

GRUNFELD GERMAN SHEPHERDS

BREED VALUE and the GSD --- The SV Zuchtwert Program

by Fred Lanting

Many GSD fanciers (yes, unfortunately even breeders) have either not heard of the Zuchtwert program or have almost no idea of what it is. For nearly four decades, the world of dogs has known about canine hip dysplasia (HD) and has followed protocols laid down in the 1950s and '60s for diagnosis and control. In the U.S., pedigree registration has been taken over by AKC, UKC, and other organizations while the primary focus on dysplasia has been on and by the OFA; in Europe and elsewhere, the breed clubs have the responsibility for both registration and disease control. In both, the methodology of diagnosis had been basically the same: a ventrodorsal radiographic view with the dog's legs stretched out straight. This has proven to be of great value in detecting DJD, degenerative joint disease, but only of limited usefulness in discovering joint laxity (the primary precursor to DJD, and another definition for HD). Since dog breeders and buyers have become dissatisfied with the lack of suitable progress, we have looked for some advance that would enable us to rise above this plateau we have reached with the old methods.

In North America, where HD control is in the hands of the individual, the great advance to help us climb to the next level is the improved diagnostic and predictive technique known as the PennHIP distraction method. (See my articles on <http://realgsd.net>, previous issues of Schutzhund-USA, and other places.)

In Germany, the new and (almost as) great leap forward is the adoption of the Zuchtwert (ZW) program by the SV. The English translation would be "Breed Value (BV)". The SV leadership in recent years realized that something had to be done, because the incidence of HD was stagnating at an still uncomfortably high percentage. They hired Prof. Dr. Reiner Beuing of the University of Gießen. Much of the information in this article is a result of my personal correspondence with him and my translation of his articles in 1998 and 1999 issues of the SV Zeitung, 1998 bulletins, plus the special HD and other news that I, as an SV conformation judge, get from the SV. In some parts of this, I will be paraphrasing Dr. Beuing.

In its general meeting in May 1998 in Leipzig, the SV unanimously agreed upon the introduction of the Zuchtwert evaluation and the publication of this knowledge to support a breeding program for the fight against hip dysplasia. The delegates at the SV National Meeting in 1999 again unanimously confirmed the implementation of this "Breed Value Assessment" (ZW). Thereby, the SV took the first step on what was incorrectly called an untrodden path. It actually is an old cattle-breeders' approach, and some organizations had been using it for a long, long time. But it is like the Vikings or Columbus telling the Indians that they (the Europeans) had just "discovered" the new world, when it was no new discovery at all to those already living here. The Seeing Eye, Inc.® has long used BV in their selection of good hips and other qualities desirable for guide dogs. Even in Germany, the ZW concept had already been adopted by other breed clubs, but it took the deliberation and then the determination of the sleeping giant (SV) to make a statistically significant impact in changing hip joint quality and genetic improvement. The path has been planned and mapped conscientiously and thoroughly by the committees of the breed control and the technical sections of the headquarters; nevertheless it is still up to the practical breeder to go along this path and to trust it. The SV has made ZW a component of the breeding rules (Zuchtordnung).

Individual animals do not always reproduce themselves as we often hope. It is common experience in the breed scene, that some show winner, performance star, or other champion or typey dog produces disappointingly, while on the other hand, an almost dreamlike ideal, normal, "to-the-standard" dog often results from an accidental breeding. Similarly, one must understand that a healthy dog gives no guarantee that his progeny will be healthy. HD, elbow dysplasia, epilepsy, eye disorders, etc. unexpectedly arise from apparently normal parents, and catch most breeders unawares. Then if characteristics can be different in the breeding animal than in its progeny, one must wonder why have all these breed surveys and breeding requirements? And how can we set it up so that the phenotypes of those animals can tell us how they will probably produce?

Each breeder tries to include already-available information concerning siblings and his own experience with other progeny. No breeder can put forward a really objective picture, however. Additionally, there is the tremendous abundance of dogs in the breed, and no one is in the position of getting and cataloging

their achievement tests or health control data, not with well over 30,000 puppies born annually. So up to now all we could do was consider only the stud dogs or the breeding bitches themselves. Today, however, the time is ripe for more. Computer technology and the information revolution have matured so that the club (SV) can document not only all members, but also can give clues regarding how good the dogs themselves should be, and how they will probably produce.

Definition of the Breed Value

Breed Value Assessment (Zuchtwert) is the attempt to describe how an animal will pass characteristics to its progeny. Hereditary transmission (whether improving or weakening) is described to breeders as "value or breed worthiness", and is expressed in the form of a number. An animal bequeathing an "average" value (neither improving nor worsening) has a value of 100. Animals that improve upon this average in the breeding scheme (in HD that would be lowering the incidence in progeny) are given value numbers under 100; animals that magnify or increase the feature will have values over 100. With this system, the breeder need no longer focus [as much?] on whether a particular dog is free of HD, or what degree of laxity/tightness it has; in the future he can expect a reduced risk of HD (smaller ZW number) or an increased risk (high number).

