

Excerpt from "Avian Genetic Resources at Risk: An Assessment and Proposal for Conservation of Genetic Stocks in the USA and Canada". 1999. J.M. Piseni, M.E. Delany, R.L. Taylor, Jr., U.K. Abbott, H. Abplanalp, J.A. Arthur, M.R. Bakst, C. Baxter-Jones, J.J. Bitgood, F.A. Bradley, K.M. Cheng, R.R. Dietert, J.B. Dodgson, A.M. Donoghue, A.B. Emsley, R.J. Etches, R.R. Frahm, R.J. Gerrits, P.F. Goetinck, A.A. Grunder, D.E. Harry, S.J. Lamont, G.R. Martin, P.E. McGuire, G.P. Moberg, L.J. Pierro, C.O. Qualset, M.A. Qureshi, F.T. Shultz, and B.W. Wilson. Report No. 20. University of California Division of Agriculture and Natural Resources, Genetic Resources Conservation Program, Davis CA USA. 120 p.

Appendix 2. Genetic stock collection data

THE INFORMATION PRESENTED HERE was collected through a survey initiated in 1995 by the University of California Genetic Resources Conservation Program. Many stocks developed before 1988 were listed in the International Registry of Poultry Genetic Stocks (SOMES, R.G., JR. 1988. International Registry of Poultry Genetic Stocks. Storrs Agr. Exp. Sta. Bull. 476. The University of Connecticut, Storrs). Therefore, curators listed in the Somes registry were the starting point for this survey. In addition, queries were sent to members of the NE-60 Regional Research Project (a USDA-organized group of researchers working on the genetic basis for resistance and immunity to avian diseases), academic and government members of the Poultry Science Association (source list: PSA Membership Directory, 1995-98) who indicated a focus on genetics or immunology, and individuals listed by the 1997 Poultry Science Resource List (prepared by the Poultry Science Association and R.D. Reynnells (USDA/CSREES)) who specialized in genetics or immunology and were affiliated with academic institutions with poultry, avian, or animal science departments.

Altogether, a total of more than 100 individuals were polled. Seventy-five responded and, of those, 40 currently maintain poultry genetic stocks as researcher-curators. These curators represent 27 different institutions (24 in the US, 3 in Canada). Approximately one-half of the institutions maintain 10 or fewer genetic stocks and only six maintain more than 20 stocks (University of Arkansas-Lafayette, University of California-Davis, University of Connecticut-Storrs, University of Wisconsin-Madison, USDA-ADOL East Lansing, MI, and University of British Columbia-Vancouver). About one-third of the reported stocks are considered to be at serious risk of loss in the near future, and at least 94 of the surveyed stocks were eliminated between

1995 and 1998. Over half of these discarded stocks were not represented in collections at other institutions and thus, are lost to science. Most stocks are maintained as living birds, but 38 chicken genetic stocks are maintained only in the form of cryopreserved semen or blastodermal cells.

The survey data are presented in three tables. Table 2.1 is a listing of the 361 reported stocks grouped first by species (chicken, Japanese quail, turkey, and waterfowl/gamebird), then by category of genetic stocks (the 28 categories used are listed in Table 2.0, then described be-

Table 2.0. Stock categories.

- Bloodtype-Gene pool
- Bloodtype-Major Histocompatibility Complex (MHC)
- Bloodtype-MHC-Inbred
- Chromosomal variant
- Endogenous virus
- Endogenous virus-Inbred
- Inbred
- Mutant-Color, eggshell
- Mutant-Color, feather
- Mutant-Developmental defect-Eye
- Mutant-Developmental defect-Face/limb
- Mutant-Developmental defect-Skin/feather
- Mutant-Developmental defect-Spine/tail
- Mutant-Gene pool
- Mutant-Immunological defect
- Mutant-Neurological defect
- Mutant-Physiological defect
- Mutant-Reproductive defect
- Mutant-Uncategorized
- Pure breed
- Randombred
- Selected-Behavioral trait
- Selected-Egg trait
- Selected-Growth trait
- Selected-Immune trait
- Selected-Physiological trait
- Transgenic
- Uncategorized

low). Table 2.2 lists stocks grouped by institution and curator, species, and category. Finally, Table 2.3 lists curators and their contact information. Accordingly, the most important information necessary to look up a given genetic stock includes 1) the species and type of stock or 2) the institution or curator who keeps that type of stock.

