

# GENETICS

- **Qualitative**
  - aka Mendelian, single-gene
  - few genes
  - discrete variables
- **Quantitative**
  - many genes
  - continuous variables

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# COLORS

- Only 2 base pigments
  - Red / yellow / orange (pheomelanin)
  - Black (eumelanin)
- Everything else is modification of those

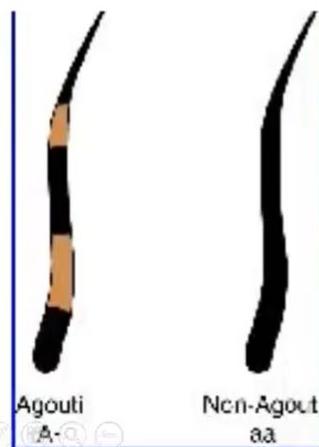
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# COLOR

Banded hair color

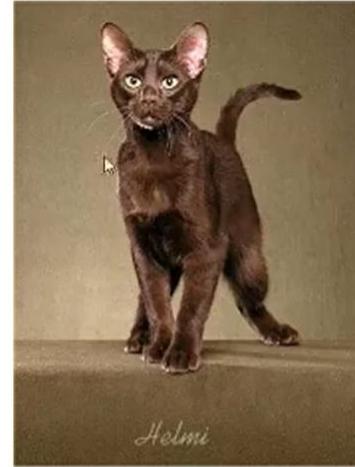
- A - agouti
- a - non-agouti



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# COLOR

- B - solid black
- b - chocolate brown
- b<sup>1</sup> - red brown (cinnamon)



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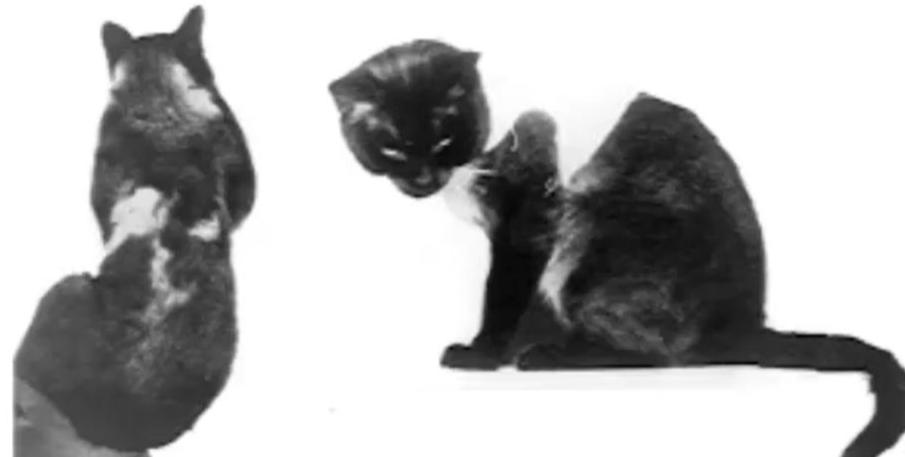
# COLOR

- Color points
  - C - full color
  - $c^b$  - Burmese
  - $c^s$  - Siamese
  - $c^a$  - blue-eyed white
  - c - albino (pink eyes)
  - We won't get into heterozygotes among these.

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# Temperature Dependence



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# COLOR

- D - intense color
- d - dilute color



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# COLOR

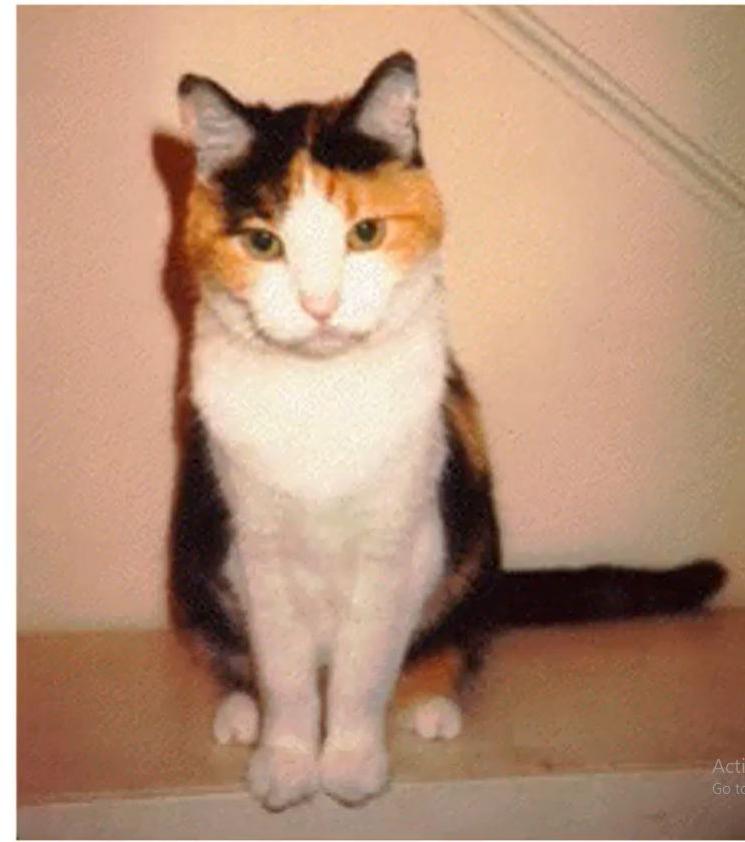
色素

- I - Pigment inhibition -- causes silver or “smoke” coloring
- i - normal pigmentation



# COLOR

- Calico
  - sex-linked
  - O - orange
  - o - non-orange



# SAMPLE #2

- The orange / non-orange gene is sex-linked in cats. It is co-dominant. The O allele gives orange color and the o allele gives non-orange color.
- If an orange queen mates with a non-orange tom, will there be any all-orange kittens? If so, can we determine the sex of these kittens by their color?

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1.00  
TOM

↳  
(black)

X °

Y

X °

QUEEN

(orange)

X °

$X^O X^o$	$X^O Y$
$X^O X^o$	$X^O Y$

# COLOR

- Spots
  - incompletely dominant
  - S - white spotting
  - s - no spotting
  - Probably several other background genes involved with this.



# COLOR

- Tabby
  - $T^A$  - Abyssinian tabby
  - $T$  - striped (Mackerel) tabby
  - $t^b$  - blotched (Classic) tabby



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# COLOR

W - dominant white

w - presence of color



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# CROSSING TWO WHITE CATS SHOULD ALWAYS PRODUCE WHITE KITTENS.

