Origin
Dr LC Strong, 1921, from a cross between the Cold Spring Harbor and Bagg albino random-bred stocks (and therefore related to BALB/c). In 1928, from Strong to Cloudman, to the Jackson Laboratory, Bar Harbor in 1947. To GD Searle, High Wycombe. A/JOlaHsd
From GD Searle to OLAC (now Envigo) in 1978.

Research applications
Behavior, lung tumors, carcinogens, teratogenesis, cleft palate, irradiation.

Characteristics
Strain A was the third most widely used strain in cancer and immunology research (Festing, 1969). It is best known for the high incidence of congenital cleft palate in the young (which are usually eaten by the mother), and the high incidence of spontaneous lung tumors. 6-30% incidence of spontaneous lung tumors, which is highly sensitive to the induction of lung adenomas in response to carcinogens (Shimkin and Stoner, 1975).

Animal model
A/J mice are an animal model for human Legionnaire’s disease (Brieland et al, 1994).

Anatomy

Behavior
Low intra-strain aggression (Southwick and Clark, 1966), low food drive and exploratory activity (Thompson, 1953). Low spontaneous bar pressing activity, low open-field activity, low social grooming during aggressive encounters and high tail rattling score during aggressive encounters (Southwick and Clark, 1968).


Drugs
Susceptible to urethane-induced lung tumors (Falconer and Bloom, 1962). Sensitive to induction of pulmonary tumors but resistant to leukemia and liver tumor induction by DMBA given neonatally (Flaks, 1968). Susceptible to the induction of lung tumors by cyclopenta(c)dypyrrene (Nesnow et al., 1994). Most benzo(a)pyrene-induced lung tumors had K-ras oncogenes inherited from the A/J parent with mRNA transcribed from the allele inherited from strain A/J being 5-20 times more abundant than that from C3H in crosses involving strain C3H (Chen et al., 1994). The A/J mouse lung can be used as a model to study the effectiveness of new chemical intervention therapies for controlling malignant tumor growth. (Belinsky et al., 1993), and in the study of chemo preventive agents such as dietary and green tea polyphenols (Castonguay and Packer, 1993, Katiyar et al., 1993), isothiocyanates (Adam-Rodwell et al., 1993, Hecht, 1995), vitamin E (Yano et al., 1994b) and other substances (Yun et al., 1995). No glycerol-associated effect on active oxygen formation and thiobarbituric acid reactive substances was observed in the lungs of A/J mice treated with 4-nitroquinoline 1-oxide, in contrast with outbred ddY strain mice (Yano et al., 1993; Yano et al., 1994a). Nicotine decreases shock avoidance learning in J substrain, but increases it in He substrain (Bovet et al., 1966). Low EDS0 to behavioral effects of nicotine. Resistant to seizures induced by nicotine (Marks et al., 1989)


Susceptible to 15% dairy fat, which produces an aggressive behavioral response (Nikulina and Klimek, 1993). A diet containing 15% dairy fat, 1% cholesterol and 0.5% cholic acid caused a high incidence of cholesterol gallstones (like SWR, C57L, contrast SM, AKR, DBA/2) (Faulkner et al., 1995).

Endocrinology
The adrenal and renal functions have been described by Shire (1968).

Genetics
Coat color genes - a, b, c : albino
Histocompatibility - H-2
Biochemical markers - Apoa-1a, Car-2b, Es-3b, Es-3c, Es-3d, Gpd-1b, Gpi-1b, Hbb-1d, Idh-1b, Ldr-1a, Mod-1a, Pep-3a, Pgm-1d, Tri-d

This strain carries the Mus musculus musculus Y-chromosome, while others have the M. m. domesticus type (Nishioka, 1987).

Immunology

Good immune response to DNP-keyhole limpet hemocyanin (Borel and Kilham, 1974).

Good immune response to GAT (random terpolymer of Glu30, Ala30, Tyr10) (Dorf et al., 1974). Poor primary hemagglutinin immune response to sheep erythrocytes at 3 x 10^8 and 3 x 10^9 dose rates, also poor hemolysin response at both doses (Ghaffar and James, 1973). High IgM antibody response to sheep red blood cells compared with C57BL/10ScSn (Vetvicka et al., 1993). Non-responder to synthetic polypeptide Glu38, Lys5, m-Ala5 (Pinchuck and Maurer, 1965). High antibody affinity to HSA (Petty et al., 1972). Erythrocytes have a high agglutinability (Rubinstein et al., 1974). Low immune response to ferritin in A-Thy1.1 (Young et al., 1976). Low immune response to dextran (Blomberg et al., 1972). Non-discrimination between ‘H’ and ‘L’ sheep erythrocytes (McCarthy and Dutton, 1975). Susceptible to the induction of experimental autoimmune orchitis induced by two or three sc injections with viable syngeneic testicular germ cells without any adjuvants (Tokunaga et al., 1993). Resistant to induction of experimental allergic encephalomyelitis (Lindsey, 1996). This strain also suffers from a defect in macrophage function somewhat resembling the mutant lps found in C3H/HeJ (Vogel et al., 1981). High immune response to ganglioside GM1 (Kawashima et al., 1992). Interleukin-3 alone does not support hematopoietic colony formation of bone marrow cells from these mice. Interleukin-3R alpha is not detectable on the cell surface by antibody staining, though it is present inside the cells (Ichihara et al., 1995).

