Balinese Breeding Policy

Gr Ch and Gr Pr Chanteur Champagne Sunset
1989

Balinese Breed Advisory Committee

Contents

1. Introduction

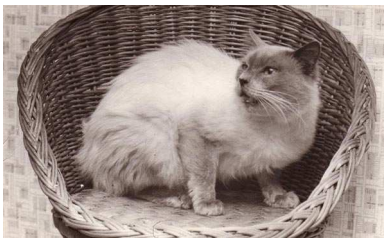
This Breeding Policy accompanies and supplements the Balinese Registration Policy and should be read in conjunction with that document.

The aim of this breeding policy is to give advice and guidance to ensure breeders observe what is considered “best practice” in breeding Balinese with the over-riding objective of improving the Balinese cat to meet all aspects of the Balinese Standard of Points

Balinese are semi longhaired cats showing Siamese colour restriction, and with elegant Siamese type. They should be beautifully balanced with head and ears carried on a slender neck, with a lithe, graceful body, slim legs and feet and a long tail. The coat should be of medium length, fine and silky in texture.
The breed was developed in America in the 1950’s from longhaired cats which occasionally appeared in Siamese litters. They were first imported into the United Kingdom in the 1970’s.

The first British imports were Verdes Blue Warrior of Davina (Blue Point Balinese) and his daughter, Davina’s Chocolate Gem (Seal Point Balinese Variant)

Verdes Blue Warrior of Davina



They were followed by Gaynell’s Bobby Boy of Ti-Mau, Ti-Mau’s Brite Sunshine, Bali-Vista Chia, Del-Ri’s Donna and Del-Ri’s Prima
Breeders concentrated on building up a pool of healthy cats, outcrossing with Siamese to increase the gene pool and improve type. As the longhair gene is recessive the offspring of Balinese/Siamese matings, Balinese Variants, are shorthaired cats carrying the gene for longhair. They can not be shown but are an important factor in the breeding process.

The early Balinese were registered on the Longhair Register but exhibitors wanted Balinese cats to be moved to the Siamese Section to be judged by Siamese judges. Balinese were accepted in the Siamese Section in 1980. Championship Status was granted in October 1985. The first certificates were awarded in June 1986.

The size of the gene pool is a cause for concern. The first stud was Sandoval Paris Review (Verdes Blue Warrior xDavina’s Chocolate Gem). Siamese females were outcrossed to Paris Review and the resulting variants mated back to him.
Other Balinese have been imported over the years, but, unfortunately, many of these come from lines developed in the UK.
The only allowed outcross is to Siamese, which is limiting because there were few foundation cats, made worse by a big reduction in breeding stock during the war and current problems with fewer breeders and the lack of cats at open stud. Possibilities of Balinese imports from Europe are restricted as European Balinese are likely to have Orientals in their pedigrees.

The Balinese of today have moved a long way from the heavier set, thick coated cats imported in the early 1970’s. The modern Balinese is a much more elegant cat whose type is closer to that of Siamese, with a coat which lies close to the body, sleek and silky. However breeders should not be complacent. The health and temperaments of their cats and of the breed as a whole should be a major consideration in their breeding programmes.

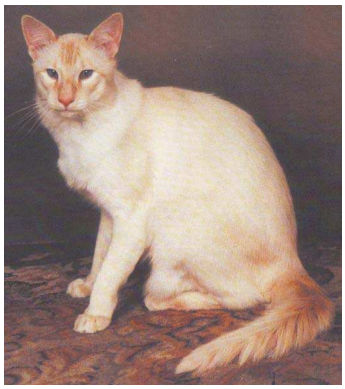
Outcrossing to Siamese should ensure good health and vigour in the offspring, but there is anecdotal evidence that this is not always the case. Breeders are reporting that the offspring of mixed matings do

not breed as well as either Balinese or Siamese. Problems include: queens not becoming pregnant, smaller litter size, and dead kittens. This is an area for further investigation.

Type and Coat have altered considerably since the first imports.

