The Icr:Ha(ICR) mouse: a current account of breeding, mutations, diseases and mortality

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Summary

This stock of albino mice is minimally inbred (0·5% per generation), and has been rigidly selected for fecundity. It is widely employed in oncological and pharmaceutical research. Spontaneous tumours arose in 55% of animals, multiple in 28%, averaging 1·66 per mouse. Females developed tumours at an earlier age than males. Predominant tumour types were pulmonary (23·1%), lymphoreticular (20%), and mammary (14%—23% of females). Miscellaneous tumour types (42·9%) ranged in frequency from 0·2 to 2·0%, the latter being hepatomas. Distribution of mammary tumours indicated that milk-borne mammary tumour virus was absent. Non-neoplastic disease was present in 58·6%, 24·1% being pulmonary and predominant in the young, while renal (31·2%) and cardiovascular (10·2%) disease was common in the elderly. Males outlived females.

The so-called 'Swiss mouse' stemmed from 2 male and 7 female albinos derived from a non-inbred stock at the Pasteur Institute and imported by Lynch (1969) via Lausanne, Switzerland, in 1926 for cancer studies at the Rockefeller Institute for Medical Research in New York. They were immediately sib-mated and became the source of various inbred strains and random-bred stock. The Swiss stock has achieved world-wide use in the study of many biological problems—particularly in oncology, infection and pharmacology—its virtues being high production and rapid growth rate. Annual production reaches many millions both by scientific and commercial colonies.

Certain characteristics seem not to have changed over the years. However, differences occur between colonies and even within a colony with the passage of time, so that contradictory results may be obtained using 'Swiss' stock from different sources. For example, the incidence of spontaneous neoplasia, although seldom reported in detail, varies with source and age (Sher, 1974). Since a large closed colony of minimally-inbred 'Swiss' stock—registered with the Committee on Nomenclature, Institute of Laboratory Animal Resources, as Icr:Ha(ICR)—is maintained at our Institute, and the mice have been distributed to about 20 laboratories and commercial breeders in this country and abroad, it is appropriate to record the details of breeding, disease, and life pattern of the colony. This is particularly important with respect to controls in carcinogenicity and cancericidal studies.

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The general history of the 'Swiss mouse' is recounted by Lynch (1969), and the development of the ICR stock by Hauschka & Mirand (1973). In 1948, T. S. Hauschka initiated his colony at the Institute for Cancer Research in Philadelphia. By random breeding, monogamous mating, avoidance of sib-mating, and rigid selection for litter size and quality of animal, he obtained the high production and growth rate characteristic of the stock first designated HA(ICR), later 'Breeder:HA(ICR)'. After Hauschka moved in 1954 to the Roswell Park Memorial Institute at Buffalo, New York, the colony at Philadelphia dwindled, but was restarted in 1958, using 100 pairs obtained from the Roswell Park colony. The original high quality is maintained through rigid selection, although the breeding pattern has been altered to obtain greater heterozygosity per generation.

Materials and methods

The minimal inbreeding system employed in the production of Icr:Ha(ICR) mice at this Institute, adapted from Robertson's method cited by Falconer (1967), retards the unavoidable inbreeding which occurs in time in any closed breeding animal population. The terms 'outbred' or 'random-bred' applied to such a stock are misnomers. However, the rate of inbreeding can be further lessened by the system to be described (Table 1), thereby assuring maximal heterogeneity for the longest possible time.

The rate of inbreeding for our colony has been set at 0·5% per generation. This requires an effective breeding population of 256 pairs of mice. Practical management, however, necessitates a colony size of 608 breeding pairs per generation to provide the effective 256 pairs, owing to our strict selection for maximal productivity. The selection criteria demand a minimum litter size of 10 at birth (average is 15), no preweaning deaths, and an interval of not more than 23 days between successive litters. Litter size is

Table 1. System for minimal inbreeding

Male from deme no.	×	*Female from deme no.*	→	*Next generation deme no.*
1		2	→	1
2		1	→	9
3		4	→	2
4		3	→	10
5		6	→	3
6		5	→	11
7		8	→	4
8		7	→	12
9		10	→	5
10		9	→	13
11		12	→	6
12		11	→	14
13		14	→	7
14		13	→	15
15		16	→	8
16		15	→	16

This illustration is limited to 16 demes. However, the system can be used for any number of demes that is an exponential function of 2 (4, 8, 16, 32, 64 etc.).

systematically reduced to 10 at birth to increase body-weight at weaning.

