RSPCA
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RSPCA Australia research report

Pre-pubertal desexing in cats

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RSPCA

for all creatures **great** & **small**

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1 EXECUTIVE SUMMARY

Unwanted cats are a concern in Australia and in many countries across the world due to risks to the welfare of the individual cats and the associated social and environmental issues. Desexing cats before they can reproduce plays an integral role in reducing cat overpopulation. Despite a high proportion of owned cats being desexed, many accidental litters are still born. Many unplanned pregnancies occur when the cat is between four and nine months of age, which can happen if owned cats are not desexed before they can breed; only a small proportion of owned cats outside of shelters and cat rehoming organisations are desexed before puberty (before four months or 16 weeks of age) when females can become pregnant.

The current scientific evidence strongly supports desexing cats before puberty. This is based on:

- the safety of desexing before puberty
- the effectiveness of desexing cats before puberty for population control
- no increase in risk of short-term complications or long-term adverse health effects
- for cats who are desexed before puberty
- documented health and behavioural benefits of desexing before puberty including:
  - decreased risk of mammary carcinoma
  - elimination of the risk of unwanted litters from pregnancies that may occur as early as four months of age
  - shorter surgical and recovery times compared to desexing at the traditional age of 5.5–6 months of age
  - elimination of the need to spay cats when they are in heat, heavily pregnant or have uterine disease and the risks associated with those situations
  - elimination of the risk of reproductive health emergencies such as pyometra and dystocia
  - potentially fewer behavioural problems in cats desexed before puberty, which could reduce the risk of cat relinquishment.

Based on extensive evidence of the benefits and a lack of evidence of adverse effects, desexing before puberty offers many advantages. If cats are routinely desexed before puberty, this will increase the overall number of younger desexed cats and avoid unintended/unwanted litters, as well as conferring all of the health and behavioural benefits associated with desexing cats before puberty.

Although some veterinarians already desex cats before puberty, particularly those in shelters and welfare organisations, much more could be done to increase the proportion of cats desexed before puberty.

This includes educating owners that breeding can start as young as four months old and supporting veterinarians, particularly in private practice, to adopt practices which encourage desexing of cats before puberty.

The extensive evidence base shows that there are many health and welfare benefits of desexing before puberty for individual cats as well as in terms of reducing the number of unwanted kittens born. RSPCA Australia advises owners to have their cats desexed before four months of age and advocates desexing of all cats, including owned cats, before puberty as routine and normal practice, as it already is in many shelters and rehoming organisations.

Recommendation 1

All kittens received by animal shelters, pounds and other cat rehoming organisations should be desexed before puberty and before adoption. Best shelter practice indicates that kittens should be desexed as soon as possible after reaching close to 1kg in weight and eight weeks of age to maximise their chances of successful adoption.

Recommendation 2

Animal welfare organisations should work with the veterinary profession and veterinary schools to increase the knowledge of the public around how early cats can start breeding and to increase the acceptance and practice of desexing of cats before puberty (i.e. before 16 weeks).

Recommendation 3

Owned kittens presenting to private practice veterinarians should be desexed before puberty. Desexing should be performed between 12–16 weeks to coincide with the kitten's vaccination schedule.

Recommendation 4

Private practice veterinarians should promote pre-pubertal desexing (PPD) of cats as routine and normal practice by:

a. Educating cat owners about cat reproduction, that cats can start breeding as young as four months old and that kittens should be desexed before puberty and without having a litter of kittens.
b. Recommending PPD for all privately owned male and female kittens.
c. Recommending PPD before sale or adoption for any litter of kittens presented by a breeder or rehoming organisation.
d. Routinely arranging PPD of kittens between 12–16 weeks of age to coincide with primary vaccinations when cat owners' engagement with preventative veterinary care is likely to be highest.
e. Reviewing their veterinary practice's internal policies to ensure PPD of cats is recommended by all veterinarians in the practice.
f. Working with animal welfare organisations and veterinary schools to increase the knowledge of the public around how early cats can start breeding and to increase the acceptance and practice of desexing of cats before 16 weeks.

Recommendation 5

The veterinary profession, veterinary schools and animal welfare organisations should work together to increase the acceptance and practice of pre-pubertal desexing of cats by Australian veterinarians through:

a. Developing evidence-based resources for veterinary schools and continuing professional development programs, which set out the evidence base for best practice pre-pubertal desexing.
b. Establishing a dedicated website to promote the pre-pubertal desexing of cats to veterinarians and the community, including links to veterinary practitioners and veterinary schools that practice or teach PPD, training videos and other resources.
c. Engaging with local governments, veterinary practitioners, cat owners, breeders and the wider community to spread the consistent message that desexing cats before puberty is safe, beneficial and should be routine and normal practice for all cats.
d. Increasing the knowledge of the public around how early cats can start breeding and increasing the acceptance and practice of desexing of cats before 16 weeks.