Sandoval Paris Review
mid 1970's
The first Balinese Stud

Ch Northstar Leo 1983
One of the first Balinese
Champions



UK Gr Ch Soleil Imperial Rufus
1988
The first Grand Champion Balinese

UK Gr Pr
Aprikat Strikingdash
1993

UK Gr Ch & UK Gr Pr
Spindiamond Knackeflerg
1996

UK & Imp Gr Pr
Aprikat Sailsinthesunset
2003

UK Gr Ch & Imp Gr Pr Lemental Red Alert
2003

UK Gr Ch Pippastro Hawkmoth
2007

2. Description

The **Standard of Points** describes the ideal cat, but no cat can ever match it completely. They all have unique combinations of good qualities and faults.
It gives the relative importance of the different features of the cat. Judges don't actually look at each aspect in isolation, giving marks to each one and then adding them up. They have to look at the cat as a whole and balance each aspect against the rest.

Type:
The standard calls for a long well proportioned, balanced head. Large ears with good width between, narrowing in straight lines to a fine muzzle, forming a balanced wedge shape with no break or pinch at the whiskers. The ears set should be neither too low nor too upright.

Balanced Head

Ear set too low

Ear set too upright

The head should be, neither round nor pointed, avoiding exaggerated type.

Correct Profile

Uneven Profile

Very Weak Chin
(suggests overshot bite)

Very Strong Chin
(suggests undershot bite)

In profile the nose should be straight, the chin strong and the bite level. The tip of the chin should line up with the tip of the nose in the same vertical line.
The eyes should be oriental in shape, slanting towards the nose, of a brilliant blue, the deeper the better.
The body should be medium in size, lithe and graceful. The legs slim with small, oval feet, the tail long and tapering. The head body, legs, feet and tail should all be in proportion, giving the whole a well balanced appearance. A well furnished plume can disguise the length of the tail making it appear longer. Although there has been large improvement in body type, slim legs and small feet prove elusive.
Care must be taken regarding the size of the cat, as small cats can appear to have better type. This is particularly noticeable in small, undernourished kittens.

Coat:
Balinese coat has changed significantly over the years. The coats of the early imports were thick with woolly undercoats.
Modern coat lies close to the body, fine, sleek and silky with a plumed tail. Nevertheless the length does tend to disguise the elegant body shape, particularly where there is a tendency to frill around the neck and

the base of the tail. While ear fronds, goatee beards and foot tufts are not mentioned in the Standard of Points, they are certainly very attractive additions.
Balinese do not normally achieve full coat until they are adult; coat length is often improved after the cat is neutered.
There may be some evidence that outcrossing to Siamese introduces polygenes which reduce coat length. This should be taken into account when selecting a suitable outcross.

Type and coat are both important. Care must be taken that one is not improved at the expense of the other.

Colour:
Breeding good colour is very difficult. While there has been great improvement in type and coat, colour has taken lower priority and has suffered as a result. It has been speculated that this may be due to mixing colours particularly warm ones such as chocolate with cold colours such as blue. Unfortunately the gene pool is far too narrow to allow 'pure' colour breeding.
Kittens are born white, and gradually develop full colour. This means that young kittens should be much paler than adults of the same colour. As this darkening continues into adulthood, the older cat can become very dark, losing contrast between points and body.

Eye Colour:
Although the Standards of Points are slightly different for each variety, effectively eye colour should be the deeper blue the better. Unfortunately, once good eye colour is lost from a line it is very difficult for it to recover.

Temperament:
When pursuing improvements in type or colour, breeders must not overlook the importance of temperament.

Permitted outcrosses:
Coming from very few foundation cats, the Balinese gene pool is very limited. Its size has been improved by outcrossing to Siamese but they also have a limited gene pool for the same reasons. It is important that no obstacle be put in the way of attempts to widen it except where there are cogent reasons not to allow the outcrossing. Thus (these categories may overlap):

- Since type (together with coat quality) is what distinguishes the Balinese from any other pointed semi longhair cat, outcrossing to breeds not of Oriental type is not permitted.
- Similarly, outcrossing to any longhaired or semi longhaired breed with different coat quality is not permitted.
- In pointed cats, where a parent is silver, it is difficult to detect with certainty which of the offspring is silver, especially if the expression is low-grade. Outcrossing to Smoke and Silver Tabbies is therefore not permitted. (This might be subject to revision if a test for silver is developed)

3. Genetic Make Up

An explanation of the genetics may be useful in understanding the make up of the Balinese.