Our colony ('population') is divided into 16 demes ('subpopulations'). Each deme consists of a given number of mating units and each mating unit includes 2 cages which are duplicates, i.e. the males are brothers and the females (from a different deme) are sisters. Breeding combinations necessary to produce the next generation are shown in Table 1, e.g., the offspring of monogamous matings of males from deme 1 with females from deme 2 become deme 1 of the next generation, and so on. The duplicate monogamous matings in the various deme combinations provide a 'back-up' measure in case of sterility of one of the mating pair, and permit application of our selection criteria.

In the present study 3 categories of mice from the Icr:Ha stock were employed. Among the neonatal animals, attention was given to pups developing Sendai viral pneumonitis, to which they are highly susceptible, and to their dams; mortality among successive litters from the same dam was recorded in an effort to detect transfer of acquired maternal immunity and to evaluate its persistence. A 2nd group of neonates considered separately suffered from a haemolytic mutation (*aha/aha*). Also observed in detail were retired breeders of both sexes, apart from those that developed tumours early and died or were killed. These breeders included 95 haemolytic mutants that had recovered from perinatal anaemia. After 6 pregnancies, breeder pairs were retired from the colony as a unit at about 1 year of age and then maintained for life, being examined 3 times each week and removed for necropsy when moribund. Tissues were fixed in buffered (pH 7) formol, sectioned in paraffin wax at 5 μm, and stained with Ehrlich's haematoxylin and eosin, special stains being employed when indicated. Brains were not examined routinely.

Mice were cared for under conditions approved by the American Association for Accreditation of Laboratory Animal Care (AAALAC), being housed in filter-capped, stainless-steel cages 30 × 12·5 × 17·5 cm, with ponderosa pine shavings as bedding. They were provided with Old Guilford Diet #911R (Emory Morse Co., PO Box 313, Guilford, Connecticut 06437, USA) and drinking water, acidified to pH 2·7 to control growth of pseudomonas ad libitum. Bacterial monitoring was carried out in our microbiology laboratory, and viral screening annually by Microbiological Associates Inc., Walkersville, Maryland 21793, USA. A program for control of ectoparasites was practised.

Results

Mutations and anomalies

Haemolytic anaemia. A spontaneous mutation arose in 1972, characterized by perinatal anaemia, normoblastosis, and either haemolytic jaundice or extreme pallor. The gene symbol *aha* has been selected pending full inbred status of the line, and details will be reported at a later date. Segregation data have shown that the condition is caused by an autosomal recessive gene with complete penetrance in the homozygote, and antibodies have been demonstrated on the erythrocytic membrane. About 75% of the *aha/aha* pups survived the perinatal episode, appeared well after 4-5 weeks, and lived an essentially normal life span; about 30% of the survivors suffered a terminal haemolytic episode, usually mild. Neoplastic disease in these retired breeders was virtually identical to that in the other animals, the only difference being a high incidence of cardiorenal disease, and varying degrees of haemosiderosis and splenomegaly, the latter due to erythroid hyperplasia.

'Eyelids open at birth'. Mice of this mutant phenotype are born with open eyes, whereas normally they remain closed for about 2 weeks. It is a relatively common mutation and has been described in several inbred strains by Hauschka & Brown (1954). It was first observed in the Icr:Ha stock in 1973, and has since reappeared sporadically. Breeding results indicate that this condition is recessive and expressed in an irregular pattern, either unilateral or bilateral.

Dermo-thymic 'mutant'. This anomaly appeared in 3 litters in 1972, comprising 3 females and 1 male, all of which failed to breed and died within 2 months. They were smaller than their litter mates and had a hypoplastic dermis and panniculus. Abnormally keratinized hair shafts, along with the virtual absence of one hair

type (awls) produced a very sparse coat. The thymus could not be detected in the females, and in the only male it was small and showed corticomedullary inversion and mucous cysts, suggestive of a relationship to the athymic nude mouse.