We thus have numbers that tell us what the animals' phenotypes or performances are like. For instance, the score earned in tracking work tells us whether the dog was good or bad. We have numbers about the size (shoulder height), and points on gait or type. In many features there is a numerical value, which tells us how pronounced the characteristic is. As breeders, however, we need a number that tells us how pronounced the feature in the progeny will likely be. In other words, use phenotype and progeny testing to give a better clue as to genotype. This number, to be applied to the breed, is called Zuchtwert (breed value). There is therefore, for each feature, one phenotypic measurement and one genetic breed value. As concerns HD, (unquestionably the most urgent ZW trait considered by the SV) a breed value is to be published from now on for each dog. The fight against hip dysplasia is of great concern in the German Shepherd Dog. As the world's most populous breed, its name is brought up again and again in connection with hereditary diseases and breed faults. One may lament that as being unjust, because in other, smaller-population breeds there are much higher percentages though the absolute numbers are less conspicuous. However, whining complaints and rationalizations are of little use. There is an old maxim: the larger and more striking a picture of oneself that one presents to the public, so much better must he actually be!

With this explanation, the definition of the breed value becomes understandable: it is a numerical value to be applied to the breed to describe the effects that the genes have on a trait, compared to the genes of the rest of the population and the effects of normal environments. We must emphasize first of all that the breed value has nothing to do with how valuable or worthless an individual dog is, but is only a numerical value describing if the genes working on this trait strengthen (improve) or weaken it for the next generation. For diseases, that means that high breed value numbers indicate a worsening of what the breeders see as undesirable re the disease or anatomical construction. The goal must be to introduce breeding animals that reduce the disease risk in the breed. Low numbers are therefore more valuable in such cases! With other traits, such as outstanding predisposition for high drives, we would take high ZW numbers as being prized or desirable. With height at withers, it is not that simple. A high breed value for a dog in this instance means that his genes increase the size. That can be valuable and important for a small bitch. For a bitch already over the limit, such a dog is not recommended. It is up to the breeder to use his best judgment to select the suitable dogs for his bitch, and it is best if he first knows what the breed values are.

The Relative Breed Value

If one is to advertise or publish breed values, they must be easily understood. An HD breed value of +0.14 means for example, that with an equivalently-rated partner, the offspring probably will be 0.14 (HD degrees or points) higher. This is unwieldy; therefore, breed values are not expressed as absolute numbers, but as relative to the breed cross-section. Therefore we take 100 (points) for the breed level (as typical or average). Dogs with ZW over 100 increase (worsen), while those under 100 reduce, the characteristic. A technical point, but to be stated despite my recommendation to forget about it right

away, is that the variation from the median amounts to 10 points either way; this means that a reported ZW of 90 should be read as a range of 80 to 100. Thus, if a bitch has a breed value of 95 for HD, one knows that she can improve the breed, but a dog with ZW of 115 exacerbates the HD problems. By referring to breed averages, the classifications regarding different characteristics also become comparable. If we get, for example, a dog with HD 92 and shoulder height 108, this makes it clear that he is a breeding partner that can be used for improving the HD scores and increasing the inherited size trait.

Why is Breed Value Median Always Only an Estimate?

One finds, in the biology of inheritance, that we can determine the true breed value only with difficulty. The owner's personal, subjective judgment of his animals is not a 100-percent reflection of the genes; therefore we recommend the use of breed values. The ZW number is not a mathematically precise guarantee of genetic constitution because:

1. The genes work only in the particular individuals themselves and not in concert with the genes in the rest of the population (there can be, for example, action of concealed recessive genes that do not show in others).
2. Environment certainly influences the expression of the genes in these animals.

Both reasons (for ZW being only an estimate) give a false picture. The reliability with which one can recognize the true breed value from the appearance (phenotype) is, for instance, around 20% for HD, for shoulder height around 50%, etc. One calls this percentage heredity and/or heritability. [Note: Such heritability figures are not always backed up with scientific studies and professional, peer-reviewed journal articles. For example, OFA has given 0.25 as the heritability of HD but has never produced any evidence to back this up. Meanwhile, organizations such as the University of Pennsylvania and The Seeing Eye, Inc. have concluded with reasonable reliability that the PennHIP diagnostic technique gives a heritability figure of over 0.4, meaning that their method is considerably more "telling" than the leg-extended views used by SV, OFA, GDC, etc. Heritability varies with breed, diagnostic technique, even a person's own strain of bloodlines.]

Each animal receives his genes from father and mother, half from each one at random. Information about siblings or progeny is thus based only on a random gene sampling from the contribution of the parents. First, the statistics allow us to get an approximate picture from abundant knowledge and/or observations. A spoonful from the stock pot gives only a chance picture as to how many "chunks" and how much "broth" are in the stew, and each additional ladle shows us more accurately how rich the soup is. So also our knowledge about the genetic "capacity" of a breeding animal increases with each additional litter he or she produces.

