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Report Prepared for: **Department Of Primary Industries & Fisheries**

Subject: **Report on the Validity and Usefulness of Early Age Desexing in Dogs and Cats**

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Signed for and on behalf of UniQuest Pty Limited

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1. EXECUTIVE SUMMARY

Mandatory desexing prior to sale or change of ownership has been advocated by some as an effective method of reducing the unwanted pet population. Because sale or change of ownership most often occurs in puppies and kittens from 6-12 weeks of age, introduction of mandatory desexing implies *de facto* mandatory early age desexing.

Traditionally, dogs and cats are desexed at 6 to 9 months of age. This convention is based on the age at which the most rapid phase of physical maturation is complete. Early age desexing (6 to 16 weeks of age) was developed in USA in the 1980's to address the pet overpopulation problem and is now practised by most large shelters in Australia.

In Queensland, only a very small minority of veterinarians' offer early age desexing for owned pets, although in principal, most support it for un-owned pets to prevent further unwanted litters. Reasons for not offering it to clients include being unfamiliar or uncomfortable with the technique, and concern about short and long-term safety of the procedure. A number of studies have been published in peer reviewed journals investigating early age desexing. These demonstrate that provided certain modifications are made to the preparation and recovery of the patient, and in the surgical method, the risk of short-term complications associated with the surgery from early age desexing is no different from traditional age desexing. Advantages of early aged desexing include shorter surgery and recovery times, and minimal blood loss. There are some contraindications to early age desexing where it should be delayed until later, and these include cryptorchism in males, body weight < 1kg and some congenital malformations.

Concerns are frequently expressed by veterinarians regarding the long-term implications of early age desexing. Because of the low frequency of complications and the long study time to document complications, there are few well conducted studies available. Cat and dog growth do not appear to be reduced by early age desexing, but rather enhanced because of delayed closure of growth plates.

In dogs there is evidence to suggest that the incidence of hip dysplasia is higher (6.7% versus 4.7%) in dogs desexed prior to 5.5 months of age. Similarly, there is evidence to suggest a higher incidence of urinary incontinence (12.9% versus 5%) and cystitis in female dogs desexed prior to 5.5 months of age. Urinary incontinence leads to dribbling urine usually when the dog is asleep, which is distressing and unpleasant for owners, and is only moderately well controlled with medication.

In cats, there do not appear to be any significant long-term health outcomes, and in fact there are a number of health benefits including a reduction in frequency of urinary tract disease (3% versus 17%). Early age desexing is associated with positive behavioural changes in both dogs and cats, including decreased aggression. This is important in reducing reasons for pet relinquishment.

Approximately 50% of cats entering shelters are kittens, whereas only 10% of dogs are puppies. Euthanasia rates in kittens are very high, exacerbated by the marked seasonal influx during spring and summer. Conversely, euthanasia rates in shelters for puppies are low and most are re-homed.

Most dogs entering shelters are aged from 6 months to 2 years of age, indicating that they initially have a home and that this is lost because they escape or are surrendered. Therefore "overpopulation" of dogs does not appear to be the primary reason for the unwanted dog population. In cats, there are insufficient homes available for the number of kittens born annually, leading to high euthanasia rates. The RSPCA shelters in Queensland receive 30% of the national RSPCA intake of cats and kittens. In Queensland, 60% of cats and kittens were euthanised in 2006-2007.

Given that overpopulation of puppies does not appear to be the major cause of unwanted pets, and that there are some long-term health concerns associated with early age desexing particularly in female dogs, it would indicate that unless there are compelling data to the contrary, all inclusive mandatory desexing implying *de facto* early age desexing is not warranted as a control strategy for unwanted dogs. It is unlikely to be effective and has significant adverse health outcomes especially in female dogs, which might potentially lead to more dogs being relinquished for health reasons. Further data is required to determine if selected targeted mandatory desexing may be beneficial. For example, all male dogs, male dogs of particular breeds not prone to hip dysplasia, or male dogs of breeds that are overrepresented at shelters and pounds.

In contrast in cats, approximately half the cats entering shelters are kittens, and there are no significant health concerns with early age desexing in kittens. Instead, there are significant health and behavioural benefits. Therefore, mandatory desexing of cats implying *de facto* early age desexing should be investigated further as a strategy for reducing unwanted cats.

Prior to introduction of mandatory desexing in cats, several things need to occur.

Firstly, there needs to be better understanding of where unwanted cats are coming from. Mandatory desexing prior to change of ownership will only affect the owned cat population, and not the un-owned population. Although most cats entering shelters appear to be socialized to humans, the majority are listed as un-owned. In Victoria, 21% of people admit to feeding a cat that they do not own. In Queensland, there are no scientifically collected data subjected to peer review to indicate the source of cats coming to shelters and pounds. This urgently needs to be collected and analysed, so that evidence-based strategies can be developed that have the greatest probability of being successful.

Secondly, the appropriate skills of veterinarians for early age desexing need to be developed and attitudes to early age desexing need to be changed. This requires research to determine current attitudes and beliefs, and to determine the most effective way to positively change those attitudes and beliefs. It will also require a greater emphasis on developing appropriate skills in the veterinary science programs at Queensland universities and for practicing veterinarians.

Thirdly, if data suggests that most kittens coming to shelters are from owned queens, than a pilot introduction of mandatory desexing in cats in a defined localised area would be indicted to assess the outcome. There are several hypotheses regarding the outcome of mandatory desexing ranging from the number of kittens entering shelters would be reduced, to a converse hypothesis that numbers would be increased because owners of queens having inadvertent pregnancies would not pay for the cost of desexing prior to finding homes for the kittens, and instead would abandon or surrender them to pounds or council.

Conclusion

In conclusion, based on the health benefits of early age desexing in cats, and evidence of overpopulation of kittens contributing to the unwanted pet problem, further research on the feasibility and likely effectiveness of mandatory desexing and hence *de facto* early age desexing in cats is warranted.

In contrast, because unwanted puppies do not comprise a substantial proportion of unwanted dogs, and because there are some long-term health risks associated with early age desexing, all inclusive mandatory desexing involving early age desexing in dogs is unlikely to be effective or well received by the public or veterinary community as a control

measure for unwanted dogs. However, targeted mandatory desexing may be a useful management strategy in dogs, and further research is required to investigate this.

Prior to introduction of mandatory desexing in cats, further data should be collected on the sources of cats entering Queensland shelters to determine if it is likely to be an effective control measure for unwanted cats. In addition, education of the public, pet shops owners, breeders and veterinarians to change attitudes about early age desexing would be required for successful implementation. Opportunities for upgrading of skills of veterinarians, and a greater emphasis on early age desexing in Queensland Bachelor of Veterinary Science (BVSc) programs would also be indicated.

