DBA/2

Origin
Developed in 1909 by Little from mice used in color experiments and this strain is the oldest of all inbred strains of mice. In 1929-30, crosses were made between sub-lines, and several new lines established; two of these were called 12 (now DBA/1) and 212 (now DBA/2).

DBA/2NHsd
In 1951, from Mider to the National Institutes of Health (NIH), Bethesda, Maryland, USA. Harlan obtained a breeding nucleus from NIH. Harlan became Envigo in 2015.

DBA/2OlaHsd
Obtained by Laboratory Animals Centre, Carshalton from the Jackson Laboratory, Bar Harbor in 1959. In 1972, to OLAC (now Envigo).

DBA/2JrcHsd
The DBA/2JrcHsd mice originate from Jackson Laboratory, Bar Harbor, Maine and were moved in 1974 to RCC Ltd. (formerly Ibm and BRL) in Füllinsdorf, Switzerland. To Harlan Laboratories through acquisition in 2004. Harlan became Envigo in 2015.

Research applications
Coat color, behavior, audiogenic seizures, epilepsy, calcification, metabolism, fetal resorption, immunology, infectious diseases, etc.

Characteristics
Anatomy
Large testes weight (Shire and Bartke, 1972). Low brain weight (Storer, 1967; Roderick et al., 1973; Wahlsten et al., 1975). High total leukocyte count, high erythrocyte count, low hematocrit, low mean corpuscular volume and low hemoglobin (Russell et al., 1951). Small forebrain, neocortex and hippocampus volume (Wimer et al., 1969). Cerebellum has an intraculminate fissure between vermian lobule IV and vermian lobule V (the ventral and dorsal lobules of the culmen) (contrast SJL, C57BL/10 and BALB/c) (Cooper et al., 1991). Large heart/body weight (Mokler and Iturrian, 1973). High proportion of acidophilic and low proportion of chromophobe cells in adenohypophysis of DBA/Sy substrain (Keramidas and Symeonidis, 1973). Hematopoietic stem cell pool 11-fold higher than in C57BL/6. This is largely due to loci on chromosome 1 (Muller-Sieburg and Riblet, 1996). High level of spontaneous sister chromatid exchange (Nishi et al., 1993).

Behavior

DBA/2 mice failed to react to a spatial change of objects in an open field, and therefore resemble
rats with dorsal lesions of the hippocampus. They may represent a model of hippocampal dysfunction (Ammassari-Teule et al., 1995). Feed restriction for nine days causes a high incidence of stereotypic cage cover climbing (contrast C57BL/6) (Cabib and Bonaventira, 1997).