Hermaphroditism. Sex mosaicism is rare in the mouse. However, 4 true hermaphrodites and 1 pseudohermaphrodite appeared in this Icr:Ha series. Each of the former had an ovary on the right and a testis on the left. Renal sexing was dimorphic. The pseudohermaphrodite had an imperforate vagina (an occasional finding in Icr:Ha), a normal and an hypoplastic uterine horn, a single functional ovary, and no male genital structures.

Neoplastic disease

The incidence of tumours (Table 2), totalled 55% males accounting for 40% and females 60%. In the 227 tumour-bearing animals 379 neoplasms were found—1·66 per mouse. Multiple tumours of different types constituted 42% and were usually found in separate organs or tissues, while those of the same variety generally affected a given organ, notably the lung.

The types and sites of tumour are given in Table 3, excluding multiple primary growths of the same type in a specific organ and indicating those which had metastasized. The incidence exceeded 10% only for the lung (23%), the lymphoreticular system (20%), and the mammary gland (14% of all animals, 23% of females). Age and sex incidence are shown in Fig. 1.

As one might expect in minimally inbred stock, the remaining 43% constituted a wide variety of neoplasms sparsely spread among multiple sites. Since the central nervous system was not examined routinely, we cannot comment upon tumours of the brain and spinal cord, although these are generally regarded as rare in mice. However, Hauschka & Mirand (1973) mention Jacobs' gross finding of 51 pituitary tumours in 350 HA(ICR) mice (14.6%) at the Roswell Park Memorial Institute.

Table 2. Summary of neoplasia

Percentages in parentheses.

	All mice	*Males*	*Females*
Mice studied	410(100)	166(40)	244(60)
With tumours	227(55)	98(59)	130(53)
Without tumours	183(45)	68(41)	114(47)
Total tumours*	379(100)	181(48)	198(52)
Tumours/mouse	1·66	1·84	1·52
Multiple tumours	113(100)	76(67)	37(33)
same type*	66(58)	55(73)	11(30)
different types	47(42)	21(27)	26(70)

* Excluding systemic spread in lymphoreticular neoplasia.

Pulmonary tumours. All were of the papillary epithelial type, ranging from well-differentiated localized ones to those showing considerable anaplasia and extensive infiltration; none had metastasized. A ratio of 68:32 males to females bore tumours of the lung. 41% of males and only 10% of females had multiple pulmonary tumours—seemingly independent new growths rather than the result of seeding.

The earliest tumour was found between 100 and 200 days, followed by a gradual rise to a peak between 700 and 800 days and a sharp decline thereafter.

Lymphoreticular neoplasia. The more or less systemic nature of this category and tendency toward cellular admixtures and transitions fit a monophyletic concept, following in general Dunn's (1954) classification, and separating leukaemias only by virtue of a significant blood picture. The combined group comprised 20% of the total, lymphomas representing 15% and leukaemias 5%. Of the former, 66% were in females and 34% males; females exceeded males in the leukaemias as well (1·3 : 1·0).

Among the lymphomas, there was variation in cellular maturity in all categories, often in the same animal, as well as in the organs and tissues involved within the same category. This was also true of the leukaemias, except that most cells in granulocytic leukaemia were relatively well differentiated, making it difficult to distinguish true leukaemia from hyperleukocytosis with myeloid metaplasia.

3 lymphomas, 2 lymphocytic and 1 mixed, appeared in females within the first 100 days; the subsequent increment reached a plateau between 500 and 800 days, followed by a terminal drop before 1000 days (Fig. 1).

Mammary tumours. None appeared in males. The incidence among females was 23% (14% of total sampling). Nearly 2/3 were adenocarcinomas (4 of which had metastasized to the lung) and 1/3 adenoacanthomas, the remainder comprised 3 squamous-cell and 1 spindle-cell carcinomas, and 1 myoepithelioma. Of the 41 tumours where position was recorded, 31 arose in the 6 cephalad glands and 10 in the 4 caudad glands, an observed ratio of 12·2 : 4·0 (Table 4). Only 2 tumours appeared between 100 and 200 days, and 4 between 300 and 400 days, peak incidence lying between 400 and 700 days.