- A. True
- B. False

B



# HAIR TYPE

H - presence of hair

h - hairlessness



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# HAIR TYPE

- L - short hair
- l - long hair

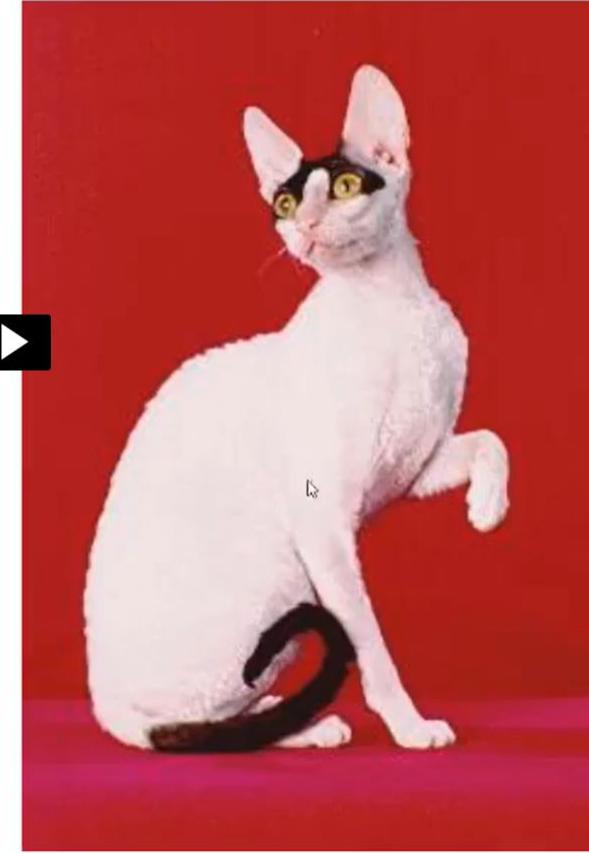


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# HAIR TYPE

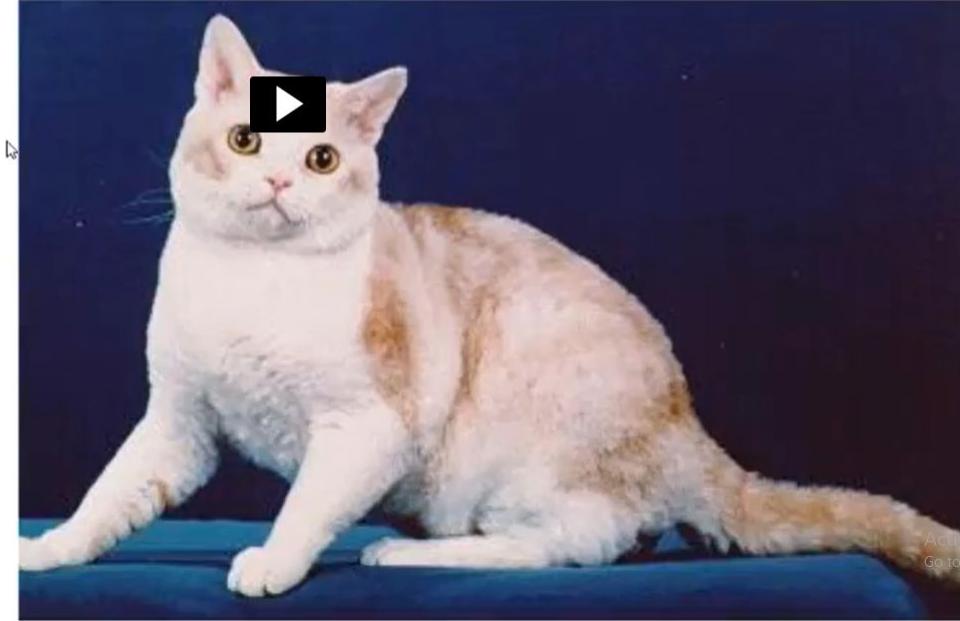
- R - normal hair
- r - Cornish rex



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# HAIR TYPE

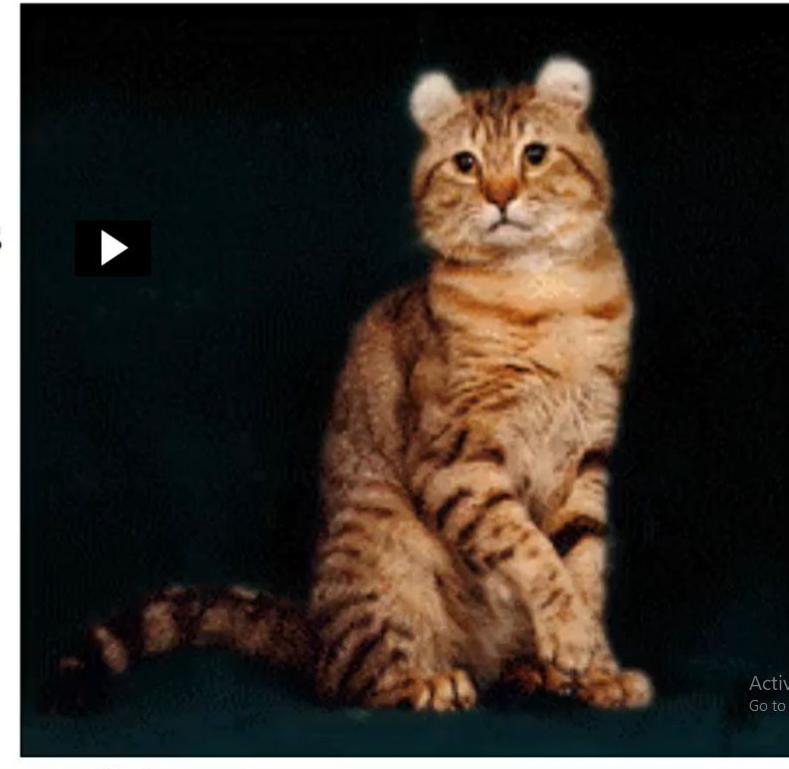
- Wh - wire hair
- wh - normal hair



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# OTHERS

- Folded ear
  - Fd - folded ears
  - fd - normal ears



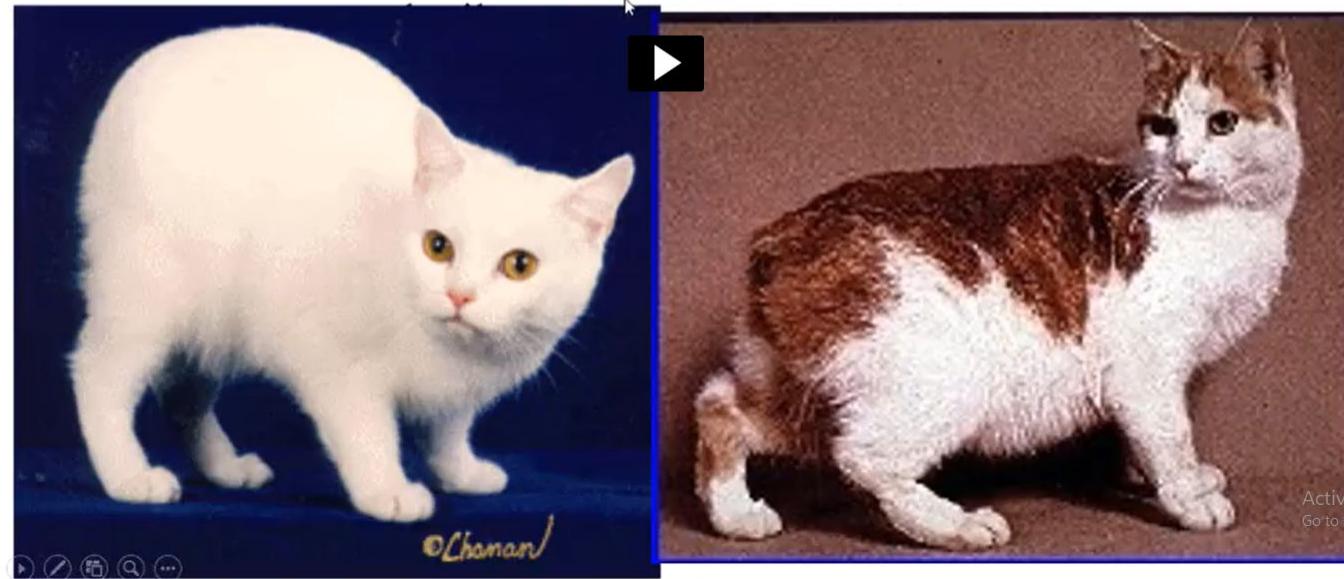
# OTHERS

- American curl
- dominant mutation

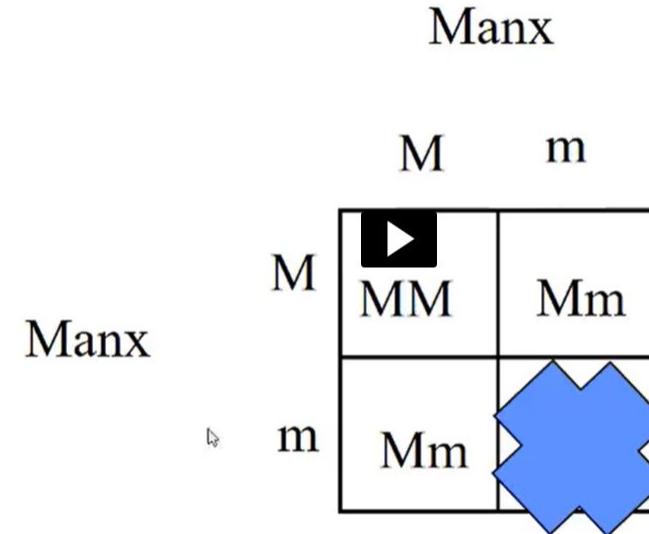


# OTHERS

- Manx tail
  - M - absence of tail



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# How can we produce tailless kittens without producing homozygotes (which would die during development)?

D

- A Cross two manx parents (both without tails).
- B Have one parent manx and the other non-manx (with a tail).
- C Cross two non-manx parents (both with tails) and hope one is a carrier.
- D This can't be done.

that is missing a tail  
and the other one.

# OTHERS

- Japanese bobtail



There is a cat with a  
naturally short tail,

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# OTHERS

- Polydactyly
  - Pd - polydactyly
  - pd - normal # of toes



Polydactyl Mutation

Front foot

Back foot

and I think it's kind  
of an interesting one.



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# “MUTATIONS”



- Happen spontaneously
- Happen fairly often, but most die out
- May be deletions, additions, etc.
- Not initiated by humans (usually)
- Often considered a negative thing
- Allow for evolution

but just to clarify  
and talk about it.

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# OTHER GENETIC CONDITIONS

- Lots of health conditions that have a genetic component
- Many are breed-specific



And I won't get into a lot  
of these in detail here,

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# PUREBREDS AND GENETIC DISEASES

- Inbreeding
  - Breeding of closely related individuals
  - Increases homozygosity
  - Necessary to solidify breed characteristics
  - Can increase incidence of phenotypes of recessive genes
- On the other hand, genetic basis can be seen when pedigrees are known

And again, much like mutation,

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# Comment about “purebreds” and “crossbreds”

纯种

- Fewer cats (than dogs) are purebreds
- Fewer genetic diseases known in cats

There are fewer cats

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# OTHER GENETIC TRAITS

- Munchkin



- Twisty



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# HYPOALLERGENIC CAT

- Allerca Lifestyle Pets company
- Most allergies are to a glycoprotein produced by cat (saliva, sebaceous glands)
- Discovered mutation in some cats
- Selectively bred these cats (with DNA confirmation)

Is this idea of a  
hypoallergenic cat.