Each cell of a cat's body (with one class of exceptions) contains 19 pairs of chromosomes, each made up of thousands of genes. Each gene has a complicated chemical structure which acts as a template for the construction of components of the body. The exceptional cells are the egg and the sperm, which have only one set of chromosomes - formed by random selection of one from each chromosome pair. On mating the single set in egg and sperm combine to form the normal pairs of chromosomes in the single cell which is the start of an embryo, the sets are replicated as cells divide during the embryo's development. So the offspring has one copy of each gene from each parent.

One of the pairs of chromosomes in the cat, as in most mammals, is unique. In the female, each of the pair is of the normal size, but in the male one of the pair is of the normal size, but one is much smaller. The normal size chromosome is called the X, the small one the Y

Many of the genes have mutated to slightly different forms, selection of these has resulted in the development of different physical characteristics which are the basis of the various breeds. The variant forms of a gene are called alleles. When a particular gene pair consists of different alleles, what usually happens is that the recipe given by just one of the alleles is followed for each cell where the gene is active: this allele is said to be dominant to the other, or the other recessive to it. In this case the effect on the cat is as though the recessive was not present.

So a cat has a set of visible characteristics, but can pass different characteristics to its offspring. It is helpful to know about the ancestors of the cats when trying to predict the result of a mating. For example a black cat with a blue mother will carry dilute and so can produce blue offspring if mated to a blue, or to another carrier. But, though from the ancestry one can determine when a recessive allele may be present, one can't determine that it must be absent. Recessive alleles may be passed through many generations without showing up in the cats' phenotype.

Genes which have known effects are denoted by single letters. The dominant allele is denoted by a capital, recessive alleles by lower case. If there is more than one recessive allele, the lower case letters have identifying superscripts. For example Black [B], Brown (Chocolate) [b], Light Brown (Cinnamon) [b^1]

So which genes are important in Balinese?

Full Colour [C] : Burmese Colour Restriction [c^b] : Siamese Colour Restriction [c^s] : Blue Eyed Albino (Recessive White) [c^a]

A series of recessive semi albino mutations which cause a reduction in the coat and eye colour as well as progressively restricting the colour to the points. c^b is incompletely dominant to c^s, the hybrids, c^bc^s, are Tonkinese which have an intermediate degree of albinism . Both are dominant to c^a.

Siamese restriction causes the eyes to appear blue and the production of pigment in the hair to become temperature dependant. The pointed pattern occurs because the extremities are cooler than the body. The mutation causes all colours to be paler than in the corresponding self cat.

Colour darkens with age, kittens are born white and gradually develop full colour.

A DNA test for the Siamese gene is available.

Agouti (or Tabby) **[A] : Non-Agouti** (Non-Tabby) **[a]**

All cats have an underlying tabby pattern, which is concealed in the presence of non-agouti. The background of a tabby pattern is produced by the pigment-generating cells at the roots of hairs switching production of pigment on and off, giving bands of colour in the hair, while in the foreground production is continuous. Non-Agouti stops the switching, so pigment is continuously produced everywhere. You can sometimes see the ghost tabby pattern - often in kittens whose coat later clears. In the paler colours rings on tails are often evident.

A DNA test for Non-Agouti is available

Black [B] : Brown (Chocolate) **[b] : Light Brown** (Cinnamon) **[b^l]**

The alleles of this gene alter the shape of the pigment granules deposited in hairs and in nose and pad leather. Because differently shaped granules reflect light differently, the result is to change the colour. Seal points or blue points can carry either chocolate or cinnamon but not both. Lilac points can also carry cinnamon. However, if a seal carrying cinnamon is mated to a chocolate then chocolate carrying cinnamon will be produced and it would look as if the seal carried chocolate.

DNA tests are available for both Chocolate and Cinnamon.

Dense Colour [D] : Dilution (popularly Blue) **[d]**

Dilution causes the pigment to be spread more thinly in the hair and this weakens the colour. It is independent of the colour genes above, so one can have black+dilution = blue, chocolate+dilution = lilac, cinnamon+dilution = fawn, or orange+dilution = cream. Cream can be blue, lilac or fawn based.