Miscellaneous tumours. 65 of the tumours listed in Table 3 had an incidence of less than 10%, representing 20 different varieties arising at 15 primary sites. They were scattered singly, coupled, and in such combinations with the 3 major categories (pulmonary, lymphoreticular, and mammary that comment on

Table 3. Primary sites and types of tumours

Percentages in parentheses.

	Total	*Males*	*Females*	*Secondary site*
Mice studied	410(100)	166(40)	244(60)	
Adrenal	7(1·7)			
adenoma B	4(1·0)	1	3	
adenocarcinoma B	1(0·2)	1		
neuroblastoma	1(0·2)		1	
pheochromocytoma	1(0·2)		1	
Bladder	1(0·2)			
papilloma	1(0·2)	1		
Bone	3(0·7)			
fibrosarcoma	1(0·2)	1		
osteosarcoma	2(0·5)	1	1	
Mammary gland*	56(14)		23	
adenocanthoma	19(4·6)		19	
adenocarcinoma	32(7·8)		32	lung (4)
myoepithelioma	1(0·2)		1	
spindle-cell carcinoma	1(0·2)		1	
squamous-cell carcinoma	3(0·7)		3	
Gastrointestinal	9(2·2)			
adenomatous polyps	3(0·7)		3	
adenocarcinoma	3(0·7)		3	
carcinoma *in situ*	2(0·5)		2	
haemangioma	1(0·2)		1	
Harderian gland	2(0·5)			
adenoma	1(0·2)	1		
adenocarcinoma	1(0·2)		1	
Heart	1(0·2)			
haemangioma	1(0·2)	1		
Kidney	1(0·2)			
adenocarcinoma	1(0·2)		1	lung
Liver	12(2·9)			
haemangioma	2(0·5)	1	1	
haemangiosarcoma	1(0·2)	1		
hepatoma	8(2·0)	5	3	
hepatocarcinoma	1(0·2)	1		lung
Lung*	95(23·1)			
papillary carcinoma	95(23·1)	65	30	
Lymphoreticular	81(20)			
lymphomas	60(14·6)	21	39	systemic
lymphocytic	32(7·8)	13	19	systemic
histiocytic A	13(3·2)	4	9	systemic
histiocytic B	7(1·7)		7	systemic
histiocytic A + B	1(0·2)	1		systemic
lymphohistiocytic	6(1·5)	2	4	systemic
plasmacytic	1(0·2)	1		systemic
leukaemias	21(5·1)	9	12	systemic
granulocytic	8(1·9)	6	2	systemic
lymphocytic	9(2·2)	2	7	systemic
plasmacytic	1(0·2)	1		systemic
stem cell	3(0·7)		3	systemic
Ovary	5(1·2)			
adenocarcinoma	1(0·2)		1	
haemangioma	1(0·2)		1	
luteoma	2(0·5)		2	
teratoma	1(0·2)		1	

Table 3—(*cont.*)

	Total	*Males*	*Females*	*Secondary site*
Panniculus	4(1·0)			
haemangioma	2(0·5)	2		
lipoma	2(0·5)	1	1	
Seminal vesicle	1(0·2)			
adenocarcinoma	1(0·2)	1		
Skin	6(1·5)			
dermatofibrosarcoma	1(0·2)	1		
melanoma	2(0·5)		2	lung (2)
papilloma	1(0·2)		1	
sebaceous adenoma	1(0·2)		1	
squamous-cell carcinoma	1(0·2)	1		
Spleen†	2(0·5)			
haemangioma	1(0·2)		1	
haemangiosarcoma	1(0·2)	1		
Testis	1(0·2)			
interstitial adenoma	1(0·2)	1		
Uterus	10(2·4)			
endometrial sarcoma	1(0·2)		1	
haemangioma	3(0·7)		3	
leiomyoma	4(1·0)		4	
leiomyosarcoma	2(0·5)		2	

* Excluding multiple primary tumours of the same type.
† Excluding lymphoreticular neoplasms.

incidence is not warranted. The only deviation from the expected was the finding of 8 epithelial tumours of the gastrointestinal tract, 5 of which (in females) were malignant.