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# HYPOALLERGENIC CAT

- \$3950 per cat (or more)
- About 15-18 month waiting list
- Questions about company ethics



questionable and it was  
horribly expensive.

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# COMMENTS ON CLONING

- Genetic Savings and Clone
  - Company that will clone your cat
  - \$50K price tag



But they said they would  
clone your cat and they were

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# COMMENTS ON CLONING

- In quick terms
  - DNA is taken from a donor cell
  - Inserted into an egg with host DNA removed
  - Egg develops into “clone” of donor



ICSI

FIRSTivf.net



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# COMMENTS ON CLONING

- Keep in mind:
  - Very expensive
  - May take many tries
  - Not everything is genetic
    - Behavior may be quite different
    - Other environmental influences

You have to have the lab setup

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# CLARIFICATIONS FROM GENETICS LECTURE

- Punnet squares only give probability of outcomes
- If we have large numbers of offspring, we'd be close to the expected probabilities
- Better to use fractions ( $1/2$ ,  $1/4$ , etc.)
- Just like flipping a coin, there is no connection between one offspring and the expectation of the next one.

So it's kind of like  
flipping a coin.

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# CAT BEHAVIOR

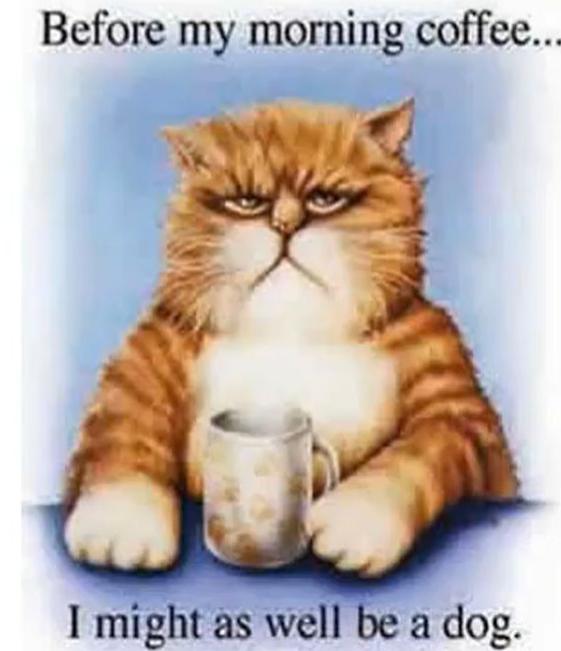


and this probably  
seems obvious to you,

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# NOT A DOG

- Very different social structure
- Commensalism vs. dominance/subordination
- Differences in motivation



but as we'll talk,

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# The Dog's Diary

- 8:00 am - Dog food! My favorite thing!  
9:30 am - A car ride! My favorite thing!  
9:40 am - A walk in the park! My favorite thing!  
10:30 am - Got rubbed and petted! My favorite thing!  
12:00 pm - Milk bones! My favorite thing!  
1:00 pm - Played in the yard! My favorite thing!  
3:00 pm - Wagged my tail! My favorite thing!  
5:00 pm - Dinner! My favorite thing!  
7:00 pm - Got to play ball! My favorite thing!  
8:00 pm - Wow! Watched TV with the people! My favorite thing!  
11:00 pm - Sleeping on the bed! My favorite thing!

You get the idea very  
quickly of the dog.

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# The Cat's Diary

- Day 983 of My Captivity
- My captors continue to taunt me with bizarre little dangling objects. They dine lavishly on fresh meat, while the other inmates and I are fed hash or some sort of dry nuggets. Although I make my contempt for the rations perfectly clear, I nevertheless must eat something in order to keep up my strength.
- The only thing that keeps me going is my dream of escape. In an attempt to disgust them, I once again vomit on the carpet. Today I decapitated a mouse and dropped its headless body at their feet. I had hoped this would strike fear into their hearts, since it clearly demonstrates my capabilities. However, they merely made condescending comments about what a "good little hunter" I am. Arrrgh!
- There was some sort of assembly of their accomplices tonight. I was placed in solitary confinement for the duration of the event. However, I could hear the noises and smell the food. I overheard that my confinement was due to the power of "allergies." I must learn what this means, and how to use it to my advantage.
- Today I was almost successful in an attempt to assassinate one of my tormentors by weaving around his feet as he was walking. I must try this again tomorrow, but at the top of the stairs.
- I am convinced that the other prisoners here are flunkies and snitches. The dog receives special privileges. He is regularly released, and seems to be more than willing to return. He is obviously retarded. The bird must be an informant. I observe him communicate with the guards regularly. I am certain that he reports my every move. My captors have arranged protective custody for him in an elevated cell, so he is safe. For now ...  
Move ahead to the cat.

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# ANTHROPOMORPHISM

- Attribution of human characteristics to non-human object
- Must be careful of this
- Some dog and dog owner research as example

And it's something that  
is very easy to do.

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# OWNER SURVEY

- About 900 dog owners
- Asked if their dog showed different emotions
  - (anger, fear, surprise, joy/happiness, sadness, disgust, guilt, jealousy, embarrassment, interest, love/affection, empathy, curiosity, shame, pride, anxiety and grief)
- About 65% said their dog exhibited jealousy
- Over 40% said their dog exhibited guilt

This was apart of some  
research projects.



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# SOCIAL HIERARCHY

- Wild cats mostly avoid each other
  - “living apart together”
  - Daily patterns to maintain spacing
- Little evidence of social ranking in domestic cats (may be a most dominant or most aggressive cat)
- Feral cats may form a group around a common food source

Actually I'm gonna skip that.

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# DIFFERENCES IN DOMESTICATION (?)

- Domestication different from other animals
  - Religion
  - More difficult to control mating
  - Fewer purebreds today
- So, less selection for behavioral traits

it's thought that the  
domestication for cats



[www.somaluna.com](http://www.somaluna.com)

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# NORMAL BEHAVIOR

- Play
  - About weeks 4-16
  - Individually and with other kittens
  - Improves
    - Coordination
    - Social interaction
  - Mother will start training to hunt ~ 3 weeks of age



and I think I mentioned  
this a bit with

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# KITTENS AND ATTACHMENT

- Daily handling for 40 min. + each day
- Weeks 2-7
- Increased attachment behaviors later in life



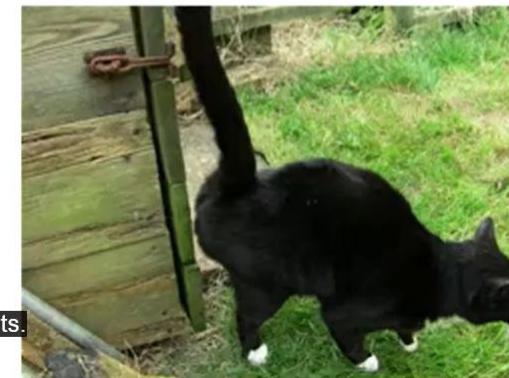
And basically the researchers



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# NORMAL BEHAVIOR

- Predation
  - Different from hunger
  - Well-fed cats still hunt
  - Will stop eating if live prey is introduced
- Eliminative
  - Talked about spraying
  - Urinate to mark territory
  - Usually bury feces



a instinctive behavior in cats.

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# NORMAL BEHAVIOR

- Scratching
  - Leaves scent
  - Sharpens claws
  - Strengthens muscles
- Rubbing / rolling



And cats will scratch.

SCIENCEPHOTOLIBRARY

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# NORMAL BEHAVIOR

- Communication
  - Vocal
    - Calling
    - Mating cry
    - Growl
    - Hiss
    - Snarl
    - Purr

But certainly some of  
these can be quite loud

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# PURRING

- Can be a sign of calm or anxiety
- Intermittent muscular contractions to cause changes in air pressure  of the glottis

