c" "a" "c" "a" "c" "t" "t" "a" "g"
##   [271] "t" "g" "a" "g" "a" "g" "g" "t" "g" "t" "c" "g" "t" "t" "c" "g" "a" "g"
##   [289] "t" "a" "c" "c" "a" "g" "g" "a" "t" "g" "t" "a" "a" "c" "a" "c" "c" "t"
##   [307] "t" "t" "g" "t" "a" "g" "a" "t" "c" "a" "a" "g" "t" "c" "t" "g" "t" "t"
##   [325] "a" "c" "c" "t" "t" "g" "c" "a" "c" "a" "a" "t" "g" "g" "g" "t" "c" "c"
##   [343] "t" "c" "t" "a" "a" "a" "g" "t" "a" "g" "c" "t" "a" "a" "t" "a" "c" "t"
##   [361] "c" "c" "t" "c" "g" "a" "t" "t" "c" "t" "c" "t" "c" "g" "t" "t" "a" "a"
##   [379] "c" "t" "c" "g" "a" "g" "t" "c" "a" "c" "a" "g" "t" "a" "g" "t" "a" "a"
##   [397] "a" "c" "t" "t" "t" "c" "c" "a" "a" "a" "c" "t" "c" "t" "a" "t" "a" "a"
##   [415] "g" "g" "g" "g" "t" "t" "c" "t" "g" "t" "t" "c" "a" "a" "g" "t" "a" "c"
##   [433] "c" "g" "g" "g" "t" "t" "a" "g" "t" "a" "c" "t" "g" "a" "g" "c" "t" "t"
##   [451] "g" "t" "t" "t" "c" "c" "a" "c" "a" "t" "t" "g" "c" "c" "g" "t" "c" "g"
##   [469] "t" "a" "c" "a" "g" "g" "a" "g" "t" "a" "c" "g" "a" "c" "c" "t" "c" "g"
##   [487] "t" "t" "t" "t" "t" "c" "g" "a" "a" "g" "a" "t" "g" "t" "t" "t" "t" "t"
##   [505] "a" "a" "a" "t" "t" "a" "t" "a" "c" "c" "g" "a" "t" "c" "a" "a" "t" "t"
##   [523] "t" "t" "t" "t" "c" "c" "c" "t" "t" "a" "a" "g" "t" "a" "t" "g" "g" "g"
##   [541] "t" "t" "t" "c" "g" "a" "g" "t" "c" "g" "t" "t" "t" "a" "g" "g" "a" "t"
##   [559] "g" "t" "a" "a" "t" "t" "a" "c" "t" "a" "t" "t" "t" "c" "c" "c" "t" "t"
```

9

```
##  [577] "t" "c" "t" "t" "c" "a" "g" "g" "a" "g" "c" "a" "c" "g" "a" "t" "a" "c"
##  [595] "c" "c" "c" "g" "t" "a" "a" "g" "t" "g" "g" "t" "a" "g" "g" "t" "a" "g"
##  [613] "a" "t" "g" "a" "t" "c" "a" "c" "g" "a" "c" "t" "g" "g" "t" "t" "g" "t"
##  [631] "t" "t" "c" "a" "g" "a" "g" "a" "t" "a" "g" "t" "c" "t" "t" "a" "c" "g"
##  [649] "t" "c" "t" "a" "c" "g" "t" "a" "t" "a" "c" "a" "a" "a" "a" "a" "c" "a"
##  [667] "c" "c" "c" "c" "t" "g" "t" "a" "g" "t" "t" "c" "t" "a" "t" "g" "t" "c"
##  [685] "g" "t" "t" "c" "t" "t" "c" "a" "a" "g" "t" "t" "c" "g" "g" "c" "c" "t"
##  [703] "t" "t" "a" "t" "c" "g" "t" "t" "a" "t" "t" "c" "t" "g" "g" "g" "t" "t"
##  [721] "t" "c" "a" "c" "t" "c" "c" "c" "t" "a" "g" "t" "t" "c" "t" "t" "c" "c"
##  [739] "c" "t" "c" "t" "t" "a" "c" "t" "t" "g" "a" "t" "a" "a" "t" "g" "a" "c"
##  [757] "c" "t" "g" "t" "g" "a" "t" "c" "a" "t" "c" "t" "c" "g" "g" "c" "c" "c"
##  [775] "t" "c" "t" "g" "t" "t" "t" "t" "a" "t" "t" "g" "t" "a" "a" "g" "c" "t"
##  [793] "t" "c" "g" "t" "t" "g" "a" "c" "c" "t" "t" "t" "a" "g" "a" "t" "c" "a"
##  [811] "c" "c" "a" "t" "g" "g" "c" "t" "c" "t" "a" "t" "a" "c" "g" "t" "a" "a"
##  [829] "g" "c" "g" "t" "t" "a" "c" "c" "t" "t" "t" "c" "t" "t" "t" "a" "c" "g"
##  [847] "a" "c" "c" "t" "a" "g" "a" "c" "c" "a" "t" "a" "a" "t" "a" "g" "t" "a"
##  [865] "a" "a" "g" "t" "c" "t" "a" "t" "g" "t" "g" "g" "t" "c" "a" "g" "g" "t"
##  [883] "g" "c" "t" "a" "a" "c" "g" "t" "t" "a" "t" "g" "t" "t" "g" "a" "a" "c"
##  [901] "a" "g" "t" "c" "t" "g" "t" "g" "g" "g" "t" "t" "c" "c" "c" "a" "c" "g"
##  [919] "a" "t" "a" "t" "t" "t" "g" "t" "g" "g" "t" "c" "g" "g" "a" "g" "g" "g"
##  [937] "t" "a" "a" "a" "g" "t" "c" "t" "t" "a" "t" "a" "t" "g" "t" "a" "g" "g"
##  [955] "c" "t" "a" "g" "t" "g" "t" "t" "a" "a" "c" "c" "t" "t" "t" "t" "a" "c"
##  [973] "a" "g" "g" "t" "t" "t" "t" "a" "t" "a" "c" "a" "t" "t" "t" "t" "t" "c"
##  [991] "g" "t" "g" "t" "t" "t" "t" "a" "a" "c" "t" "c" "t" "g" "a" "c" "c" "g"
## [1009] "g" "t" "g" "t" "c" "c" "t" "a" "a" "c" "t" "c" "c" "t" "t" "a" "c" "a"
## [1027] "g" "g" "g" "c" "a" "g" "a" "t" "a" "a" "g" "t" "t" "a" "g" "a" "t" "c"
## [1045] "t" "c" "c" "g" "g" "a" "t" "a" "a" "a" "c" "c" "c" "c" "g" "g" "t" "a"
## [1063] "a" "c" "g" "g" "c" "c" "a" "a" "a" "g" "t" "a" "a" "c" "t" "t" "c" "c"
## [1081] "c" "c" "c" "c" "a" "c" "c" "t" "g" "t" "c" "c" "c" "t" "a" "c" "c" "a"
## [1099] "t" "c" "t" "a" "c" "c" "t" "a" "c" "c" "a" "t" "g" "c" "c" "a" "a" "t"
## [1117] "a" "g" "t" "g" "g" "t" "a" "g" "t" "t" "t" "t" "a" "c" "t" "c" "g" "t"
## [1135] "c" "c" "c" "c" "a" "g" "t" "c" "c" "t" "a" "t" "a" "c" "g" "t" "c" "g"
## [1153] "g" "c" "t" "g" "g" "a" "c" "t" "t" "c" "t" "c" "g" "t" "g" "t" "g" "t"
## [1171] "c" "t" "t" "a" "c" "g" "g" "t" "a" "a" "c" "t" "g" "t" "t" "c" "t" "a"
## [1189] "a" "t" "g" "a" "t" "t" "g" "t" "t" "t" "c" "a" "t" "t" "t" "a" "a" "g"
## [1207] "a" "c" "a" "a" "t" "a" "a" "c" "t" "t" "t" "t" "c" "t" "a" "c" "t" "t"
## [1225] "a" "t" "g" "t" "g" "t" "c" "a" "a" "g" "t" "g" "t" "c" "g" "t" "c" "a"
## [1243] "t" "c" "c" "a" "t" "t" "t" "c" "t" "c" "a" "a" "g" "t" "t" "g" "g" "t"
## [1261] "g" "g" "a" "c" "c" "t" "t" "t" "t" "t" "t" "c" "t" "t" "a" "t" "c" "t"
## [1279] "c" "t" "t" "a" "a" "a" "t" "t" "t" "a" "t" "t" "t" "t" "t" "t" "c" "a"
## [1297] "a" "c" "t" "a" "c" "t" "a" "c" "c" "a" "a" "a" "g" "g" "a" "c" "c" "t"
## [1315] "g" "t" "a" "a" "a" "c" "c" "t" "g" "a" "a" "t" "g" "t" "t" "a" "c" "g"
## [1333] "g" "c" "t" "t" "g" "a" "c" "a" "a" "c" "c" "a" "a" "g" "a" "t" "a" "a"
## [1351] "c" "c" "t" "t" "t" "t" "a" "c" "t" "t" "t" "c" "t" "t" "g" "a" "a" "a"
## [1369] "c" "c" "t" "g" "a" "t" "g" "g" "t" "g" "c" "t" "a" "a" "g" "t" "t" "t"
## [1387] "a" "c" "a" "c" "t" "t" "c" "t" "t" "g" "a" "a" "t" "a" "t" "a" "c" "t"
## [1405] "t" "t" "t" "c" "c" "a" "t" "t" "c" "t" "t" "c" "g" "g" "t" "c" "a" "a"
## [1423] "t" "t" "t" "t" "t" "t" "g" "t" "t" "a" "c" "g" "g" "t" "t" "c" "c" "t"
## [1441] "t" "t" "a" "a" "c" "c" "t" "t" "t" "g" "c" "c" "g" "a" "c" "g" "a" "a"
## [1459] "a" "c" "t" "t" "a" "a" "a" "a" "t" "g" "g" "t" "g" "t" "t" "t" "a" "c"
## [1477] "g" "c" "t" "a" "t" "t" "g" "t" "g" "c" "a" "c" "g" "t" "a" "c" "c" "t"
## [1495] "t" "t" "c" "a" "c" "a" "g" "t" "t" "t" "t" "t" "a" "c" "c" "c" "t" "g"
## [1513] "a" "a" "t" "a" "c" "t" "g" "a" "t" "g" "g" "g" "t" "t" "t" "t" "a" "t"
## [1531] "g" "a" "g" "t" "c" "t" "c" "c" "t" "t" "c" "g" "t" "t" "t" "t" "a" "a"
```

10

```
## [1549] "t" "t" "t" "g" "t" "c" "t" "c" "t" "t" "c" "t" "t" "t" "a" "t" "c" "t"
## [1567] "a" "c" "c" "c" "c" "a" "t" "t" "t" "c" "g" "a" "c" "c" "t" "t" "a" "g"
## [1585] "t" "t" "g" "t" "t" "c" "c" "t" "a" "a" "a" "t" "g" "g" "t" "c" "t" "a"
## [1603] "a" "a" "a" "c" "c" "g" "c" "t" "a" "g" "a" "t" "a" "a" "g" "t" "t" "g"
## [1621] "a" "c" "a" "g" "c" "g" "g" "t" "c" "a" "a" "g" "t" "a" "a" "c" "c" "a"
## [1639] "t" "g" "a" "c" "c" "a" "t" "c" "a" "g" "a" "g" "g" "g" "a" "c" "c" "c"