Accumulative tumour incidence. The accumulation of tumours with age in males and females is compared in Fig. 2. There was a 4% lag of tumour accumulation among the males during the first 300 days of life,

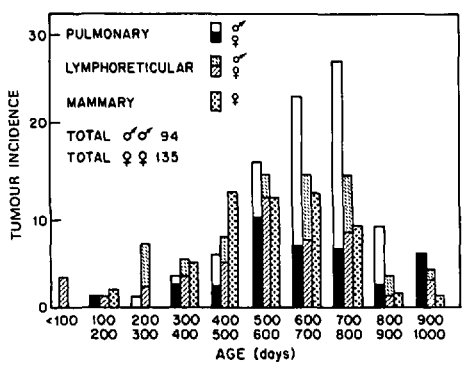

Fig. 1. Incidence of predominant tumours by age and sex.

followed by a rapid gain among the females to average 20% until the population at risk became small. The curves also show that tumours arose earlier in females: between 400 and 800 days of age tumours appeared on average 100 days sooner than in males.

Non-neoplastic disease

More than half of the mice, whether tumour-bearing or not, had inflammatory or degenerative disease, although frequently not life-threatening (Table 5). Certain other conditions can be diagnosed by inference, such as anaemia from erythroid hyperplasia in the spleen, infection or inflammation from leukocytosis in blood vessels and cardiac chambers, and so on; however, the background of such changes seemed too nonspecific for tabulation.

Amyloid. The incidence of amyloidosis was far lower than in certain inbred strains—especially A and SM/J—and their hybrids, and the distribution was haphazard, 1 being limited to the lamina propria of the small intestine, another such also involving the lung, then 1 each in the heart, kidney and liver, 2 in both liver and spleen, and 1 in both heart and kidney. Most were found in the mice without tumours.

Table 4. Distribution of mammary tumours

Tumour type	*Total*	*Anterior*	*Posterior*	*Ant:post*
		no. mean age (days)	*no. mean age (days)*	
Adenocarcinoma	26	20 479	6 567	12·4:4
Adenoacanthoma	15	11 632	4 648	12·0:4
			Mean	12·2:4

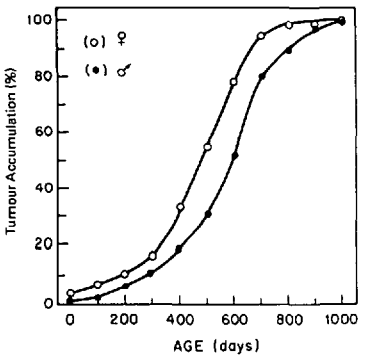

Fig. 2. Tumour accumulation by age and sex.

Cardiovascular disease. Virtually all mice in this category had enlarged hearts, with or without focal fibrosis of the hypertrophied myocardium. There was 1 instance of mural thrombosis in the left atrium. The incidence was nearly equal among mice with and without tumours, but about twice as high in males, particularly elderly survivors of a haemolytic mutant. No dystrophic cardiac calcification was encountered.

Dermal lesions. Chronic ulcerative dermatitis of unknown aetiology was noted in 3 tumour-bearing females and 15 non-tumorous mice of nearly equal sex distribution.

Hepatic disease. Tumour-bearing animals were singularly free of liver lesions, while others showed a scattering of abscesses, periportal hepatitis, bilary angiectasia, and microinfarcts, with an incidence of 13·7% about equally divided between the sexes. No evidence was encountered of infection with mouse hepatitis virus.

Pulmonary disease. Virtually all lesions of the lung were interstitial pneumonitis of the Sendai viral type, rarely pyogenic bronchopneumonia. Since the incidence of viral pneumonitis was highest among pups, the offspring of 96 dams selected at random were surveyed. The presence of 1 or more pneumonic pups was recorded in each of the 6 litters which make up the standard mating life. 94 of the 96 had only 1 affected litter, and only 2 had 2 consecutive ones. Pneumonitis occurred in 21% of litters during parities 1, 2 or 3, then dropped to 13·6, 12·6 and 11·5% in parities 4, 5 or 6 respectively.

Renal disease. Nearly 1/3 of the mice had significant glomerular lesions, divided about equally between active glomerulonephritis and glomerulosclerosis. Males were affected almost twice as often as females.

Table 5. Diseases other than neoplasms*

Percentages in parentheses: 410 mice (100%) studied.