Present Standing of the Knowledge

Breed values help decide many things: whether to use a stud dog for a given bitch, a breed survey, a puppy sale, if the puppy should become a breed dog, and yes, even before birth, since the question is put as to whether subsequent puppies are themselves programmed for life by their genetic portion. All available information must be used to bring us to the knowledge needed to make an estimated breed value (ZW). Estimated breed value means "the most probable genetic production, as determined by the current knowledge". Since in the course of time more knowledge is always forthcoming, certain limitations of the ZW estimates will also change. Several have made comments such as, "It is not clear how the SV arrives at the ZW-HD numbers. Until we know that, the ratings are less valuable than they should be, despite SV regulations." Certainly, there is a need for the SV to do more about the limitations of the system and its interpretation, but it is still a big step forward; there is also a need for breeders to support such programs. Dr. Beuing presents the picture of this need as consisting of half a dozen or so "levels of knowledge".

First level of knowledge

From father and mother ZW estimates, we can make some statements about what genetic contributions may exist. Since father and mother each bring in half of the genes in each of the puppies, and the effect of these genes is described by the breed value, then for the calculating of ZWs of the puppies, it must be $1/2$ the sire's breed value plus $1/2$ the dam's breed value. This is the same as saying you can add the ZWs of sire and dam and take the average (divide by 2) to give the starting ZW for your dog. Once a dog gets out of Germany, however, no matter how good his hips or non-German progeny, his ZW will remain the same. Only those producing in SV-registry countries can change their ZWs by virtue of producing good-hip offspring. The better the breed values of the parents are, the more favorable the probable genetic make-up (ZW) of the puppies!

Second level of knowledge

While one can learn the ZW even before the actual mating, dogs can also be evaluated and "scored" by using data on earlier litters of these parents. These siblings can improve the evidence about father or mother and their "progeny-correcting" breed values. Breed values for individual puppies thus can be known somewhat, without physically evaluating the puppies themselves.

Third level of knowledge

At the beginning, the level of knowledge was derived only from the breed values of the parents, which with time and more progeny become increasingly more accurate. Since all puppies of a litter have the same parents, all puppies must also begin with equal estimated breed values. Each puppy however has received respectively half from the father's and half from the mother's genomes. By sheer good fortune, a puppy thus can have received more favorable genes than have his littermates. This "distribution of good luck" or "distribution of bad luck" at the stage of cell combination and development of the egg and sperm leads to the fact that full siblings can considerably differ genetically [as well as phenotypically] in their particulars. Whether an individual animal is blest or cursed by the random allocation, for instance in reference to the HD genes, can be estimated only if the animals are radiographed for HD. The picture depends on "egg & sperm contribution" but also on environmental factors, radiographic technique, position, and subjective judgment.

Fourth level of knowledge

If full siblings also get evaluated, and especially if most are assessed quite close to the time that the animal of interest (called the "proband" or "probationer") is under consideration, then their "declarations" supplement the breed values of the parents and also indirectly the breed value of the "probationer" (your dog, for example). Breed values thus can change further after individual appraisals, even if a dog is never used in the breed.

Fifth level of knowledge

If the animal does come into the breed's gene pool, his genetic continuity becomes effective in his progeny, combined with different breeding partners. With each examined offspring, the knowledge climbs in importance beyond his own former ZW. The estimated values themselves vary from the average of the [original] breed value. With each puppy whelped, points begin again for another first level of knowledge, so that the breeder comes full circle and starts all over again with each litter.

Further knowledge

If a descendant is evaluated, he gives knowledge about father and mother. The father will bring such information to the descendant that is not clearly provided by the mother, and the mother contributes only that which is not donated by the father. The following simple situation should serve as example:

I import a dog and a bitch; nothing is known about their relatives. A litter from these reveals bad HD results. Since the placing of blame on only one parent is not possible, both receive uniformly and equally a bad breed value (e.g., 110). The bitch whelps a second litter sired by a frequently used stud dog with a ZW of 89 (he already has 80 offspring, 30 of them radiographed, with predominantly good hips) and we find again that she produces medium and severe HD. Now, the transmission of many bad genes by the bitch becomes evident through this second pairing, because with a known good-producing dog she has undesirable results! Her breed value index drastically rises thereby. And that has consequences for further use of the imported stud dog that was the sire of the first litter. He is exonerated, and can possibly get 100 or under, even if he personally has no further progeny.

The claim

Breed Value Assessment (Zuchtwertschätzung) does not claim to document the truth about the "genes". But it should give indication of the presence of good or unfavorable genes. The breeder urgently needs these signs. He must build his kennel with the foundation of genes from the best families, and take all indications of problems under consideration, be they HD, size, character, working ability, etc. When breed clubs offer instruction through this Zuchtwert assessment, at least for some feature urgently in need of attention in the beginning, the breed will develop quickly in the desired direction. Since 1989, Zuchtwertschätzung has been used in other clubs, with subsequently developed breeding programs, but also for non-binding information.

ZW Mandatory As Of July 1999

Wide implementation of the method of Breed Value Assessment has been effective in the "commercial animal" breeds (food & textile). This includes, in a computer record, all available data of the ancestors and any available progeny as well as of the personal phenotype of the animal concerned, and can work authentically and exceedingly effectively in the purebred dog. In cooperation with the Institute for Breeding Animals and Animal Genetics at the University of Gießen, the SV developed a breeding program that became obligatory as of July 1, 1999. Before that, starting in September 1998, the process was voluntary. Each breeder currently and henceforth knows about the inheritance (HD-production) risk of his bitch through this HD breed value. The breed value numbers of all stud dogs are likewise disclosed. From both of these sides comes a greater knowledge of HD risk for their progeny. The official position of the SV is that considerable breeding progress in the area of declining HD incidence can be had by implementing this measure.