Drugs
Resistant to skin ulceration by DMBA (Thomas et al., 1973). Resistant to induction of subcutaneous tumors by 3-methylcholanthrene (Kouri et al., 1973; Whitmire et al., 1971). Resistant to induction of adenocarcinomas of the colon by 1,2-dimethylhydrazine (Evans et al., 1974). Resistant to teratogenic effect of 1-ethyl-1-nitrosourea (Diwan, 1974). Phenobarbital i.p. does not induce hepatic epoxide hydrase (Oesch et al., 1973). Resistant to lethal effects of ozone (Goldstein et al., 1973). Susceptible to induction of cleft palate by cortisone (Kalter, 1965). Good ovariatory response to 3 I.U. of PMS but zero response to 7 I.U. (Zarrow et al., 1971). Low incidence of convulsions induced by flurothyl (Davis and King, 1967). Long hexobarbital sleeping time and low liver hexobarbital oxidase level (Vesell, 1968). Sensitive to chloroform toxicity (Hill et al., 1975; Deringer et al., 1953). Sensitive to seizures induced by nicotine (Marks et al., 1989). Sensitivity may be related to brain alpha-bungarotoxin binding, which is significantly higher in ST/b than in sensitive DBA/2 mice (Marks et al., 1996). High self-selection of nicotine which is inversely correlated with sensitivity to nicotine-induced seizures (Robinson et al., 1996). High bronchial reactivity to methacholine and serotonin (Konno et al., 1993). Resistant to daunomycin-induced nephrosis (Kirimura et al., 1993). High neural sensitivity to pentyleneetrazol convulsions (Kosobud et al., 1992). Sensitive to neurotoxic effects of monocrotrophos (Rao et al., 1991). Low histamine release from peritoneal mast cells induced by compound 48/80, a calcium dependent histamine releaser (Toda et al., 1989). High histamine release from peritoneal mast cells induced by Ca2+ ionophore A23187 (contrast C57BL/6) (Toda et al., 1989). Carries gene (Tpm7) for high levels of thiopurine methyltransferase activity, catalysing the S-methylation of 6-mercaptopurine and other heterocyclic and aromaticthiol compounds (unlike C57BL/6 and AKR) (Otterness and Weinsliboum, 1987a; 1987b). Resistant (contrast five strains) to the induction of micronuclei by polycyclic aromatic hydrocarbons, presumably due to inducible Ah locus (Sato et al., 1987). Iron overload does not cause inhibition of hepatic uroporphyrinogen decarboxylase and uroporphyrin in contrast with C57BL/10ScSn. This was not correlated with the Ah locus in a study involving 12 mouse strains (Smith and Francis, 1993). Resistant to hepatotoxic effects of cadmium (Shaikh et al., 1993). Low voluntary consumption of morphine in two-bottle choice situation (Belknap et al., 1993).

Less susceptible to the development of micronuclei than BALB/c following treatment with clastogenic base analogues and nucleosides (Sato et al, 1993). Unique poor responsiveness to the antinoceptive effects of nitrous oxide, a polygenic trait (Quock et al., 1996). Nine-fold lower ED50 for haloperidol-induced catalepsy than C57BL/6, but this is not associated with numbers of cholinergic neurons (Dains et al., 1996). Airways hyperreactive to acetylcholine (Zhang et al., 1995). Resistant to rate-depressant effects of ethanol on schedule-controlled behavior (Elmer and George, 1995). A diet containing 15% dairy fat, 1% cholesterol and 0.5% cholic acid did not cause a high incidence of cholesterol gallstones (like AKR, SM contrast C57L, SWR, A) (Faulkner et al, 1995).

Genetics
Coat color genes - a, b, C, d: non-agouti, dilute brown.
Histocompatibility - H-2d, Thy-1b.
Biochemical markers - Apoa-1, Car-2, Es-1, Es-2, Es-3, Gpd-1, Hba, Hbb, Idh-1, Ldr-1, Mod-1, Mup-1, Pep-3, Pgm-1, Pgm-2trim.

Although the DBA/1 and DBA/2 are substrains of the DBA there are differences between these strains, probably due to a substantial residual heterozygosity following the crosses between the substrains. DBA/1 and DBA/2 differ at least at the following loci: Car-2, Ce-2, Hc, H-2, If-1, Lsh, Tla, and Qa-3. With such large differences, they should probably be regarded as different strains rather than substrains of the same strain. This strain carries the Mus musculus Y-chromosome, while others have the M. m. domesticus type (Nishioka, 1987).