2. INTRODUCTION

The problem of unwanted of stay dogs and cats is of great concern to animal control agencies, public health officials, veterinarians and the community in general (Salmeri *et al* 1991; Crenshaw & Carter 1995). Euthanasia of unwanted dogs and cats is the leading cause of death for companion animals in Australia. More cats and dogs die each year because they are unwanted than those that die as a result of accidents, disease and old age (Olsen *et al* 1991). Due to a paucity of reliable data, the exact number of cats and dogs euthanised in shelters and pounds in Australia each year is not known. However, when estimates of all shelters and pounds in Australia are taken into account, it is believed that the annual euthanasia figure is in excess of 200,000 dogs and cats (J.Verrinder, pers comm.)

According to the most recent RSPCA statistics, Queensland has the highest intake of unwanted cats nationally and the second highest intake of dogs, with approximately 30% of national cat intakes and 26% of national dog intakes respectively (RSPCA 2007). However, lack of fundamental statistical information on the number and nature of animals entering and exiting shelters and pounds creates difficulty in understanding the extent of the problem in Australia. This in turn affects the ability to implement effective strategies, and to evaluate their effectiveness. Regardless, the high euthanasia levels of unwanted dogs and cats is a serious issue nationally, particularly in Queensland. Based on National RSPCA data released in 2007, despite improvements in the percentage of cats and dogs being re-homed, the total number of dogs being euthanised has increased from 2005 - 2006 and the number of cats euthanised has not decreased over the last 7 years, because of increasing numbers of unwanted dogs and cats entering shelters. The characteristics of unwanted pets appears to be different between dogs and cats (RSPCA 2007; Patronek *et al* 1996)

While it is known that cats enter shelters predominantly either as strays or relinquished by their owners, there is very little else known about the background of cats that are euthanised in shelters, particularly in Queensland. Complicating this situation is the fact that the types of admissions to shelters varies from state to state – in Queensland approximately 50% of the cats entering shelters are classified as stray cats, whereas in Victoria, this is 79% (Marston 2006; Verrinder 2007). There is no information available to determine the reasons for this difference in admission patterns.

Approximately 50% of the cats entering RSPCA shelters are kittens (although this figure varies from state to state). This indicates that indiscriminate breeding is an issue that needs to be

addressed to control the population entering shelters. Female cats begin to cycle at 4 months of age and can have their first litter by six months of age (Webb 2004). Ovulation is triggered by mating so pregnancy rates are very high. One female cat can produce 41 offspring in 12 months.

Early age desexing began in the early 1980's in the USA, to address the pet overpopulation problem (Webb 2004). Following similar concerns about pet overpopulation, especially of cats, Australia followed the USA in the early 1990's. Currently, thousands of early age neuterings have been performed in shelters and private veterinary practices in Australia (Webb 2004). One of the primary reasons for promoting early age desexing is to reduce the large number of animals being euthanised in shelters annually (Webb 2004).

Early age neutering, also known as prepubertal gonadectomy, paediatric or juvenile desexing, is the surgical sterilisation of sexually immature dogs and cats performed between the ages of six to sixteen weeks (Root Kustritz 1999, Webb 2004). The normal neutering age is considered to be six months or older, when it is believed that physical maturity has been achieved (Lieberman 1987, Webb 2004). Most veterinary practices and shelters performing early age desexing in Australia require kittens to reach a minimum body weight of 1kg and puppies 2 kg in weight prior to performing desexing. This weight is generally reached by 8 weeks but may be later.

The aim of this report is to advise the Minister for Main Roads and Local Government and the Minister for Primary Industries and Fisheries and the independent expert on the validity and usefulness of widespread early age desexing to underpin mandatory desexing as a proposed primary solution to the problem of euthanasia rates of unwanted cats and dogs, in the Queensland context. The independent expert is to report on the need for and effectiveness of education, registration, identification and desexing as solutions to the problem of euthanasia rates of unwanted cats and dogs, in the Queensland context. The aim of our report is to provide expert veterinary advice on the science and practicality of early age desexing and mandatory early age desexing.

Specifically the report was required to analyse and evaluate:

1. Evidence of the medical, anaesthetic and surgical risks, safety and outcomes of the procedure of early age desexing of puppies and kittens;

2. Evidence of the contra-indications and positive and negative medical outcomes of early age desexing of puppies and kittens;

3. The costs and practicality of early age desexing at pounds and shelters;

4. The costs and practicality for owners of cats and dogs and for dog and cat retailers of *de facto* mandatory early age desexing; and

5. Current and predicted availability in Queensland of veterinary practices which provide early age desexing services.

To achieve this, the methods to be employed were:

To conduct a review of relevant scientific and anecdotal literature; and
To consult key Queensland and national stakeholders and experts.

The report was required to be tabled in 10 working days.

3. ACKNOWLEDGEMENTS

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4. EVIDENCE OF THE MEDICAL, ANAESTHETIC AND SURGICAL RISKS, SAFETY AND OUTCOMES OF THE PROCEDURE OF EARLY AGE DESEXING OF PUPPIES AND KITTENS

Overview

- Safe surgical and anaesthetic protocols are established for performing early aged desexing in cats and dogs
- When using specialised protocols, the risk of complications during and in the first week after surgery is no different from traditional age desexing
- Some modification of surgical methods are required, including avoiding use of spay hooks, use of modified clamps and gentler handling of tissues
- Special considerations for early age desexing include monitoring heat loss and blood glucose concentrations, and using a minimum withholding period for food
- Advantages of early aged desexing include shorter surgery and recovery times, and minimal blood loss
- Contraindications include cryptorchism in males, body weight < 1kg and congenital anomalies such as cardiac malformation

Early age desexing also known as prepubertal gonadectomy, paediatric or juvenile desexing, is the surgical sterilisation of sexually immature dogs and cats performed between the ages of six to sixteen weeks (Stubbs *et al* 1995, Root Kustritz 1999, Webb 2004). The current surgical techniques available are ovariohysterectomy or ovariectomy in female puppies and kittens, and castration in males (Root Kustritz 1999). The traditional or conventional age for desexing of cats and dogs is considered to be six to nine months, when it is thought physical maturity has been reached (Lieberman 1987, Webb 2004).

There are several techniques utilised to perform ovariohysterectomy and castration including traditional midline ovariohysterectomy, lateral flank ovariohysterectomy, castration, ovariectomy and vasectomy. However, the end result of removing the ovaries, usually in addition to the uterine horns and body, or testes is to render the animal reproductively sterile (Howe 2006, Hedlund 2007).

As with all surgical procedures, early age desexing does have associated risks. Since the late 1980's a number of studies have been conducted to evaluate the benefits and risks associated with the procedure in male and female, juvenile dogs and cats (Salmeri *et al* 1991, Stubbs *et al*

1995, Stubbs 1996, Howe 1997, Root Kurstritz 1999, Howe 1999a, Howe 1999b, Howe *et al* 2000, Howe *et al* 2001, Root Kurstritz 2002, Spain 2004a, Spain 2004b).