The HD Program of the SV

Success speaks for itself. The SV has had a protocol for HD control since 1966, which was recognized at an international technical convention in 1974 as "the best in the world." Nothing has changed about it until recently.

Through mid-1999, over 260,000 German Shepherd Dogs had been X-rayed in the SV's HD scheme, and about 240,000 dogs received that coveted "a" stamp, which denotes official permission for the dog to be bred. Approximately 13,000 new "a" stamps are awarded annually. The percentage of dogs with medium and severe HD was drastically reduced by initially 27%, until today there are only around 6% as identified in the old diagnostic technique. The SV has indeed made greater strides in lowering the number of severe-HD cases and preventing severely dysplastic dogs from breeding, than have U.S. or many other counterparts, and this is to be admired. However, because of the failings in their "standard" diagnostic method (see my articles in the Internet on the PennHIP and OFA methods) the SV has not made as much progress as they should have in reducing the number of "carriers" and actual dysplastic dogs that slip through the net designed to catch them. This is why the SV has decided to use Breed Value. What they really ought to do is use both ZW and PennHIP. I am sure you noticed the proximity of those numbers of total dogs radiographed and those "passed": this should create even more questions about how stringent the "a"-stamp program is. It is time to raise the bar, since the SV has reached a plateau just as the OFA-type evaluation has, although with the ZW, that SV plateau will prove to be at a slightly higher altitude.

Decisively involved with the success of the battle in Germany are the SV-certified HD radiologists and HD veterinarians. Nearly 3,000 veterinarians have become authorized by the SV as "acknowledged HD veterinarians". Contrast this with the most well-known American system, where any vet can take a picture and send it to OFA or just give his own reading. And with the PennHIP one, in which only P-H-certified and trained vets may participate — in the former, there is a statistical bias if not all films are sent in; in the latter, the vet would lose privileges if he were to withhold any from the database. In this respect, and in the amount of useful information gathered, the SV's total system is intermediate in value or usefulness between OFA and PennHIP. Toward the end of this article, I condense the instructions the SV gives to their listed vets.

Dr. Beuing, the administrator of the ZW project for the SV, answers the following most frequent questions on the SV website and mailings to certain members. However, he does not really answer satisfactorily, partly because geneticists use such complicated formulas for BV. My (Fred's) comments in brackets.

1. How is the Breed Value HD worked out for my dog? What is the formula for it?

There is no precise formula in these calculations. The ZW of every animal [whose parents were not already calculated] was considered "unknown" at the beginning of the calculations. Then an equation is put up for every animal, with the formula:

$(ZW \text{ for HD}) = \text{the breed average} + \text{Breed Value of this animal} + \text{variation of sex} + \text{other influences.}$

In this equation the breed average, breed value and the effect of the sex are formulated as the "cause" of HD. In the

SV, 450,000 equations were formulated for 450,000 animals, with the 450,000 unknown Breed Values. Then some

supplementary conditions (stipulations or prerequisites) of the laws of inheritance and heredity are mathematically

formulated. Following this, the computer has to solve the 450,000 equations with the 450,000 unknown factors. The

answers are the assessed (estimated) Breed Values. This means that there is no formula, in which a dog's breed value

is worked out on its own.

2. What role does its own HD score play in my dog's HD Breed Value?

The dog's own HD grade modifies that which was already known about the sire and dam. Siblings may differ because of their own HD status. If an animal has progeny, its own HD status ["a"-stamp grade] recedes more and more into the background, becomes less of a factor. With 30 - 40 progeny, it is practically of no consequence. [We see here that the ZW program uses that old reliable "progeny testing" approach, which makes it far better than what we use in the U.S. Hinted in Beuing's answer here is the tacit acknowledgement that the "a"-stamp for hips is not all that reliable, something he dares not say unequivocally. Even though the "Normal" is given more weight than "Fast Normal or Noch Zugelassen, the unreliability of these assessments casts some doubt on the reliability of the ZW itself. The greater the number of radiographed dogs that contribute to a parent's ZW, of course, the more these discrepancies are minimized.]

3. How is a foreign "a" [or equivalent] evaluated for the ZW Breed Value Assessment?

At this time, dogs from abroad with the "a", OFA, etc. are evaluated in the formulations as though they were not X-rayed. Their ZW is gained only through their X-rayed relatives. As these foreign animals cannot be clearly termed as "HD-free" or "still acceptable" [noch zugelassen], an assumption in this case, would be unfair.

4. How can a dog that was not X-rayed have a ZW for HD?

In the system of equations (see Answer 1), there is a lateral clause, that the father and the mother each contribute half of their genes to the progeny. Therefore the Breed Value of the progeny can be assessed or estimated, if nothing is known about the animal (not X-rayed), as well as if the breed value of the sire and dam are known. In the same way, a parent can be assessed if the progeny is known, because progeny have one half of their genes from each parent. Siblings on the one hand help to characterize the parents, the knowledge about the breed value of the parents helps on the other hand, to assess the breed value of the untested siblings.