## [1657] "c" "c" "g" "t" "t" "a" "g" "t" "c" "a" "a" "a" "g" "a" "c" "c" "t" "a"
## [1675] "c" "a" "c" "g" "a" "g" "a" "t" "t" "a" "c" "c" "c" "a" "g" "a" "g" "a"
## [1693] "t" "g" "t" "c" "a" "c" "a" "t" "c" "t" "t" "a" "t" "a" "c" "a" "t" "a"
## [1711] "a" "a" "t" "t" "g" "t" "a" "a" "t" "c" "c" "t" "a" "a" "a" "g" "t" "c"
## [1729] "t" "t" "c" "g" "t" "a"
## attr(,"name")
## [1] "CY106568.1"
## attr(,"Annot")
## [1] ">CY106568.1 Influenza A virus (A/Merida/2189-CIR/2009(H1N1)) hemagglutinin (HA) gene, complete
## attr(,"class")
## [1] "SeqFastadna"
```

```r
# Secuencia complementaria de la influenza A-H2N2
secuencia.complemento(influenzah3n2)
```

```
## [[1]]
##    [1] "g" "t" "t" "t" "t" "t" "g" "a" "a" "g" "g" "g" "c" "c" "t" "t" "t" "a"
##   [19] "c" "t" "g" "t" "t" "g" "t" "c" "g" "t" "g" "c" "c" "g" "t" "t" "g" "c"
##   [37] "g" "a" "c" "a" "c" "g" "g" "a" "a" "c" "c" "c" "g" "t" "g" "g" "t" "a"
##   [55] "c" "g" "t" "c" "a" "t" "g" "g" "t" "t" "t" "g" "c" "c" "t" "t" "g" "c"
##   [73] "t" "a" "t" "c" "a" "c" "t" "t" "t" "t" "g" "t" "t" "a" "g" "t" "g" "c"
##   [91] "t" "t" "a" "c" "t" "g" "g" "t" "t" "t" "a" "a" "c" "t" "t" "c" "a" "a"
##  [109] "t" "g" "a" "t" "t" "a" "c" "g" "a" "t" "g" "a" "c" "t" "c" "g" "a" "c"
##  [127] "c" "a" "a" "g" "t" "c" "t" "c" "a" "a" "g" "g" "a" "g" "t" "t" "g" "t"
##  [145] "c" "c" "a" "c" "t" "t" "t" "a" "t" "a" "c" "g" "c" "t" "g" "t" "c" "a"
##  [163] "g" "g" "a" "g" "t" "a" "g" "t" "c" "t" "a" "g" "g" "a" "a" "c" "t" "a"
##  [181] "c" "c" "t" "c" "t" "t" "t" "t" "g" "a" "c" "g" "t" "g" "t" "g" "a" "t"
##  [199] "t" "a" "t" "c" "t" "a" "c" "g" "a" "g" "a" "t" "a" "a" "c" "c" "c" "t"
##  [217] "c" "t" "g" "g" "g" "a" "g" "t" "c" "a" "c" "a" "c" "t" "a" "c" "c" "g"
##  [235] "a" "a" "g" "g" "t" "t" "t" "t" "a" "t" "t" "c" "t" "t" "t" "a" "c" "c"
##  [253] "c" "t" "g" "g" "a" "a" "a" "a" "a" "c" "a" "a" "c" "t" "t" "g" "c" "g"
##  [271] "t" "c" "g" "t" "t" "t" "c" "g" "g" "a" "t" "g" "t" "c" "g" "t" "t" "g"
##  [289] "a" "c" "a" "a" "t" "g" "g" "g" "a" "a" "t" "a" "c" "t" "a" "c" "a" "c"
##  [307] "g" "g" "c" "c" "t" "a" "a" "t" "a" "c" "g" "g" "a" "g" "g" "g" "a" "a"
##  [325] "t" "c" "c" "a" "g" "t" "g" "a" "t" "c" "a" "a" "c" "g" "g" "a" "g" "t"
##  [343] "a" "g" "g" "c" "c" "g" "t" "g" "t" "g" "a" "c" "c" "t" "c" "a" "a" "a"
##  [361] "t" "t" "g" "t" "t" "a" "c" "t" "t" "t" "c" "g" "a" "a" "g" "t" "t" "a"
##  [379] "a" "c" "c" "t" "g" "a" "c" "c" "t" "c" "a" "g" "t" "g" "g" "g" "t" "t"
##  [397] "t" "t" "a" "c" "c" "t" "t" "g" "t" "t" "c" "g" "a" "g" "a" "c" "g" "a"
##  [415] "a" "c" "g" "t" "t" "t" "t" "c" "c" "t" "c" "t" "a" "g" "a" "t" "t" "a"
##  [433] "t" "t" "g" "t" "c" "a" "a" "a" "g" "a" "a" "a" "t" "c" "a" "t" "c" "t"
##  [451] "a" "a" "c" "t" "t" "a" "a" "c" "c" "a" "a" "c" "t" "g" "g" "g" "t" "g"
##  [469] "a" "a" "t" "t" "t" "t" "a" "a" "g" "t" "t" "t" "a" "t" "g" "g" "g" "t"
##  [487] "c" "g" "t" "a" "a" "c" "t" "t" "g" "c" "a" "c" "t" "g" "a" "t" "a" "c"
##  [505] "g" "g" "t" "t" "t" "g" "t" "t" "a" "c" "t" "t" "t" "t" "t" "a" "a" "a"
##  [523] "c" "t" "g" "t" "t" "t" "a" "a" "c" "a" "t" "g" "t" "a" "a" "a" "c" "c"
##  [541] "c" "c" "c" "c" "a" "a" "g" "t" "g" "g" "t" "g" "g" "g" "c" "c" "c" "a"
##  [559] "t" "g" "c" "c" "t" "g" "t" "t" "a" "c" "t" "g" "g" "t" "t" "t" "a" "g"
##  [577] "a" "a" "g" "g" "a" "c" "g" "t" "a" "c" "g" "a" "g" "t" "t" "c" "g" "t"
```