A DNA test is available.

Dilute Modifier [Dm] : normal [dm]

As its name suggests, Dilute Modifier is thought to modify the effect of the Dilution gene d. Although it has no known effect where the Dense gene D is present. (i.e. seal, chocolate, cinnamon and red cats) it has been suggested that it could be the cause of a general deterioration of colour.

In dilute cats expressing any of the alleles of Black (i.e. blue, lilac or fawn) it produces caramel. Though each gives a distinct colour, for historical reasons all three are given just one colour name. In dilute cats together with orange, it produces apricot.

While this is the accepted genetic basis for Caramel and Apricot, it remains a hypothesis while no discrete gene has been identified. As there seems to be fewer blue/lilac/cream cats than expected the genetics could be more complicated.

Inhibitor (Silver) **[I] : normal [i]**

The Inhibitor gene suppresses the development of pigment in the hair of the coat, typically producing hairs that are fully coloured only at the tip and have a white base.

The gene has now been identified. There is as yet no test, but it is expected that one will be available shortly. It is dominant, but the expression is variable so that cats possessing the gene may not necessarily be recognised as doing so.

Normal Hair Length [L] : Long-hair [l]

A recessive mutation which increases hair length. More subtle variations in length and texture are produced by the action of groups of polygenes.

4 independent mutations in the FGF5 (Feline Fibroblast Growth Factor 5) gene determine the long-haired phenotype.

3 of these seem to be breed specific, occurring in Norwegian Forest Cats, Main Coons and Ragdolls. The 4^{th} is present in all breeds of long haired cats including Balinese. It is possible that other mutations causing long hair may exist which have not yet been identified.

DNA tests are available for all 4 mutations.

Orange (popularly Red) **[O] : non-orange [o]**

The Orange gene causes the pigment granules to become yellow. This makes the coat, paw pads and nose leather appear red in B series cats, cream in dilute cats and apricot where the DM gene is present. It does not matter which of the B series alleles is present as the appearance is almost indistinguishable. A cat which would be seal without the orange gene is called a seal based red, similarly reds can also be chocolate or cinnamon based, and creams blue, lilac or fawn based.

Orange masks the effect of non-agouti: orange series cats nearly always appear to have tabby markings. (Apparently clear coated reds are either ticked on careful inspection, or have been carefully selected for bad tabby pattern). All orange series with one or more tabby point parents must be registered as tabby point until proven otherwise. This used to mean using a number of test matings, but can now be proved by a DNA test.

Orange is a very unusual gene: its position is on the part of the X chromosome for which there is no counterpart in the Y. So in a male cat only one of the two alleles can be present: the cat is either orange series OY, or not oY. In a female there are three possibilities, the cat can be OO orange series,

oo not orange series or Oo which gives rise to the Tortie. *A* peculiarity of the X chromosome is that only one is active in each cell, but the inactivation of the other happens quite late in the embryo's development, when there already very many cells, and each cell independently chooses which X to inactivate. In this case some of the pigment-producing cells O is active, in others o, giving the typical mottled appearance of the Tortoiseshell.

Occasionally male Tortoiseshells appear, although they are usually sterile. They always represent a genetic anomaly. The most likely cause is the presence of three rather than two sex chromosomes (XXY Alternatively, there may be two pairs of sex chromosomes (XX and XY) with only one of the pair being present in each cell. The easiest way to understand how this could happen is development from a fusion of two fertilised eggs, but no doubt the truth is rather more complicated.

Piebald White Spotting [S] : Normal [s]

A dominant gene producing white areas, Piebald White Spotting is behind Bicolour in all breeds. Expression is variable, and the homozygous [SS] state produces a larger proportion of white than the heterozygous [Ss] state. While variability of expression could, in principle, give no perceptible white at the low end, and complete white at the high end there is no evidence of this happening

Torties with Piebald White Spotting have their areas of areas of orange and non-orange in patches rather than the usual mingled effect without white.