2 INTRODUCTION

2.1 Reproduction in cats

Female cats can breed several times during a season and will only release an egg after mating (i.e. they are seasonally polyestrous induced ovulators) [1]. Cats breed when the days are long, but in areas where the climate is mild and the day length does not vary substantially (such as areas closer to the equator) their breeding season is prolonged [1,2]. Due to the climate and photoperiod in many areas of Australia, cats have a prolonged breeding season, allowing them to produce multiple litters per year. Cats are highly prolific breeders capable of producing on average 4.2 kittens per litter and 2.1 litters per year [1].

Female cats can become pregnant as early as four months of age [3] and, with an average gestation period of 63 days, they can produce their first litter at six months of age. Male cats can reach sexual maturity and sire a litter from about five months of age [4]. For more details see Appendix A.

2.2 Desexing

Desexing is a surgical procedure performed to render an animal permanently infertile and is the most effective strategy for preventing unwanted pregnancies. The procedure involves the removal of the ovaries and uterus of females (ovariohysterectomy or 'spaying') and the testicles in males (castration). Desexing is also known as sterilisation or gonadectomy. In females, desexing before reaching puberty will prevent unwanted pregnancies, which would otherwise contribute to cat overpopulation. For more details on the medical and behavioural benefits of desexing see Appendix A.

Age of desexing

Desexing can be performed at different ages and, based on the age at which it is performed, has been described by a range of different terms (Table 1) [5–7].

The age at which veterinarians desex cats has traditionally been around 5.5-6 months of age, with a range of five to nine months [5–7], although this can vary between individual animals, veterinarians and situations. This traditional age of desexing (TAD) has generally been adopted by veterinarians who have been concerned about perceived risks associated with desexing a patient younger than 5.5-6 months of age. However, there is now a large evidence base which alleviates these concerns.

Desexing before puberty, or 'pre-pubertal desexing' (PPD), refers to desexing at or before 16 weeks of age, before cats are physically capable of reproduction. In most cases, PPD is performed between 12–16 weeks of age.

The term 'Early-age desexing' (EAD) has been used extensively to describe a subset of pre-pubertal desexing, i.e. desexing at 8–12 weeks of age.

Desexing at 8–12 weeks of age is commonly practiced by animal shelters and other rehoming organisations to ensure that kittens are desexed before adoption (transfer of ownership). EAD is a term commonly used to describe desexing earlier than traditional age.

To avoid any confusion, the term EAD is used in this paper specifically to describe desexing at 8–12 weeks of age.

TABLE 1

TERM AND ACRONYM	AGE OF DESEXING
Traditional age desexing (TAD)	5.5 to 6 months, range of 5 to 9 months
Pre-pubertal desexing (PPD)	At or before 16 weeks
Early-age desexing (EAD) — a subset of pre-pubertal desexing carried out at an early age	8–12 weeks
Paediatric desexing — term not used in this paper	6–14 weeks
Juvenile desexing — term not used in this paper	Over 16 weeks

2.3 Who currently practises pre-pubertal desexing (PPD)?

In private veterinary practice, the recommendation and practice of PPD is variable.

There are reportedly differences in recommended desexing age among veterinarians with different demographics (gender, veterinarian age and year of graduation, university of graduation, current employment in non-private practice, experience within practice and practice policy) [8–11]. In addition, it has been identified that veterinarians who provide services to animal welfare organisations or pounds may be more likely to perform PPD compared to non-providers [12].

There is recent evidence from Australia indicating that there may still be only a relatively small number of private veterinary practices offering PPD for clients and that most cats are desexed well after puberty:

- A 2014 South Australian study found that only 47% of owned cats were desexed at three to six months of age and that 22% had a litter before being desexed [13].
- A 2014 Australian study reported that in 2013, 97.4% of cats aged two or more years of age were desexed compared with 28% of cats less than two years old in a convenience sample of Western Australian pet cats of known age presented for microchipping [14].
- A 2016 survey found that Australian veterinarians most commonly recommended desexing at six months of age (traditional age desexing — TAD), with only a minority (18.6%) recommending PPD (at or before 16 weeks of age) [8]. However, 81% stated they would perform PPD on cats if this was specifically requested.
- A 2019 survey of veterinarians was performed in the Australian Capital Territory (ACT), in which three months of age is the legal maximum age for desexing cats in that jurisdiction [11]. The survey found that only 10% of respondents recommended that clients have their cat desexed at three months of age, half of the veterinarians stated that they almost never (37%) or never (13%) desexed cats before three months of age, and no veterinarians reported always desexing cats before three months of age.
- A 2020 survey of veterinarians in Queensland reported that almost 45% of respondents recommended desexing cats at six months of age, and less than 8% recommended desexing cats by 16 weeks of age [15]. Furthermore, the actual average age at which cats were desexed was over six months of age for 57% of the veterinary practices, indicating that clients were having their cats desexed later than recommended by their veterinarian. In addition, a substantial proportion of cats (11% or more) had already had litters of kittens before being desexed in 39% of practices.
- A 2021 Australian study assessed the veterinary medical records and desexing status of 52,941 cats born between 2010 and 2017 through the VetCompass Australia database. This study reported a median age at which cats were desexed as six months old (range <1 to 93 months) and that, of the desexed cats, only 23.2% had been desexed by four months of age and 62.6% by six months of age [16].