```
## [595] "a" "g" "t" "c" "c" "t" "t" "c" "t" "t" "a" "g" "t" "g" "t" "c" "a" "g"
## [613] "a" "g" "a" "t" "g" "g" "t" "t" "t" "t" "c" "t" "t" "c" "g" "g" "t" "t"
## [631] "g" "t" "t" "t" "g" "a" "c" "a" "t" "t" "a" "g" "g" "g" "c" "t" "t" "a"
## [649] "t" "a" "g" "c" "c" "t" "a" "g" "a" "t" "c" "t" "g" "g" "g" "t" "c" "t"
## [667] "c" "a" "t" "t" "c" "c" "t" "t" "a" "t" "a" "g" "g" "g" "g" "t" "c" "g"
## [685] "t" "c" "t" "t" "a" "t" "t" "c" "g" "t" "a" "g" "a" "t" "a" "a" "c" "c"
## [703] "t" "g" "t" "t" "a" "t" "c" "a" "t" "t" "t" "t" "g" "g" "c" "c" "c" "t"
## [721] "c" "t" "g" "t" "a" "t" "g" "a" "a" "a" "a" "c" "t" "a" "a" "t" "t" "g"
## [739] "t" "c" "g" "t" "g" "t" "c" "c" "c" "t" "t" "a" "g" "a" "t" "t" "a" "a"
## [757] "c" "g" "a" "g" "g" "a" "t" "c" "t" "c" "c" "a" "a" "t" "g" "a" "a" "g"
## [775] "t" "t" "t" "t" "a" "t" "g" "c" "t" "t" "c" "a" "c" "c" "c" "t" "t" "t"
## [793] "t" "c" "g" "a" "g" "t" "t" "a" "t" "t" "a" "c" "t" "c" "t" "a" "g" "t"
## [811] "c" "t" "a" "c" "g" "t" "g" "g" "g" "t" "a" "a" "c" "c" "g" "t" "t" "t"
## [829] "a" "c" "g" "t" "t" "a" "a" "g" "a" "c" "t" "t" "a" "c" "g" "t" "a" "g"
## [847] "t" "g" "a" "g" "g" "t" "t" "t" "a" "c" "c" "t" "t" "c" "g" "t" "a" "a"
## [865] "g" "g" "g" "t" "t" "a" "c" "t" "g" "t" "t" "t" "g" "g" "t" "a" "a" "a"
## [883] "g" "t" "t" "t" "t" "a" "c" "a" "t" "t" "t" "g" "t" "c" "t" "t" "a" "g"
## [901] "t" "g" "t" "a" "t" "a" "c" "c" "c" "c" "g" "g" "a" "c" "a" "g" "g" "g"
## [919] "t" "c" "t" "a" "t" "a" "c" "a" "a" "t" "t" "c" "g" "t" "t" "t" "t" "g"
## [937] "t" "g" "a" "g" "a" "c" "t" "t" "t" "a" "a" "c" "c" "g" "t" "t" "g" "t"
## [955] "c" "c" "c" "t" "a" "c" "t" "c" "t" "t" "t" "a" "c" "a" "t" "g" "g" "t"
## [973] "c" "t" "c" "t" "t" "t" "g" "t" "t" "t" "g" "a" "t" "c" "t"
## attr(,"name")
## [1] "EU502537.1"
## attr(,"Annot")
## [1] ">EU502537.1 Influenza A virus (A/MEXICO/2519/2006(H3N2)) segment 4 hemagglutinin (HA) gene, par
## attr(,"class")
## [1] "SeqFastadna"
```

```r
# Secuencia complementaria de la influenza A-H7N3
secuencia.complemento(influenzah7n3)
```

```
## [[1]]
##    [1] "t" "c" "g" "t" "t" "t" "t" "c" "g" "t" "c" "c" "c" "c" "t" "a" "t" "g"
##   [19] "t" "t" "t" "t" "a" "c" "t" "t" "g" "t" "g" "a" "g" "t" "t" "t" "a" "a"
##   [37] "a" "a" "c" "c" "g" "t" "g" "a" "g" "t" "a" "a" "c" "g" "a" "a" "c" "a"
##   [55] "t" "a" "c" "g" "a" "c" "t" "a" "a" "c" "c" "t" "c" "g" "a" "t" "t" "t"
##   [73] "c" "c" "t" "c" "t" "a" "t" "t" "t" "t" "a" "t" "a" "c" "a" "g" "a" "a"
##   [91] "c" "c" "c" "g" "t" "g" "g" "t" "a" "c" "g" "a" "c" "a" "c" "c" "g" "t"
##  [109] "t" "t" "a" "c" "c" "t" "t" "g" "t" "t" "t" "t" "c" "a" "c" "t" "t" "g"
##  [127] "t" "g" "t" "a" "a" "t" "t" "g" "t" "c" "t" "c" "t" "c" "t" "c" "c" "t"
##  [145] "t" "a" "g" "c" "t" "t" "c" "a" "t" "c" "a" "t" "t" "t" "a" "c" "g" "g"
##  [163] "t" "g" "t" "c" "t" "t" "t" "g" "c" "c" "a" "c" "c" "t" "c" "t" "g" "a"
##  [181] "c" "g" "t" "t" "t" "a" "t" "g" "a" "t" "t" "c" "t" "t" "t" "t" "a" "t"
##  [199] "a" "c" "g" "t" "g" "a" "g" "t" "c" "c" "c" "c" "t" "t" "t" "t" "c" "t"
