

Judged by that single base position the first tree is the best. Phylogenetic software is used to make such calculations for much larger data sets. One common and user friendly program is PAUP: Phylogenetic Analysis Using Parsimony (and now other methods)

If two arrangements are equal then the node is collapsed to indicate lack of resolution.



There is a lot of academic debate concerning choosing the best phylogenetic method for a particular data set. However, this is not much of a concern for forensic species i.d., because all of the methods perform similarly with closely related species.

ANOTHER FORENSIC USE FOR PHYLOGENETIC ANALYSIS

THERE ARE SITUATIONS IN WHICH HIV TRANSMISSION IS CONSIDERED A CRIME OR AT LEAST WORTH A CIVIL SUIT.

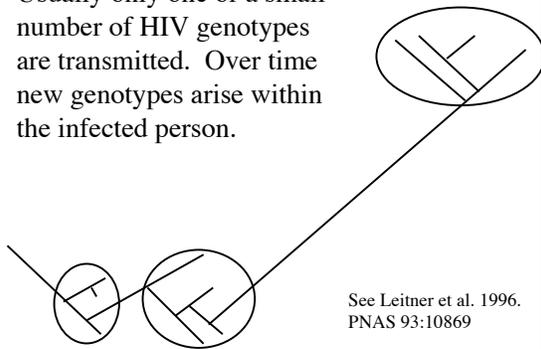
THERE ARE SITUATIONS IN WHICH HIV TRANSMISSION IS CONSIDERED A CRIME OR AT LEAST WORTH A CIVIL SUIT.

The fact that two people are HIV+ and had the sort of contact from which transmission is possible is not very incriminating.

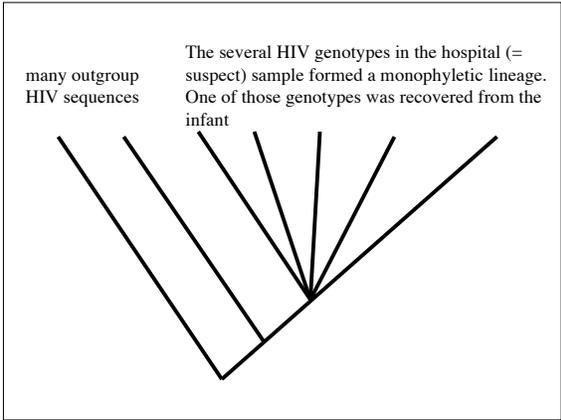
How can the source of an HIV infection be identified?

It turns out that HIV mutates so rapidly that transmission events can (sometimes) be reconstructed using the tools of evolutionary biology.

Usually only one or a small number of HIV genotypes are transmitted. Over time new genotypes arise within the infected person.



Unpublished case: A father was accused of deliberately infecting his newborn child. He worked in a hospital lab and was able to obtain infected blood. An infected blood sample was missing. Investigators were able to get a replicate of the missing sample.







Journal List > J Clin Microbiol > v.39(3); Mar 2001

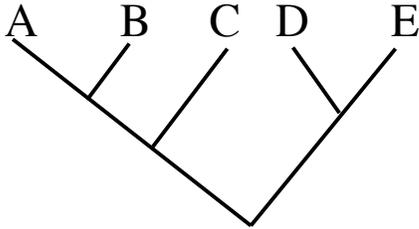
J Clin Microbiol. 2001 March; 39(3): PMCID: PMC87908
1204–1206.
doi:
10.1128/JCM.39.3.1204-1206.2001.
Copyright © 2001, American Society for Microbiology

Molecular Evidence of Male-to-Female Sexual Transmission of Hepatitis C Virus after Vaginal and Anal Intercourse

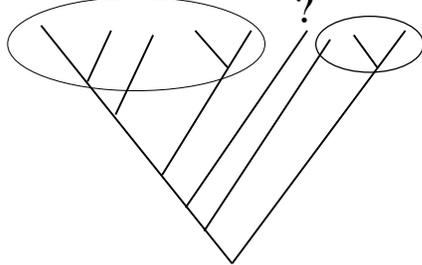
Philippe Halfon,^{1*} Hervé Riflet,² Christophe Renou,³ Yves Quentin,⁴ and Patrice Cacoub⁵

Some phylogenetic jargon.