2.4 Who currently practises early-age desexing (EAD)?

Early-age desexing (EAD) is a subset of PPD which is performed at 8–12 weeks of age. EAD is routinely performed at RSPCA shelters and other large shelters in Australia on kittens who meet the relevant criteria. For example, in most RSPCA shelters, kittens will be considered for desexing from when they are eight to eight and a half weeks of age and close to 1kg in weight, they must also be healthy and in good body condition. For males, it should also be verified that both testes are in the scrotum before desexing [17].

EAD is often a necessity within the shelter environment. It is important to ensure that animals suitable for adoption are safely desexed to prevent pregnancies in animals leaving shelters and to guarantee they will not contribute further to cat overpopulation. Desexing kittens in the shelter as soon as possible also means that the kittens can be adopted earlier than if desexing was delayed. This increases the chances of finding suitable homes for them, as younger animals are generally more likely to be adopted [18,19]. It also allows the kittens to transition more quickly through the shelter environment, reducing their risk of infectious disease, exposure to other animals, stress, impaired immunity and development of socialisation and behavioural issues. EAD allows more efficient management and adoption of shelter animals, and this improves shelter capacity by enabling shelters to accept more unwanted animals and to save more lives overall. Approximately 13,000 kittens were desexed and rehomed through RSPCA shelters in 2019/20.

The practises of smaller shelters and most council pounds in Australia vary. However, not all council pounds routinely desex animals before rehoming.

Some cat breeders will also request veterinarians perform EAD on their kittens to ensure the kittens are desexed before they are rehomed, usually at or before 12 weeks of age [20].

2.5 Why are more cats not desexed before puberty?

Desexing before puberty is supported by many veterinarians as a cat population control strategy. For example, 77% of participating ACT veterinarians in a recent survey answered that desexing before puberty is an appropriate management strategy to prevent overpopulation of cats (37% answered maybe and 40% definitely) [11].

However, the majority of veterinary clinics do not routinely desex cats before puberty [8,15].

The most recent literature reports that the majority of Australian veterinarians recommend desexing cats at the age of six months [8] and Australian veterinary students are generally only trained to desex at the traditional age of 5.5–6 months [44]. Therefore, veterinarians might be unfamiliar or uncomfortable with performing desexing before puberty. This may be a factor maintaining TAD along with lack of familiarity with the evidence demonstrating that desexing before puberty is safe and beneficial.

Younger and recently graduated veterinarians in Australia are more likely to perform TAD compared to experienced practitioners [8]. This may reflect the lack of training in desexing before puberty in veterinary schools and also a difference in surgical experience and confidence performing paediatric anaesthesia and surgery for less experienced veterinarians [8].

A recent UK study explored reasons why veterinarians do not desex cats before puberty and/or would not recommend desexing client-owned cats before puberty [9]. Five key themes relating to concerns or barriers to desexing cats before puberty were identified, including:

1. Size and development of the kitten; for example, a belief that it would be beneficial for the cat to be more mature before desexing.
2. Perceived risks with general anaesthetic and analgesia of the patient.
3. Concern that the surgery was more complicated in a smaller patient or concern related to the veterinarian's lack of familiarity with desexing cats of this age.
4. Perceived lack of applicability to the veterinarian's practice; for example, they did not feel there was a problem with unwanted litters of cats in their area.
5. Lack of compliance from owners or colleagues due to the veterinarian's practice having a policy that precluded or did not support desexing before puberty or concerns that colleagues and owners may not support or comply with a change to the age at which desexing was performed.

In a 2016 Australian study, almost three-quarters of veterinarians cited concerns about anaesthetic risk as the reason for not recommending desexing before puberty. The study's authors surmised this perception of anaesthetic risk may reflect a lack of experience and confidence with paediatric anaesthesia [8].

The currently available evidence does not support increased risk of complications or long-term adverse health effects associated with desexing cats before puberty (see Section 4). This should alleviate concerns within the veterinary profession about perceived negative consequences. However, there is still a need for more widespread awareness and acceptance of the safety and benefits of desexing cats before puberty.

3 THE CASE FOR DESEXING BEFORE PUBERTY

3.1 A strategy to reduce overpopulation

Desexing cats before they reach puberty and become sexually mature prevents any unwanted/unplanned litters, thereby helping to minimise the overpopulation of cats in the community. Minimising cat overpopulation helps to reduce the number of cats who are abandoned, killed (humanely and, sometimes, inhumanely), surrendered, or need to be found homes if they are stray or unowned. Reducing the number of cats surrendered or needing to be found homes can improve welfare and outcomes for cats in care. In addition, reducing the number of unwanted cats minimises welfare issues associated with overpopulation of cats in the community (for example, long-term shelter stays leading to increased risk of disease or stray cats in poor condition).

Evidence from shelter statistics and the owned cat population indicates that most cats are being desexed after sexual maturity [12]. Furthermore, the longer a cat remains entire, the more likely an unplanned pregnancy will occur [12], resulting in unwanted litters of kittens. This is supported by the evidence that there are many owned kittens entering shelters, with reasons for their surrender often cited as 'too many animals' or that the kittens were 'unwanted' [21].