Performing early age desexing in both prepubertal cats and dogs is very similar to the adult procedures in surgical technique; however there are some considerations and modifications required (Stubbs & Bloomberg 1995; Howe 2006; Root Kustritz 2002; Hedlund 2007). When desexing young animals it is essential that the potential for hypothermia, hypoglycaemia, a small blood volume and delicate tissues be taken into consideration (Stubbs & Bloomberg, 1995).

All animals including pediatric animals should be examined thoroughly prior to any surgery to ensure they are in good health (Root Krustritz 2002). Animals with congenital defects such as cardiac malformations may require desexing to be postponed until a later age.

For pediatric animals, the surgical preparation needs to be modified by reducing the area clipped and the volume of fluids used to clean the skin minimized, to keep the patient as dry and warm as possible throughout the procedure and during recovery (Stubbs & Bloomberg 1995; Root Kustritz 2002). Particular care should be taken when preparing male pups, as the canine scrotal skin is sensitive and swells with minimal trauma or irritation (Hedlund 2007).

Early age desexing – Female

Instruments utilised for 'traditional' female desexing have been reported to be adequate for use in juvenile procedures (Stubbs & Bloomberg 1995), however the use of a spay hook is not recommended as pediatric tissues require careful handling to avoid excess traction and tearing (Hedlund 2007, Howe 2006). It can also prove difficult to place clamps appropriately without tearing tissues, and positioning may be awkward, therefore clamp size may need to be modified as well (Stubbs & Bloomberg 1995; Howe 2006).

Early age desexing - Male

It is critical that male puppies and kittens are examined closely prior to the procedure to determine that both testicles are descended (Bloomberg 1996; Howe 2006). If. one or both testes have not descended (cryptorchid), surgery should be postponed until the testes are given an opportunity to descend into the scrotum (Root Kustritz 2002).

Anesthetic Protocol

The traditional practice of performing surgical sterilisation of dogs and cats at six months of age or older is not based on objective scientific data (Stubbs & Bloomberg 1995) but primarily on available anaesthesia protocol (i.e. pentobarbital anaesthesia) and the belief that at physical maturity, animals are less prone to the possible adverse effects of the surgical procedure (Lieberman 1987; Romatowski 1993). Anesthesia methods have advanced enormously such that it is now practical and safe to anesthetize pups and kittens as young as six weeks old (Kustritz 1999, Romatowski 1993, Root Kustritz 2002; Webb 2004). Several studies have established safe surgical and anaesthetic protocols for performing early aged desexing in cats and dogs (Aronsohn & Faggella 1993; Faggella & Aronsohn 1993)

Puppies and kittens are not miniatures of adult animals but are physiologically different, and therefore their response to anesthesia varies from adults. Puppies and kittens may be safely and effectively anesthetised if appropriate considerations and modification to protocols and equipment are observed (Faggella & Aronsohn 1994). Several studies by Howe (1997, 1999), Root Kustritz (2002) and Meyer (2007) found that when specialised protocols are utilised, the risk of anesthesia to pediatric patients during early age desexing is no different from the anesthetic risks associated with traditional age desexing. In fact, early age desexing has a positive association with rapid anaesthetic recovery and fewer perioperative complications than desexing procedures performed on older animals (Howe 1997). Importantly, in a well controlled prospective study, it was shown that even when fourth year veterinary students performed early age desexing as part of their surgical teaching program, desexing prior to 12 weeks of age did not increase morbidity or mortality on a short-term basis, compared to desexing at the traditional age (Howe 1997).

Specific anesthetic concerns unique to pediatric puppies and kittens include:

(1) altered metabolism and excretion of drugs due to immature hepatic enzyme systems, decreased protein binding of drugs, and decreased glomerular filtration rate;
(2) the risk of airway obstruction due to the airway cartilage being less rigid; the alveoli being smaller; and the oxygen requirement per kg of body weight is 2 -3 times greater than adults.
(3) the cardiovascular system has lower ventricular compliance, less cardiac muscle; baroreceptor responses are poor with reduced ability to vasoconstrict
(4) predisposition to hypoglycaemia with fasting prior to and directly after surgery due to decreased glycogen stores secondary to smaller liver size and skeletal muscle mass; and

(5) predisposition to hyperthermia due to decreased ability to maintain body temperature due to a greater surface area-to-volume ratio, less subcutaneous fat, the depressant effects of anesthetics on thermoregulation and reduced shivering muscular activity (Root Kustritz 1999; Root Kustritz 2002; Meyer 2007).

To alleviate these issues Goerke (2004) suggested as a minimum, the provision of the following:

- titration and reduced drug dosage should be considered
- maintenance of high heart rates and high respiratory rates which can be monitored with the aid of monitoring devices
- endotracheal intubations
- oxygen supplementation
- a withholding time of food no more than two hours pre-operatively and feeding within two hours of surgery to prevent hypoglycaemia
- peri-operative heating, and glucose and fluid therapy

Risk of infectious disease

There has been some concern that the early age desexing procedure can be associated with an increased incidence of infectious disease (Howe 1997). It has been hypothesised that when a paediatric patient is placed under additional stress, and if desexing occurs prior to the end of vaccination period, young puppies and kittens will succumb to an infectious disease (Howe 1997; Howe *et al* 2001).

Several studies (Howe 1997; Howe *et al* 2001) have examined this issue and one study found that incidence of infectious disease, in particular parvovirus in puppies, was increased in animals that had been desexed at an early age. However this increase in incidence was determined to have been influenced by holding times of shelters and increased exposure to other animals (Howe 1997; Howe *et al* 2001). Another study however, conducted under more controlled conditions, revealed no association with an increase in the incidence of infectious disease and early age desexing (Howe 2001). Additionally, like anaesthetics and surgical procedures, control of infectious diseases has improved in recent years (Studdert 2004). The prevalence of infectious disease as a complication of early age desexing can also be reduced by ensuring animals are in the best physical condition possible, and stress is minimised prior to and after surgery (Howe 1997).

Conclusion

Overall, early age desexing is associated with rapid anaesthetic recovery as puppies and kittens recover much quicker than adults from anaesthesia, and have similar or less post-operative complications compared to traditional-aged desexing provided modified preoperative, operative and postoperative protocols are used (Howe 1997, Howe *et al* 2001, Kustritz 2002, Spain *et al* 2004, *Stubbs et al* 1996, Studdert 2004).

Advantages of early aged desexing in terms of medical, anaesthetic and surgical risks also include enhanced response to relatively low doses of anaesthetic agents which can equate to lower cost, shorter surgery time with minimal bleeding, and rapid recovery from anaesthesia (Root Kustritz 2002).