Piebald White Spotting should not be confused with Brisket Spotting, which gives rise to minor white spots on the underside of the body which are variable in size and irregular in occurrence. The genetics and mode of inheritance of brisket spotting are unclear but are thought to be polygenic.

Brisket Spotting can be masked by Piebald White Spotting.

Dominant White [W] : Normal [w]

A dominant gene which causes a white coat, hiding all other colours and patterns. The gene also causes eye colour to be blue (but with variable expression, so non-blue and odd eyes also occur).

There is an association with deafness, particularly in blue-eyed whites. Deafness can be tested using the BAER test.

In order to reduce the possibility of deafness Foreign Whites have been developed to be White Pointed Siamese so the blue eyes are a consequence of the Siamese gene

Polygenes

These are collections of genes which, although individually insignificant, have considerable effect when combined together. They modify the effect of the major genes and can alter all aspects of the cat.

Type seems to be completely controlled by a very wide range of polygenes.

Points colour is determined by major genes, but the more subtle differences are due to polygenes.

Siamese colour restriction reduces pigment causing the eyes to appear blue, but depth and intensity are polygenic.

The action of polygenes can cause subtle differences in texture, density and length.

4. Breeding Systems

Listed above are the main genes that help define the Balinese cat through the expression of colour and coat, but of course there are a large number of other genes that together create the distinctive physical shape and confirmation which is the essence of Balinese breed type.
In order to ensure the maintenance of the good Balinese breed type already achieved, while allowing scope to further improve aspects of type, coat, and colour, to meet the ideal described in the Standard, breeders need to have a clear, definite and well understood breeding system. This means the development and management of a breeding programme in which certain cats are affirmatively selected to be bred to others, for predetermined reasons. Equally important, it also means that breeders allow no matings until they have given careful consideration to the outcome. In particular three key rules must be followed:

- **Health must be the overriding consideration in any Balinese breeding programme.**

- **The good and bad features of the individual cats should be assessed and weighed against each other before any mating.**

- **When planning a breeding programme, breeders must realise that doubling up on the good traits in a cat also results in doubling up on the defects; the breeding of cats with similar faults should be avoided at all costs otherwise there is a danger of fixation. (i.e. creating a characteristic which cannot subsequently be eliminated).**

Breeders must make themselves aware whether the characteristics they wish to promote or avoid, are due to a dominant gene (which will always be expressed when present) or a recessive gene (only expressed in the homozygous state i.e. where the cat inherits the gene from both parents).
The prime motive is to perpetuate the Balinese as a recognisable breed and to improve the quality of the breed as measured against the Standard
The skill in breeding lies in the choice of the individual cats and the matings to be performed between them.

Selection
A breed is defined by its own distinctive set of characteristics, achieved and further developed by a reduction in genetic diversity This reduction is controlled by selective breeding, where the cat chosen is that which most closely approaches the breeder's ideal cat. As selection alone is not very efficient in reducing diversity it is often used in conjunction with inbreeding. Some inbreeding, albeit on at a low level is inevitable in the development of a breed.

Inbreeding
Inbreeding is an inclusive term covering many different breeding combinations and degrees of relationship – including the more distant, less intense. It is consistently more efficient in eliminating heterozygous (varying and diverse) genotypes and increasing homozygous (same) genotype, thereby ensuring a greater likelihood that kittens will closely resemble their parents. Used here, the term does not mean close, purposeful, inbreeding of closely related cats (brother/sister, father daughter), but rather the moderate form that results from the mating of not too distantly related (but not directly related) cats (first cousins, half brother/half sister, second cousins, etc). Some inbreeding is essential to stabilise conformation around a definite type. Inbreeding is the act of mating individuals of various degrees of kinship, and if continued it produces ever increasing homogeneity in the offspring.

"The more intense the in-breeding, the more careful must be the selection". "Loss of innate genetic variability must not be too great".
Inbreeding should be restricted to experienced breeders with sound knowledge of pedigrees. A complete outcross every few generations is recommended.
Breeders must realise that there has been considerable inbreeding in the past in the development of Balinese. This might not be apparent in 5 generation pedigrees.