The large numbers of unwanted kittens surrendered to shelters from the owned cat population seems to be at odds with the reportedly high percentage of owned cats who are desexed. The proportion of owned cats who are desexed has been reported as 83-97% [16,22,23] and yet almost 40% of kittens entering RSPCA shelters in Australia are reported to be from the owned cat population [21]. One possible explanation for the discrepancy is that cats are producing unplanned litters of kittens before being desexed. Studies have found that only 23–33% of animals aged under six months are desexed [16,21,24]. Data from Australia and the US is reported to show that 13–20% of owned queens who are ultimately desexed have a litter of kittens before being desexed [25]. It has been calculated that the number of kittens born from cats who were ultimately desexed is only slightly less and not statistically different from those who were never desexed (2.5 versus 3.4) [25]. Furthermore, a study in the UK found that only 66% of cats aged 6–12 months were desexed and that up to 71% of litters from owned cats may be unplanned [26]. The evidence indicates that cats are producing unplanned litters of kittens before being desexed, because these cats are being desexed after puberty. Desexing before puberty can prevent these unplanned and unwanted pregnancies in cats. Conversely, desexing cats at the current traditional age of 5.5–6 months does not eliminate this risk, because female cats can reach sexual maturity well before the traditional age of desexing [27].

It is important to continually strive to improve outcomes for cats in shelters and pounds. To do this it is necessary to reduce intake and so the factors that lead to cat admissions must be addressed [28]; this includes the birth of unwanted kittens and the resultant 'oversupply' of cats. Desexing before puberty is a strategy that can address this source of cat overpopulation by ensuring that unwanted litters of kittens from accidental pregnancies are not produced before desexing [29]. A report from RSPCA UK concluded that 'The promotion and practice of pre-pubertal neutering (at four months) by vets — as the norm for owned cats — is vital to tackling the cat population crisis' [30].

3.2 Welfare benefits of desexing before puberty

Desexing, especially before puberty, prevents the birth of unplanned litters of kittens, but there are also other widely accepted health and behavioural benefits associated with desexing, whether it is performed before puberty or at a traditional age. For more details see Appendix B.

There is a large body of evidence comparing the medical and behavioural outcomes of desexing before puberty and traditional age desexing. These studies indicate that desexing before puberty may offer improved surgical, anaesthetic, health, and behavioural outcomes when compared to desexing at the traditional age [27,31]. A summary is given below — a more detailed examination of the safety of desexing before puberty is provided in the next section.

When compared to traditional age desexing, desexing before puberty has been shown to have:

- Faster surgical times for both males and females [17].
- Improved surgical outcomes [5,31], including minimal tissue trauma and improved recovery time [5,17,31,32], and this may result in reduced pain [33,34].
- A lower overall complication rate [5,17].
- Similar or lower postoperative wound infection rate [32,35].
- Reduced time under anaesthesia [5,31,32]; this provides significant animal welfare benefits, including reduced risk of wound infection [36].
- Shorter recovery times from anaesthesia [37].
- Similar or lower morbidity (medical problems, signs of disease) [3,5,32,38].
- No increase in mortality rates [3,17,39].
- No difference in any health issues arising within the first 30 days following adoption [17].
- Elimination of unwanted pregnancies and potential related complications because desexing cats before they reach sexual maturity eliminates the risk of an unplanned litter [31].
- Reduced risk of mammary neoplasia; the greatest reduction in incidence of mammary neoplasia is associated with desexing before puberty [40–42].
- In addition, PPD is less costly per patient as less anaesthetic agent is required by younger smaller patients, the surgical time is shorter and less suture material and other consumables are used [31,43].

3.3 Safety of desexing at different ages

The available evidence shows that desexing cats before puberty has a similar level of safety to traditional age desexing. This repudiates the health and behavioural concerns that have often led to delays in desexing cats until a 'traditional age' which does not eliminate the risk of unwanted kittens being born.

Table 2 provides a comparison between risk for cats desexed before puberty or at a traditional age for short- and long-term health and behavioural issues. The evidence presented here is drawn from research involving kittens desexed at a variety of ages that are categorised as desexing before puberty (from 8–16 weeks of age). Where evidence exists that the procedure is not associated with any health or behavioural contraindications at 8–12 weeks of age compared to desexing at a traditional age, it has been inferred that this is also applicable to kittens desexed at 12–16 weeks of age if there is no evidence to the contrary.

Numerous controlled prospective studies, retrospective cohort studies, owner surveys and reviews have concluded that desexing cats before puberty is not associated with increased risk and that there are no health or behaviour related contraindications when compared to TAD [27,41,56–61].

The following section summarises the evidence on the main areas of concern that have been expressed regarding potential short-term and long-term risks associated with desexing cats before puberty. More detail on each of these concerns and the available evidence is given in Appendix C.

TABLE 2 COMPARISON BETWEEN RISK FOR CATS DESEXED BEFORE PUBERTY OR AT A TRADITIONAL AGE FOR SHORT- AND LONG-TERM HEALTH AND BEHAVIOURAL ISSUES.