5. EVIDENCE OF THE CONTRA-INDICATIONS AND POSITIVE AND NEGATIVE MEDICAL OUTCOMES OF EARLY AGE DESEXING OF PUPPIES AND KITTENS

Overview

- Concerns are frequently expressed by veterinarians regarding the long term implications of early age desexing.
- Because of the low frequency of complications and the long study time to document complications, there are few well conducted studies available.
- Cat and dog growth does not appear to be reduced by early age desexing
- There is evidence to suggest that the incidence of hip dysplasia in dogs is higher (6.7% versus 4.7%) in dogs desexed prior to 5.5 months of age
- Similarly, there is evidence to suggest a higher incidence of urinary incontinence (12.9% versus 5%) and cystitis in female dogs desexed prior to 5.5 months of age
- In cats, urinary tract disease is reduced by early age desexing (3% versus 17%)
- Early age desexing is associated with positive behavioural changes in both dogs and cats. This is important in reducing reasons for pet relinquishment

Many veterinarians have continued to express concern regarding early aged desexing (Johnson 1993; Dowling 1997; Spain, 2002) because gonadal hormones influence reproductive, skeletal, physical and behavioural development in young animals (Salmeri *et al* 1991). Questions have been raised regarding the safety of early aged desexing in regards to the long term effects on dogs and cats (Salmeri *et al* 1991).

Although limited research has been completed in addressing these concerns, what studies are available have relatively similar designs and are therefore easily comparable (Studdert 2004). Concerns related to risks of desexing at any age are thought to include musculoskeletal disorders (including hip dysplasia, stunted growth, long bone fractures), urinary incontinence in female dogs, urethral obstruction, feline urologic syndrome, infantile genitalia, immune suppression, obesity and behavioural changes (Howe *et al* 2001, Studdert 2004). There is some concern that these conditions may increase in severity and frequency if desexing is performed in younger animals (Howe *et al* 2001, Studdert 2004). Only some of those concerns have been shown to be valid. Because of the low frequency of complications and the long study time to document complications, there are few well conducted studies published involving adequate numbers of animals followed for sufficient time. However, two well conducted, retrospective cohort studies of 1842 dogs and 1660 cats followed for up to 11 years after desexing have been reported (Spain 2004a, Spain 2004b).

Musculoskeletal disorders

Several studies have been undertaken to assess the effects of early age desexing on skeletal growth and dogs (Salmeri *et al* 1991; Howe *et al* 2000; Spain 2004a; Howe 2006) and cats (Stubbs *et al* 1996; Howe *et al* 2001; Spain 2004b; Howe, 2006;) in response to the theory that early aged sexing is linked to stunted growth and increased occurrence of long bone fractures.

For dogs, each of these studies demonstrated that although growth rates in dogs were unaffected by early aged desexing, the growth period and final radial / ulnar length was extended. Therefore rather than being 'stunted', they were actually determined as taller (Salmeri *et al* 1991; Howe *et al* 2000; Spain 2004a; Howe 2006).

Similar studies focusing on cats found that although physeal closure was delayed in desexed cats in comparison to those sexually intact, no differences were detected between cats desexed at 7 weeks or 7 months (Stubbs *et al* 1996; Howe *et al* 2001; Spain 2004b; Howe, 2006;).

Early age desexing was not found to influence frequency or occurrence of long bone fractures in both dogs and cats. In fact, long bone fractures were found to be rare overall, indicating that these are not common problems in desexed dogs in general (Spain 2004a; Spain 2004b; Howe 2006).

Several long term studies have examined the incidence of hip dysplasia in dogs and the association with age at desexing, with some mixed results (Howe 2006). It has been suggested that the increased length of time that the growth plates remain open and the subsequent increased long bone growth seen in dogs neutered at an early age might predispose these dogs to hip dysplasia or angular limb deformities (Spain 2004b; Howe *et al* 2001; Howe 2006). Although an early study of 269 dogs reported no association between age of desexing and hip dysplasia (Howe *et al* 2001), a more recent study by Spain *et al* (2004b) of 1842 dogs over a number of years found that early aged desexing was associated with a significant increase in the occurrence of hip dysplasia. Dogs that were desexed before 5.5 months of age had a 6.7% incidence of hip dysplasia, whereas dogs desexed at the traditional age of 6 months or older only had an incidence of 4.7%.

Canine Urinary incontinence

Desexing as a factor in the development of urinary incontinence in female dogs is a widely held view that has been investigated in several long and short term studies (Root Kustritz 1999; Howe *et al* 2001; Root Kustritz 2002; Spain *et al* 2004b).

Spain *et al* (2004) found that in female dogs, decreasing age at desexing, on a continuous scale, was associated with increasing incidence of urinary incontinence that required medical treatment (Spain 2004b). Female dogs desexed before 3 months of age had a 12.9% incidence of urinary incontinence during the first six years of life. Female dogs desexed at 3 months or older only had a 5% incidence (Spain 2004b).

Additionally, Spain *et al* (2004b) also found a significant relationship with age at desexing and cystitis. Incidence of cystitis was significantly higher for female dogs desexed before 5.5 months of age.

Acquired urinary incontinence and recurrent cystitis can be life long conditions that require daily medication (Arnold 1992), and problems with urination inside the house are common reasons for the relinquishment of dogs to shelters (Spain *et al* 2004b).

Urethral development in Cats

Many veterinarians have expressed concern that increased incidence of Feline Lower Urinary Tract Disease (FLUTD) and urethral obstruction in male cats may be associated with early aged desexing (Howe 2006). Experimental studies examining differences between male cats castrated at 7 weeks, 7 months and left intact have addressed urethral development, all finding that there was no difference in urethral diameter in male cats desexed at 7 weeks or 7 months in comparison to intact cats (Stubbs *et al* 1993; Root *et al* 1996).

The incidence of urinary tract disease in cats desexed at an early age was examined in a long term study looking at 263 cats over a mean follow up period of 37 months (Howe *et al* 2000). This study found that cats desexed after 5.5 months had significantly more urinary tract problems (17%) in comparison to cats desexed at an early age (3%). Cystitis was the most common problem seen, with a greater incidence occurring in cats desexed at a ‘traditional’ age. However, a more recent long term study that utilised 1660 cats over a mean follow up period of 47 months concluded there was no association between the incidence of FLUTD or urethral obstruction and age at desexing (Spain *et al* 2004a).

Neoplasia and tumours

The reduced risk of neoplasia, particularly testicular and ovarian, is one of the benefits of desexing regardless of whether the procedure occurs prepubertally or at an older age (Sorenmo 2000). Additionally, there is a decreased risk for female dogs desexed at an early age to develop mammary tumours. Desexing before puberty dramatically reduces the risk of dogs developing mammary neoplasia (Sorenmo 2000). If desexed before their first heat, the risk of mammary neoplasia is as low as 0.5%, compared with a risk of 8% if they are spayed after their first heat but before their second (Sorenmo 2000).

There is some evidence that early age desexing impacts differently in different dog breeds. In a study by Cooley *et al* (2002), the incidence of osteosarcoma (bone cancer) was found to be higher in desexed female Rottweilers, particularly if they had been desexed prior to 5.5 months of age. However, the overall risk of death was lower than Rottweilers desexed after 5.5 months of age.