5. How accurate can the Breed Value Assessment be, if no HD information is available for more than half of the whelps?

In the ZW Estimate, the percentage of the pups does not matter, but the total number. The last Sieger has his heritage well demonstrated by 71 X-rayed progeny as of early 1999. [Each month I get from the SV the news of breedings by German dogs, and can watch the ZW numbers change. Sieger Rikkor, mentioned here, had as high as 118, meaning that he has produced an uncomfortably high number of dysplastic dogs. As his owner requires (or is limited to) lower ZW numbers on prospective partners, his own ZW slowly comes down a little. This has been seen in the past year and more, with a ZW of about 110 as of mid-2000. The ZW of an unproven dog is an average of both parents, and the "requirement" now is that this average must not exceed 100 (the breed "average"); that such a mating will not be allowed/registered. However, even though the SV says that, they allow plenty of exceptions, as the monthly stud service/litter announcement publication shows.]

6. My bitch has passed on [the ability to get] the "a"-stamp well up to now. What happens if I mate her to a dog that has a HD Breed Value over 100?

If the bitch has produced well, this must be seen in her ZW. Good progeny, however, can also be the result of good matings. If the bitch, for instance, is mated to a dog with a value of 100 [or higher], then the risk for the puppies is higher. The bitch is only "accredited negatively" if the pups are worse than could be expected with that stud dog. Generally it might well be that the stud dog owner would want to accept "poor" bitches, because that way his dog can show plainly that he "improves". [(in regard to hips) Unfortunately, this is not the best way to improve the breed as a whole, and can be considered a very selfish and deceptive tactic, as well as very risky, because more people will look at his ZW than calculate how much better the progeny's hips are than their dams' were]. With HD, where there is no better rating than "HD-free", it is difficult to prove a positive heritability of the top bitches.

7. How do dogs that have no HD findings flow into the HD ZW calculations?

At this stage, non-radiographed animals are "neutral" for the ZW; they are not taken into consideration.

8. What does the mean Breed Value of 100, and the stated deviation of the standard of ten points mentioned in

the breeding plan mean?

The ZW of 100 means that the animal's hip heredity is typical or average for the breed. At this time the breed mean is 1.71 (that is, between HD-free and mild HD). What is passed on can be better or worse than 100. The average deviation above or below this mean will be set at 10 points.

9. What does a hip Breed Value higher than 100 mean for my dog?

This ZW for such a dog means that he passes on poorly [in regard to sound hips]. As the breed average itself is still unsatisfactory, matings should be striven for that bring the average under 100. Still, "you must not throw out the baby with the bath water." The first priorities are working ability, temperament, and so on. If one finds a stud dog who brings the expectations for the pups (the average of father and mother) below the 100 value, that is sufficient.

10. Conversely, what does a breed value below 100 mean for my dog?

A ZW below 100 means that there is a greater freedom in the choice of dogs [to breed with] who are firm in character, strong in performance, and of good body construction, even if their breed value is around 100. With a bitch value of 83, one can even accept breeding to a dog of 117!

11. Can a Breed Value be worked out for criteria other than HD and, if so, for which ones?

A ZW estimate can be obtained for other characteristics. For this, it is important that the particular characteristic is accurately defined.

Dr. Reiner Beuing, Institute for Breeding Animals and Animal Genetics, University of Gießen, Germany.

Some Recommendations for Breeders: The Next Step in Progress

Dr. Beuing says: The most important aspect is that we care for the health of the dog. It is also a question of humane animal protection: the animal protection law in Germany, section 11-b, forbids breeding animals if, in the procedure, pain or grief is expected because of a faulty part or organ. [Dr. Beuing, with the official blessing of the SV, has admitted what his colleagues have complained about, which is the need for better orthopedic soundness.] Breeders have invested 30+ years in the HD fight, with an annual cost to the breeder communities between one and two million Deutsche Marks (up to about a million dollars). Of course, although some long-term improvement can be shown, the amount of success is nevertheless unsatisfactory. In addition, in the last several years the progress has stagnated, so that more effective methods of breeding are long overdue. [That is the plateau I mentioned earlier.] First, each of our breeders should select more strictly. One should exclude not only the animals with medium and severe HD, but also stay away from breeding the dogs with mild and borderline cases of HD.

Oh, yes, objections will immediately come up here! We should not base our selection only on what the individuals themselves are like but, since it deals with the selection of breeding animals, we must pay attention to how the animals produce. Therefore it must also be possible to weed out from the breed some supposedly "HD-free" individuals if they produce badly, and we must perhaps give good-producers from good lines a chance, even if their own radiographic evaluations have shown HD in a borderline or mild case. [Remember, there are inaccuracies in the standard view of hips. Using the combination of low ZW numbers and the best diagnostic method, this weeding and improving can be accomplished most rapidly.]