POTENTIAL RISK	COMPARISON BETWEEN DESEXING BEFORE PUBERTY AND TAD	NOTES
Short term		
Anaesthesia and surgery	Risk of anaesthetic and surgical complications is no different and possibly less than desexing at a traditional age.	As with any surgery, adequate training and experience and access to appropriate resources and equipment and adherence to recommended preoperative, operative, and postoperative protocols is necessary.
Infectious disease	No increased risk of infectious disease compared with desexing at a traditional age.	Appropriate and routine procedures must be followed to minimise infectious disease risk as with any surgery.
Long term		
Behaviour	No association with desexing cats before puberty and the occurrence of significant problem behaviours (e.g. hunting, fearful behaviour, destructive behaviour, attention seeking, stealing of food, excessive vocalisation, non-play related aggression toward animals and toward humans, house soiling and sexual behaviour).	Desexing at any age helps to eliminate or reduce behaviours associated with entire cats that people find objectionable (e.g. scent marking, spraying, fighting, roaming, and behaviours associated with oestrus in females such as calling).
Musculoskeletal development	No increased risk of clinical musculoskeletal problems is associated with desexing cats before puberty.	Conflicting information regarding the clinical relevance of delayed physeal closure which is associated with desexing cats before puberty. This area needs further investigation.
Obesity	No association between age at desexing and the development of obesity.	Desexing in general may predispose toward obesity in cats. Appropriate diet and exercise can prevent and/or control obesity.
Diabetes	No association identified between the age at which a cat is desexed and risk of developing diabetes mellitus.	Desexed cats have a two to nine-fold increased risk of developing diabetes mellitus than sexually intact cats.
Infantile external genitalia	Under-development of external genitalia is often attributed to desexing, particularly if desexing is performed before puberty.	Clinical significance of these changes is unknown and these changes do not appear to lead to an increase in the incidence of feline lower urinary tract disease (FLUTD) or urinary obstruction.
Urethral obstruction	No increase in urethral obstruction in cats castrated before puberty.	
Urinary tract disease	No association between the age of desexing and the occurrence of feline lower urinary tract disease.	Possible increased risk for urinary tract problems (including cystitis) for cats desexed at a traditional age.

Anaesthesia and surgery

Numerous studies have demonstrated that there is no increased risk of anaesthetic complications associated with desexing cats before puberty compared to TAD, provided appropriate measures are in place [3,5,17,31,32,38,39,50,51]. However, it has been suggested that a lack of experience with paediatric anaesthesia can contribute to the reluctance on the part of some veterinarians to desex cats before puberty [10,17,52]. This can be addressed with adequate training, including the ability to gain experience in paediatric anaesthesia and surgery. As with any anaesthetic and surgical procedure, it is essential to have adequate training and experience and access to appropriate resources and equipment to ensure that the recommended preoperative, operative and postoperative protocols are used.

RSPCA shelters in Australia currently desex tens of thousands of cats before puberty every year. The RSPCA's experience with desexing cats before puberty is that the risk of anaesthetic and surgical complications is no different and possibly less than desexing at a traditional age.

Infectious disease

There is no evidence that desexing cats before puberty results in an increased risk of infectious disease compared with desexing at a traditional age. Appropriate and routine procedures must be followed to minimise infectious disease risk as with any surgery [53].

It is important for veterinarians to select appropriate and healthy patients, and to adequately weigh the risks and benefits of desexing patients with mild infectious (or non-infectious) medical conditions when selecting patients for desexing at any age, not just before puberty [53].

In the shelter context, the length of stay (the period of time the animal is in the shelter's care, from intake to exit) has been clearly identified as a major risk factor for animal illness such as infectious disease [54]. Desexing cats before puberty enables shelters to rehome animals more efficiently, which in turn reduces their length of stay and, in this way, may actually reduce the risk of infectious disease in shelters.

In non-shelter contexts such as private practice, where desexing is an elective procedure, kittens should be vaccinated before surgery [3]. Veterinarians can tailor the vaccination protocol to ensure animals are adequately vaccinated before their admission for desexing. For example, owned kittens would be desexed approximately two weeks after their vaccinations are complete, at around 16 weeks of age [55].

Behaviour

Desexing, including desexing before puberty, helps to eliminate or reduce behaviours associated with entire cats that people find objectionable (e.g. scent marking, spraying, fighting, roaming, and behaviours associated with oestrus in females such as calling) [12,31].

There has been no evidence that desexing cats before puberty is associated with the occurrence of significant problem behaviours. For example: hunting, fearful behaviour, destructive behaviour, attention seeking, stealing of food, excessive vocalisation, non-play related aggression toward animals and toward humans, house soiling and sexual behaviour [7,27,43,58,60,61].

As well as the positive effects of desexing (desexing before puberty or at a traditional age) on behaviour, there may be some additional behavioural benefits resulting from desexing earlier than traditional age. These include a decrease in occurrence of hyperactivity and, in male cats, reduced occurrence of abscesses, aggression toward veterinarians, sexual behaviours and urine spraying [27].