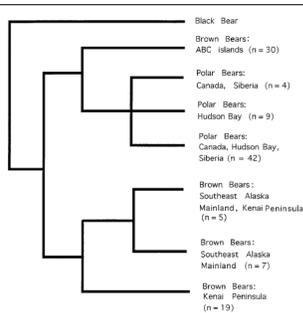
A+B is monophyletic
 A+B+C is monophyletic
 B+C is paraphyletic (1 branch left out)
 C+D is polyphyletic (>1 branch left out)



known specimens
 species A



If candidate species aren't monophyletic, an intermediate specimen is hard to assign.



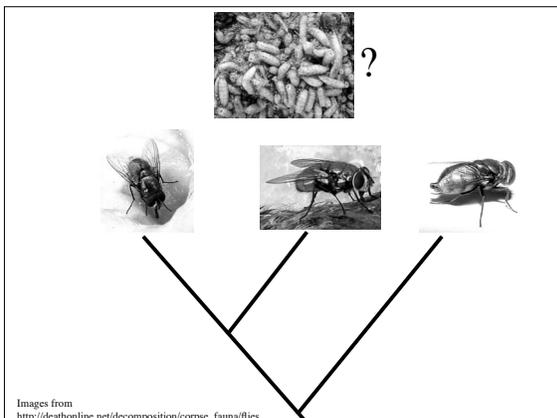
This is not unusual for recently diverged species. Unfortunately these are exactly the ones where DNA is most needed.

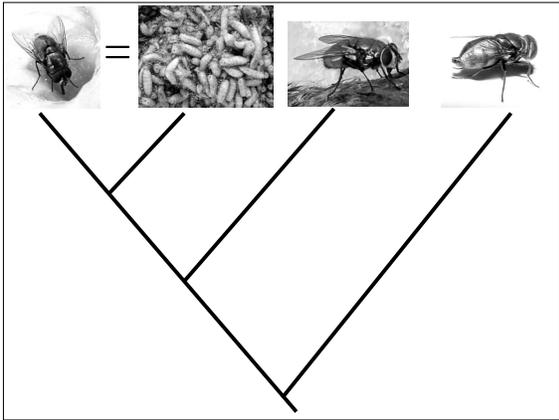
Cyt b phylogeny. From Shields et al. 2000. Mol Phyl Evol 15:319.

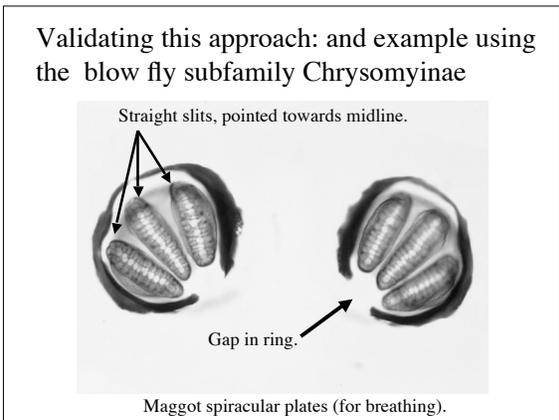
Finding a locus that works for a particular group is often a matter of trial and error.

Faced with a specimen that requires genotyping to identify:

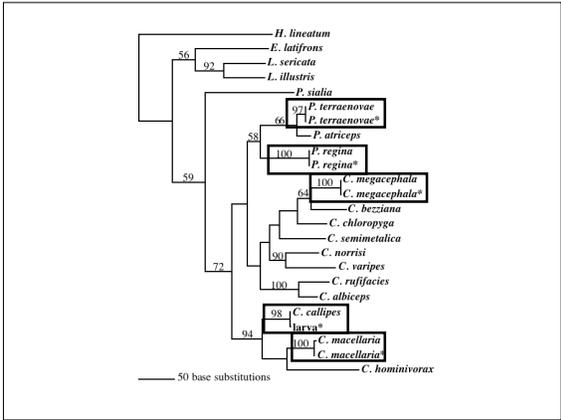
- One must (usually) have reason to think that there is reference data for that species.
- A genotype is generated for the specimen, and added to the phylogenetic data file.
- The specimen's closest relative will provide the identification.