##  [217] "g" "g" "t" "t" "g" "t" "c" "t" "a" "g" "a" "c" "c" "c" "t" "g" "t" "t"
##  [235] "a" "c" "g" "c" "c" "t" "g" "a" "a" "g" "a" "t" "c" "c" "t" "t" "g" "g"
##  [253] "g" "a" "t" "t" "a" "t" "c" "c" "t" "g" "g" "a" "g" "g" "g" "g" "t" "t"
##  [271] "a" "c" "g" "c" "t" "a" "g" "t" "t" "a" "a" "a" "g" "a" "c" "c" "t" "t"
##  [289] "a" "a" "a" "c" "t" "g" "c" "g" "a" "c" "t" "a" "a" "a" "t" "t" "a" "t"
##  [307] "t" "a" "a" "c" "t" "t" "t" "g" "c" "t" "t" "c" "t" "c" "t" "t" "c" "c" "t"
##  [325] "t" "g" "g" "c" "t" "a" "c" "a" "c" "a" "c" "a" "a" "t" "a" "g" "g" "g"
##  [343] "c" "c" "c" "t" "t" "c" "a" "a" "g" "t" "g" "t" "t" "t" "a" "c" "t" "t"
##  [361] "c" "t" "t" "a" "g" "t" "g" "a" "c" "t" "c" "c" "g" "t" "t" "t" "a" "g"
##  [379] "g" "a" "a" "g" "c" "t" "c" "c" "c" "a" "g" "t" "c" "c" "t" "c" "c" "t"
```
```

```
##  [397] "t" "a" "a" "c" "t" "a" "t" "t" "t" "c" "t" "c" "a" "g" "t" "t" "a" "c"
##  [415] "c" "c" "a" "a" "a" "g" "t" "g" "g" "a" "t" "a" "t" "c" "a" "c" "c" "t"
##  [433] "t" "a" "t" "t" "c" "t" "t" "g" "g" "t" "t" "a" "c" "c" "c" "c" "g" "c"
##  [451] "t" "g" "t" "t" "c" "a" "c" "g" "a" "a" "c" "g" "t" "c" "t" "t" "c" "t"
##  [469] "a" "g" "t" "c" "c" "a" "a" "g" "a" "a" "g" "g" "a" "a" "g" "a" "t" "a"
##  [487] "c" "g" "c" "c" "t" "c" "t" "a" "c" "t" "t" "c" "a" "c" "c" "a" "a" "t"
##  [505] "g" "a" "c" "a" "g" "c" "t" "t" "a" "a" "g" "t" "c" "t" "g" "t" "t" "a"
##  [523] "c" "g" "c" "c" "g" "a" "a" "a" "a" "g" "g" "g" "g" "t" "t" "t" "a" "c"
##  [541] "t" "g" "a" "t" "t" "c" "a" "g" "c" "a" "t" "g" "t" "c" "t" "t" "t" "a"
##  [559] "g" "g" "g" "t" "c" "c" "t" "t" "g" "t" "t" "t" "g" "g" "t" "c" "g" "a"
##  [577] "g" "a" "c" "t" "a" "t" "t" "a" "a" "a" "c" "c" "c" "c" "t" "c" "a" "c"
##  [595] "g" "t" "a" "g" "t" "a" "a" "g" "a" "c" "c" "t" "a" "g" "c" "c" "g" "a"
##  [613] "t" "g" "a" "c" "t" "c" "g" "t" "c" "t" "g" "g" "t" "t" "t" "g" "a" "g"
##  [631] "a" "t" "a" "c" "c" "c" "t" "c" "a" "c" "c" "t" "t" "t" "g" "t" "t" "c"
##  [649] "a" "a" "c" "t" "a" "t" "t" "g" "t" "c" "a" "t" "c" "c" "t" "t" "c" "g"
##  [667] "a" "g" "c" "t" "t" "t" "a" "t" "g" "g" "t" "c" "g" "t" "c" "a" "g" "t"
##  [685] "a" "a" "g" "t" "g" "g" "g" "g" "t" "t" "c" "g" "g" "g" "c" "c" "c" "c"
##  [703] "c" "g" "t" "g" "c" "t" "g" "g" "t" "g" "t" "c" "c" "a" "c" "t" "t" "a"
##  [721] "c" "c" "c" "g" "t" "t" "a" "g" "t" "c" "c" "t" "t" "c" "c" "t" "a" "a"
##  [739] "c" "t" "g" "a" "a" "a" "g" "t" "g" "a" "c" "c" "g" "a" "t" "g" "a" "g"
##  [757] "g" "a" "a" "c" "t" "a" "g" "g" "g" "t" "t" "a" "c" "t" "g" "t" "g" "t"
##  [775] "c" "a" "c" "t" "g" "g" "a" "a" "g" "t" "g" "t" "a" "a" "g" "t" "t" "a"
##  [793] "c" "c" "c" "c" "g" "t" "a" "a" "g" "t" "a" "t" "c" "g" "a" "g" "g" "a"
##  [811] "c" "t" "g" "t" "c" "t" "c" "g" "t" "t" "c" "a" "a" "a" "g" "a" "a" "a"
##  [829] "t" "c" "t" "c" "c" "t" "c" "t" "c" "a" "g" "t" "t" "a" "t" "c" "c" "t"
##  [847] "c" "a" "a" "g" "t" "c" "t" "c" "a" "c" "t" "a" "c" "a" "a" "g" "g" "a"
##  [865] "a" "a" "c" "c" "t" "a" "a" "g" "a" "c" "c" "a" "a" "c" "a" "c" "t" "c"
##  [883] "c" "c" "c" "c" "t" "a" "a" "c" "g" "a" "a" "g" "g" "t" "g" "t" "t" "a"
##  [901] "c" "c" "c" "c" "c" "a" "t" "g" "c" "t" "a" "t" "c" "a" "c" "t" "c" "a"