Description of stock categories

Bloodtype refers to cell-surface antigens that have been characterized on red or white blood cells. **Bloodtype-Major Histocompatibility Complex (MHC)** consists of stocks with a defined MHC or B-haplotype, and may be defined for a variety of other erythrocyte alloantigens. **Bloodtype-MHC-Inbred** is congenic (genetically identical) to an established highly inbred line, except for the specified bloodtype. **Bloodtype-Gene pool** stocks contain a variety of different bloodtypes. Leukocyte cell surface antigens are also defined for one gene pool stock (NIU Male Breeder Alloantigen Reservoir).

Chromosomal variant refers to stocks with alterations in chromosome structure. These variations include: insertions, deletions, translocations, inversions, aneuploidy, and polysomy. Stocks with specific insertions (naturally occurring or as a result of genetic engineering) are listed under the Endogenous virus or Transgenic categories.

Endogenous virus (EV) stocks are characterized by specific viral insertions (one or more insertions of a defined endogenous virus), and **Endogenous virus-Inbred** stocks are congenic (genetically identical) to an established highly inbred line, except for the specified viral insertion.

Inbred stocks usually have a level of inbreeding exceeding 95% ($F > 0.95$), although one exception is UCD 001 (F is approximately 0.90). Other inbred stocks include congenic stocks developed by continued back-crossing to a given inbred stock. Such congenic stocks are categorized by the unique gene or gene complex isolated in the inbred background (e.g., Bloodtype-MHC-Inbred, Endogenous virus-Inbred, and Mutant-Developmental defect-Face/limb). In such stocks, the inbred ancestral stock is listed under "Origin and History".

Mutant stocks are classified into the following categories:

Mutant-Color, eggshell

Mutant-Color, feather

Mutant-Developmental defect-Eye

Mutant-Developmental defect-Face/limb

Mutant-Developmental defect-Skin/feather

Mutant-Developmental defect-Spine/tail

Mutant-Gene pool

Mutant-Immunological defect

Mutant-Neurological defect

Mutant-Physiological defect

Mutant-Reproductive defect

Mutant-Uncategorized

Color variation for feather and eggshell also occur in the pure breed and randombred categories, particularly among the different chicken breeds. Researchers interested in such variants should look up the color genetics for these breeds or discuss this with the pure breed stock curators.

Some developmental defect mutations may actually fit into more than one category (e.g., *wingless-2* affects face, limbs, feathers, and kidneys, but was listed by its effect on the face and limbs). Some of the mutations listed under neurological, physiological, and reproductive defects can also cause developmental defects. On the other hand, a few of the mutations or variants did not clearly fit into any of the above specific categories, so were classified as **Mutant-Uncategorized**. A close reading of the mutant descriptions is recommended.

Mutant-Gene pool refers to stocks that contain two or more mutations, which may or may not affect affect the same structures or systems. Some unique mutations are only maintained in gene-pool stocks, and so do not appear under the more specific mutant categories. However, brief descriptions of all mutations carried within that stock are listed for each of the pooled stocks.

The **Pure breed** category includes all stocks that are maintained as a closed flock of an identified breed. It is usually not highly inbred, selected, or otherwise characterized. Some overlap occurs between the Pure breed category and the Randombred category. However, if an otherwise Pure breed stock is commonly used as a control/standard for another stock, it will be listed as Randombred.

Randombred stocks are usually purebred or synthetic (mixed commercial) stocks that are kept in large, closed populations (100 birds or more).

Typically propagated with little or no selection of breeding stock each generation, the number of progeny from each male or female usually depends upon their reproductive success at the time eggs are collected to produce the next generation.

Stocks that have been selectively bred for a quantitative characteristic are termed **Selected**—along with the identified trait: **Selected-Behavior trait**, **Selected-Egg trait**, **Selected-Growth trait**, **Selected-Immune trait**, and **Selected-Physiological trait**. Each stock usually has an unselected control paired with it, and two divergently selected stocks (e.g., for high or low body weight at 6 weeks) from the same source may be grouped together here.

Transgenic stocks are the product of genetic engineering. Such stocks have successfully integrated the introduced genetic material into their chromosomes.