Obesity

Obesity is considered to be the most common nutritional disorder in companion animals and has serious health implications associated with heart disease, diabetes and other serious diseases (Root Kustritz 2002). Regardless of age at time of procedure, desexed cats and dogs are more likely to have a higher body weight, body condition score, and body mass index than their sexually intact counterparts, and therefore obesity has previously been used as an argument against desexing cats and dogs in general (Root Kustritz 2002; Studdert 2003; German 2006). Metabolic rate has been shown to be decreased in desexed dogs and particularly in cats. However age at time of desexing has been shown to have no effect (Salmeri *et al* 1991; Crenshaw and Carter 1993; Root *et al* 1996; Howe *et al* 2000; Howe *et al* 2001; Root Kustritz 2002; German 2006).

Therefore, although obesity may be associated with desexing of cats and dogs, the risk has no association with age at desexing. The problem is related to the lifestyle of the pet and may be managed by the diet and increasing physical activity (Studdert 2004).

Behaviour

The effects of early aged desexing on behavior are extremely important to consider as it is often identified as a significant reason for the relinquishment of companion animals (Miller 1996; Salman 2000). Many studies looking at the long-term effects of early age desexing have

recognized this and included behavioral outcomes in their studies (Salmeri 1991, Stubbs 1996, Howe *et al* 2001, Spain 2004a, Spain 2004b).

Differences in long-term outcomes between dogs desexed at the traditional age and those at an early age found that the most common problems reported in dogs of both groups were behavioral in nature. However a difference between age groups was not detected in incidence of overall or specific behavioral problems (Howe et al 2001).

Spain *et al* (2004b) found seven behavioral outcomes significantly associated with the age of dogs at the time of desexing. Among both male and female dogs it was demonstrated that early age desexing was associated with increased rates of noise phobias and sexual behaviours. However, escaping behaviour, separation anxiety and urination in the house when frightened were significantly less frequent in dogs desexed before 5.5 months of age. For aggression towards family members, barking or growling at visitors, and excessive barking that bothered a household member, an association was detected between male dogs and early age desexing. However, when analysis was restricted to only dogs displaying these behaviours to the extent of a serious problem, the correlation with age at desexing was lost. It is possible the apparent increase in aggressive behaviour was a spurious association with early age desexing. The study followed dogs adopted from a shelter. It is more difficult to select with confidence puppies with behaviours suitable for rehoming when they are very young, because aggressive behaviours are less likely to be evident in young puppies. Therefore, selection against aggressive behaviour would occur more often in dogs desexed over 5.5 months of age, and aggressive dogs would not be made available for adoption.

Other studies have also reported desexing of dogs in general reduced the incidence of roaming, urine marking, and aggression towards other dogs (Neilson *et al* 1997).

When considering cats, early age desexing was associated with a decreased occurrence of hyperactivity and increased occurrence of shyness around strangers (Spain *et al* 2004a). Male cats desexed prior to 5.5 months of age also demonstrated a reduced occurrence of aggression towards veterinarians, sexual behaviours and urine spraying but an increased risk of hiding frequently (Spain *et al* 2004a).

Stubbs (1996) compared the behavioral outcomes of kittens desexed at 7 weeks, 7months and left intact, and found no statistical difference between each group in activity levels, playfulness, excitement, or frequency of vocalization. The intact group however, did display significantly

greater interspecies aggression than the desexed groups (irrespective of age at desexing) and were significantly less affectionate to people than the desexed groups.

Conclusion

Although early age desexing appears to offer more benefits than risks for male dogs, available literature indicates that the long term implications of this procedure on female dogs need further consideration. Increased incidence of urinary incontinence and cystitis are negative medical impacts associated with early age desexing in female dogs, and they can affect both the quality and length of life (Spain *et al* 2004b). Some studies recommend that female dogs not be desexed until 3 months of age (Spain *et al* 2004b). The frequency of hip dysplasia might be increased in male and female dogs.

For both male and female cats, early aged desexing does not appear to be associated with increased occurrence of any serious medical or behavioral conditions. Importantly, urinary tract disease appears to be reduced in frequency by early age desexing in kittens (Spain *et al* 2004a). Other long term benefits, particularly for male cats have been also been reported including decreased aggression and urine spraying (Spain *et al* 2004a).

6. THE COSTS AND PRACTICALITY OF EARLY AGE DESEXING AT POUNDS AND SHELTERS

Overview

- Early age desexing in pounds and shelters would ensure animals leaving will not contribute further to the pet overpopulation crisis
- Evidence suggests 7.6% owner relinquished cats and but 1.5% of strays are desexed
- Owner compliance with 'return to desex' programs is less than 60%
- No comprehensive data is available for Queensland regarding shelters and pounds that perform early age desexing; however, large shelters (RSPCA and AWL) do perform early age desexing. Council pounds do not routinely desex animals prior to rehoming.
- It is presumed that shelters that do not desex prior to adoption of animals do not have adequate facilities
- Surgical facilities onsite are important do to avoid the additional stress and possible negative health consequences associated with moving young animals to off-site surgical facilities
- To set up adequate surgical facilities in an available room is estimated to cost approximately $50,000, without the inclusion of ongoing costs
- 'Traditional' age desexing procedures are estimated to be approximately 25 – 50% more costly for labour and materials compared with early age desexing.

Unwanted dogs and cats are a problem to society in general, particularly to veterinarians, shelter staff, pound staff and government agencies dealing with public health and animal control (Crenshaw and Carter 1995). Early age desexing allows for animals entering shelters and pounds to be adopted as pets ensuring that these animals will not reproduce and perpetuate the pet overpopulation crisis in Australia (Crenshaw and Carter 1995; Webb 2004).

Although it has been reported that 90% of cats registered in Victoria are desexed Marston *et al* (2006) have reported only 2.81% of all the cats admitted to Melbourne animal shelters were obviously desexed. Few (7.6%) of owner relinquished cats were desexed, and only 1.5% of strays. This indicates a strong requirement for pounds and shelters to ensure any animals adopted are desexed to avoid exacerbating the pet overpopulation issues currently faced in Australia.

Alternative programs such as issuing desexing vouchers for discounted procedures with all puppy and kitten adoptions have been utilised with limited success (Stubbs & Bloomberg 1995; Webb 2004). Numerous kittens and pups adopted from shelters with desexing vouchers never returned for desexing (Webb 2004). Additionally, Stubbs & Bloomberg (1995) found that owner compliance with the mandatory desexing of all companion animals after adoption implemented by many humane organisations in the USA was estimated to be less than 60%, with many of these animals producing one litter prior to desexing (Crenshaw and Carter 1995; Stubbs & Bloomberg 1995).

Currently in Queensland, it is believed that the majority of large shelters currently employ mandatory 'desexing prior to sale' policies in an attempt to ensure they are not exacerbating the pet overpopulation problem by releasing animals back into the population with the ability to reproduce (J.Verrinder pers comm.). Shelters that do not possess adequate facilities or resources to desex animals may have affiliations with local veterinarians, neighbouring large shelters, or issue desexing vouchers. However, without conducting a comprehensive survey of all shelters in Queensland, it is not possible to determine with confidence the number of shelters which already practice desexing prior to sale, early age or not.

