



Genotypes: How we use them to determine parentage

Dr. Jean Dubach, wildlife geneticist, is often asked to answer scientific questions that require looking deeper than the outer phenotypes. Determining parentage of individual animals that live in flocks, for example, can present certain problems. To discover the true parents of a chick, Dr. Dubach looks to the DNA, specifically genetic markers called microsatellites, or Short Tandem Repeats (STRs).

Why use DNA?

STRs come about due to errors made during DNA replication. The simple repeats, usually only 2-6 bases long, result from replication errors when DNA copies itself. However, the repeated bases are unique to the individual and are passed from one generation to the next, one from the mother and the other from the father, they can be used to identify individuals and determine an organism's parentage. DNA must be used since it is difficult to visually identify individuals. Females may mate with multiple males making it difficult to determine paternity, and females sometimes steal infants of other females, raising the offspring as their own.

Remember, if a locus is homozygous, the numbers for both sequences will be the same. If they are different, the individual is heterozygous at that locus. Budgerigars are small seed-eating parrots that inhabit the dry habitats of Australia. Members of this species tend to live in nomadic flocks, moving from place to place based on the availability of water and food. Zoos currently keep large flocks of budgerigars for interactive displays, where the public can feed the birds and make a more personal connection with wildlife. The social nature of these birds makes them a perfect species for this type of exhibit.

Your task: A chick was found on the ground, having fallen from a nest. Because many nests are located in this area of your institution, it was impossible to determine from which nest it fell. You will use DNA collected from the birds in the aviary and compare it to ascertain the parents of this mystery chick. This information will help decide potential future mates for the chick to avoid inbreeding and maximize genetic diversity in the flock.

Procedure:

- 1) Obtain a **Budgerigar DNA Analysis Form** from your instructor.
- 2) You will need to go through each line of DNA sequence and find the STR sequence. In these DNA sets, the repeat will only be 2 letters in length.
- 3) Once you have found the repeating sequence, count the number of times it repeats, not the number of individual bases, and write it on the line labeled "Genotype" which is beneath each set of sequences.
- 4) Then turn your sheet over and log your data into the table provided.
- 5) Compare the numbers to determine the male and the female from whom the chick in question received its alleles. Keep in mind that one allele from every gene comes from each parent during sexual reproduction.
- 6) Answer the analysis questions to explain how you discovered the parentage of the chick.