	With tumours 227			*Without tumours 183*		
	total†	*males*	*females*	*total*‡	*males*	*females*
Affected 240 (58·6)	125(55·1)	39	86	115(62·8)	54	61
amyloid 8 (2·0)	2(0·8)	1	1	6(3·2)	2	4
cardiovascular 42 (10·2)	24(10·6)	17	7	18(9·8)	12	6
dental 1 (0·2)	0(0·0)	0	0	1(0·5)	1	0
dermal 18 (4·4)	3(1·3)	0	3	15(8·2)	7	8
hepatic 26 (6·3)	1(0·4)	1	0	25(13·7)	12	13
pulmonary 99 (24·1)	38(16·9)	10	28	61(33·3)	27	34
renal 128 (31·2)	82(36·1)	32	50	46(25·1)	23	23
Unaffected 170 (41·4)	102(44·9)	50	52	68(37·2)	14	54

* Multiple lesions frequent in affected mice.
† Percentages of 227.
‡ Percentages of 183.

Table 6. Life table of Icr:Ha(ICR) mice

Age (*days*)	$\dot{e}_x$ ♂♂	♀♀	d_x ♂♂	♀♀	q_x ♂♂	♀♀	*t/p* ♂♂	♀♀	t_x ♂♂	♀♀
0-99	166	244	31	40	0·187	0·164	2	4	0·012	0·016
100-200	135	204	8	20	0·059	0·098	0	5	0·000	0·025
201-300	127	184	8	7	0·063	0·038	4	4	0·031	0·022
301-400	119	177	9	12	0·076	0·068	5	8	0·042	0·045
401-500	110	165	11	34	0·100	0·206	8	22	0·373	0·133
501-600	99	131	15	45	0·152	0·344	11	28	0·111	0·214
601-700	84	86	27	40	0·321	0·645	21	29	0·250	0·337
701-800	57	46	36	25	0·632	0·543	27	22	0·474	0·478
801-900	21	21	10	11	0·476	0·524	9	4	0·429	0·190
901-1000	11	10	9	8	0·818	0·800	9	1	0·818	0·100
1001-1100	2	2	2	2	1·000	1·000	2	2	1·000	1·000

$\dot{e}_x$ exposure; d_x no. dying at each age; q_x mortality rate; *t/p* no. tumours per age group; t_x tumour rate

A few instances of pyelonephritis and hydronephrosis occurred.

Mortality

Data relating to survival and concomitant tumour incidence are presented in standard actuarial form (Table 6), showing the number of animals at risk at the beginning of each 100 day period (e_x), the number dying within the period (d_x), the age-specific mortality rate (q_x), the number bearing tumours at death within the period (*t/p*), and the age-specific tumour rate (t_x). The results are shown graphically in Fig. 3.

From these data we may conclude that in this particular stock:

death in both sexes prior to 100 days of age was rarely related to tumours, and resulted most frequently from pneumonitis;

2/3 of females older than 800 days did not have tumours (death due mostly to cardiorenal disease);

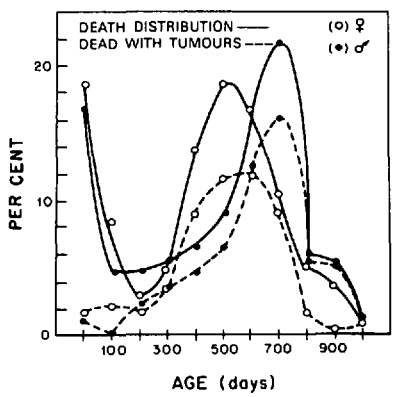

Fig. 3. Sex differences in longevity with and without tumours.

the tumour incidence in females was high between 401 and 700 days, reaching a peak at 600 days;

the tumour incidence in males showed a steady rise between 201 and 800 days, then a rapid drop to the 1001–1100 day level. However, apart from a dip at 501-600 days, the tumour rate rose continually and coincided with the mortality rate beyond 800 days;

the peak of male life span and tumour incidence curves were 22 and 16% respectively at 700 days, while those for females were 18 and 12%, the former at 500 days and the latter at 600. The curves for males were more narrowly based and steeply inclined, with a shift to the right. Thus, the male life span was significantly greater than that of females, irrespective of the incidence of tumours.