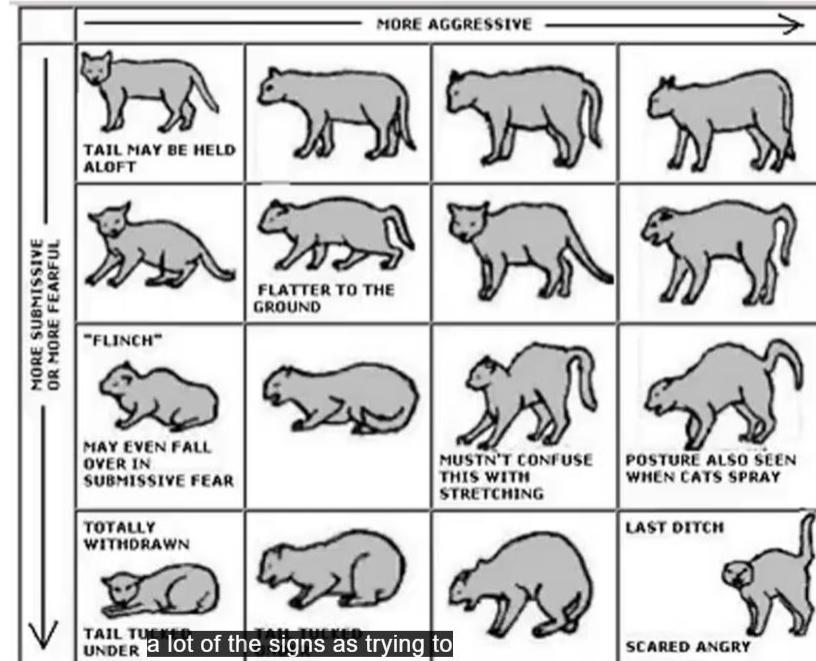
it's this contraction to

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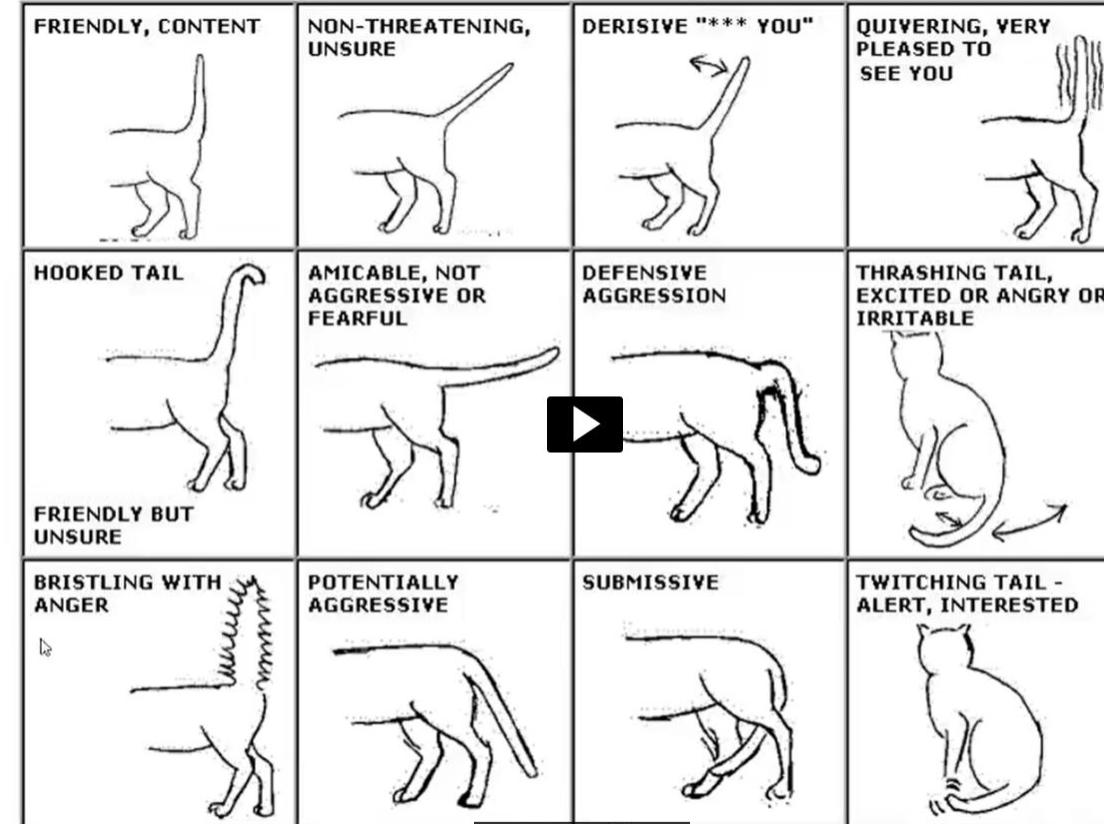


# NORMAL BEHAVIOR

- Postural
  - Hair
  - Ears
  - Tail
  - Back



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Again, lots of these.

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		MORE AGGRESSIVE →
MORE SUBMISSIVE OR MORE FEARFUL	EARS PRICKED FORWARDS	
	EARS OUT SIDEWAYS, FLATTENED	
	PUPILS DILATED, EARS RIGHT BACK	
	PUPILS DILATED, EARS HALF BACK	 the cat. Ears again.
	EARS TURNED BACK	



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# NORMAL BEHAVIORS

- Many forms of aggression
  - Inter-male
  - Fear-induced
  - Pain-induced
  - Territorial
  - Etc.



↳

aggression can be considered  
a normal behavior.

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# ABNORMAL BEHAVIORS

- Pica
  - Chewing / eating non-nutritional items
    - Plant eating
    - Wool sucking



abnormal behaviors that  
you might run into.

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# ABNORMAL BEHAVIORS

- Redirected aggression
  - “stress release”
  - Can be toward another cat or toward humans
    - Solution often to remove original stressor
- Petting induced aggression
  - Cat may be over-stimulated (?)
  - May just be a sign that the cat has had enough

I think it's sort of an  
interesting one to think about.

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# TOP 4 REPORTED BEHAVIOR PROBLEMS

- House soiling
  - Pet-to-pet problems
  - Aggression to humans
  - Destructive behavior
- 
- At least 28% of cats surrendered to shelters  
are due to behavior problems

And I don't think this  
will shock any of you.

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# CONSIDERATIONS WITH BEHAVIORAL PROBLEMS

- Is it an owner problem (i.e., a normal cat behavior that the owner just doesn't like?)
- Common reasons for cat behavioral problems
  - Stress/frustration/boredom
  - Improper socialization
  - Genetic problem
  - Medical problem

what are some considerations  
with some of these problems?

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# TOP 4 REPORTED BEHAVIOR PROBLEMS

- House soiling
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how scratching is  
in normal behavior.

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  - Stress/frustration/boredom
  - Improper socialization
  - Genetic problem
  - Medical problem

Sometimes things  
such as stressors.

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# GENERAL TREATMENT OPTIONS

- Client education
- Environmental modification
- Behavioral modification
  - Conditioning
  - Counter-conditioning
  - Desensitization
    - Habituation
    - Flooding
  - Extinction
  - Aversive conditioning
- Drug therapy

is it something that  
the owner just needs to



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# REINFORCEMENT VS. PUNISHMENT

- Reinforcement
  - Positive often works well
  - Treats, petting, etc.
- Punishment
  - Vocal “no”
  - Squirting with water often works
  - Removal of petting, treats, etc.
- Need to be careful with punishment
  - May be associated with caretaker
  - Response may be difficult to predict
- Timing is still **very important**  
There are a few cases where punishments can be used.

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# SPECIFICS

- Not using litter box
  - Check health of cat
  - Check litter box
    - Location
    - Size and number
    - Presence of stressors
    - Cleanliness
    - Residual odors
    - Type of litter



We're going to talk about  
urolithiasis, for example,

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# LITTER BOX USE, cont.

- Other changes
  - Added pets
  - Diet changes
- Cleaning “accident” areas
  - Clean well
  - Do not use ammonia-based cleaners
  - Eliminate odors
  - Can put food bowl in that area

one of the best things you  
can do is to clean it as

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# SCRATCHING

- Get a scratching post (or 3!)
- Try to match consistency of what they are scratching
- Cover material
  - Double-sided tape
  - Aluminum foil
- De-claw (?)

you want them to  
scratch on and not your



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# AGGRESSION

- Take away stimulus
- See general treatment options (previous)



but sometimes you can figure  
that out and do that.

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# BOREDOM

- Need to spend time with cat
- Many toys available
- Multiple cats (?)
- Feeding toys



Again, boredom can be a  
real issue with cats.

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# OTHER UNEXPLAINED CAT BEHAVIORS

- Earthquake sensing
- Cat that senses death (?)
- Homing ability
  - Cats have traveled up to 1500 miles to return home

do tend to be some  
strange cat behaviors.

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# CAT REPRODUCTION



# Cat Reproduction

- Most cats should not be used for reproduction
- Myths About Cat Breeding
  - I can make lots of money selling kittens.
    - Few responsible breeders make money
  - My children should see the miracle of birth.
    - Many animals give birth at night. Queens can delay parturition somewhat, so they may wait until people are not around.

the years that I'm  
not sure I believe.

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# *Myths About Cat Breeding (continued)*

- I will get another cat just like this queen.
  - Each animal is a unique individual and may not resemble the mother.
- I can find a good home for the kittens.
  - There are not enough homes for all the kittens produced.



we talked about even the  
genetics is not really

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# Cat Reproduction

- Unless you plan to show or breed your cat professionally, you will have a better pet if you have your cat altered.
  - Females yowl and wander
  - Males spray, get into fights, leave home for days. Odor is strong.
  - Altering makes both sexes less likely to roam.
  - With proper diet, weight can be controlled  
healthy for your cat as well as not producing kittens.