Immunology

Precipitating and skin-sensitising antibodies have fast electrophoretic mobility (Fahey, 1965). Non-discriminator between `H' and `L' sheep erythrocytes (McCarthy and Dutton, 1975). Low anti-DNP antibody concentration (Paul et al., 1970). Poor immune response to Pro-Gly-Pro-ovalbumin and (Pro-Gly-Pro)n, but good immune response to (Pro)n (Fuchs et al., 1974). High susceptibility to IgG-mediated but low susceptibility to IgE-mediated passive cutaneous anaphylaxis (De Souza et al., 1974). Develops a lethal form of syngeneic graft-vs-host disease when treated with cyclosporine (unlike other five strains) (Prud’homme et al., 1971). Erythrocytes have a high agglutinability (Rubinstein et al., 1974). Poor immune response to Salmonella strasbourg lipopolysaccharide, depending on subclass) (Di Pauli, 1972). Low PHA-stimulated lymphocyte blastogenic response (Hellman and Fowler, 1972). Low immune response to ferritin (Young et al., 1976). Resistant to induction of anaphylactic shock by ovalbumin (Tanioka and Esaki, 1971). Resistant to experimental autoimmune orchitis induced by two
or three sc injections with viable syngeneic testicular germ cells without any adjuvants (Tokinaga et al., 1993). Anti-BPO IgE monoclonal antibody failed to produce potent systemic sensitization sufficient for provocation of lethal shock in most aged (six-ten months) mice (Harada et al., 1991). High expression of neutral glycosphingolipid GgOse(4)Cer in concanavalin A stimulated T lymphoblasts (Muthing, 1997).

**Infection**


High susceptibility to develop leukemia on infection with Friend virus (Dietz and Rick, 1972). Mouse mammary tumor proviral loci have been identified by Lee and Eicher (1990).

**Life-span and spontaneous disease**

Primary lung tumors 1% in males, 2% in females. Lymphatic leukemia zero in males, 2% in females and 3% in virgin females. Mammary adenocarcinomas in unfostered substrains 1% in males, 72% in breeding females and 48% in virgin females (Hoag, 1963). A high proportion of mammary tumors are of the acinar type (Tengbergen, 1970). Overall tumor incidence 15% in males, 49% in females, including lymphomas 10% in males and 12% in females; mammary tumors zero in males and 31% in virgin females (Smith et al, 1973). Leukemia 3% (Myers et al, 1970). Long life-span in SPF fostered conditions (629 days in males, 719 days in females) with 6-35% liver and 1-23% lung tumors (Festing and Blackmore, 1971). Long life-span in conventional conditions (707 days in males, 714 days in females) (Storer, 1966). Life-span 722 days in males and 683 days in females (Goodrick, 1975). High incidence of expression of RNA tumor virus group-specific antigen (Dwan et al, 1973). Type B reticulum cell neoplasms 18% at about 20 weeks (Dunn and Deringer, 1968). Spontaneous calcified heart lesions progress with age. 90% of individuals affected by one year (Rings and Wagner, 1971). Incidence of calcareous heart lesions high among some related strains (Di Paola et al, 1964). Dystrophic cardiac calcification may be related to disturbed myocyte calcium metabolism (Brunnert, 1997). Chronic hypertropic gastritis, duodenal polyps and calcareous pericarditis frequently observed. Other lesions include malignant lymphoma and degenerative processes in the myocardium, skeletal muscle, subcutaneous adipose tissue, cornea and blood vessels. Lesions partly depend on diet (Hare and Stewart, 1956). Carry three separate recessive genes similar to those found separately in C57BL/6J, BALB/cBy and WB/ReJ, causing age-related hearing loss (Willott et al, 1995).

**Miscellaneous**

Recommended host for the following transplantable tumors: fibrosarcoma SaD2, lymphatic leukemia P1534 and mammary adenocarcinoma CaD2 (Kaliss, 1972). Hybrids involving DBA/2 are recommended host for transplantable leukemia Li1210, melanoma S91 and MOPC myeloma used as models in screening potential anticancer drugs (EORTC Screening Group, 1972). The Fv2 allele appears to be lethal on the DBA/2 genetic background (Blank and Lilly, 1976). High mortality after neonatal thymectomy (Law, 1966).

The relationship of genotype, sex, body weight, and growth parameters to lifespan in inbred and hybrid mice is described by Ingram et al (1982). Characteristics of the DBA/2 strain have been described by Festing (1997) and Lyon et al, (1996).

**Physiology and biochemistry**

References:


