**Case scenario**

Your spouse (also an FP) is ensconced in the living room doing some journal reading when you hear her say, “Wow. I have always wondered what that meant.” You ask her what she is talking about. “Phylogenetics. It is high-tech detective work. It is the analysis of the small genetic changes that viruses and bacteria undergo in order to map out where they come from.”

“You mean like paternity testing?” you ask, not quite understanding how that would work. “Exactly! If you suspect where the measles cases might be coming from, you can do genetic testing to either confirm or exclude that possibility.” You sit down with her to have a look.

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**Evidence**

*Phylo* refers to a tribe, race, or related group. A phylogenetic figure is a lot like a family tree. The root of the tree represents the ancestral lineage, and the branches represent the descendants of that ancestor. As you move from root to tip, you move forward in time. **Figure 1** shows the phylogenetic tree for measles in Canada in 2015.

![Figure 1. Phylogenetic tree for measles in Canada, 2015](image)

Adapted from Sherrard et al.²

The yellow area represents a group (measles genotype B3) endemic to Africa that developed new lineages (or branches) in the United States. The green represents a genotype linked to China, and the blue represents a genotype linked to India. This was established by the National Microbiology Laboratory, which examines the specific nucleotide sequencing of virus samples sent for testing. They send this information on to the World Health Organization, which maintains a measles nucleotide database.³ The turquoise area represents a new lineage in the D4 genotype. There were 17 cases in Canada from this “new branch on the family tree.” Phylogenetics provided genetic evidence that these cases were linked—even though links could not be established with public health investigation and the actual source was never found.⁴

Measles remains one of the most contagious infections on the planet and it is endemic in many countries, such as India and China.⁵ Maintaining Canada’s measles elimination status requires phylogenetic reporting to document that the few cases we have each year are repeated travel-related cases rather than sustained local transmission. Every FP can help maintain Canada’s elimination status by early diagnosis: ask for a travel history from anyone with fever and a rash and check for the “4 Cs”: cough, coryza, conjunctivitis, and Koplik spots.

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**Bottom line**

Phylogenetics is fascinating in that it documents evolution—the tiny genetic changes in viruses and bacteria—in close to real time. It is increasingly being applied to advancing our understanding of all infectious diseases.

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**References**