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# Puberty

- Normally queen reaches puberty between 7 and 12 months. (can be as young as 4 months)
- Tom will reach puberty in about 9 months and starts showing Flehmen response



So, as I mentioned with some  
other reproductive cycles,

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# *Facts about Cat Reproduction*

- Cats are seasonally polyestrous (long day breeders)
- Normally start breeding 20 days after the winter solstice (shortest day light period), though temperature can also have an effect
- Cycle about every 2-3 weeks
- A long anestrous period
- Some cats cycle year-round

but the cat is

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# *Behavioral Changes with Estrus*

- Constant calling (especially Siamese)
- Rolling
- Rubbing against objects
- May spray urine
- Licks genital area
- Crouching (lordosis) -With reference to cat you may see term “swayback”
- Lasts an average of 9 days

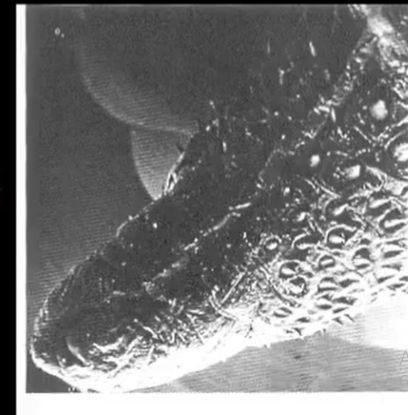


Well, I've mentioned  
this calling and I'll,

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# *INDUCED OVULATION*

- Queen must be **induced** to ovulate
- Physical act of mating causes this
- Multiple matings will increase LH surge
- If mating does not occur, follicles will regress



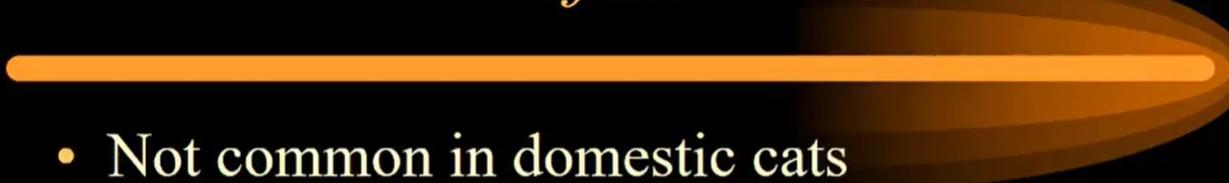
Now, this picture may  
be a little obnoxious,

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# *IF YOU ELECT TO BREED YOUR CAT*

- Best choice is selective breeding.
- Animals selected for breeding should be excellent representatives of the breed, free of hereditary defects.
- May want to deworm queen ahead of time
- Consider time and distance of shipment.
- Place in own quarters, adjoining tom's but separated from his by wire mesh.
- Often mate at night
- After mating three or four times, tom and queen can be left together for two or three days.  
But if you're going to,
- May still be in estrus when you get her home, so be careful\*\*

# *Artificial insemination*



- Not common in domestic cats
- Can be done
- Logistics may be more difficult

It isn't very common in cats,

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# *Selected or Non-selected Breeding*

- Peak estrus for cats: March, June, Sept. (maybe)
- If you let your queen out for a moonlight stroll while in heat she will present you with a litter in about 66 days.

I think the queens are going



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# *Signs of Pregnancy*



- Signs of pregnancy
  - Cycles stop
  - “Pinking-up” Reddening of nipples in about three weeks
  - Weight gain up to 2 lb. not unusual
  - Swollen abdomen
  - Behavior becomes maternal

I think that will be pretty  
obvious in most situations,

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# *Care of Pregnant Queen*

- Handle gently, especially instruct children on handling a pregnant queen
- Feed pregnant cat well (but don't overdo) and allow ample exercise
- A few days before birthing the queen will search for a nest.

Really, there's not a whole lot

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# *BIRTHING (kittenning)*

- Prepare a box - line with rags, old towel or shredded paper
- Should be in dark, warm place, out of traffic.
- If these conditions are not provided she will likely move them.



be in a dark, warm  
place typically.



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# *READY TO GIVE BIRTH*



- Nesting
- Milk leaking from nipples
- Restless pacing
- Panting
- Excessive grooming
- Temperature drop
- Contractions

Well again, kind of  
forming that nesting area,

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# *BIRTHING (kittening)*



- Gestation can be from 58 to 70 days (from mating)
- She should do well by herself, but if she has not delivered any kittens after four hours of labor call a veterinarian. (may need Caesarean birth)
- Be sure that each kitten born is followed by its placenta. (\*)
- Process normally takes less than 6 hours

I would say, uh you see  
here gestation can vary.

Activate Windows  
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## *Notify a veterinarian if any of the following occur:*

- You cannot remove a kitten from the birth canal.
- Labor is strong and persistent for 30 minutes without a birth.
- Labor is weak and intermittent for 5 hours without any results.
- There is a dark, vaginal discharge, and no labor or births have occurred within 3-4 hours.
- The pregnancy lasts more than 67 days.

– [www.cpvh.com/2011/07/27/gestation-in-cats/](http://www.cpvh.com/2011/07/27/gestation-in-cats/)

If there's a kitten  
stuck in the birth canal,

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- Remember the importance of colostrum

初乳



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# *New Mother*

- Feed the queen as much as she wants while nursing.
- Little or no care is required for queen will clean the kittens and take care of their waste.



again let the queen take



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# New Mother

- Kittens will open their eyes in about 10 days.
- Double their weight in first 2 weeks



## *More kitten development*



- Ears will open in week 3
- Ears will become more erect
- Teeth may start to come in
- Start to move around – week 3 or 4
- Some people start litter training  
Generally, the teeth will start to

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## *More kitten development*



- Can offer feed, queen may start weaning kittens
- Weeks 5 and 6 – a lot of socialization between kittens, and with humans
- Often deworm at 6 weeks
- 7 weeks – first vaccinations are common

feed by five to six weeks or so

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# *More kitten development*

- Socialization is very important
  - Expose kitten to many different things
  - Teach good habits
    - Don't allow biting, scratching hands
  - Spend time with the kittens



noises, little kids,

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# *Spay / neuter*

- Can be done before 4 months of age
- Some suggest 5-7 months
  - Easier for anesthesia ►
  - Risk of early pregnancy

you might be looking to get  
them spayed or neutered.

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# *FIRST AID FOR PETS*

- General:
  - Always approach a sick or injured animal slowly and cautiously ►
  - use towels or blankets to subdue cats or small dogs

First thing I would suggest,

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Press Esc to exit full screen

# FIRST AID



- FRACTURES

- if out of alignment, put on splint
- if compound, splint and wrap
- transport to hospital without movement

to get them to a veterinarian.

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# FIRST AID



- FRACTURES

- if out of alignment, put on splint
- if compound, splint and wrap
- transport to hospital without movement

prevent further damage  
from this moving around.

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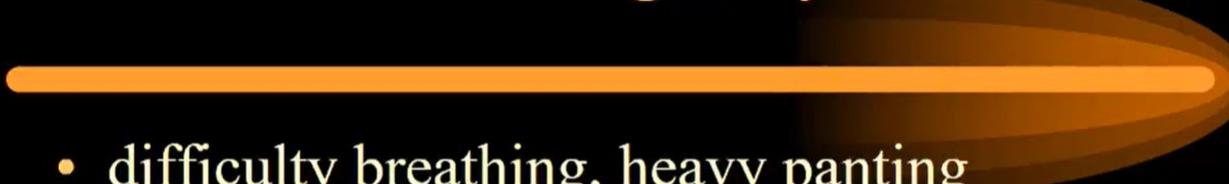
# HEATSTROKE



- Causes
  - poor ventilation
  - inadequate shade
  - excitement
  - overexertion
  - hot weatherIn many situations is probably number one,

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# *Signs of heatstroke*



- difficulty breathing, heavy panting
- elevated body temperature
- rapid heart rate
- dilated pupils, pale mucous membranes
- staggered gait
- collapse
- convulsions and vomiting

You've got heavy panting,  
rapid heart rate,

Activate Windows  
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# *Treatment of Heatstroke*



- Reduce body temperature
  - place in cool, shady place
  - place in ~~cold~~ shower
  - sponge with cool water, rubbing alcohol
  - use fan, air conditioners
  - give small amount of water or saline solution
  - if vomiting discontinue fluid
  - do not drop **temperature** below 100 F  
That's the number one thing.

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# Shock

- What is shock?
  - Inadequate blood flow to organs
    - Low blood volume
    - Inadequate cardiac function
  - Brain (and other organs) becomes short of oxygen
  - Wastes accumulate

really prevention would  
be the best bet there.

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# SHOCK

## Signs

Drop in body temperature

Shivering

Listlessness and weakness

Cold skin

Pale mucous membranes

Faint pulse

you don't have the blood  
circulating throughout.