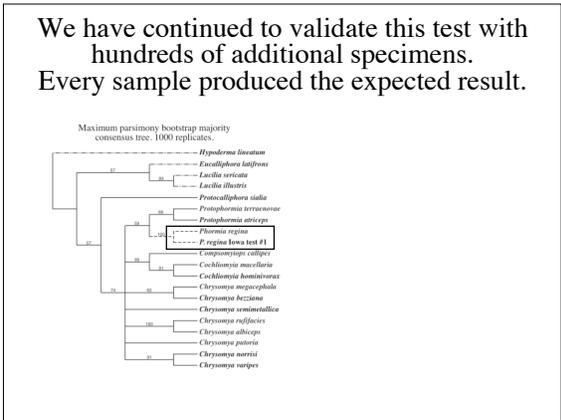


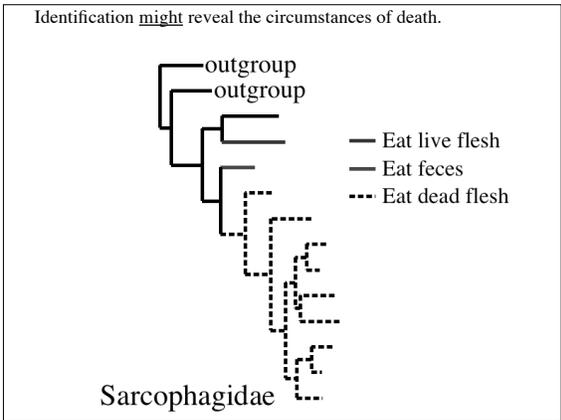


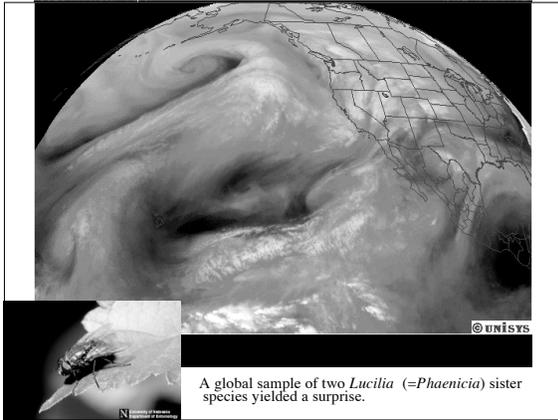


- ### General Steps
- We know every corpse-eating species in this group found in Canada and the USA.
 - We characterized the DNA of identified adult specimens.
 - We “validate” our data set by comparing it to DNA from additional specimens. Is each new specimen paired with the correct species?

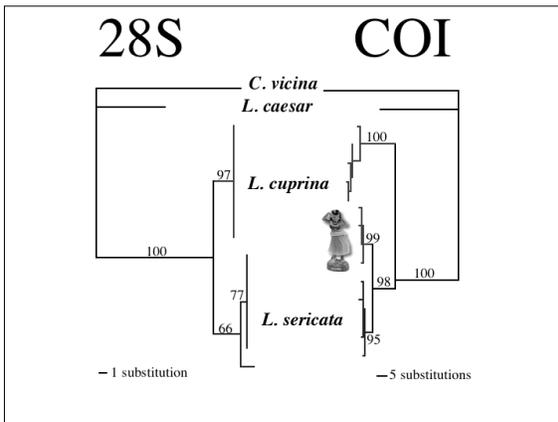








A global sample of two *Lucilia* (=Phaenicia) sister species yielded a surprise.



So far we have not found these
problematic *L. cuprina*
haplotypes in North America.

ARTICLE IN PRESS

Forensic Science International xxx (2010) xxx–xxx

Contents lists available at ScienceDirect

Forensic Science International

Journal homepage: www.elsevier.com/locate/forensicint

mtDNA-based identification of *Lucilia cuprina* (Wiedemann) and *Lucilia sericata* (Meigen) (Diptera: Calliphoridae) in the continental United States

Ronald W. DeBry^{a,*}, Alicia E. Timm^a, Gregory A. Dahlem^b, Trevor Stamper^a

^a Department of Biological Sciences, Box 210006, University of Cincinnati, Cincinnati, OH 45221-0006, USA

^b Department of Biological Sciences, Northern Kentucky University, Highland Heights, KY 41090, USA