##  [919] "a" "g" "g" "g" "a" "c" "g" "g" "t" "a" "a" "g" "g" "t" "c" "t" "t" "g"
##  [937] "t" "a" "g" "t" "t" "g" "g" "g" "a" "t" "c" "t" "t" "g" "t" "c" "a" "c"
##  [955] "c" "c" "t" "t" "t" "t" "a" "c" "g" "g" "g" "a" "g" "c" "t" "a" "t" "a"
##  [973] "c" "a" "g" "t" "t" "t" "g" "t" "c" "t" "g" "t" "t" "c" "g" "g" "a" "g"
##  [991] "g" "a" "a" "a" "a" "c" "c" "g" "a" "t" "g" "t" "c" "c" "c" "t" "a" "c"
## [1009] "t" "c" "t" "t" "t" "g" "c" "a" "g" "g" "g" "t" "c" "t" "c" "t" "t" "g"
## [1027] "g" "g" "g" "t" "t" "c" "c" "t" "a" "t" "c" "c" "t" "t" "c" "t" "c" "g"
## [1045] "g" "c" "t" "g" "t" "a" "g" "c" "t" "t" "c" "c" "t" "g" "g" "t" "c" "t"
## [1063] "c" "c" "g" "g" "a" "a" "a" "a" "a" "c" "c" "t" "c" "g" "c" "t" "a" "a"
## [1081] "c" "g" "a" "c" "c" "t" "a" "a" "g" "t" "a" "t" "c" "t" "c" "t" "t" "a"
## [1099] "c" "c" "t" "a" "c" "c" "c" "t" "t" "c" "c" "a" "g" "a" "g" "t" "a" "a"
## [1117] "c" "t" "a" "c" "c" "t" "a" "c" "c" "a" "t" "a" "c" "c" "a" "a" "a" "g"
## [1135] "t" "c" "t" "g" "t" "a" "g" "t" "t" "t" "t" "a" "c" "g" "t" "g" "t" "t"
## [1153] "c" "c" "t" "c" "t" "t" "c" "c" "t" "t" "g" "a" "c" "g" "t" "c" "g" "a"
## [1171] "c" "t" "a" "a" "t" "g" "t" "t" "t" "t" "c" "g" "t" "g" "a" "g" "t" "t"
## [1189] "a" "g" "a" "c" "g" "c" "t" "a" "t" "c" "t" "a" "g" "t" "c" "t" "a" "g"
## [1207] "t" "g" "t" "c" "c" "g" "t" "t" "t" "a" "a" "c" "t" "t" "a" "g" "c" "a"
## [1225] "g" "a" "t" "t" "a" "a" "c" "t" "g" "t" "t" "t" "t" "g" "t" "t" "t" "a"
## [1243] "g" "t" "c" "g" "t" "c" "a" "a" "a" "c" "t" "t" "g" "a" "c" "t" "a" "t"
## [1261] "c" "t" "g" "t" "t" "g" "c" "t" "t" "a" "a" "g" "t" "c" "a" "c" "t" "t"
## [1279] "t" "a" "t" "c" "t" "t" "g" "t" "t" "g" "t" "t" "t" "a" "a" "c" "c" "c"
## [1297] "t" "t" "a" "c" "a" "g" "t" "a" "a" "t" "t" "g" "a" "c" "c" "t" "g" "t"
## [1315] "g" "c" "t" "c" "t" "a" "a" "g" "t" "t" "a" "c" "t" "g" "a" "c" "t" "c"
## [1333] "c" "a" "t" "a" "c" "c" "a" "g" "c" "a" "t" "g" "t" "t" "a" "c" "g" "a"
## [1351] "c" "t" "t" "a" "a" "c" "g" "a" "c" "c" "a" "t" "c" "g" "a" "t" "a" "c"
```

```
## [1369] "c" "t" "t" "t" "t" "a" "g" "t" "c" "g" "t" "g" "t" "g" "t" "t" "a" "t"
## [1387] "c" "t" "a" "g" "a" "a" "c" "g" "t" "c" "t" "g" "a" "g" "t" "c" "t" "t"
## [1405] "t" "a" "c" "t" "t" "g" "t" "t" "t" "g" "a" "a" "a" "t" "a" "c" "t" "c"
## [1423] "g" "c" "a" "c" "a" "t" "t" "c" "c" "t" "t" "t" "g" "t" "t" "g" "a" "c"
## [1441] "t" "c" "c" "c" "t" "c" "t" "t" "a" "c" "g" "a" "c" "t" "t" "c" "t" "c"
## [1459] "c" "t" "a" "c" "c" "c" "t" "g" "a" "c" "c" "t" "a" "c" "g" "a" "a" "a"
## [1477] "c" "t" "t" "t" "a" "t" "a" "a" "a" "g" "t" "a" "t" "t" "c" "a" "c" "a"
## [1495] "c" "t" "a" "c" "t" "a" "g" "t" "c" "a" "c" "g" "t" "a" "c" "c" "t" "c"
## [1513] "t" "c" "g" "t" "a" "g" "t" "c" "c" "t" "t" "g" "t" "t" "g" "t" "g" "a"
## [1531] "a" "t" "a" "c" "t" "g" "g" "t" "a" "t" "g" "a" "g" "t" "t" "a" "t" "g"
## [1549] "t" "c" "t" "c" "g" "c" "c" "t" "c" "a" "g" "t" "a" "a" "c" "g" "t" "c"
## [1567] "t" "t" "a" "t" "c" "t" "t" "a" "t" "g" "t" "c" "t" "a" "t" "c" "t" "g"
## [1585] "g" "g" "t" "c" "a" "c" "t" "t" "t" "a" "a" "c" "t" "c" "a" "t" "c" "a"
## [1603] "c" "c" "t" "a" "t" "g" "t" "t" "t" "c" "t" "g" "t" "a" "t" "t" "a" "g"