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# *SHOCK*

- Wrap loosely in a blanket
- Try to keep animal calm and comfortable
- Stop bleeding if that is the cause
- May have to administer CPR

because they have an  
injury and they're bleeding,

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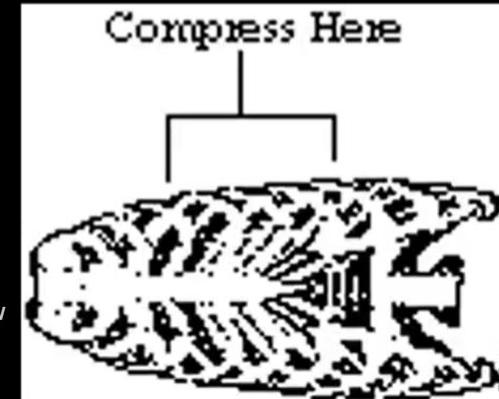
# CPR For DOGS and CATS

心肺复苏

- Similar to CPR for humans
- Airway, breathing (?), compressions
- Dog or cat should lay on right side, if possible
- Person kneels behind them



and you don't have to know  
all the details of this,



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# Frostbite

- Signs
  - cold, pale skin
  - loose, scaly skin
- Treatment
  - protect from further injury (**watch for salt and ice**)
  - slowly warm, immerse in lukewarm water,  
apply warm wet packs
  - do not rub affected area  
cold in the winter  
is an issue as well.
  - maintain respiration

# CAT NUTRITION

- *Most* general nutrition rules still apply
- Cats have some very specific needs, however
  - Obligate carnivores
- Huge business
  - ~\$6.4 billion – 2014
  - (treats ~.5 billion)



may have mentioned in the introductory lecture.

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# ENERGY

- Most need 70-90 kcal/kg body wt. / day ME
- Kittens – up to 250 kcal/kg/day
- Fats, carbohydrates, proteins



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# WHAT IS ME?

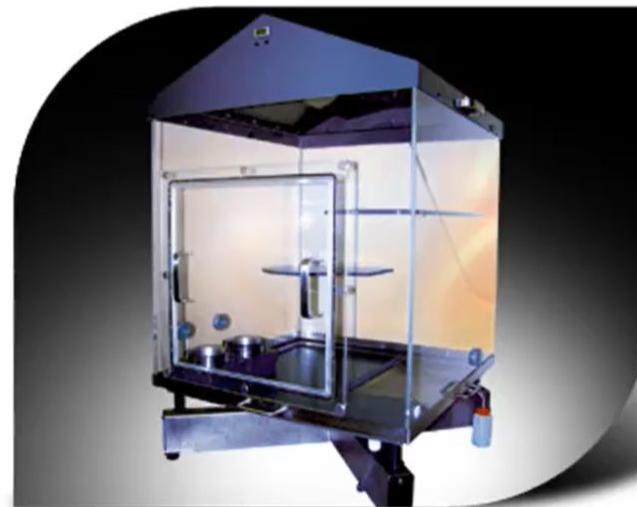
- GE = gross energy
- DE = digestible energy
- ME = metabolizable energy
- $GE - \text{fecal energy} = DE - (\text{urine and gas energy}) = ME$
- Energy is usually expressed as **DE** or **ME**  
ME used for: maintenance, heat  
increment, production (growth, gestation,  
activity and lactation)

what I think I was  
talking about in

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# METABOLISM CAGE



the urine and the gases from them.

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# MORE ON ENERGY

- Most animals eat to meet their energy requirement (\*\*)
  - Intake can be upset by:
    - Decreased activity
    - Drastic change in environmental temperature
    - Palatability changes
    - Change from low energy to high energy food
    - Change in health of teeth and gums
    - Improper balance of nutrients

the calories, but  
just understand that.

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# MORE ON ENERGY

- No real requirement for carbohydrate
  - Cats lack salivary amylase
- High levels of carbohydrates (esp. sugars, rather than starches) probably not very healthy
- Many adult cats are lactose intolerant

Again, there's no real  
requirement for carbohydrate.

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# FATS

- Fat

- Cats can handle 50% fat in their diet
- Need at least 9% (of dry matter)
- Free choice 15 - 20%
- Fat affects **palatability** 飴口
- Required fatty acids (linoleic, linolenic, arachidonic\*\*) – deficiency usually causes skin and coat problems first
- Excess can cause diarrhea

quite a bit of it in  
their natural diet.

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# Protein

- Very high requirement (up to 40%)
- 25-30% usually suggested
- Body doesn't adjust well to low-protein diets
- Specific amino acid requirements
  - Arginine
    - One meal without arginine can be potentially deadly
    - Not usually a problem, since arginine is very common

cats being carnivores,  
they do have

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# IS IT HEALTHY TO FEED ONLY DOG FOOD TO A CAT?

- A. Yes
- B. No



B

probably is not  
healthy to do that.

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# “Amino acid-like” substance

- Taurine
  - Most animals can convert cysteine to taurine
  - Cats can't
  - Deficiency can caus▶
    - Retinal degeneration
    - Heart problems
  - Only present in animal tissues



And it's basically an amino acid.

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# Vitamins

- Vitamin A
  - Cats can't convert beta-carotene to Vit. A (retinol)
  - Other animals can
  - Toxicity can occur, esp. if feeding large amounts of liver
- Niacin
  - Most animals convert amino acid tryptophan
  - Cats can't

somebody probably told  
you to eat your carrots.

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# Vitamins

- Thiamin \*\*\*
  - Not usually deficient, but some anti-thiamin substances occur
    - In some raw fish, esp.



It's in the diet and  
they would get it.

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# Minerals

- 12 known to be required by cats and dogs
- Bioavailability is a concern (whether the animal can actually use the mineral)
  - Example phosphorous in plants
- NaCl (salt is very important)
- Concern about urolithiasis\*\*
- Remember calcium to phosphorus ratio (esp. with high-meat diets)  
Certainly there are minerals required.

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# Lastly...What Is The Most Important Nutrient?

- 70% of adult and 75% of young are water.
- Serious consequences of dehydration.
  - Do cats sweat?
- May be a concern when feeding dry diet
- Provide cool fresh water throughout the day

They should have access to  
fresh water all the time.



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# “Non-nutritional” Feed Considerations

- Digestibility is very important
- Consistency, odor, volume, etc. of feces
  - Low cost = high defecations
- pH of urine (esp. in cats)
  - Urinary calculi
- Appeal of feed to owner (color, odor, texture)
- Appeal of food to animal (smell)



I want to mention a bit

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# Cat foods

- Three basic types
- Dry
  - **5-12% moisture**
  - 8 -12% fat
  - 28 - 36 % protein
- Semi – moist
- 15-30% moisture
- often contains fish products
- 28 - 40 % protein
- Canned
  - **72-85% moisture**
  - 10-40% fat (on basis of dry wt)
  - 28 -50% protein (on basis of dry wt)
  - 80% of thiamin is lost in canning process, so processor must add extra thiamin



And I'll compare those two.

# IS DRY CAT FOOD BETTER THAN WET CAT FOOD?

- A. Yes
- B. No



↳

I will give you some  
comments here in

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# DRY VS. WET

- Dry
  - Less water
  - May have more plant protein
  - May have more carbohydrate
  - Cheaper
  - Less spoilage in dish
  - Better for teeth
- Wet
  - More water
  - May have more animal protein
  - May have less carbohydrate
  - More expensive – pay for a lot of water
  - Spoils more quickly

Again, a lot more. Okay?



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# Regulatory Agencies

- USDA (United States Department of Agriculture)
- FDA (Food and Drug Administration)
- FTC (Federal Trade Commission)
- State Associations = Department Agriculture, Trade, Consumer Protection (DATCP)
- **AAFCO** (Association of American Feed Control Officials) \*\*\*
- National Academies 2006; Nutrient Requirements of Dogs and Cats.
  - A valuable resource for industry professionals and a bit about the regulatory agencies formulating diets; label regulations etc.

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# AAFCO

- Association of American Feed Control Officials
  - Maintains official definitions of feed ingredients
  - Regulates labeling terms “Complete” and “Balanced”, “Nutritious”, etc.

Number one, they have

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# Examples of Ingredient Definitions

- "meat" is defined as the "clean flesh of slaughtered mammals and is limited to...the striate muscle...with or without the accompanying and overlying fat and the portions of the skin, sinew, nerve and blood vessels which normally accompany the flesh."
- "meat meal" is "the rendered product from mammal tissues, exclusive of any added blood, hair, horn, hide trimmings, manure, stomach and rumen contents."

have further defined  
how much protein,

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# Regulatory Agencies

- USDA (United States Department of Agriculture)
- FDA (Food and Drug Administration)
- FTC (Federal Trade Commission)
- State Associations = Department Agriculture, Trade, Consumer Protection (DATCP)
- **AAFCO** (Association of American Feed Control Officials) \*\*\*
- National Academies 2006; Nutrient Requirements of Dogs and Cats.
  - A valuable resource for industry professionals formulating diets, lab analysis that your pet food regulations etc.

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# HOW MUCH TO FEED?

- Unlimited access?
  - Cats will eat 8-16 small “meals” each day
  - Many will overeat, especially with inactivity



up and this is a question  
that comes up very

↳

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# HOW MUCH TO FEED?

- Two meals a day are usually good
  - Limits intake
  - Also helps to monitor eating habits
- Multiple cat households may need to use separate feeders



One, it limits the intake  
so that they don't overeat.

