

Coefficient of Inbreeding (COI)

COI indicates the closeness of relationship in a pedigree. A higher number means more closely related; a lower number indicates less closely related. It is usually expressed as a percentage. The concept was developed by Sewall Wright (Coefficients of inbreeding and relationship. Am Nat. 56:330-8, 1922). The basic concept is that inbreeding exists when an ancestor appears on both sire's and dam's side of the pedigree.

Methodology

Breeder's Assistant software is used to calculate COI's for BeaCon's Open Health Registry. It is possible to choose the number of ancestor generations and to fine tune the calculation by controlling the treatment of ancestors beyond the number of generations that are visible to the calculation because of multiple occurrences of the same ancestor in different generations of the pedigree. The fine tuning possibilities with Breeder's Assistant are:

1. Strict options mean that the program is to strictly observe the ancestor generation limit imposed on the calculation; these cannot go beyond the last generation even though that information may be available in the database.
 - a. **Strict with Minimal Common Ancestor Inbreeding** considers only the inbreeding of a common ancestor that is visible within the pedigree at both the sire and dam side occurrences, on a path by path basis.
 - b. **Strict with Maximum Common Ancestor Inbreeding** uses the maximum inbreeding of the common ancestor as can be deduced by examining its sire and dam side occurrences, again on a path by path basis.
2. Relaxed options are faster when computing inbreeding to any significant depth of ancestors.
 - a. **Relaxed with Maximal COI** includes all possible common ancestors that can be deduced from the pedigree, subject only to the generation limit.
 - b. **Relaxed with Maximal Speed** computes the inbreeding coefficient as fast as possible by ignoring knowledge of the parents of ancestors that only occur in the last generation.

BeaCon has used 10 generations and relaxed with maximal speed for COI calculations. COI values obtained with other software programs can only be compared if the calculation methodology is identical.