Ten-point plan for dog breeding

1. **Collaborate**: encourage collaboration amongst all interested parties; facilitate genuine dialogue amongst all interested parties, resulting in positive action that can be embraced by all stakeholders
2. **Review breed standards**: review breed standards and change them where necessary; provide incentives to encourage the breeding of healthy dogs with favourable temperaments
3. **Conduct pedigree analyses and monitor the extent of genetic variation**: enable pedigree analyses to be conducted on all breeds, to determine the actual levels of inbreeding and loss of genetic diversity. Complementary to the pedigree analyses, obtain estimates of actual genetic diversity levels in all breeds, using any information that may be available. Increasingly in the future, DNA technology (including dog SNP chips) will be used to obtain estimates of genetic diversity
4. **Limit the mating of close relatives**: recommend that the offspring of any mating between first-degree relatives (parent-offspring; full-sibs), and possibly second-degree relatives (e.g. half-sibs, double-first cousins, uncle-niece/aunt-nephew, grandparent-grandchild), be not registered
5. **Import genetic variation from other countries and from other breeds**: especially for the numerically-small breeds, encourage and facilitate (a) importation of less-related animals from the same breeds in other countries, and (b) programs involving an outcross to another breed, followed by backcrossing. Provide examples of how this has been done successfully without compromising the integrity of breeds. Such programs are very effective strategies for introducing genetic diversity in numerically-small breeds and for addressing particular inherited disorders in any breed. Progress in such programs can be monitored by genotyping with dog SNP chips
6. **Monitor the incidence of inherited disorders**: in conjunction with epidemiologists, implement the LIDA strategy for continually estimating the prevalence of inherited disorders within breeds, and for making this information available to breeders, veterinarians, researchers, and potential pet-purchasers
7. **Control single-gene disorders**: recognise the distinction between:
   (a) eliminating (or decreasing the incidence of) inherited disorders (which is certainly possible), and
   (b) eliminating all mutant genes that cause disorders (which is not possible)
   Consistent with this reality, for known autosomal-recessive disorders, devise guidelines/rules that encourage/ensure that all matings involve at least one parent that is known to be (or has a high chance of being) homozygous normal [this will achieve (a) above]. At the same time, do everything possible to expand research into inherited disorders, especially with the aim of expanding the list of inherited disorders for which DNA markers are available for identifying homozygote normal animals. For practical feasibility, aim to expand current DNA testing to the stage where all available DNA tests can be incorporated in a single dog SNP chip (which can also include DNA profiling)
8. **Control multifactorial disorders**: for multifactorial disorders, develop schemes (in close collaboration with breeders) for using the most powerful means of predicting the results of any mating (namely estimated breeding values; EBVs), using phenotypic and pedigree data (and in the future, also from DNA marker data); and provide incentives for matings for which the average of the parental EBVs is on the favourable side of the kennel average and/or the breed average
9. **Investigate insurance schemes**: investigate the potential of insuring breeding stock against throwing offspring with particular disorders, especially those for which neither DNA tests nor EBVs are available. This provides increased financial security for vendors of breeding stock, reduces the likelihood of serious legal disputes between vendors and purchasers, and (very importantly) encourages reporting of disorders
10. **Facilitate continuing education for all stakeholders**: work with educational institutions to enable breeders, administrators, veterinarians and pet owners to increase their understanding of the biological and ethical issues involved in dog breeding

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