

Approach to animal bites



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How common is animal bites?

- USA: Bite wounds account for 1% of all emergency room visits
- 2 million bite wounds per year
- Dogs: 80 to 90%
- Cats: 5-15%
- Although most bites are minor, they can result in major morbidity.

Contents

- A) Overview on common pathogens associated with bites from specific animals
- B) General principles on animal bite management
- C) Consideration of prophylactic or therapeutic antibiotic
- D) Consideration of *Tetanus* prophylaxis
- E) Consideration of Rabies prophylaxis
- F) Other animal bite management (*C. Canimorsus*, *F. Tularensis*, Rat bite fever, Cat Scratch Disease, Snake bite)

(A) PATHOGENS ASSOCIATED WITH BITES FROM SPECIFIC ANIMALS

Animal	Pathogen
Any vertebrate	* <i>Clostridium tetani</i>
Mammal	* Rabies <i>Lyssaviruse</i>
Dog	* <i>Pasteurella multocida</i> * <i>Capnocytophaga canimorsus</i>
Cat	* <i>Bartonella henselae</i> * <i>Pasteurella multocida</i> * <i>Francisella tularensis</i>
Rat	* <i>Streptobacillus moniliformis</i> * <i>Spirillum minus</i>
Fresh-water species	<i>Aeromonas hydrophila</i> <i>Mycobacterium marinum</i>
Salt-water species	<i>Vibrio vulnificus</i> <i>Mycobacterium marinum</i>
Macaque(獼猴)	<i>Herpesvirus simiae (B virus)</i>

(B) General principles on animal bite management

HELICOPTER: An Acronym for Management of Animal Bite Wounds

H	History
E	Examination
L	Liberal cleansing and
I	Irrigation
C	Closure, culture consideration
O	Operative cleansing and closure
P	Prophylactic or therapeutic antimicrobial agent use
T	Tetanus immunization status
E	Elevation
R	Rabies risk

History taking



- Circumstances of the injury (provoked or unprovoked)
- Type of animal involved (Dog bites become infected 2-20% of the time, one of the lowest rates for mammalian bites.)
- Current location of the animals/ ownership/ vaccination status
- Patient's underlying medical conditions
- Drug allergy
- Tetanus immunization status

Physical exam



- Location/type/depth of wound
- Range of motion, neurovascular function
- Signs of infection
- LN
- Xray if wound near joint or bone

Principle of wound management

- Clean with 25% soap solution or dilute povidone-iodine solution, followed by irrigation with copious normal saline with syringe
- Take culture after topical decontamination (if infection suspected)
- Remove foreign bodies and necrotic tissue. Delayed suturing is advised for contaminated, large or deep wounds and hand wounds
- Ortho/ surgical consultation as appropriate
- Elevation and immobilization of wound



Bacteria commonly isolated from Dog/Cat bite wounds Often polymicrobial

- Aerobes:

- Streptococci species
- Staph aureus and other species
- Pasteurella multocida
- Moraxella species
- Corynebacterium species
- Neisseria species

Anaerobes:

- Actinomyces
- Bacteroides
- Fusobacterium
- Peptostreptococcus
- Prevotella
- Capnocytophaga species
- Eikenella corrodens

C) Prophylactic Antibiotics Regimens for animal bite wounds

- Empirical Rx:
 - Oral amoxicillin-clavulanic acid
 - Duration 5-7 days
-
- For patient with allergy history of life threatening reactions to penicillin:
 - Oral clindamycin + fluoroquinolone
 - Oral clindamycin + tetracycline
 - Oral clindamycin + Septrin (pediatric)
 - For patient with allergy history of non-life threatening reactions to penicillin:
 - Oral cefuroxime + metronidazole

(B) General principles on animal bite management

Indications for Initiation of Antimicrobial Therapy in Animal Bite Wounds

- All puncture wounds
- Bites involving the hands, feet, face, or genital area
- Moderate or severe wounds, particularly with edema or crush injury
- All wounds in immunocompromised individuals
- Bite wounds with signs of infection

C) Treatment of established bite wound infection

- Treatment after wound swab for C/ST
- depends on the progress; usually 7-14 days; extend if there are joint/ bone involvement
 - Parenteral therapy preferred for admitted patient with infected bites
 - IV/Oral amoxicillin-clavulanic acid
 - For patient with allergy history of life threatening reactions to penicillin:
 - Oral clindamycin + fluoroquinolone
 - Oral clindamycin + tetracycline
 - Oral clindamycin + Septrin (pediatric)
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D) *Tetanus*

- Tetanus only occurs when spores of *C. tetani* gain access into tissues.
- usual mode of entry is through puncture wound or laceration. Injury itself is often trivial
- About 4% of tetanus infection are due to bite injuries.

D) Tetanus management:

Active Immunisation with tetanus toxoid (TT)

- Long lasting protection greater than or equal to 10 years for most recipients. Boosters are recommended at 10-year intervals.
- 3 doses of 0.5 ml (TT) by IMI
 - 1st : on the day of attendance
 - 2nd: 1 to 2 months after 1st dose
 - 3rd: 6 to 12 months after 2nd dose
- Complications:
 - Fever /painful local erythematous or nodular reaction at injection site
- Contraindications
 - Previous anaphylactic reaction
 - Acute respiratory infection or other active infection

D) Tetanus management:

Passive immunisation

Passive Immunisation

Human Tetanus Immune Globulin (HTIG) should be reserved for protecting non-immunised patients or patients having existing immune deficient conditions with wounds that are considered to be Tetanus-prone. Advice from senior medical staff should be sought when in doubt.

HTIG is safe and indicated for patients with a contraindication to TT (such as anaphylaxis) and have a Tetanus-prone wound.

Dosage

The prophylactic dose of HTIG is 250 units IMI and TT can safely be given at the same time but at different sites. Different syringes should be used.

500-unit dose is recommended if :

- (a) there is gross contamination of wound;
- (b) wound is older than 12 hours; or
- (c) patient's body weight exceeds 90 kg.

The HTIG will not guarantee that a non-immunised patient will not develop Tetanus after injury.

Clinical Guidelines for Tetanus Prophylaxis

History of Full TT Course or TT Booster	Simple Wounds (non-Tetanus prone)		Complicated Wounds (Tetanus-prone)	
	TT	HTIG	TT	HTIG
No or Unknown	Full Course	No	Full Course	Consider
Full TT course < 5 years	No	No	No	No
Full TT course between 5 - 10 years	No	No	Booster	No
Full TT course > 10 years	Booster	No	Booster	Consider *

Tetanus –prone wound:

- wound complicated by delay in treatment for over 6 hr
- deep puncture wounds
- avulsion
- heavily contaminated wounds

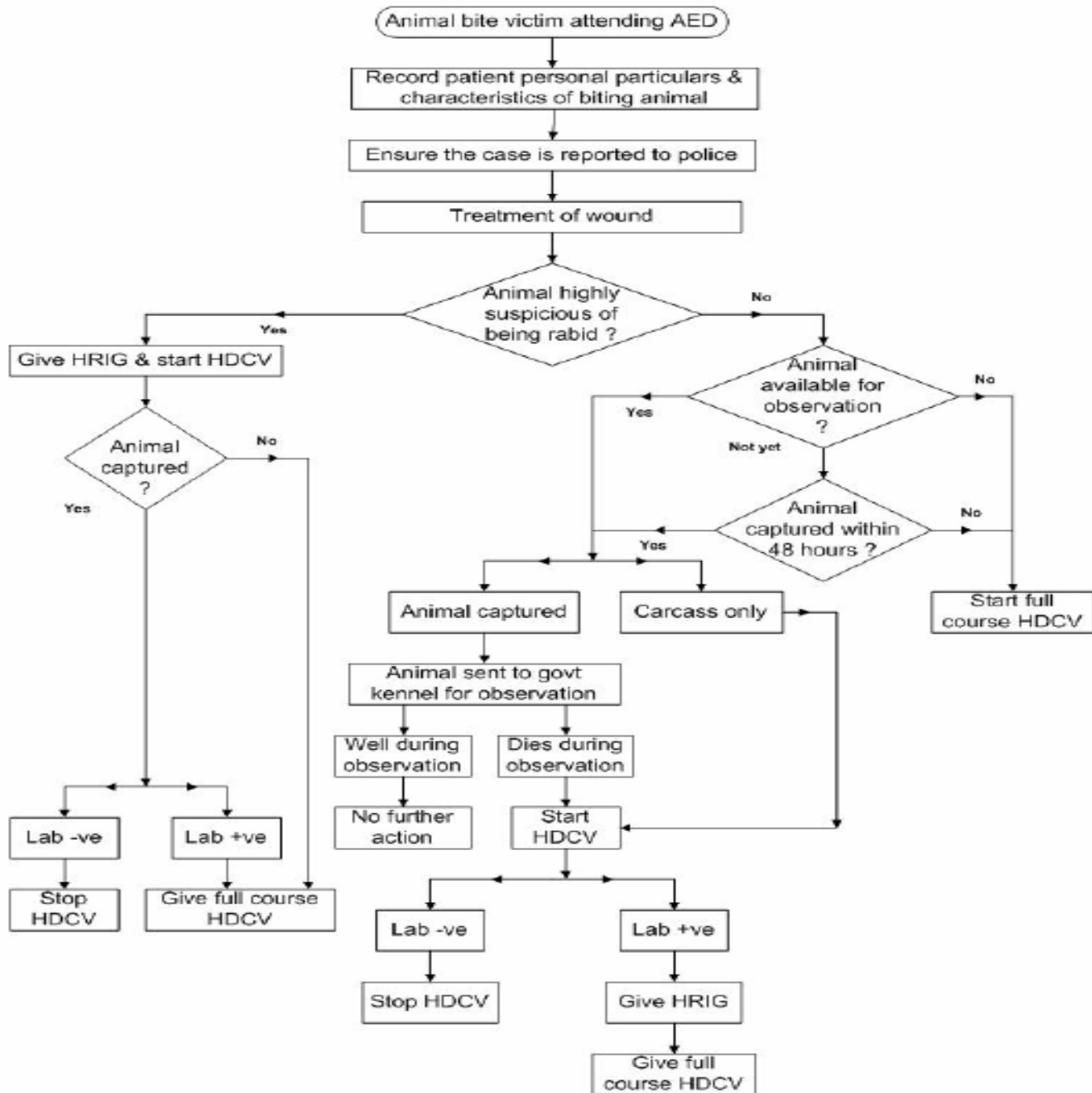
D) Tetanus management: Wound care and antibiotics

- Prompt and thorough surgical wound toilet is of key importance.
- Antibiotic prophylaxis cannot replace proper wound cleaning, debridement and proper immunisation.
- Eradication of organism from infection source:
 - through cleaning of wound and extensive debridement of necrotic tissue after antitoxin has been given.

E) Rabies

- Rabies infects **mammals_only**.
- Last local and imported human rabies cases occurred in 1981 and 2001 respectively.
- Animal rabies has not been reported in HK since 1987.
(1980-1987: 32 dogs, 2 cats)
- Animal highly suspicious of being rabid:
 - Animal is from rabies infected area
 - The biting incident was unprovoked and the animal has bitten more than one person or other animal
 - The animal shows clinical signs and symptoms of rabies, eg increase salivation, shivering, change in behaviour, paralysis or restlessness
 - Wild mammals: raccoons, skunks, foxes, coyotes

Flow Chart for Management of Animal Bite Patients



E) Management of Rabies

- Active immunization of Human diploid cell vaccine (HDCV) on day 0,3,7,14,28
 - Adults :Deltoid muscle
 - Infants and small children: Mid anterior thigh muscles
 - Victims who have previously immunised either with a five-dose course or as prophylaxis against rabies within the past 5 years should receive 2 doses of HDCV on day 0,3. HRIG is not recommended
 - 5 dose full course is recommended if vaccination is incomplete or received more than 5 yrs ago. Consider passive immunisation.
 - Adverse reactions:
 - Local reactions(30-74%): pain, erythema, swelling, itchiness at injection site
 - Systemic reactions(5-40%): headache, nausea, abdominal pain, myalgia, dizziness
 - Guillain-Barré syndrome

E) Management of Rabies

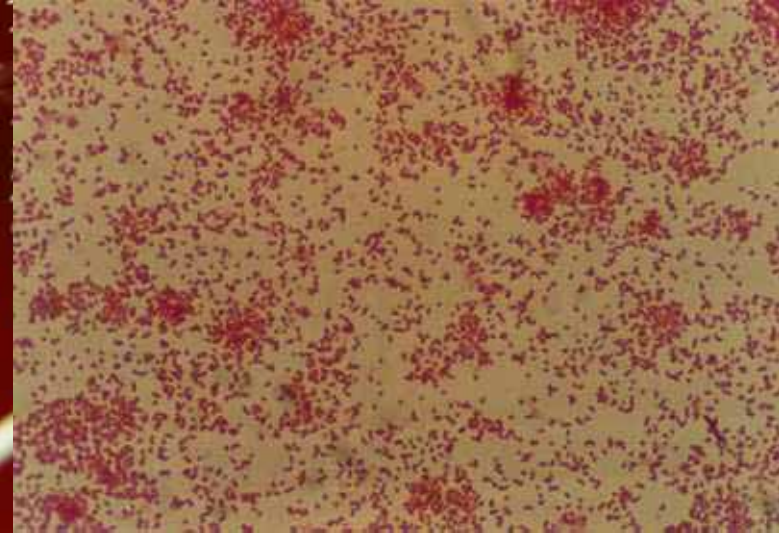
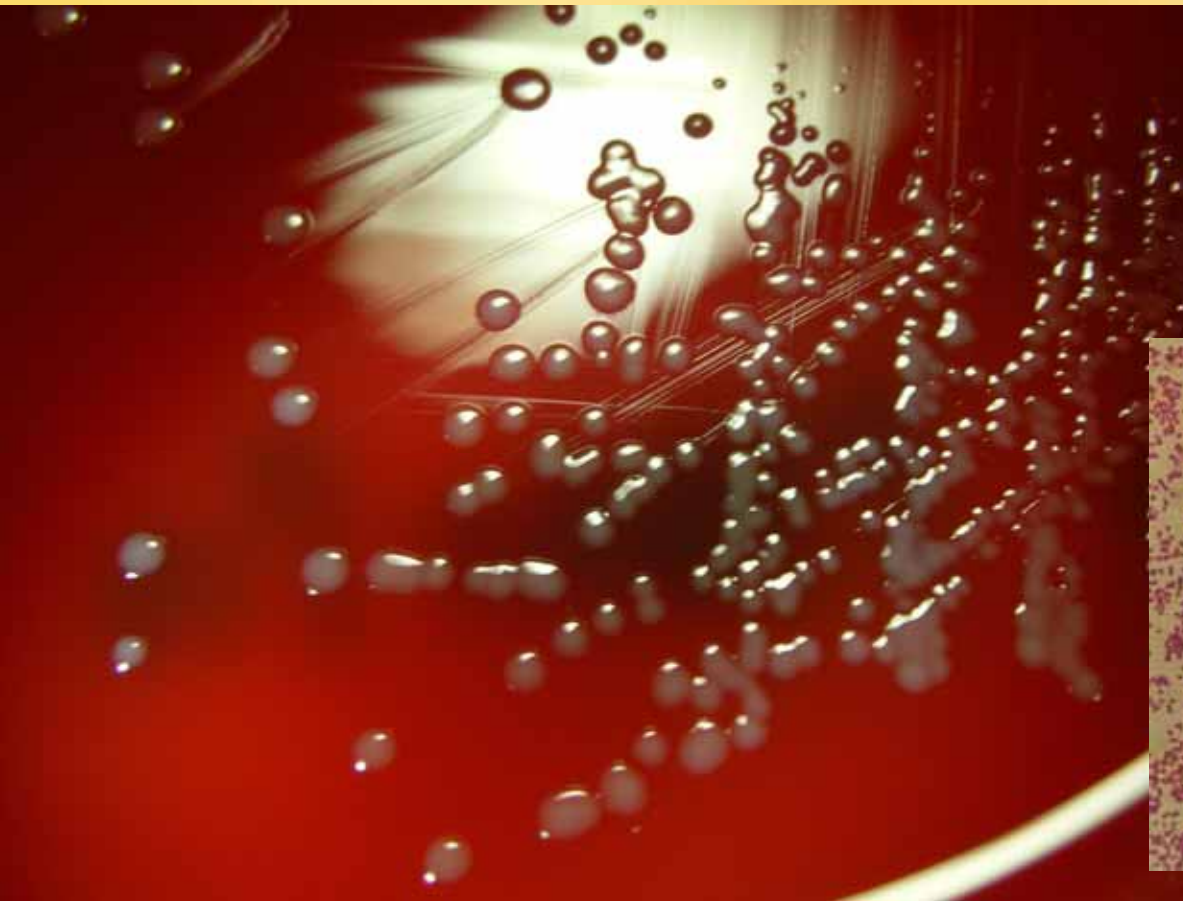
- Passive immunisation with Human Rabies Immune Globulin (HRIG)
- Single administration of 20 IU/kg
 - Infiltrated around the wounds as much as possible and any remaining volume should be administered IM at an anatomical site distant from vaccine administration.
 - Adverse reaction: local pain or low grade fever.
 - Immunosuppressive agents, anti-malarials, immunocompromised state can interfere the development of active immunity after vaccination.
 - Pregnancy is not a contraindication to post-exposure prophylaxis. No foetal abnormalities have been associated with rabies vaccination.