Similarly, there is no published data indicating desexing policies and programs utilised by Queensland council pounds. Further comprehensive investigation is required to obtain reliable information.

Presumably, shelters and pounds that do not currently operate early age and/ or prior to sale desexing, do not possess adequate resources or facilities to undertake these procedures. Potential difficulties for shelters and pounds to set up an operational surgery include scheduling time for surgeries, availability of a registered and suitably trained veterinarian, purchasing equipment, drugs and supplies, and having suitable space for surgery and recovery (Stern 1996). It should also be noted that it is unknown if there are other reasons that shelters and pounds do not desex all animals pre-adoption, for example attitudes and beliefs against early age desexing.

In terms of welfare, it is best for pounds and shelters to have both a veterinarian and appropriate surgical facilities available onsite to perform early age desexing. Moving young puppies and kittens to a private veterinary practice from a shelter or pound is not desirable because of increasing risk of death from hypoglycaemia and rapid heat loss (Goerke 2004; Root Krustritz 2002). Travel prior to and after surgery will increase stress, possibly resulting in less successful recoveries and a higher incidence of infectious and metabolic disease.

Facilities required to perform sterile surgery, to hold animals directly before and after surgery, and for animals during recovery are estimated to cost approximately $50 000. This cost is estimated to cover refurbishing a room including equipment, instruments, plumbing and electricity (T.Thelander pers comm.). In addition, services of appropriate staff (veterinary and nursing), and ongoing maintenance costs would need to be considered, and will vary between facilities because of differences in animal load and shelter size.

The costs of early age desexing in shelters and pounds for labour and materials (this excludes fixed costs) are reported to be approximately 25 – 50% less than for 'traditional' age and adult desexing procedures (Joy Verrinder, Animal Welfare League, pers comm.). For example, desexing of both male and female dogs at 10kg – 19kg is 25% more costly in materials and labour then if desexing took place at 2kg. Desexing a dog (male or female) at 40kg or greater is approximately 50% more costly in materials and labour than for a 2 kg puppy. For cats, it is estimated that labour and material costs are 40% less for a 1kg female kitten, and 45% less for a 1kg male kitten then desexing a 6kg cat (Joy Verrinder, Animal Welfare League, pers comm.).

Another consideration for shelters and pounds not already undertaking desexing of all cats and dogs prior to sale or adoption is impact on the psychological well-being of shelter and pound staff (Theran 1993). The adverse psychological impact of high euthanasia rates of healthy unwanted companion animals on shelter staff is a serious issue. The implementation of an early age desexing program assures the shelter staff that none of the animals they place in new homes will ever produce an unwanted litter (Theran 1993).

Conclusion

Pre-adoption desexing of puppies and kittens in shelters and pounds would ensure that pets released from these organisations will not reproduce, which is hypothesised to help reduce pet overpopulation and have a positive psychological impact on shelter and pound staff (Theran 1993; Crenshaw and Carter 1995). Currently, the majority of large shelters undertake early age desexing of both puppies and kittens prior to adoption, however, the practices of many smaller shelters and most council pounds are not known (JoyVerrinder, Animal Welfare League, pers comm.). A prospective study is required to accurately determine the frequency of early age desexing in smaller shelters and all council pounds.

Desexing vouchers are issued by some pounds in Queensland, however evidence suggests that compliance with an alternative program such as this has a limited success rate (Stubbs & Bloomberg 1995; Webb 2004).

In general, early age desexing is best performed at suitable premises on-site, and transport to an alternative location would likely increase the risk associated with the procedure. The added stress of transport on puppies and kittens would be anticipated to increase the risk of infectious disease, hypoglycaemia and hypothermia.

The cost and practicality of setting up appropriate facilities in existing shelters and pounds that currently do not employ desexing techniques may prove too high both financially and in human resources. In addition, space may not be available for creating these facilities regardless of available funding. Excluding fixed costs, the materials and labour costs associated with early age desexing in a shelter are 25-50% less than for traditional age and adult desexing.

7. THE COSTS AND PRACTICALITY FOR OWNERS OF CATS AND DOGS AND FOR DOG AND CAT RETAILERS OF DE FACTO MANDATORY EARLY AGE DESEXING

Overview

- Most shelters in Australia wait until puppies and kittens are a minimum of 1kg before desexing which usually occurs at approximately 8-10 weeks
- Retailers (and shelters and pounds) may need to delay releasing puppies and kittens to homes in order to ensure they reach minimal weight and are desexed
- Associated costs and current owner beliefs may be deterrent to participation in mandatory desexing programs

One of the benefits of early aged desexing in terms of pet overpopulation is that animals are able to be desexed prior to owner acquisition. This eliminates the chance that new pet owners will not desex their new pets. In a survey of attitudes to desexing dogs, it was discovered that 61% of male dog owners and 47% of female dog owners in the Brisbane area would not have their dog desexed if it had not already been done at time of acquisition (Blackshaw & Day 1994). Further to this, no less than six different reasons were reported as the most common for owners not desexing their cats and dogs. These included it was unnecessary, owner was planning to breed from the animal, the procedure was too expensive, the dog was too old, and that the dog may get fat (Blackshaw & Day 1994). Although more research is clearly required, these findings indicate that a solution to this issue needs to be broad enough to cover the varied reasons for not desexing.

The four major acquisition sources for dogs as identified in the Victorian Pet Acquisition Survey (Pawsey 2005) are 30% from breeders, 14 % from newspapers, 14% from pet shops and 13% from friends. For cats, however, it was identified that 22% are acquired from animal shelters, 22% are adopted as a stray and 19% from friends. It was further identified that for both cats and dogs, most pets are acquired at less than 6 months of age (Pawsey 2005). The majority of owners appear to prefer to acquire puppies and kittens when they are young, between 8 – 12 weeks, this is when puppies and kittens are able to be weaned, and it seems that the consumer is more willing to pay more for an animal at this stage of development (Webb 2004; Anon. 2007).

Early age desexing is therefore a practical tool that can be utilised to ensure cats and dogs are desexed prior to acquisition and do not produce unwanted litters (Webb 2004). Other practical benefits for breeders and retailers participating in early age desexing prior to sale include protection of purebred lines from cross bred litters and 'backyard' trades (Cloud 1993; Webb 2004).

Desexing is considered a 'loss-leader' in veterinary practices, and is viewed as an important step in building a lasting relationship with the pet owner. Therefore costs charged are reported to be below cost price, and are approximately 1/3 of the price that would be charged for this type of surgery were it not desexing.

Financially, early age desexing has been suggested to be extremely cost effective in comparison with 'traditional' age desexing as the procedure is faster, requires fewer materials and requires less time of veterinary and nursing staff (Webb 2004).