## [1621] "a" "a" "t" "a" "c" "c" "a" "a" "a" "t" "c" "g" "a" "a" "g" "c" "c" "c"
## [1639] "c" "g" "t" "a" "g" "t" "a" "c" "a" "a" "a" "a" "g" "a" "a" "g" "a" "a"
## [1657] "g" "a" "t" "c" "g" "g" "t" "a" "a" "c" "g" "t" "t" "a" "c" "c" "c" "t"
## [1675] "a" "a" "c" "c" "a" "a" "a" "a" "g" "t" "a" "a" "a" "c" "g" "t" "a" "t"
## [1693] "t" "t" "c" "t" "t" "a" "c" "c" "t" "t" "t" "g" "t" "a" "c" "g" "c" "c"
## [1711] "a" "c" "g" "t" "g" "a" "t" "a" "a" "a" "c" "a" "t" "a" "t" "a" "t" "c"
## [1729] "a" "a" "a" "c" "t" "c" "t" "t" "t" "t" "t" "t" "t" "g" "t" "g" "g" "g"
## [1747] "a" "a" "c" "a" "a" "a" "g" "a" "t" "g" "a"
## attr(,"name")
## [1] "CY125728.1"
## attr(,"Annot")
## [1] ">CY125728.1 Influenza A virus (A/Mexico/InDRE7218/2012(H7N3)) hemagglutinin (HA) gene, complete
## attr(,"class")
## [1] "SeqFastadna"
# Secuencia complementaria de la influenza tipo B
secuencia.complemento(influenzab)

## [[1]]
##    [1] "t" "g" "a" "c" "a" "g" "a" "g" "t" "t" "g" "a" "c" "a" "t" "g" "t" "c"
##   [19] "t" "a" "g" "a" "c" "c" "t" "a" "c" "a" "c" "c" "g" "g" "a" "a" "c" "c"
##   [37] "c" "g" "t" "c" "c" "g" "g" "t" "t" "a" "c" "a" "c" "a" "c" "a" "c" "c"
##   [55] "c" "c" "t" "g" "g" "t" "g" "t" "g" "g" "a" "a" "g" "a" "c" "g" "a" "t"
##   [73] "t" "t" "c" "g" "a" "a" "g" "t" "t" "a" "t" "g" "a" "g" "g" "t" "g" "c"
##   [91] "t" "t" "c" "a" "g" "t" "c" "t" "g" "g" "a" "c" "a" "a" "t" "g" "t" "a"
##  [109] "g" "g" "c" "c" "c" "a" "c" "g" "a" "a" "a" "g" "g" "a" "t" "a" "t" "t"
##  [127] "a" "c" "g" "t" "g" "c" "t" "g" "t" "c" "t" "t" "g" "t" "t" "t" "t" "t"
##  [145] "a" "g" "t" "c" "c" "g" "t" "t" "g" "a" "t" "g" "g" "g" "t" "t" "a" "g"
##  [163] "a" "a" "g" "a" "g" "t" "c" "t" "c" "c" "t" "a" "t" "a" "c" "t" "t" "t"
##  [181] "t" "a" "t" "a" "g" "t" "c" "c" "a" "a" "t" "a" "g" "t" "t" "g" "g" "g"
##  [199] "t" "c" "t" "t" "g" "c" "a" "a" "t" "a" "g" "c" "t" "a" "c" "g" "t" "c"
##  [217] "t" "t" "t" "t" "t" "c" "g" "t" "g" "g" "t" "c" "c" "t" "c" "c" "t" "g"
##  [235] "g" "g" "a" "t" "g" "t" "c" "t" "g" "a" "a" "c" "c" "t" "t" "g" "g" "a"
##  [253] "g" "t" "c" "c" "t" "a" "g" "a" "a" "c" "g" "g" "g" "a" "t" "t" "a" "c"
##  [271] "g" "a" "t" "g" "g" "t" "c" "a" "t" "t" "t" "t" "a" "g" "c" "c" "t" "a"
##  [289] "a" "a" "a" "a" "g" "c" "g" "t" "t" "g" "t" "t" "a" "c" "c" "g" "a" "a"
##  [307] "c" "c" "c" "g" "a" "c" "a" "g" "g" "g" "t" "t" "t" "c" "c" "t" "g" "t"
##  [325] "t" "g" "a" "t" "g" "t" "t" "t" "t" "t" "a" "c" "g" "t" "t" "g" "c" "t"
##  [343] "t" "g" "g" "g" "t" "g" "a" "t" "t" "g" "t" "c" "a" "t" "c" "t" "t" "c"
##  [361] "a" "t" "g" "g" "t" "a" "t" "g" "t" "a" "a" "a" "c" "a" "t" "g" "t" "c"
##  [379] "t" "t" "c" "c" "c" "c" "t" "t" "c" "t" "g" "g" "t" "t" "t" "a" "a" "t"
```

```
