SAMP8/TaHsd (Senescence Accelerated Mouse Prone 8)

Origin
The SAMP8 Mouse is developed by Dr. Toshio Takeda, Kyoto University, from AKR/J mice and crossed with mice from an unknown strain, followed by sib mating since 1975.

SAMP8/TaHsd
In 2002 from Takeda Chemical Ltd to Harlan Laboratories. Harlan became Envigo in 2015.

Characteristics

Behavior
SAMP8 mice showed impairments in passive avoidance tasks (Miyamoto et al, 1986; Yagi et al, 1988), one-way (Miyamoto et al, 1986), T-maze (Flood and Morley, 1993) and Sidman (Ohta et al, 1989) active avoidance tasks and an impairment of their spatial memory task ability (Miyamoto, 1997). SAMP8 mice had age-related emotional disorders characterized by reduced anxiety-like behavior (Miyamoto et al, 1992). The SAMP8 and SAMP10 showed a profound disorder of the circadian rhythm of spontaneous motor activity and drinking behavior (Miyamoto, 1997). The SAMP8 showed age-related appearances of spongiform degeneration in the brain stem (Yagi et al, 1989), and of PAS-positive granular structures in their hippocampal formation (Akiyama et al, 1986), and astrogliosis in their brain stem (Yagi et al, 1989), hippocampus, pyriform cortex, brain stem nuclei and white matter (Kawamata et al, 1997). Clusters of activated microglia were also seen around the vacuoles in the brain stem (Amano et al, 1995). A monoamine-oxidase-B-positive granular structure was found in hippocampus of old mice (Nakamura et al, 1995). Beta/A4 protein-like immunoreactive granular structures were observed in various regions, including the medial septum, cerebral cortex, hippocampus, cerebellum, and some cranial nerve nuclei and roots and increased markedly in number with age (Takemura et al, 1993). Other age-dependent histological changes included cortical atrophy in the pyriform cortex, neuronal cell loss in the locus ceruleus and lateral tegmental nucleus, intraneuronal accumulation of lipopigment in Purkinje cells, and eosinophilic inclusion bodies in thalamic neurons (Kawamata et al, 1997; Akiguchi et al, 1994). Similar changes were also observed to a lesser degree in SAMP10. Blood-brain barrier function was impaired with advancing age in the olfactory bulb and medial hippocampus in SAMP8 (Ueno et al, 1993; Ueno et al, 1996; Ueno et al, 1997; Vorbrodt et al, 1995).

Immunology
SAMP8 mice also showed a more rapid decline in the lymphoproliferative response to concanavalin A, but cytotoxic T lymphocyte responses did not change with age. Natural killer cell activity was reduced with age in both SAMR1 and SAMP8, but no strain difference was observed (Powers et al, 1995).

Genetics
Coat colour gene - c : albino.

All SAMP mice have been identified at approximately 20 loci. There is only minor variation among the strains, restricted to Idh-1, Mod-1 and Car-2 loci.

Life-span and spontaneous disease
The SAMP8 mouse showed accelerated ageing (Takeda et al, 1991). They had age-related emotional disorders characterized by reduced anxiety-like behavior (Miyamoto et al, 1992). SAMP8 showed a profound disorder of the circadian rhythm of spontaneous motor activity and drinking behavior (Miyamoto, 1997). The SAMP8 showed age-related appearances of spongiform degeneration in the brain stem (Yagi et al, 1989), and of PAS-positive granular structures in their hippocampal formation (Akiyama et al, 1986), and astrogliosis in their brain stem (Yagi et al, 1989), hippocampus, pyriform cortex, brain stem nuclei and white matter (Kawamata et al, 1997). Clusters of activated microglia were also seen around the vacuoles in the brain stem (Amano et al, 1995). A monoamine-oxidase-B-positive granular structure was found in hippocampus of old mice (Nakamura et al, 1995). Beta/A4 protein-like immunoreactive granular structures were observed in various regions, including the medial septum, cerebral cortex, hippocampus, cerebellum, and some cranial nerve nuclei and roots and increased markedly in number with age (Takemura et al, 1993). Other age-dependent histological changes included cortical atrophy in the pyriform cortex, neuronal cell loss in the locus ceruleus and lateral tegmental nucleus, intraneuronal accumulation of lipopigment in Purkinje cells, and eosinophilic inclusion bodies in thalamic neurons (Kawamata et al, 1997; Akiguchi et al, 1994). Similar changes were also observed to a lesser degree in SAMP10. Blood-brain barrier function was impaired with advancing age in the olfactory bulb and medial hippocampus in SAMP8 (Ueno et al, 1993; Ueno et al, 1996; Ueno et al, 1997; Vorbrodt et al, 1995).