The concept that is really new and lacking from previous education in SV thinking is that now the inherited traits, that is to say, the puppies' quality, moves into the forefront. We breeders should no longer concentrate on the individual breeding animal, but on the pairing, the combination! Both partners in the breeding pair jointly determine the hereditary factors (genes) in the puppies. [It is interesting to note, as I did earlier, that the SV is trailing by many years the cattle industry and The Seeing Eye, Inc., both of which have long been relying on Breed Value numbers for guidance in such pairings.]

Comments on the Individual Items

1. General

[The GSD is certainly not the only breed in which hip dysplasia appears, but as mentioned elsewhere, HD has a very high profile in the breed. A hereditary predisposition is responsible for it. Therefore, measures were subsequently formulated to serve the genetic improvement of the breed. In addition, the SV continues to give advice for the breed's suitable nourishment and necessary care in infancy. According to the SV, scientific investigations have shown that for HD, as diagnosed with the old leg-extended view, around 20% of the (phenotype) variation from one animal to another depends on differences in the genes. This low heritability shows that other factors (in the individual) must also be considered, and therein lies the SV's mistaken or undue amount of emphasis on "upbringing". Especially on optimized nourishment and expert, cautious raising and training. Therefore they say that a breeding program can be concerned with and solve only a part of the problem. Beyond that, it is the duty of the SV, they say, to wage the HD fight via nourishment advice and enlightened training and upbringing/maintenance practices.]

2. Determination of genetic risks

The SV employs an estimate, in its attention to genes, by means of the Zuchtwert evaluation. Presently the statistical process is determined by MMP and MME as the best available procedure, which includes information on all relationships. The breed worthiness is expressed as relative breed values with the median value being 100 (representing a breed cross-section) and having a standard deviation of 10 points. In the breeding program it must be determined how best to make use of the Zuchtwert numbers and information. Since it is a complex mathematical process, what is presented to the public is only a summary of this scientifically studied and accepted method. The door is left open for changing the process for a more effective one if it became available. Presently, however, it is the technology of the Mixed Linear Models that is the optimal process:

- MME: Mixed Model Estimates for the determination of any gross false clutter or interference with the evaluation, and
- MMP: Mixed Model Prediction for the forecasting of the inherited transmission by the animals). The process some perhaps know as "BLUP" belongs to this methodology.

3. Information

The HD classifications serve as information for the Zuchtwert evaluation according to the guidelines of the FCI. Further knowledge (from an earlier radiograph, for example) is handled according to its relevance and importance. If one wants to calculate breed worthiness from currently available information, it must be regulated and defined just what information that would be. It should be clear that current radiography remains unchanged at present. It was determined that the current HD classifications [Normal, Fast-normal, and Noch Zugelassen, plus the obvious and disqualifying grades of HD] suffice to define the inherited distinctions. The disadvantages of a shift in policy, direction, and judgement of the classification would lead to too large a change, and would result in a loss of all current knowledge, [being replaced by something that would be no longer comparable]. Nevertheless, the situation anticipates that further knowledge can be included. We (the SV) will work on such possibilities. [Thus, they close the door to PennHIP adoption yet say they leave it open a crack at the same time.]

4. Present calculation and information responsibility

The current Zuchtwert numbers are made available in a suitable manner at least at the beginning of each quarter to members, breeders, and local clubs. In addition, the Zuchtwert is updated on "information-software" CD-ROMs ("SV Genetics"), which are obtainable from the SV headquarters. These numbers are required to be published in the mating-notice bulletins (Nachrichten des SV-Zuchtbuchamtes, — stud service or mating news — etc.). In Germany, Landesgruppen (regional groups) delegates with access to the Internet (www.schaeferhund.de) are responsible to the members and breeders for making available this information to those not on the 'net. This obligation is resolved by the EDP (electronic data) department at the SV headquarters through the news media, through PC (computer) support, and through the Internet, but naturally also by direct inquiries to the headquarters (for a fee).

5. Progress

Animals with medium and severe HD have already been excluded from the gene pool — forbidden to breed — according to Section 4, paragraph 1.3 of the breeding rules of the VDH. Nothing is lost if animals that are themselves severely affected by HD are left with no potential partners with far-enough below-average ZW numbers to breed to, anyhow... their own Zuchtwert numbers are too high. Dogs that in regard to other features are allowed to breed according to the Zuchtordnung (the breeding rules of the SV), may be so included only in regard to their partners' scores; which is to say, if the HD risk for the puppy itself as averaged from the ZW numbers of the parents does not exceed a certain limit. At this time, a limit of 100 is determined to be an upper boundary. It is recommended that you strive for the lower values. The respective breed value published in the quarter in which the date of mating falls, is the figure that counts as the Zuchtwert of the breeding pair. If the mating should occur within a maximum of 2 weeks after publication of the Zuchtwert numbers, you could also use the numbers given in the prior quarter as the bases for the average.

[Without such restrictions and/or selection, no further progress could be expected. The peculiarity here, however, lies in the distinctive form of the restrictions. To a certain extent, it is contradictory to the idea of the master plan, if these breeding restrictions were to be based on the owner's judgement of the animals and he wanted to loosen them. However, the new rules now take effect. In the breed scene the breeder now has the duty to look for such studs for his bitch who prove to be the good genetic producers, those that are expected to produce puppies with below-average risk. According to the SV, it is important that a bitch remains in the gene pool as long as the breeder is successful in finding dogs that are good enough for that bitch.]

Let us play through another example: A bitch has a breed value (ZW) number of 102, i.e., she ranks slightly higher than the medium risk. The breeder must be sure his first-choice dogs (for performance, beauty, character, type, etc.) have ZWs of 98 or lower. Let us assume he chooses a dog with the breed value of 96; then the initial expectation for the puppies is 99, which is acceptable for the breeding program. No one prevents him from taking her to perhaps "an 89 dog". Both studs are acceptable, but the conclusion is that the 98 is not as good as the 89!

Now, a ZW assessment is no guarantee. It certainly can happen that bad results can arise from this combination. If the father already had many x-rayed progeny and one knows his breed value with a high degree of confidence, this mostly affects the bitch. Let us say her breed value amounts to 107 and that of the dog is 97 (average 102), so a repeat mating would be not permitted. [However, I have already noted that this "rule" is being circumvented all the time!] The breeder must choose for the next breeding a dog with a maximum of 93 (average of 107 and 93 is 100). The breed progress regulations thus allow for a range that permits much freedom in the choice of dogs, if the bitch produces well. This always puts greater limits on choices, and forces the use of good genetic producers, in proportion to how badly the bitch produces. Also, in this standard range young animals from good producing lines have the best chances. The principle of this Zuchtwert-oriented breeding is called "strategic pairing".

Now, there was still the problem in the practical routine that after a cutoff date, breed values might have lost their validity and new numbers put in their place. A mating planned and arranged today could have become inadmissible tomorrow. In the discussion leading to the establishment of this breeding scheme,

this failing was revealed and disarmed: in the first 14 days after validating a new Zuchtwert figure, the numbers of the preceding quarter can also be put on the application. If the new is better than the old, then the new of course is valid. If the new number no longer meets the averaging requirements, but all is arranged, the mating still is possible, insofar as the two-week time limit is observed.

6. Matings in foreign countries

Dogs from the foreign countries are welcomed and may be used only if:

- they are found in the database of the SV with at least 3 generations,
- an HD evaluation comparable with the German method exists, and
- a calculated breed value was used in the breeding.

Proof of the "a"-stamp for HD was also necessary. In the passage of the new breeding program, it was anticipated that the owners of dogs certified in the foreign country may get a similar registration by applying to the SV and submitting the HD evaluation result. After that first step, it is put "into the German market". If the dog is initially integrated into the EDP of the SV, and the SV has a studbook (SZ) number for him, then he is automatically included in the breed value procedure. His progeny in Germany then determine his future image. Without this regulation we would have bitches for which the suitable partner is simply difficult to find in Germany, but is licensed in foreign countries. However, that cannot be in the best interest of the breed.

Experience and History with ZW

The current expressions of opinion are generally positive in outlook, supported substantially by two basic principles:

1. The application is very simple for the breeder. For his bitch, whose HD breed value he knows, the breeder can select from a broad offering of dogs that are qualified to breed — suitable stud dogs that also complement his wishes in reference to form and performance.
2. The breeding program is formulated comprehensively and unmistakably. Otherwise-suitable puppies under 100, (therefore with below-average HD risk), should be bred.

This most modern Breed Value Assessment of the dog undertaking the inclusion of all relatives was begun in 1983 for HD in the German Spaniel. Later, German Jagdterriers followed with breed values that would describe the risk for transmission of lens luxation (LL). This ocular disorder typical in terriers had in this breed a frequency of approximately 2%. Simultaneously there was offered to the breeders the ZW for size inheritance and for four hunting features: "nose", bay (tracking sound), working body construction, and enjoyment of water. The number of breeds in which the Zuchtwert evaluation is routinely used rose constantly after that. The Cynology (canine science) computer center of the TG publishing house in Gießen, serving the enterprises for breeding animals and stud book management, has already made it possible to have taken care of over 60 breeds with this ZW option. With the availability of the breed value assessment, uncertainty quickly arose over the application and conversion of the knowledge. Since Zuchtwert numbers are only an "estimate" and thus greatly depend on the current standard of knowledge, selection by means of general breed warnings or prohibition for animals with an inherited predisposition is not meaningful. It would not be good that a bitch blocked today, then readmitted, would again be blocked with the next evaluation. The relation therefore had to become more flexible. The thought of not hindering breeding animals (parents) by requirements on their individual admission or traits, but on the admissibility of a pairing, was absolutely new in the breeding of animals. The principle of "strategic pairing" was born.

Each good animal is suitable for breeding, if it with a suitable breeding partner produces puppies with below-average Zuchtwert numbers.

The principle of this breed planning was agreed upon for Golden Retrievers by the German Retriever Club (DRC), and adopted at once by the specialty breed club for the Hovawart (RZV) as a breed strategy. While

the Retriever breeders, after the first successful breeding years, changed it from being obligatory to a "recommendation for mature breeders" (in order to sell dogs), the Hovawart breeders have continued to utilize this breeding program until the present day. The attractive principle fell on fertile soil in the RZV, for although only "HD-free" dogs were still being bred, the by-then positive trend was again diminishing after 1984... things were actually getting worse with the number of HD-free animals steadily declining. With introduction of the Zuchtwert Evaluation in 1989, and with attention to the HD status of all relatives, it was now possible to distinguish the better-producing, HD-free dogs from those more tainted by this hereditary disease. The flexible breeding program, with its principle of leaving untouched all bitches in the breed so that the breed's potential and the breed continuity is protected in the kennels, turned back immediately the trend. Today, thanks to this daring step, the 90% mark is surpassed for HD-free animals, with a radiograph quota (percent of animals X-rayed) around 70%. [The Hovawart is a large "yard-guard" breed with an uncanny resemblance to the Golden Retriever but perhaps more closely related to the GSD's ancestors.]

The Jagdterrier breeders on the other hand had it difficult. Lens luxation appears between the 3rd and 5th year of life on, and had often been concealed. The honest people felt cheated and the diagnoses had not always been made by competent ophthalmologists. So it came about that a breeding program had to be formulated that contained, beside the Zuchtwert assessment, also the basic conditions in reference to data gathering and reliability: a veterinary consulting board was set up, to offer those particular owners competent advice and help. A fund jointly held was arranged in which each breeder would pay 10 DM per puppy. From this treasury could come an assistance of up to 500 DM paid to soothe the buyers, around the costs one perhaps might pay for necessary eye surgery. DNA investigations were imposed for proof, so that the wrong parents are not charged with the defective descendant. Altogether a campaign of instruction with magazine articles and breeder seminars has led to the fact that now, any association with hereditary disease is taken more responsibly and less emotionally. The breeders now feel greatly obligated toward the breed goal. As the breed values would be published, and the principle of strategic pairing began to be grasped (limit for pairings being no higher than 105 average), the year's averages sank for the lens luxation risk from year to year. The breed average, which at the beginning had a high level of approximately 112, sank until today it stands at 95. The frequency of the affected animals lies in the less-than-1% range, although the reporting of it has climbed, obviously because of the guarantee certificate that accompanies each pedigree.

One now has, through the Breed Values, a tangible criterion of quality and can document thereby the efforts in a breed scheme in reference to health. Successful breeding in reference to form and performance were honored up to now with Sieger titles, championships and sports-dog awards. Surely, it now also becomes attractive to reward the genetically healthy dog. How important is a breeding program like that of the SV, and how important also should be the transformation, are demonstrated by the Club for the Pyrenees Dogs (Berger des Pyrenees, Great Pyrenees), which as a young club in 1989 introduced the "Zuchtwert with strategic pairing" (limit of 102). The first radiograph series yielded no rosy picture, with less than 10% "HD-free" animals. The Zuchtwert evaluation, however, immediately put the finger on the "sources of the evil" and in the following year there was shown a rise in the numbers of HD-free animals. After 1992, the breed strategy of the program was no longer obligatory, but though the breeders' convention of "only recommended" was decided upon, the number of HD-free animals declined again. The club was well advised to prescribe the obligatory breed strategy again in 1995. Thereafter they saw again a rapid rise following that decision. Today HD in the Berger des Pyrenees is for practical purposes, not a serious problem. A relatively "safe" level in this breed is considered to be when 60 to 70% HD-free is reached. For almost every bitch, there can be found sufficient breeding partners that are assured to be within the limits for the pairing.

Additional breeds will be named, their successful breed work supported through breed value numbers. The SV will take stock of its own success as the radiographs and statistics for the years 1999, 2000, and later are developed. Until then, the breeders must trust the experiences of other clubs and to observe how the breeders receive the offer and use it. The public respect for the club will profit from the fact that show-dog and working-dog breeding will be practiced not at the expense of, but in harmony with, health.

In January of 1999, Bill Miller noted that while the SV had begun the "Breed Value Assessment", USA had not even placed the matter on the table. The real question for American breeders will be: What will info on progeny produced in the US, under less than standard guidelines, mean? I submit that USA has the opportunity to scoop the AKC and the GSDCA, and be a light in their darkness, if the organization can find some way to adopt the ZW system, with SV help. To start, those with Internet access might want to "bone up", to use a pun, on the subjects, by looking into such websites as:

www.schaeferhund.de/13_ZW/INFO_ZW/IB_E1098.HTM; <http://realgsd.net/GSDinfo/Care/1health.htm>; and <http://home.sprintmail.com/~impactgsd/OFAstop.html>. If you want to find the current rating on a SV-registered dog then go here: http://www.schaeferhund.de/13_ZW/SZWALLE.HTM; you can either enter the SZ seven digit number or the dog's name and kennel name, I've been told (I don't know personally, as I don't have Internet). Then hit "Suchen HD Zuchwert" and the rating should come up on the next screen. Laurie Tollifson recommended buying the CD, but you need frequent updates. According to SV it is a little more than a tool. You can call it a tool if you like, she says, but for those breeders whose dogs have high scores it will become a direct factor in breeding. But then again, Fumi Cummins reminded us, USA had not been implementing this requirement. The breeders will have to decide if they will comply with SV standards or USA's lesser standards. By the time this is printed, perhaps the USA organization will have formulated and implemented a plan.

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