## [397] "g" "a" "c" "a" "a" "a" "c" "c" "c" "c" "c" "a" "a" "g" "g" "t" "a" "a"
## [415] "g" "t" "c" "t" "a" "t" "t" "g" "t" "t" "t" "t" "g" "g" "g" "t" "t" "t"
## [433] "a" "c" "t" "t" "c" "t" "t" "g" "g" "a" "g" "a" "t" "a" "c" "c" "t" "c"
## [451] "t" "g" "a" "g" "t" "t" "t" "a" "g" "g" "a" "g" "t" "t" "t" "t" "c" "a"
## [469] "a" "g" "t" "g" "g" "a" "g" "t" "a" "g" "a" "c" "g" "a" "t" "t" "a" "c"
## [487] "c" "t" "c" "a" "t" "t" "g" "g" "t" "g" "t" "g" "t" "a" "a" "t" "a" "c"
## [505] "a" "a" "a" "g" "a" "g" "t" "c" "t" "a" "a" "c" "c" "g" "c" "t" "g" "a"
## [523] "a" "g" "g" "g" "t" "c" "t" "a" "g" "t" "t" "t" "g" "t" "c" "t" "t" "c"
## [541] "t" "g" "c" "c" "t" "c" "c" "t" "g" "a" "t" "g" "g" "t" "g" "t" "t" "t"
## [559] "c" "g" "c" "c" "g" "t" "c" "t" "t" "a" "a" "c" "a" "a" "c" "a" "a" "c"
## [577] "t" "a" "a" "t" "g" "t" "a" "c" "t" "a" "c" "g" "t" "t" "t" "t" "t" "g"
## [595] "g" "a" "c" "c" "c" "t" "t" "t" "t" "g" "t" "c" "c" "t" "t" "g" "t" "t"
## [613] "a" "a" "c" "a" "g" "a" "t" "a" "g" "t" "t" "t" "c" "t" "c" "c" "a" "c"
## [631] "a" "a" "a" "a" "c" "a" "a" "c" "g" "g" "a" "g" "t" "t" "t" "t" "c" "c"
## [649] "a" "c" "a" "c" "c" "a" "c" "a" "c" "g" "c" "t" "c" "a" "c" "c" "g" "t"
## [667] "c" "c" "t" "c" "g" "t" "t" "t" "c"
## attr(,"name")
## [1] "CY099329.1"
## attr(,"Annot")
## [1] ">CY099329.1 Influenza B virus (B/Mexico/InDRE26124/2009) hemagglutinin (HA) gene, partial cds"
## attr(,"class")
## [1] "SeqFastadna"
```

6) Agrega una interpretación escrita de las gráficas que integras.

En las gráficas podemos observar que algo que comparten las 4 variantes de influenza es que tienen más adenina que los demás componentes, una gran propiedad principal de ella es que cuando se encuentra en la doble hélice, siempre está formando pareja con la timina de la hebra opuesta. Las otras bases del genoma podemos decir que cambian dependiendo de las variantes, como por ejemplo, en la A-H3N2 se puede observar una cantidad mayor de timina, seguido por la citosina y por último la guanina. En la variante H7N3 encontramos a su vez una mayor cantidad de guanina seguido por la timina y al terminar la citosina. Para concluir, en la variante de la influenza B se encuentra el mayor balance entre todas las bases, predominando por una pequeña cantidad la citosina, luego la timina y por útlimo la guanina.

```r
citation(package = "seqinr")
```

```
##
## To cite seqinr in publications use:
##
##   Charif, D. and Lobry, J.R. (2007)
##
## A BibTeX entry for LaTeX users is
##
##   @InCollection{,
##     author = {D. Charif and J.R. Lobry},
##     title = {Seqin{R} 1.0-2: a contributed package to the {R} project for statistical computing devot
##     booktitle = {Structural approaches to sequence evolution: Molecules, networks, populations},
##     year = {2007},
##     editor = {U. Bastolla and M. Porto and H.E. Roman and M. Vendruscolo},
##     series = {Biological and Medical Physics, Biomedical Engineering},
##     pages = {207-232},
##     address = {New York},
##     publisher = {Springer Verlag},
##     note = {{ISBN :} 978-3-540-35305-8},
##   }
```

```r
citation(package = "mgsub")
```

```
##
## To cite package 'mgsub' in publications use:
##
##   Mark Ewing (2019). mgsub: Safe, Multiple, Simultaneous String
##   Substitution. R package version 1.7.1.
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {mgsub: Safe, Multiple, Simultaneous String Substitution},
##     author = {Mark Ewing},
##     year = {2019},
##     note = {R package version 1.7.1},
##   }
##
## ATTENTION: This citation information has been auto-generated from the
## package DESCRIPTION file and may need manual editing, see
## 'help("citation")'.
```