SAMP8 mice have a median survival time of 12.1 months.
Hippocampal glutamatic acid content is higher than in SAMR1 (Nomura et al., 1991). Muscarinic acetylcholine receptors, alpha 2-adrenoreceptors, N-methyl-D-aspartate (NMDA) receptor channels and L-type Ca2+ channels were all changed in the cerebral cortex and hippocampus in aged SAMP8 (Kitamura et al., 1989). High levels of K+ and NMDA induced [3H] noradrenalin release in brain slices, and this release was significantly lower in SAMP8 than in SAMR1 (Zha and Nomura, 1990). Damage to the central histaminergic neurons (Meguro et al., 1992), synaptic dysfunction in the glutamatergic (Kitamura et al., 1992) and cholinergic systems (Ikegami et al., 1992; Zhao et al., 1992) seem to be present in SAMP8. The SAMP8 retained a higher concentration of GM3 than SAMR1 throughout their life span (Ohsawa and Shiumiya, 1991). The endogenous levels of the beta-subunit of NGF in these mice was already elevated in the thymus, adrenal gland, testes and hypophysis during the early period of life as compared to SAMR1 (Kato-Semba et al., 1991; Kato-Semba et al., 1993). Neurotrophin-3 (NT-3) mRNA in the cortex was higher in SAMP8 than in SAMR1, whereas in the midbrain, hippocampus and forebrain, NT-3 expression levels were lower in SAMP8 than in SAMR1 during early development (Kaisho et al., 1994). Brain glucose metabolism was also impaired, as indicated by reductions in 2-deoxyglucose uptake (Kurokawa et al., 1996; Ohta et al., 1996) and in hexokinin activity (Kurokawa et al., 1996) in aged SAMP8. The binding of [3H]phorbol-12,13-dibutryte to protein kinase C in both cytosol and membrane fractions in the hippocampus of aged SAMP8 was reduced (Nomura et al., 1997).

References

5. Flood JE, Morley JE (1993) Age-related changes in foot shock dysfunction in the glutamatergic (Kitamura et al., 1992) and cholinergic systems (Ikegami et al., 1992; Zhao et al., 1992) seem to be present in SAMP8. The SAMP8 retained a higher concentration of GM3 than SAMR1 throughout their life span (Ohsawa and Shiumiya, 1991). The endogenous levels of the beta-subunit of NGF in these mice was already elevated in the thymus, adrenal gland, testes and hypophysis during the early period of life as compared to SAMR1 (Kato-Semba et al., 1991; Kato-Semba et al., 1993). Neurotrophin-3 (NT-3) mRNA in the cortex was higher in SAMP8 than in SAMR1, whereas in the midbrain, hippocampus and forebrain, NT-3 expression levels were lower in SAMP8 than in SAMR1 during early development (Kaisho et al., 1994). Brain glucose metabolism was also impaired, as indicated by reductions in 2-deoxyglucose uptake (Kurokawa et al., 1996; Ohta et al., 1996) and in hexokinin activity (Kurokawa et al., 1996) in aged SAMP8. The binding of [3H]phorbol-12,13-dibutyrate to protein kinase C in both cytosol and membrane fractions in the hippocampus of aged SAMP8 was reduced (Nomura et al., 1997).