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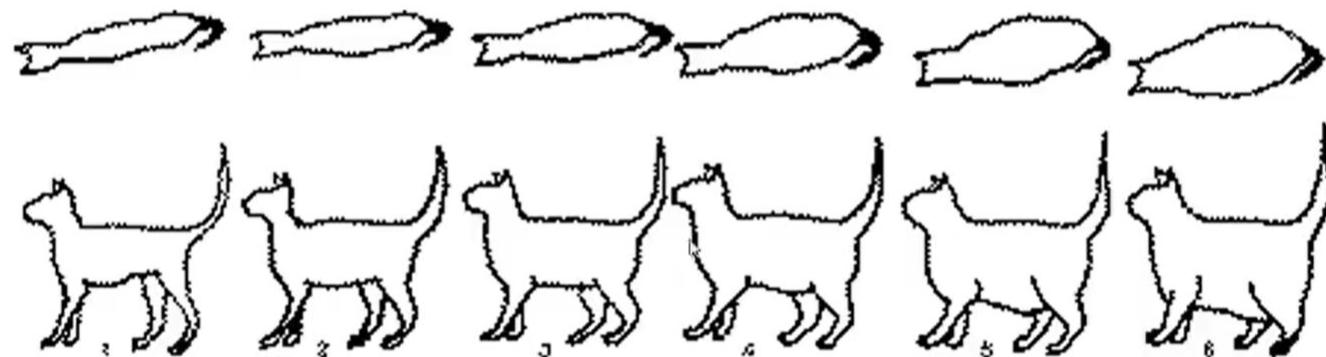
# How Much To Feed?

- Different companies have come up with different methods
- Body Condition Scores
  - Example 1-5
  - 1 = emaciated 消瘦的
  - 3 = ribs and musculature palpable
  - 5 = extremely obese

not just with cats but  
with many animals.

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# ANOTHER BODY CONDITION SCORE SYSTEM



The point being, you really  
would like your cat to be

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# How Much To Feed?

- Different companies have come up with different methods
- Body Condition Scores
  - Example 1-5
  - 1 = emaciated
  - 3 = ribs and musculature palpable
  - 5 = extremely obese
- Body Mass Index (?)

Now the other method is  
called the body mass index.

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# OBESITY

- Very common problem
- Weighed 15 kg
- “waist” measured 77 cm



# CAT “DIETS”

- Be very careful
- Restricting food can be dangerous
- Hepatic lipidosis
- Cats may have to be tube-fed for a while



And I mentioned that

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# TREATS AND TABLE SCRAPS

- Commercial diets are formulated to be fed as the sole ration
- Can be difficult to feed a balanced diet from table scraps
- Table scraps / leftovers may not be ideal
- Treats, if fed in large quantities, can affect formulation
- Generally, shouldn't be more than 10% of diet

Certainly not more than  
10% of the diet.



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# VEGETARIAN DIETS

- Difficult to fulfill all nutrient requirements
- **ESPECIALLY DIFFICULT** for cats
- Cat digestive systems are not really designed for vegetarian digestion
- No taurine in a vegetarian diet; no B-12 and little of other B-vitamins; zinc low etc
- Need several supplements



need to be on a carnivore diet.

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# SUPPLEMENTS

- Feed is manufactured to be complete diet
- Probably better to feed a little better feed rather than use supplements
- Over-supplementation can cause problems

are not a wonderful thing in most cases.



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# FEEDING GERIATRIC CATS

- Most important to feed high quality proteins
- Energy needs are typically less (maybe 30-40% less)
- Fat levels can be lowered slightly
- Monitor dental health

The last thing I have  
is as cats get older.

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# CAT HEALTH & DISEASES



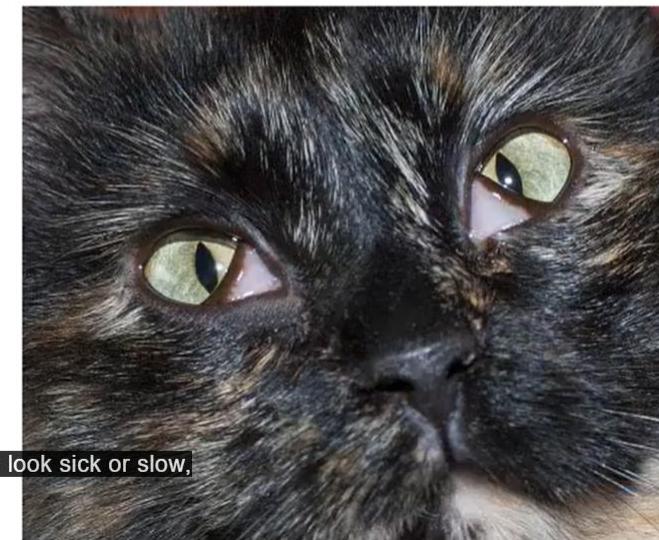
the other health and  
disease lectures,



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# Sick Cats

- Cats will attempt to hide illness
- Signs of illness: coughing, sneezing, vomiting, nasal discharge, lumps under skin, nictitating membrane exposed
- Normal temperature should be ~101.5 F



And so if they look sick or slow,

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# WHERE WOULD YOU FIND THE NICTITATING MEMBRANE?

- A. On the tongue
- B. On the eye
- C. On the anus
- D. In the ear
- E. Between the toes



B



But the nictitating membrane.



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# NICTITATING MEMBRANE



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## Sick Cats (continued)

- Cats will neglect cleaning themselves when very sick or very old.
- Do not treat major problem yourself, but take your cat to a veterinarian.
  - He or she can advise you and help you reach a decision.



Another sign that  
your cat may have

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# CHRONIC VS. ACUTE

- **Chronic**
  - A long illness
  - Might see dull coat, excessive shedding, listless behavior, refusal of food, dull eyes
- Contrast this with an **acute** illness
  - Often more severe
  - End results are in a few days, usually

We can talk about chronic  
versus acute illnesses.

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# DISEASE PREVENTION METHODS

- Biosecurity
- Nutrition
- Tooth hygiene
- Sanitation
- **Vaccinations**
- Parasite control



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# BIOSECURITY

- Methods of disease spread
  - **People**
  - Fomites
  - Contact with feral cats
  - Rodents, insects, etc.
  - Bringing new cats into an old cat's environment
    - Check for internal and external parasites
    - Isolate new animal for two weeks if possible
- Biosecurity seeks to avoid these concerns

And so really we can  
think about the ways

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# Nutrition

- Basic lecture and cat-specific lecture on nutrition
- Complete ration
  - AAFCO labeling
  - Formulated to meet the cat's status
- Ration must contain adequate vitamin A, niacin & taurine

Certainly nutrition  
can be important.

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# DON'T HAVE A COUCH POTATO CAT!



I would encourage you to,

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# Tooth Care

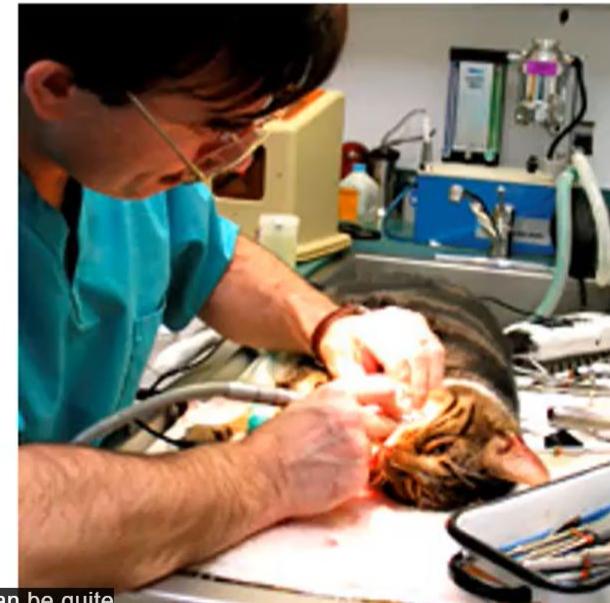
- Dry feed
- Flossing toys (maybe)
- Other dental treats
- Train to accept toothpaste and brush
- Veterinarian tooth cleaning (expensive)

And I would say for  
many years I've been

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# Cleaning Teeth



So again, it can be quite

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# Sanitation

- Could be considered part of biosecurity
- Household cleaning compounds
  - Chlorine bleach with water
  - Lysol spray
  - Most are effective, if used correctly
- Litter box - plastic or steel and not wood or paper (rinse clear of disinfectant odor)

But you can consider this  
part of biosecurity.