Discussion

After 20 years of minimal inbreeding and rigid selection for size and fecundity, our Icr:Ha(ICR) stock has retained the characters for which it was originally selected by Hauschka when he developed his 'Breeder: Ha–ICR)' Swiss mouse, the stock being prolific and the individuals large and vigorous. It is well to remember that constant selection is a sine qua non for the maintenance of these and other attributes of the stock.

No histologically verified series of tumours observed under conditions similar to ours was available for comparison. In Hauschka's Philadelphia colony (1950-1951) the incidence of mammary tumours in 175 breeding females observed for 20 months was 29·3%, his findings in the Buffalo colony of about 25% is comparable with our value of 23%. However, the incidence of lung tumours in his Philadelphia colony was 14% in males and 15% in females, while 25% of his 350 breeding females in Buffalo were affected (males not reported); our series showed an incidence of 39% in males and 11% in females.

Lymphoreticular neoplasia was noted in 11% of 350 breeding females (males not reported) compared with our incidence of 12% in females and 7% in males.

Females develop tumours earlier than males and have a shorter life span, irrespective of their being tumour-bearing. Whether the latter is due to the stress of the breeding regimen is a matter of speculation.

With respect to our finding of non-random prevalence of anterior mammary tumour sites (Table 4), we believe that milk-borne mammary tumour virus (MuMTV) is absent in the Icr:Ha stock. Mice carrying this MuMTV display fairly even distribution among anterior and posterior glands, with an expected anterior : posterior ratio of 6 : 4, whereas Prehn (1954) showed that strains carrying only endogenous MuMTV are characterized by a preponderance of cephalad tumours. Our observed ratio of 12·2 : 4·0 is statistically significant ($P = 0{\cdot}01$). Furthermore, tumours among milk-borne MuMTV carriers arise relatively early, whereas our peak incidence is late. Regarding non-neoplastic disease, a high susceptibility to certain viral infections has long been known, a vast number of the original Rockefeller Foundation stock having been used in research on yellow fever. In the Icr:Ha colony, interstitial pneumonitis caused by the Sendai virus proved to be the most troublesome infection among newborn. As parity increased, the incidence of pneumonitis in the pups decreased, indicating that repeated exposure of breeding females to the virus was required to passively immunize the pups, which presumably acquire the virus from their parents. Cage-to-cage air transmission by air-borne virus is unlikely, since all cages are equipped with filter bonnets, and because the pneumonitis cycle can be broken by removing carriers. We are now conducting field trials of a killed Sendai virus vaccine (Microbiological Associates) which shows great promise; if successful, the infection could be eliminated from closed colonies.

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Die Icr:Ha (ICR) Maus: ein aktueller Bericht über die Zucht, Mutationen, Krankheiten und Sterblichkeitsrate

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Zusammenfassung

Dieser Albino-Mausstamm hat einen minimalen Inzucht-Quotienten (0·5% pro Generation) und wurde konsequent auf Fruchtbarkeit selektioniert. Dieser Stamm findet auf einer breiten Basis in der Tumor- und Pharmaforschung Anwendung. Spontane Tumorbildung wurde bei 55% der Tiere festgestellt, wobei 28% der Tiere multiple Tumoren aufwiesen, im Durchschnitt 1·66 Tumoren pro Maus. Bei den Weibchen entwickelten sich Tumore in jüngerem Alter als bei Männchen. Am häufigsten wurden Pulmonal- (23·1%), Lymphoretikular- (20%) und Mammatumoren (14-23% der Weibchen) festgestellt. Andere Tumorarten (42·9%) kamen in einer Häufigkeit von 0·2 bis 2% vor, wobei es sich beim letzteren Prozentsatz um Hepatomas handelt. Die Verteilung der Mammatumore zeigte, dass kein durch die Milch übertragener Mammatumor-Virus vorhanden war. Nicht neoplastische Erkrankungen waren zu 58·6% vorhanden, wobei 24·1% im Pulmonalbereich und vorwiegend bei Jungtieren festgestellt wurden, hingegen waren renale (31·2%) und cardiovaskulare (10·2%) Erkrankungen am häufigsten bei älteren Tieren zu finden. Männliche Tiere wurden älter als weibliche.