The overall approach should be one of balance and moderation in the degree of inbreeding coupled with consistent selective breeding with a clear objective in mind – i.e improvement of key aspect and/or the elimination of weak traits or defective genes.
Breeding systems and practices need to operate so as to ensure the Balinese gene pool contains enough variation to give scope to continue improving the breed and avoid the danger of either fixing type too quickly (before the ideal of the standard is reached) or deleterious genes being expressed and fixed in the breed. Breeders need to use inbreeding to gain sufficient homogeneity to fix recognisable Balinese type but with sufficient variation to both enable improvement, and maintain health and vigour, avoiding fixation of defective genes or unwanted traits (and to ensure the elimination of anomalies).

While it is recognised that breeders do not wish to entrust their valuable breeding lines to individuals who may not operate humane and qualitatively intelligent breeding practice the GCCF would strongly recommend that breeders do not place excessive numbers of healthy good quality cats on the non-active register because they want to operate commercially restrictive practices. This could have serious future consequences in reducing the viable, active gene pool of a breed to an unacceptably low level and potentially promote undesirable practices.
The unavailability of female kittens on the active register discourages potential new breeders.

Inbreeding Depression

A breed, breeding line or individual can suffer from inbreeding depression when inbreeding is taken too far and a loss of genetic variability results. Inbreeding depression can result in a general loss of vigour, even if the animals in question are not suffering from specific recessive genetic diseases. A small gene pool is likley to result in inbreeding depression in a breed. A popular and numerous breed with a small gene pool has a low 'effective population size', regardless of the numerical size of the breed's population. A popular breed with a small effective population size can be compared to an overinflated balloon.

Inbreeding depression can compromise a cat's immune system and make it less able to resist disease. A group of genes called the Major Histocompatability Complex, or MHC plays an important role in the immune system. The way in which the genes in the MHC are inherited means that it is particularly vulnerable to inbreeding depression and a loss of genetic diversity in the MHC can impact on the health of the cat.

Inbreeding depression can manifest in different ways depending on the particular make-up of the gene pool in question. Few cases of inbreeding depression will manifest all of the signs. Although these are problems which can occur in any random-bred cat, a combination of some of these signs could well indicate a problem with inbreeding depression. A breeder who is worried about inbreeding levels in their lines should consider introducing cats from different lines or outcrossing to approved breeds.

Signs of inbreeding depression include slow growth rate, small adult body size, small litter size, reduced fertility, increased kitten mortality, increased prevalence of allergies, reduced ability to fight infections, physical asymmetries, especially facial, an increase in congenital abnormalities, increased prevalence of cancers, increased incidence of genetic disease, and reduced life expectancy.

Anomalies – the problem of the genetic anomaly is something of which all breeders should be aware – this is not to suggest that such anomalies are common but the cat must be expected to have its quota of defects just as are found in other animals.
The golden rule is that health is paramount and must be constantly and consistently monitored; any evidence of weakness or the emergence of lack of vigour must be dealt with immediately through modification of the breeding system.

No cat with any evidence of health problems or lack of vigour should be used for breeding.

No cats showing reproductive problems, or their offspring should be used for breeding for example:

- Queens which have repeatedly failed to conceive, re-absorbed, miscarried or had more than one caesarean,
- Queens which have rejected their kittens, failed to produce milk or produced fading, small, weak or abnormal kittens,
- Studs with low fertility, or siring abnormal kittens with several unrelated queens.

List of Genetic Anomalies known in Balinese or in the related breeds, Siamese & Oriental

Amyloidosis
Amyloid is a type of cellular protein, and amyloidosis describes the disease that occurs when this particular protein is deposited within the body organs, mainly the liver (hepatic) and kidney (renal). Some Siamese and Oriental cats are subject to hepatic amyloidosis, resulting in dysfunction of and haemorrhage from the liver. therefore lines for outcrossing must be carefully selected. Young cats (approx 8 months – 7 years) are most commonly affected. Affected cats are often related, but the mode of inheritance and contribution of environmental factors is unknown. *
At the moment Balinese seem to be free of amyloidosis which has been found in some Siamese and Oriental lines**.**

Bites
Incorrect bites are an issue in Balinese. Generally bites that are misaligned tend to be overshot, are occasionally undershot, and very occasionally slightly twisted. *