Early age desexing can differ significantly between practices in Queensland in regards to what ages the procedure is offered, if it is even offered at all, and the cost of the procedure. Some clinics offer early age desexing at substantially lower rates making this an attractive option to new clients, responsible breeders and pet retailers (Webb 2004). Other clinics charge almost the same as adult prices, or give only a 10% reduction (per comm. with a range of veterinary practices in Queensland). Currently many breeders utilising early age desexing are able to command high prices for the puppies (eg. $1500 - $2000 for a "designer breed" puppy) because of the restricted availability of puppies. The price of desexing is generally not a significant issue in the purchase price of these animals.

Where early age desexing is practiced, some provisions must be made. In general it is recommended that puppies be a minimum of 1 – 2 kgs (depending on breed) and kittens a minimum of 1kg (Joy Verrinder, Animal Welfare League, pers comm.). Although minimum weights are commonly reached at approximately 8 weeks of age in both puppies and kittens, in some instances surgery may need to be delayed until body weight reaches the acceptable minimum. In terms of practicality, it may mean that the sale or transfer of ownership will not be able to occur at 8 weeks, but is delayed until 10 or more weeks.

Conclusion

Overall, the costs and practicality of pet owners and retailers ensuring cats and dogs were desexed prior to transfer of ownership are manageable, however the price of desexing procedures, finding a veterinary practice that will perform the surgery and waiting extra time until the puppy or kitten has reached minimum weight may prove a hurdle or deterrent to some potential owners.

8. CURRENT AND PREDICTED AVAILABILITY IN QUEENSLAND OF VETERINARY PRACTICES WHICH PROVIDE EARLY AGE DE-SEXING SERVICES

Overview

- Availability of early age desexing from 8 weeks in Queensland veterinary practices is currently limited
- Additional training of veterinarians in practice and graduating veterinarians will be required for widespread implementation
- Research to understand negative attitudes and beliefs is required, as is investigations into the most effective measures to change attitudes

Although surgical sterilisation of dogs and cats is one of the most commonly performed procedures in veterinary practice (Howe 2006), many veterinarians have continued to express concern regarding early aged desexing (Johnson 1993; Dowling 1997; Spain, 2002). Irrespective of established safe surgical and anaesthetic protocols for performing early aged desexing in cats and dogs (Aronsohn & Faggella 1993; Faggella & Aronsohn 1993), many veterinarians do not provide early age desexing services.

In a study looking at the practices and beliefs of veterinarians in the state of New York, Spain *et al* (2002) reported that 84% of practicing veterinarians perceived at least one risk associated with desexing cats and dogs before four months that they believed was not associated with desexing at an older age. In addition 29% of practitioners thought that early age desexing increased the risk of at least one medical condition later in life.

Ninety percent of US veterinarians favour some or all shelter animals undergoing routine desexing prior to adoption, and are reported to believe that the earliest age for desexing both dogs and cats in shelters should be approximately 2 -3 months, whereas client owned animals should not be desexed until 5 months or more (Spain *et al* 2002). This discrepancy may be explained by veterinarians' belief that early age desexing is an important strategy for reducing pet overpopulation and facilitating adoptions; therefore any associated risks are warranted (Spain *et al* 2002). This is further supported by anecdotal evidence that most Queensland veterinarians not currently practicing early aged desexing, believe that early aged desexing in terms of managing overpopulation issues would be beneficial. Additionally, these veterinarians indicated they would enter into partnerships performing early aged desexing for breeders and the pet industry if they knew early age desexing was safe and the law supported this (Joy Verrinder, Animal Welfare League, pers comm.).

In Queensland the current availability of veterinary practices offering early aged desexing services is not accurately known. The current AVA recommendation is that desexing is acceptable for owned 16 week old puppies and kittens and un-owned 12 week old animals (Dr Craig Pullen, AVA, pers comm). However in an unpublished survey undertaken by the National Desexing Network (NDN) of veterinary clinics in Australia currently offering early aged desexing, 24 Queensland practices were found to offer early age desexing of cats and dogs between 12 – 16 weeks, and 7 other Queensland practices offer these services for animals aged between 8 – 12 weeks. For client-owned pets, mandatory desexing and hence *de facto* early age desexing would likely be most readily supported by veterinarians for male cats, compared with female cats or dogs, because of the ease and speed of surgery, combined with the health and behavioural benefits in male cats (Dr Craig Pullen, AVA, pers comm.).

Reasons given to the National Desexing Network (Joy Verrinder, Animal Welfare League, pers comm) for not offering early age desexing include:

- Not being comfortable with the procedure
- Not familiar with the technique
- Not sure of the health consequences
- Surgically they found it more difficult
- Not sure of correct and safe anaesthetic protocol

In predicting the availability of these services in the future, it has been suggested that training and experience with early aged desexing would allay many veterinarians concerns (Spain *et al* 2002). The University of Queensland has implemented some early age desexing training into the veterinary curriculum. In 2007, six lectures on Urban Animal Management were introduced into the fifth year of the University of Queensland veterinary science course to increase graduating veterinarians' knowledge and awareness of companion animal overpopulation issues. One lecture covers early age desexing exclusively, outlining benefits, risks and impacts (Rand 2007). However, additional practical training would be warranted in the BVSc program if early age desexing was to become widely practised.

Conclusion

Although early age desexing is practiced in Queensland veterinary clinics, availability of these services are not widespread, and are extremely variable between practices in terms of age of puppies and kittens accepted for the procedure.

It appears that Queensland veterinarians have mixed attitudes and beliefs regarding the associated risks and benefits of early age desexing, and despite many indicating that early age desexing may be a useful tool in reducing pet overpopulation, recommendations for private pet owners can be vastly different.

In light of the information here, it is clear that further research into veterinarian attitudes towards and services provided for early aged desexing is required to know the extent of available early age desexing services in Queensland. Further training initiatives may also be required for existing veterinarians to update skills and knowledge if mandatory desexing is to be introduced. These initiatives need to be in conjunction with the inclusion of additional practical training in early age desexing techniques in veterinary science programs in Queensland. Research would also be required to determine attitudes and beliefs of veterinarians to early age desexing, and an intervention program developed to change existing attitudes.

To increase the number of veterinarians performing early age desexing in private practice, further investigation in terms of attitudes and beliefs is required in order to quantify target areas and formulate appropriate programs designed to promote change.

9. DISCUSSION

The surgical and anaesthetic protocols for early age desexing have been demonstrated to be safe and cost effective, and are associated with minimal blood loss, faster surgical and recovery times, and less post operative complications than procedures associated with 'traditional' age desexing.

Early age desexing is still questioned by many veterinarians in terms of long-term safety and associated risks. The long-term impacts of early age desexing are difficult to assess due to the high costs associated with longitudinal studies as well as the challenges of following up information with owners and pets over a period of 10 years. This has resulted in relatively few rigorous assessments of these impacts. Consequently, the available literature is somewhat inconsistent in terms of outcomes, and points to a strong need for further long-term clinical trials.