The weight of current evidence supports the conclusion that desexing cats before puberty does not have a negative impact on their behaviour, and that this includes not only their early development but also extends well beyond that into social maturity. Therefore, based on the available evidence it is concluded that there are no behaviour-related contraindications to desexing cats before puberty.

Musculoskeletal development

Concerns have been raised over whether delayed physeal closure associated with desexing (at any age) might increase the risk of musculoskeletal problems (e.g. fractures, angular limb deformities, hip dysplasia etc.) and whether desexing before puberty might further increase any risk. The available evidence provides conflicting information regarding the clinical relevance of delayed physeal closure which is associated with desexing cats

before puberty and this area needs further investigation [62]. However, the available evidence suggests that there is no increased risk of clinical musculoskeletal problems [27,57,61,63–67].

Obesity

Desexing in general may predispose toward obesity in cats [67–69], but longer term studies have found no association between age at desexing and the development of obesity [27,61].

There is no evidence that desexing cats before puberty increases any risk of obesity [41,51], and appropriate diet and exercise can prevent and/or control obesity. In fact, desexing cats before puberty may positively affect their food intake to maintain a more ideal body condition score compared to cats desexed at a traditional age [70].

Diabetes

Desexed cats have a two to nine-fold increased risk of developing diabetes mellitus than sexually intact cats [67]. However, there has been no association identified between the age at which a cat is desexed and risk of developing diabetes mellitus [3]. Other risk factors for the development of diabetes mellitus include breed, gender, activity level and increasing age [3,71,72].

Infantile external genitalia

Under-development of external genitalia is often attributed to desexing, particularly if desexing is performed before puberty. However, the clinical significance of these changes is unknown [73]. Even if desexing cats before puberty were to result in anatomic differences in the genitalia, these changes do not appear to lead to an increase in the incidence of feline lower urinary tract disease (FLUTD) or urinary obstruction [60].

Urinary problems

Urethral obstruction

There have been concerns that castration before puberty may predispose male cats to urinary obstruction. This has been investigated in a number of studies, which have found no increase in urethral obstruction in cats castrated before puberty [27,57,61].

Urinary tract disease

The evidence regarding the incidence of urinary tract disease in cats shows:

- No association between the age of desexing and the occurrence of feline lower urinary tract disease [27,57].
- A possible increase in risk for urinary tract problems (including cystitis) for cats desexed at a traditional age compared to those desexed earlier [61]. It has been postulated that desexing cats before puberty may result in some unidentified protective effect on the urinary tract [61].

In summary, the evidence shows that desexing cats before puberty does not have any negative developmental, health or behavioural consequences.

4 RECOMMENDATIONS FOR DESEXING BEFORE PUBERTY

4.1 Cats in shelters, pounds and other cat rehoming organisations/groups

The most effective way to ensure that cats adopted from shelters, pounds and other cat rehoming organisations/groups do not reproduce and contribute to the overpopulation of companion animals is to desex them before their adoption. In addition, being sexually intact has been identified as a significant risk factor for owner relinquishment of cats [74]. To address these risks, it is important for rehoming organisations to ensure they only rehome desexed cats.

Desexing kittens before puberty, usually through EAD at 8–12 weeks of age, ensures that they can be desexed before being rehomed and this maximises the potential benefits by allowing kittens to be rehomed as promptly as possible.

There are no significant health or behaviour-related contraindications to desexing cats before puberty. Desexing cats before puberty is the best available desexing strategy for male and female cats in shelters, pounds and other cat rehoming organisations/groups.

Recommendation 1

All kittens received by animal shelters, pounds and other cat rehoming organisations should be desexed before puberty and before adoption. Best shelter practice indicates that kittens should be desexed as soon as possible after reaching close to 1kg in weight and eight weeks of age to maximise their chances of successful adoption.

Recommendation 2

Animal welfare organisations should work with the veterinary profession and veterinary schools to increase the knowledge of the public around how early cats can start breeding and to increase the acceptance and practice of desexing of cats before 16 weeks before puberty.

4.2 Privately owned cats

The recommendation to delay desexing until the traditional age of six months results in a substantial proportion of cats already having had litters of kittens before being desexed [13,15,25]. Particularly because there is evidence indicating that if desexing is recommended at the traditional age of 5.5–6 months of age, some owners may delay desexing [15], not realising the potential consequences of doing so.

Furthermore, even if desexing was planned for six months but the cat became pregnant before that, she would likely be in mid-late term pregnancy at six months of age when she was scheduled to be desexed. If this happens, desexing may to be delayed or cancelled due to the pregnancy. This makes it even more important to recommend desexing cats before puberty, to increase the chances of owners having their cats desexed before the cat can reproduce.

Non-desexed 'owned' cats are also likely to contribute to the numbers of unowned and semi-owned cats (often referred to collectively as 'stray' cats). Therefore, desexing of owned pet cats before puberty may also help to reduce the number of unowned and semi-owned cats overall, in combination with other targeted strategies [9].

Desexing owned kittens before puberty at 12–16 weeks of age (PPD) is clearly desirable in terms of effective cat population control but there are also significant benefits for individual cats in terms of their health and welfare and no significant negative effects (see sections 3.2 and 5). Therefore, desexing before puberty should be the standard recommendation for owned cats. For most owned cats, this would mean recommending desexing at approximately 16 weeks of age once they have been vaccinated and coordinating desexing with the cat's preventative health program.