Cleft palate
Cleft palates may have an environmental cause, but some lines of Siamese appear to be over-represented. *

Feline Asthma
Feline Lower Airway disease is typified by wheezing and bouts of coughing. As asthma in humans has a hereditary component, it is speculated that there may be a hereditary component to the disease in cats, but any genetic predisposition has yet to be identified. Siamese and Balinese cats seem to be over-represented. *

Flat-chest syndrome
There is good evidence that this is caused by a simple recessive gene, but it may also have a more complex genetic cause; the disorder results in a kitten with a compressed flattened rib-cage that has difficulty in breathing, etc. It can be fatal in a number of cases, depending on degree of severity. No test is available. *

Heart defects
It is believed that the majority of cases have a genetic origin. However there may be several genetic mutations

Kink
Kinks typically result from deformities of bone and are listed as defects by the GCCF. They are usually only of aesthetic relevance as they cause no pain or discomfort to the cat. *

Mammary tumour
Balinese are at increased risk of developing mammary carcinomas and affected Balinese cats tend to be younger compared to other breeds. Male cats can occasionally be affected. Tumours occur with equal frequency in all glands in cats. Single or multiple nodules associated with the gland or nipple may develop; the masses may be ulcerated, inflamed swollen or associated with discharge from the nipple. *

Nystagmus
Nystagnus causes the eye's to jerk back and forth. It can be associated with squint and is believed to be a polygenic trait with a threshold character

Progressive retinal atrophy (PRA)
PRA describes an inherited ophthalmic condition leading ultimately to irreversible blindness.
The underlying pathology is of rod and cone photoreceptor dysplasia and/or degeneration. Usually the rod photoreceptors are affected first, leading to night blindness as an early sign. In time, the cone

* *information from the Feline Advisory Bureau*
* *information from the Feline Advisory Bureau*

photoreceptors also become involved, so that ultimately total blindness ensues. Two forms of PRA have been described in the Abyssinian breed: autosomal dominant retinal dystrophy (Rdy) and autosomal recessive rod-cone degeneration (rdAC):
DNA tests are available

Squint
Convergent squint is seen commonly in Balinese. It is believed to be a polygenic trait with threshold character. *

Thymic lymphoma
Siamese cats are over-represented amongst cases of thymic lymphoma. Affected cats are usually young (often less than 2 years old), FeLV negative, and they typically respond favourably to chemotherapy. These cats MUST NOT be used for breeding. Although the mode of inheritance has not been confirmed, it is suspected to be recessive in nature. *
At the moment Balinese seem to be free of Thymic Lymphoma.

Appendix 1. Normal + Mutant Genes

Gene	Symbol	Effect
Agouti	A	Yellow band to the hairs
Non-Agouti	a	Absence of band in the hairs
Black	B	Blackish Brown hair pigment granules
Brown	b	Brown hair pigment granules
Light Brown	b^l	Light brown pigment granules
Full Colour	C	Maximum production of pigment
Burmese	c^b	Reduction in production of pigment
Siamese	c^s	Greater reduction in production of pigment
Blue Eyed White (Recessive White)	c^a	No pigment develops in the coat, the eyes are pale blue
Dense	D	Normal packing of pigment molecules
Dilute	d	Dilution of pigment granules
Dilute Modifier	Dm	Lightens hair of dilute phenotypes
Normal	dm	Normal dilute phenotype
Inhibitor	I	Inhibits production of pigment granules
Normal	i	Normal production of pigment granules
Normal Hair Length	L	Short hair length
Long-hair	l	Increases hair length
Orange	O	Converts black/brown pigment granules to yellow
Normal	o	Normal black/brown pigment granules