Infection
Resistant to infection by salmonella typhimurium strain C5 (Plant and Glynn, 1974; Robson and Vas. 1972). This may be associated with activation of complement (Nakano et al, 1995). 100-fold more susceptible to Listeria monocytogenes monocytogenes than C57BL/6 when measured by median lethal doses (Sadarangani et al, 1980). This seems to be associated with reduced levels of gamma interferon and granulocyte-macrophage colony stimulating factor compared with resistant C57BL/6 mice (Iizawa et al, 1993). Susceptible to Plasmodium berghei (Most et al, 1966). Highly susceptible to mammary tumor virus, which is carried in an acute form in unfostered substrains (Murray and Little, 1967).


Legionella pneumophila replicates within and kills thigoglycolate-elicited macrophages, in contrast with strain BALB/c. This is associated with differences in availability of intracellular iron (Gebran et al, 1996). Develops acute pneumonia that resembles human Legionnaire’s disease 24 to 48 hours after intratracheal inoculation of Legionella pneumophila (Brieland et al, 1994). Susceptibility to most strains of Legionella depends on the Lgn1 locus (Miyamoto et al, 1996). Resistant to the lethal effects of murine hepatitis virus strain 3 (contrast BALB/c), but resistance destroyed by methylprednisolone (Fingerote et al, 1995). Highly susceptible to infection with Candida albicans (Asman et al, 1996). Mice infected with Sendai virus or MHV had impaired wound healing. However Herpes simplex virus, type 1, did not reduce tensile strength (Kenyon, 1983).

Life-span and spontaneous disease
Primary lung tumors 6% in male, 32% in female and 26% in virgin females in J substrain; 44% in males, 23% in females and 30% in virgin females in He substrains (Hoag, 1963). Zero incidence of lymphatic leukemia in He substrain, 1% in J substrain. Mammary adenocarcinoma zero in males, 1% in virgin females, 28% in breeding females of J substrain and 54% in breeding females of He substrain (Hoag, 1963). Pulmonary tumors 90% in mice at 18 months (Heston, 1963). Leukemia 3% in HeJ substrain (Myers et al, 1970). A high proportion of the mammary tumors are of the acinar type (Tengbergen, 1970). Lung adenomas 53-64% in BrA and A substrains, but mammary tumors zero (Mulhbock and Tengbergen, 1971). Lung tumors 4-31% and lymphatic leukemia 10-43% (Festing and Blackmore, 1971). Spontaneous lung tumors occur at rate of 0.21 tumors/mouse at 24 weeks (Poirier et al, 1975). Rare spontaneous myoepitheliomas arising from myoepithelial cells of various exocrine glands have been observed in the J and HeJ substrains (Sundberg et al, 1991).


Spontaneous congenital cleft palate 4% and high susceptibility to teratogenic effects of cortisone, which may be associated with the H2a allele, (Bonner and Slavkin, 1975). Congenital malformations in newborn mice 10%, including clift lip and palate and polydactyly (Kalter, 1968). WySn substrain has 20% craniofacial defects due to the action of two genetic loci with unequal duplicate epistasis (Juriloff, 1995). Cleft palate is a function of foetal genotype rather than maternal factors (Yoshida et al, 1996). An exclusion map for the major gene causing nonsyndromic cleft lip with or without cleft palate has swept 40% of the mouse genome, with candidate regions on chromosomes 12, 18 and 19 with a few candidate loci (Juriloff, 1993).

Low incidence of virus-like particles in chemically induced sarcomas (Liebelt et al, 1970). Can be made obese by a suitable diet (Fenton and Dowling, 1953). Does not develop non-insulin-dependent diabetes mellitus and hypertension when fed a high fat-high simple carbohydrate diet, whereas C57BL/6 mice do (Mills et al, 1993). Blood glucose levels and insulin insensitivity in crosses between diet-induced type II diabetes sensitive C57BL/6 and resistant A/J are genetically independent (Surwit et al, 1991). High incidence of amyloidosis (Russell and Meier, 1966). No amyloidosis found by Powers et al (1976) in He and HeJ substrains, in contrast to previous reports. About 4% incidence of congenital open eyelids (Dagg, 1966). Relatively resistant to secondary amyloidosis which does not appear to be associated with variation in the serum amyloid A gene cluster (Butler and Whitehead, 1994). Incidence of mammary tumors high in breeding females, but very low in virgins (Heston and Vlahakis, 1971). The relationship of genotype, sex, body weight, and growth parameters to lifespan in inbred and hybrid mice have been described by Ingram et al (1982). The occurrence of epithelial
and non-epithelial tumors in aging mice have been described by Kawada and Ojima (1977). A review of the life span of aging mice has been described by Myers, (1978).

Malignant Mouse Tumors

Recommended host for the following transplantable tumors: Anaplastic carcinoma 15091 AK, Hepatoma H6, round cell tumor C1300 and spindle Cell carcinoma Sal. (Kalis, 1972). Injection of murine C1300 neuroblastoma cells into the tail vein provides a reproducible model for bone marrow metastasis (Iwakawa et al, 1994). A/He mice will be useful for study of teratocarcinogenesis because of the high incidence of experimentally produced teratomas and the extreme low incidence of spontaneous teratomas (Stevens, 1970). Characteristics of the A strain have been described by Festing (1997) and Lyon et al, (1996).

Physiology and biochemistry


References