Recommendation 3

Owned kittens presenting to private practice veterinarians should be desexed before puberty. Desexing should be conducted between 12–16 weeks to coincide with the kitten's vaccination schedule.

4.3 What can private practice veterinarians do?

Veterinarians in private practice can help reduce the population of unwanted owned kittens. The effective implementation of desexing before puberty for owned cats, as well as for cats in shelters, will help to address cat overpopulation and the associated cat welfare problems. For this to occur effectively, it will require private veterinarians to gain more confidence in the benefits and in the practical implementation of desexing cats before puberty.

Establishing the desexing of cats before puberty as routine and normal practice will likely require a review and revision of current practice policies and recommendations [9].

Veterinarians also have an important role to play in educating owners that cats should not be allowed to produce a litter before being desexed. The common misconception of owners that female cats should be allowed to have one litter before being desexed is reported to contribute to the high proportion (80% of litters produced) of accidental litters of pet cats [75]. Therefore, this belief is a risk factor that could be addressed to reduce the number of accidental litters. Veterinarians can also ensure that owners know that cats can become pregnant as early as four months of age. Research has demonstrated that cat owners have poor knowledge of cat reproduction and are often unaware of how early cats can reproduce [75] and only a minority of owners intend to get their cat neutered by four months [76].

Recommendation 4

Private practice veterinarians should promote pre-pubertal desexing (PPD) of cats as routine and normal practice by:

a. Educating cat owners about cat reproduction, that cats can start breeding as young as four months old and that kittens should be desexed before puberty and without having a litter of kittens.
b. Recommending PPD for all privately owned male and female kittens.
c. Recommending PPD before sale or adoption for any litter of kittens presented by a breeder or rehoming organisation.
d. Routinely arranging PPD of kittens between 12–16 weeks of age to coincide with primary vaccinations when cat owners' engagement with preventative veterinary care is likely to be highest.
e. Reviewing their veterinary practice's internal policies to ensure PPD of cats is recommended by all veterinarians in the practice.
f. Working with animal welfare organisations and veterinary schools to increase the knowledge of the public around how early cats can start breeding and to increase the acceptance and practice of desexing of cats before 16 weeks.

4.4 What can the veterinary profession and universities do?

Professional veterinary bodies should support desexing cats before puberty and encourage their members to implement this procedure that can help to address cat overpopulation. Many professional veterinary and feline welfare bodies, working groups, task forces and organisations around the world already support and encourage desexing cats before puberty including the following:

- American Veterinary Medical Association (AVMA)
- Veterinary Task Force on Feline Sterilization for Age of Spay and Neuter Surgery
- American Association of Feline Practitioners (AAFP)
- Association of Shelter Veterinarians (ASV)
- American Animal Hospital Association (AAHA)
- Winn Foundation
- Catalyst Council
- Cat Fanciers' Association
- International Cat Association
- British Veterinary Association (BVA)
- British Small Animal Veterinary Association (BSAVA)
- Federation of Veterinarians of Europe
- International Cat Care (iCatCare)
- The Cat Population Control Group (CPCG), whose members include Battersea, Blue Cross, Cats Protection, International Cat Care (iCatCare), People's Dispensary for Sick Animals (PDSA), Mayhew, Royal Society for the Prevention of Cruelty to Animals (RSPCA), Scottish SPCA, Linnaeus, Celia Hammon Animal Trust and Woodgreen
- The Cat Group, whose members include Battersea, Blue Cross, British Small Animal Veterinary Association (BSAVA), Cats Protection, the Governing Council of the Cat Fancy (GCCF), International Cat Care (iCatCare), International Society of Feline Medicine (ISFM), People's Dispensary for Sick Animals (PDSA), Mayhew, Royal Society for the Prevention of Cruelty to Animals (RSPCA) and Woodgreen

The Australian Veterinary Association's policy on desexing companion animals states that 'Veterinarians should make decisions about the type of sterilisation procedure and age of sterilisation on a case-by-case basis, in consultation with the client, based on the risks and benefits to the individual animal'. This policy and the background information on age for desexing clearly allows for desexing cats before puberty and states that PPD is particularly important in cats [77].

Universities also have an important role to play by ensuring that their graduates are knowledgeable about and comfortable with desexing cats before puberty. A survey of veterinary teaching staff in Australian and New Zealand universities found that only 32% of the staff members advocated for desexing before four months of age in cats in this study, with the main reasons for not recommending it stated as concern about anaesthetic risk. However, most staff who taught desexing to veterinary students thought four to five months was the best age to routinely perform desexing on client-owned cats (68% of staff for male cats and 64% of staff for female cats) [44]. This aligns with the recommendations to desex owned cats before puberty at 16 weeks and is a positive step towards shifting to the practice of desexing before puberty as routine and normal for owned cats.