Finally there is a disparate group of stocks classified as **Uncategorized**, either for want of better descriptive information or because there may be too few representatives of a type to warrant an additional category.

While most stocks clearly belong to a single descriptive category, some logically could be classified in more than one. In such situations, the stock was listed under the category that most closely fit the stock description. The distribution of all listed stocks according to these categories is summarized in Chapter 5 of this report.

Notes on specific fields

Table 2.1 contains the fields described below. **Stock name** is also used in Table 2.2.

Stock name: The designation used usually incorporates the name of the institution where the stock is housed or was developed, and the name that the curator assigned to the stock. In Table 2.2, the stock name is followed by the words ‘Cryo. only’, if that stock is only maintained by cryopreservation. This information is given in the **Status** field for Table 2.1 (see below).

Stock description: Only a brief description of the unique characteristics of the stocks is provided; for more information, the curator should be contacted.

Origin and history: Information in this field includes when a stock was established or acquired,

its current and historical genetic background (if available), and any other possibly useful background information. In particular, for stocks that are congenic, the specific inbred stock with which it is essentially identical is noted.

Breed: The source breed(s) or genetic background for stocks is noted here.

Genetic characteristics: For those stocks that are characterized by a distinct mutation or set of mutations, this field presents information on the pattern of inheritance (autosomal, sex-linked), penetrance and expressivity (dominant, co-dominant, recessive, incomplete penetrance, maternal effect, sex-limited), and effect on viability (lethal, semi-viable; if a mutation is fully viable, no notation is provided).

Allele symbol: Here the short notation for the mutant form of the gene is listed. If the symbol is in question or has not yet been officially assigned, the allele symbol is written in parentheses (i.e., (wgr) for the wing-reduced syndrome).

Status: This field provides a subjective evaluation of the potential for continued financial support of each stock, assessed by the curator of that stock. ‘Good’ indicates dependable institutional or government support for at least the next two to three years. ‘Fair’ indicates less certain support. ‘Poor’ describes a stock which is seriously at risk of elimination. When the specific source of funding support for the stock was provided, that information was noted: USDA, Industry, Institutional, State Agricultural Experiment Station (Exp. Sta.), Hatch funds (Hatch), research funds (regional), or other (misc.). In some cases, a stock is no longer maintained as living birds, only by germplasm cryopreservation. For such stocks, the notation in the status field is ‘No live birds’. Finally, some once-distinct mutant stocks are no longer carried as separate accessions, but were recently combined with another accession, and the name of the recipient stock is indicated in the status field (e.g., ‘Combined with UBC G’). For the purposes of Table 2.1 and this report, the original mutant is still counted as a separate accession.

Number of birds: When available, this is the number of birds (males and females) kept to maintain the stock.

Cryopreservation: If no germplasm has been cryopreserved for a given stock, the entry in this field is ‘No’. If germplasm has been cryopreserved,

then the cell type is indicated (semen, germ cells, blastodisc cells (for dissociated blastodiscs)). Stocks that are only maintained as cryopreserved germplasm can be identified by the remark 'No live birds' in the Status field. Curators can be contacted for details on recovery of these stocks and costs associated with the recovery.

Available: Many curators provide eggs or chicks to other researchers for collaborative projects; some will provide eggs or chicks for a fee (usually to offset bird maintenance costs), while other stocks may not be available because of proprietary concerns. Curators should be contacted for details.

Curator: The surname of the researcher in charge of the given stock is indicated here. Contact information for them is listed in Table 2.3, alphabetically, by surname.

Disclaimer

The University of California Genetic Resources Conservation Program and the Avian Genetic

Resources Task Force present this information as a service to those interested in poultry genetic stocks that can be found at academic and government institutions in the USA and Canada. No certification is implied for the stocks listed herein, either their status with regard to freedom from egg-borne disease agents, or their current availability (note that availability at the time the survey was conducted is indicated). Inquiries regarding particular stocks should be directed to the individual curator(s). In addition, readers are reminded that it is not possible to guarantee the authenticity or scientific accuracy of the information presented herein.

Those wishing to acquire any of these stocks or genetic material derived from these stocks are reminded that they must obtain the appropriate customs forms and documentation, and follow the protocols governing such shipments. Even transfer between different states in the US or provinces in Canada may require health certification or other documentation. In the US, the USDA Veterinary Services can provide some of this information.