Appendix 2. Glossary of Genetic Terms used in the text

Allele	One of two or more alternate forms of a gene at the same site or locus in each of a pair of chromosomes, which determines alternative characters in inheritance.
Chromosome	The carrier of the genes in the cell nucleus.
Dominance	When the effect of one allele of a heterozygous pair completely hides the effect of the other..
Dominant gene	The allele whose effect completely hides the effect of another at the same locus.
Expression	The manifestation of an heritable trait in an individual carrying the gene or genes which determine it.
Fixation	A result of selection or inbreeding causing the genes of a group of cats to become homozygous or fixed.
Gene	The ultimate determinant of heredity.
Gene Pool	The genetic make up of a group of individual cats
Genotype	Genetic Constitution of a cat.
Heterozygous	Where members of a gene pair are different, as in Aa.
Homozygous	Where members of a gene pair are identical as in AA or aa.
Inbreeding Depression	A decline in the vigour of a breeding line.
Incomplete Dominance	Where one allele for a specific trait is not completely dominant over the other allele resulting in a combined phenotype. For example the offspring of a Burmese x Siamese mating are Tonkinese
Mutant Gene	Mutant (altered) form of an original gene.
Normal Gene	Original gene present in the genotype of the cat.
Phenotype	The physical appearance of the cat or expression of a gene.
Polygenes	Minor genes each with a small, cumulative effect on the expression of a characteristic. These may explain, for example, the variation in type from the round, cobby British to the long, slender Siamese.
Recessive	Where the effect of one allele of a heterozygous pair is completely hidden by the expression of the other.
Recessive gene	The allele whose effect is hidden by another at the same locus. Where there are multiple alleles (in the colour restriction series for example), one allele can be dominant in some combinations and recessive in others. Recessive genes can be hidden for many generations
Threshold	Build up of polygenes with no discernable effect until a tipping point results in a sudden large effect

Appendix 3. Kittens to be expected from Balinese Matings

Shown below are details of the various matings possible in the Balinese breeding programme and the results which can be expected:

	Mating	Kittens to be expected
1	Balinese x Balinese	All Balinese
2	Balinese x Variant	Half litter Balinese Half litter variants
3	Balinese x Siamese	All variants
4	Variant x Variant	Quarter litter Balinese Half litter Variants Quarter litter shorthaired not carrying longhair gene, registerable only as Balinese Variants
5	Variant x Siamese	Half litter Variants Half litter shorthaired not carrying longhair gene, registerable only as Balinese Variants

Although in theory, the above results can be expected, in practice only matings 1 and 3 can be relied upon entirely. In other cases there is a great element of chance.

As far as Mating 2 is concerned, sometimes there are more, sometimes fewer, longhairs. However, all shorthairs will carry the longhair gene.

If mating 4 is used a longhair kitten may never appear, or alternatively two could appear in the same litter. However, this mating, if successful, should produce a fairly typy longhair kitten, drawing strong Siamese characteristics from both parents.

Longhaired carriers from Matings 4 & 5 can be identified by DNA test.

Appendix 4. GCCF Registers

FULL REGISTER (REG NO. BEGINS CS)
A cat/kitten resulting from an ideal mating to produce that breed; it can be shown, and can be used for breeding.
All Balinese, including those with Variant parents, are registered on the Full Register

SUPPLEMENTARY REGISTER (REG NO. BEGINS CSSR)
A cat/kitten resulting from a more mixed mating but nevertheless acceptable as an example of the breed; it can be shown, and can be used for breeding.

EXPERIMENTAL REGISTER (REG NO. BEGINS CSEXP)
A cat/kitten of a relatively new breed which had Preliminary Status when it was registered. It can be both shown and bred from. It may or may not be eligible for Championship status depending on how far the breed has progressed since the cat/kitten was originally registered (Original registration numbers are not altered even when a breed progresses).

REFERENCE REGISTER (REG NO. BEGINS CSREF)
Cats registered on the reference register may not be shown
1. A cat/ kitten from a mating regarded as an outcross for this breed; not intended for breeding except under very specifically controlled circumstances.
2. A cat/kitten from a mating recommended for a breed which lacks some of the defining characteristics of the breed (a variant); it can be used for breeding.

Independently of the register a cat is registered on, it may be registered either as active, in which case the cat may be used for breeding, or as inactive, in which case it may not.

References

Feline Advisory Bureau
"Robinson's Genetics for Cat Breeders & Veterinarians" Edited Valla, Shelton, McGonagle & Stanglien, published by Butterworth & Heinman Press.
GCCF Breeding Policy

DNA Tests are available from Langford, University of Bristol and UC Davis in California