There is a need for animal welfare organisations to partner with universities to give veterinary students the knowledge and confidence they need to start desexing cats before puberty in practice, under the mentorship of more experienced veterinarians. There are also benefits for veterinary schools to partner with shelters to increase awareness among veterinary students of the magnitude of the challenges facing shelters, the scale of the issues associated with cat overpopulation, and the role that veterinarians can play in addressing the situation. This could be achieved in part by providing the opportunity for a shelter rotation to all veterinary students, especially those in later years of training. These opportunities teach students about the critical and specific role that private practice veterinarians play in reducing the number of unwanted cats.

There is a need for future research to identify the factors most likely to encourage private veterinarians to desex cats before puberty. It has been suggested that veterinarians need access to resources and training to allow them to feel comfortable to perform and recommend desexing cats before puberty [9].

Within-practice experience, practice policy and social norms have been identified as important to veterinarians desexing cats before puberty [9]. Therefore, it is important that practices make policies that allow and encourage desexing cats before puberty. Practices can also ensure their veterinarians have access to resources, training and mentoring in desexing cats before puberty; this should help to increase uptake. If these are not available within the practice initially, it has been recommended that veterinarians explore shelter medicine resources, online resources on desexing cats before puberty and opportunities for peer-to-peer support [9].

Collaboration between the veterinary profession, universities and welfare organisations can help increase availability of resources to encourage veterinarians to desex cats before puberty, as has been done in the UK. The Cat Group was formed in 2013 by seven UK-based animal welfare organisations, including RSPCA UK and the British Veterinary Association, aiming to reduce reproduction rates in owned cats. The Cat Group established a website dedicated to promoting the desexing of cats before puberty and providing a resource to veterinarians and the community. The website includes a register of veterinary schools that teach their students about desexing cats before puberty, a register of veterinary practitioners who will desex cats before puberty and training videos and resources for veterinarians on the desexing of cats before puberty.

Recommendation 5

The veterinary profession, veterinary schools and animal welfare organisations should work together to increase the acceptance and practice of pre-pubertal desexing of cats by Australian veterinarians through:

a. Developing evidence-based resources for veterinary schools and continuing professional development programs that set out the evidence base for best practice pre-pubertal desexing.
b. Establishing a dedicated website to promote the pre-pubertal desexing of cats to veterinarians and the community, including links to veterinary practitioners and veterinary schools that practice or teach PPD, training videos and other resources.
c. Engaging with local governments, veterinary practitioners, cat owners, breeders and the wider community to spread the consistent message that desexing cats before puberty is safe, beneficial and should be routine and normal practice for all cats.
d. Increasing the knowledge of the public around how early cats can start breeding and increasing the acceptance and practice of desexing of cats before 16 weeks.

5 CONCLUSIONS

Based on the extensive evidence available and the RSPCA's experience desexing cats before puberty, the RSPCA considers this to be a safe and effective strategy to prevent unintended litters of kittens. The RSPCA advocates that all cats offered for sale or adoption as companion animals (rather than for breeding by appropriately registered/licensed breeders), should be desexed before transfer of ownership (see RSPCA Australia Policy A7 on companion animal management).

It is necessary for cats to be desexed before puberty to prevent unintentional first oestrus litters. Desexing cats before puberty prevents production of unwanted litters of kittens and the resulting negative animal welfare impacts. In addition to the population control benefits, desexing cats before puberty has positive impacts for the welfare of individual cats. The evidence demonstrates improved surgical outcomes, reduced time under anaesthesia and faster recovery and associated lower morbidity (medical problems, signs of disease) in cats desexed before puberty, as well as long-term health and behavioural benefits.

Desexing both male and female kittens before puberty, usually at 8–12 weeks of age (EAD), in shelters, pounds and other cat rehoming organisations/groups is justified, practical and has many benefits. Desexing all animals before they are rehomed ensures that these cats do not contribute to cat overpopulation. Reducing the number of unwanted animals also helps to reduce the number of animals received by shelters, pounds and other cat rehoming organisations/groups and, consequently, can improve welfare and outcomes for cats in care. EAD also contributes to efficient management of shelter animal populations by ensuring kittens can be desexed and rehomed as soon as possible; this maximises the potential of finding suitable homes for kittens and minimises the time they spend in the shelter environment. This allows efficient management and adoption of shelter cats, which increases shelter intake capacity and helps to improve cat welfare and outcomes.

Desexing owned male and female cats before puberty is recommended to prevent unplanned litters. Desexing cats before puberty has been shown to be safe and beneficial; therefore, this should be the recommendation for all owned cats. Private practice veterinarians can include desexing before puberty at 16 weeks of age as part of a kitten's preventative health program when they are presented by their new owner. Veterinarians can also advise desexing of a litter of kittens presented by an owner/breeder/rehoming organisation before sale/rehoming, to remove any risk of unplanned litters post-sale/rehoming.

Desexing cats before puberty is a key strategy to address overpopulation of cats. Furthermore, it is safe and provides health and welfare benefits for individual cats. Given the significant benefits of desexing cats before puberty, current recommendations and practices should reflect the current scientific evidence with both owned kittens and kittens from shelters, pounds and other cat rehoming organisations/groups being desexed before puberty and this being routine and normal practice.

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