However, the consistent picture that emerges from the available long-term studies shows that the long-term risks and benefits associated with early aged desexing differ between dogs and cats, and between males and females. In general, adverse medical and behavioural impacts of early age desexing in male and female cats are not more frequent than with traditional age desexing. In fact, there are many positive outcomes associated with early age desexing and these include, for example, positive behavioural changes, particularly in male cats. In contrast in dogs, several studies report that the incidence of urinary incontinence in female dogs is significantly higher in those desexed prior to 5.5 months of age. Hip dysplasia was also more common in both male and female dogs desexed prior to 5.5 months.

Data from the RSPCA indicate that the majority of dogs entering shelters are not puppies but healthy adults. It appears that the majority of unwanted dogs are approximately one to two years of age and are more likely to be male and sexually intact (Marston, *et al*, 2004; Salaman, *et al*, 1998; DiGiacomo, *et al*, 1998; Patronek, *et al*, 1996). Importantly, studies investigating owner relinquishment of dogs have identified behavioural factors, lifestyle and owner unpreparedness to care for a dog as the most commonly occurring reasons (Marston, *et al*, 2004; Salaman, *et al*, 1998; DiGiacomo, *et al*, 1998; Patronek, *et al*, 1996). This, therefore, indicates that the issue of unwanted dogs may not be as strongly associated with indiscriminate breeding issues as it is in the case of cats. It follows that the health risks associated with early age desexing in female puppies, particularly for female dogs housed indoors, outweighs the potential benefits of early age desexing in dogs. Consideration, however, of the benefits of targeted mandatory desexing of dogs is warranted, particularly for example, in the case of male

and possibly female dogs of breeds overrepresented in shelters, or male dogs of breeds not predisposed to hip dysplasia. Further data are required to determine the likely actual impact that targeted strategies such as these might have on the number of unwanted dogs entering shelters and pounds.

It is currently accepted that approximately 50% of the cats entering RSPCA shelters nationally are kittens (although this figure varies from state to state) (RSPCA, 2007). This indicates that indiscriminate breeding is an issue that needs to be addressed to control the population entering shelters, and early age desexing of cats could be a particularly useful intervention. Moreover, as more than 90% of the registered cats in Victoria are reportedly desexed (Marston, *et al*, 2006), it seems that legislating for compulsory desexing alone might not be an effective management strategy

Currently, the question of introduction of early age desexing of cats is not underpinned by a clear evidence-based appreciation of the broad problem of unwanted cats in Australia. To assume that unwanted cats are only coming from irresponsible owners is inaccurate, and legislation to control the owned-cat sector of the population may therefore be largely ineffective. A comprehensive understanding of the complex issues associated with unwanted cats can only be achieved through comprehensive and rigorous scientific research.

Early age desexing is seen by many veterinarians as a valuable tool and by shelter and pound staff as a useful control measure for dog and cat overpopulation. Desexing dogs and cats at 8 – 12 weeks of age would allow for the procedure to take place prior to sale and, more importantly, before they can reproduce. Mandatory desexing with *de facto* early age desexing would potentially neutralize both owner resistance and negative attitudes and beliefs toward desexing, and raise the value of pet dogs and cats. This might reduce the overall number of dogs and cats entering the population, and reduce relinquishments of animals perceived to have a higher value.

Desexing dogs and cats entering shelters and pounds prior to adoption is already a widespread practice in Queensland. Further investigation of the practices of shelters and pounds that currently do not undertake desexing is required to determine whether it is attitudes and beliefs, or space and resources that are sustaining these practices. If resources are the overwhelming issue, some smaller shelters may be forced to turn away or euthanise more animals as they will be unable to comply if a mandatory early age desexing program is introduced.

The introduction of mandatory desexing and, hence, *de facto* early age desexing, may also impact negatively on pet ownership in Australia. For example, pet retailers and breeders would

be burdened with additional costs and potentially longer holding periods than those currently imposed, in turn increasing costs for potential owners. It follows that a major shift in attitude would be required for successful implementation of a *de facto* early age desexing program. Compounding all issues is the current availability of early age desexing services in private veterinary clinics in Queensland. Early age desexing is not a widely available service offered in veterinary practices in Queensland. Hence, further investigation is required to understand what systemic change might need to occur before a mandatory program could be initiated.

10. THE WAY FORWARD

From relevant literature and information collected within this report, the following recommendations are suggested in order to progress the matter of early age desexing in Queensland:

- The population of unwanted dogs, and particularly cats, that are entering shelters needs to be better understood.
- Potential methods for managing the unwanted pet crisis in Queensland, both dogs and cats, must be carefully and critically assessed in prospective studies prior to any widespread implementation of early age desexing.
- For example, a prospective localised trial to evaluate the efficacy of mandatory desexing in cats as a control strategy could be instigated in a large regional town with a shelter and council pound.
- Community attitudes and beliefs require further and more detailed investigation to understand why people do not desex animals, and why pets are relinquished.
- The attitudes and beliefs of the veterinary community to early age desexing require further investigation to ascertain conclusively why early age desexing is not routinely practised, at least in cats, and to establish targets for education and professional development initiatives in order to achieve widespread change.

Conclusion

In conclusion, mandatory desexing incorporating early age desexing as a strategy for addressing the unwanted cat population is likely to be more beneficial for cats than for dogs. This is because there are positive health and behavioural outcomes of early age desexing compared to traditional age desexing in cats, and a major proportion of cats entering shelters are kittens. However, the usefulness of such a strategy in reducing the number of unwanted cats is unclear, and requires further investigation prior to a decision being made to implement mandatory desexing. Importantly, the source of cats and kittens entering shelters and pounds in Queensland is not well understood, and it needs to be demonstrated that a substantial number of unwanted kittens are in fact being bred from owned cats. If a significantly large proportion of unwanted cats and kittens is coming from unowned cats, then the strategy is unlikely to be successful, and its implementation a waste of resources.

In contrast, mandatory desexing of dogs incorporating early age desexing is less likely to be successful as a strategy for addressing the unwanted dog population for a number of reasons. Adverse long-term health outcomes including the increased risk of hip dysplasia in male and

female dogs and increased urinary incontinence in female dogs will be of concern to the pet-owning public and veterinarians, and potentially lead to non-compliance. Additionally, the evidence for mandatory desexing being a useful strategy is weak, because only approximately 10% of unwanted dogs are puppies, and in general these are readily rehomed by urban shelters. Further investigation is required to determine whether a focused mandatory desexing strategy might be appropriate. For example, male dogs of breeds overrepresented in shelters and pounds, and breeds at minimal risk of hip dysplasia, might be targeted. Such an approach might be both feasible and beneficial, while also taking account of the major arguments against early age desexing in dogs.

Prior to any consideration of implementation of mandatory desexing incorporating early age desexing, negative attitudes and beliefs to early age desexing by the public, breeders, pet-shop owners and veterinarians need to be understood, and strategies developed to overcome these concerns.

Additionally, initiatives such as widespread upgrading of the skills and knowledge of practising veterinarians, and relevant changes to practical training in the curricula of Queensland's undergraduate Bachelor of Veterinary Science programs will be required, if mandatory early age desexing prior to change of ownership is to be introduced.

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