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# Vaccinations

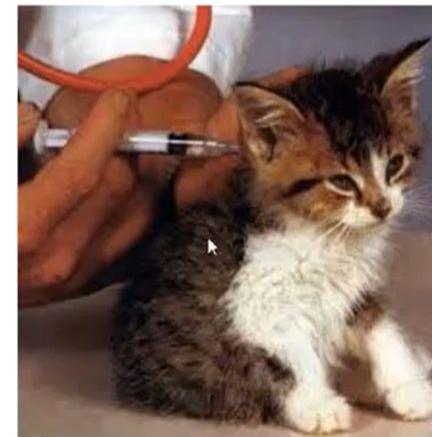
- Follow the recommendation of the veterinary clinic
- Vaccination requirements may vary by state
- Principles of immunization
- Passive immunization from mother
- We'll discuss some common diseases later

And then really, what I  
think most people think

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# VACCINATION

- Give antigen
  - Usually mild, killed, or attenuated form
  - Could be protein, toxoid, etc.
- Body mounts response to antigen
  - Antibody production
  - Long-term protection
- Form of *active immunity*



Generally it's going to be  
a shot as you see here,

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# PASSIVE IMMUNITY

- Contrast to active immunity
- Short-term protection
- Usually from **colostrum**
  - Passive transport, 24 hours
  - Lasts 1-2 mo



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# Parasite Control

- Prevention before moving into a new apartment
- Feed your cat cooked food
- Avoid allowing consumption of birds, rabbits and rodents
- Treatments/preventatives to control external parasites (sprays, shampoos, dips, pills and systemic injections)

But a few things to think about.

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# CAT DISEASES

- Preventive Medicine
- Common Ailments
  - Viral
  - Bacterial ↵
  - Fungal
  - Protozoa
  - Parasites
  - Others



And again, I will  
go through viral,

Nottingham  
Vet School

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# Common Viral Ailments



So with that, we'll talk about



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# Feline Infectious Peritonitis (FIP)

- Biology - a coronavirus & a problem in catteries, uncommon in home environment, high mortality (~ 95%)\*
- Clinical signs
  - **Enlarged abdomen** caused by fluid buildup
  - Fever, weight loss, eye lesions, nasal discharge
- Prevention - vaccine introduced in 1991
  - Place drops in nose (two doses, 3 or 4 weeks apart)
- Treatments - No cure, fluids, avoid secondary infections by use of antibiotics

But feline infectious  
peritonitis.

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# Feline Infectious Peritonitis (FIP)



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# Feline Leukemia Virus (FeLV)

- Biology - a virus shed in saliva, urine and feces
  - 25 to 60 % of free roaming cats are infected  
(most common very young and very old)
  - If chronically infected rarely live longer than three years.
  - **Impaired immune system** – die of other diseases
- Clinical signs - fever, anorexia, leukopenia, anemia and enlargement of lymph nodes  
It is a pretty common disease.

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# FeLV (continued)

- Treatment -Control secondary infections
- Prevention
  - Avoid contact with infected animals
  - Vaccinate - 9 weeks, 12 weeks, and annually
- No Cure



# Feline Panleukopenia (FPL)

## {cat distemper, cat fever, cat plague}

- Biology - A contagious viral disease that affects all members of the cat family as well as raccoons, mink and ferrets
  - Can live in environment for more than a year
  - Transmitted via feces, vomit, urine
  - Incubation period is 2 to 9 days
  - It is an acute disease with either recovery or death within a week

it is carried by several  
different animals.

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# Feline Herpesvirus & Feline calicivirus

- Herpesvirus also know as feline rhinotracheitis virus
- Most commonly called feline URI (upper respiratory infection)
- Biology
  - Transmitted by cat-to-cat contact, clothing, food and litter boxes
  - Virus shed for a year after recovery
  - Species-specific
- Clinical Signs
  - Fever, sneezing, coughing, hypersalivation, nasal discharge, tearing, oral ulceration These are these rhinotracheitis.
  - Treatment - Supportive care antibiotics & fluids

# FHV and FCV (continued)

- Prevention and Control
  - Clean up with alcohol and detergents
  - Vaccination - Both viruses are usually in a single vaccine

try to vaccinate and prevent.

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would vaccinate for as well.

# RABIES

- A virus
- Infects all mammals
- Will be covered in special lecture



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# Bacterial -Feline Pneumonitis

- Biology
  - The bacteria *Chlamydia psittaci*
  - Transmitted by direct contact, aerosol & secretions
  - humans can be infected
- Clinical signs - chronic conjunctivitis for 45 days
  - Mild rhinitis
  - sneezing and nasal discharge
- Treatment - antibiotics



# Cat Scratch Fever

- Biology – *Bartonella* infection
  - Not a problem in cats but is zoonotic
  - Symptoms (in humans)
    - Bump or blister at wound site
    - Fever
    - Malaise, fatigue
    - Swollen lymph nodes
    - Headache

Now, this one is a  
bacterial infection.



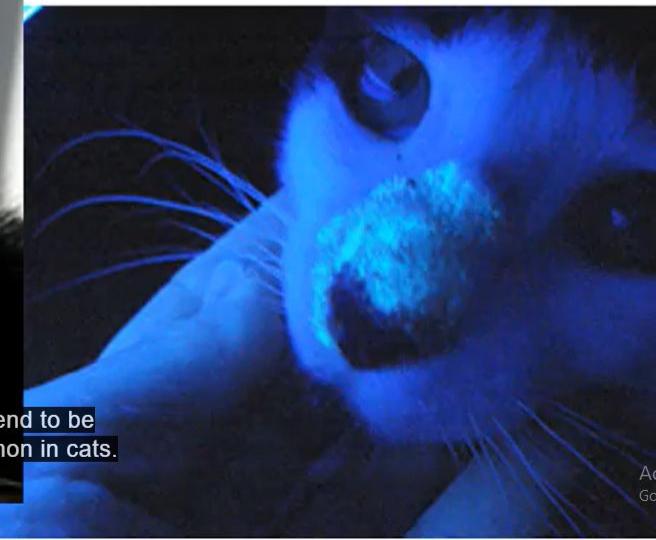
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# Fungal

- Ringworm



It does tend to be  
fairly common in cats.



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# Protozoal

- Toxoplasmosis
  - Life cycle/transmission, oocysts
  - Special precautions



A fetus may contract toxoplasmosis through the placental connection with its infected mother



in the human. Protozoal.



The mother may be infected by:

Improper handling of cat litter

Handling or ingesting contaminated meat

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# INTERESTING RESEARCH



And it has to do with the fact

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# Toxoplasma

- In **2003**, E. Fuller Torrey of the Stanley Medical Research Institute in Bethesda, Maryland his colleagues noted a link between Toxoplasma and schizophrenia – specifically, that women with high levels of the parasite were more likely to give birth to schizophrenics-to-be.
- Women with *Toxoplasma* infections were 54% more likely to attempt suicide – and twice as likely to succeed.
- Suicide attempt risk was positively correlated with the level of infection. Those with the highest levels of antibodies were 91% more likely to attempt suicide than uninfected women.
- In **2006**, researchers linked Toxoplasma infection to neuroticism in both men and women. Neuroticism – as defined by psychology – is the “an enduring tendency to experience negative emotional states,” including depression, guilt and insecurity.
- <http://blogs.scientificamerican.com/science-sushi/2012/07/04/toxoplasmas-dark-side-the-link-between-parasite-and-suicide/>

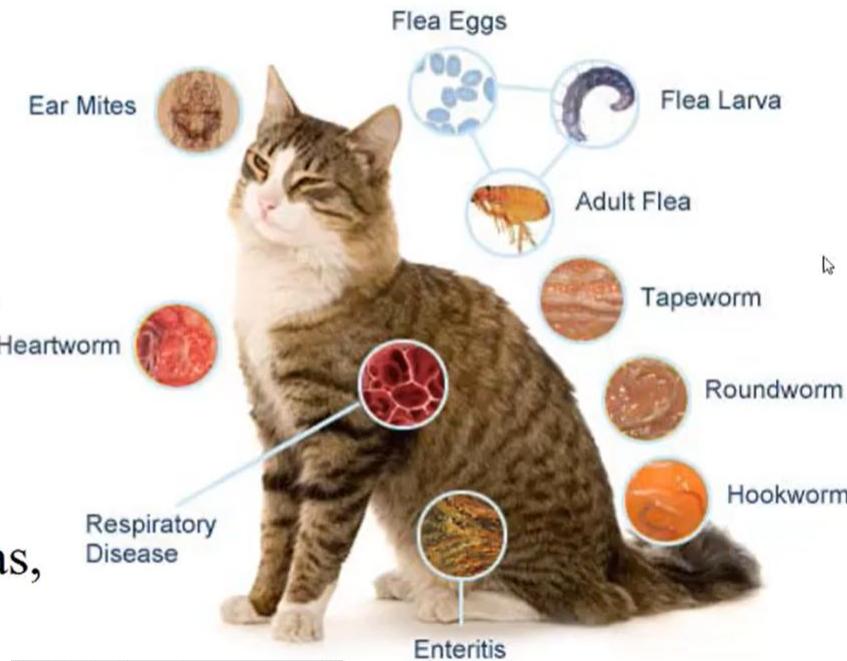
**And so what people found.**

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# Parasites

- Internal and External
  - Internal (tapeworms, roundworms, whipworms, hookworms, heartworm)
  - External (fleas, ticks, lice, earmites)



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# Other Medical Problems

- Feline Urinary Syndrome or FUS
  - Also called urolithiasis, FLUTD (Feline lower urinary tract disease)
- Diabetes
- Allergies
- Hair balls
- Poisons

Again, I've mentioned  
this urolithiasis.

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# RINGWORM



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