E) Management of Rabies

- Rabies should be considered in patients suspected **acute progressive viral encephalitis**, regardless of a history of animal bite.
- Once a patient develops symptomatic rabies, available **diagnostic tests** include:
 - Assays for viral antibodies in the serum or cerebrospinal fluid (CSF);
 - Viral isolation from CSF or saliva;
 - Viral antigen detection in biopsies of skin, corneal impressions or brain tissue;
 - Reverse transcription PCR of saliva, CSF or related tissues (such as salivary glands or brain tissue).

F) Pasteurella multocida

- Commonly associated with cat bite infection, occasionally dog bite as well
- A cause of **rapidly progressive infections** similar to *Group A Strep* or *Vibrio* (i.e. patient may present within a few hours of a cat bite with established severe infection)
- Often clinical evidence of wound infection within a few hours of a *bite* injury, a *scratch* or *lick*.
 - Cellulitis or abscesses +/- bacteremia
 - Occasional cause of pneumonia and endocarditis
 - Other: metastatic seeding of internal organs from bacteremia.
 - CNS: meningitis (rare), most often in young children or the elderly.



It's Gram -ve rod, slightly mucoid (some can be very mucoid),
having a characteristic odour.

It is Penicillin sensitive (not common for Gram -ve to be
Penicillin sensitive)

F) Pasteurella multocida

- **Diagnosis**
 - Based on culture (swab, blood, body fluid). May be confused with *Haemophilus* or *Neisseria* spp. on Gram stain.
- **TREATMENT**
 - Sensitive to Amoxicillin/clavulanate, Ampicillin/sulbactam, Penicillin, Ciprofloxacin, levofloxacin, doxycycline
 - First generation cephalosporins, cloxacillin, erythromycin and clindamycin ineffective

F) Capnocytophaga canimorsus

(Rare; Less than 50 cases reported in literature)

- **Clinical presentation**
 - Facultatively anaerobic gram-negative rod, part of normal oral flora of dogs and cats.
 - Many patients have history of dog bite or scratch, less commonly in cats.
 - Cellulitis
 - Bacteremia/sepsis
 - Meningitis and endocarditis (rare)
 - Severe: shock, DIC, acral gangrene, disseminated purpura, renal failure, meningitis and pulmonary infiltrates
 - **Fulminant sepsis following dog > cat bites, particularly in asplenic patients, alcoholics or immunosuppressed**

F) Capnocytophaga canimorsus

- **Treatment**

- **Mild Cellulitis /Dog or Cat Bites**

- Preferred : Amoxicillin/clavulanate
- Alternative: Clindamycin, doxycycline

- **Severe Cellulitis /Sepsis**

- Penicillin G 2-4 mU q 4h IV or Clindamycin 600mg IV q 8h.
- Alternative : Ceftriaxone 1-2q IV qd, ciprofloxacin 400mg IV q12h or meropenem 1g IV q8h.

- **Prevention**

- In all asplenic patients with amoxicillin/clavulanate for 7-10d

F) Bartonella henselae

Cat Scratch Disease(CSD)

- Affect both normal and immunocompromised hosts.
- 80 % of cases occur in children.
- Linked to exposure to cats, especially kitten and cats with fleas. CSD can result from a cat scratch or bite, as well as from a fleabite.
- Characterized by self-limited regional lymphadenopathy near the site of organism inoculation.
- Occasionally life threatening manifestations (5-14%) include visceral organ, neurologic, and ocular involvement because of the dissemination of organism.
In AIDS patients: Bacillary angiomatosis
- Diagnosis : a positive *B. henselae* antibody titer or a positive Warthin Starry stain or PCR analysis of tissue.
Very difficult to isolate from tissue specimens.

F) Bartonella henselae Cat Scratch Disease(CSD)

- Treatment
- Antibiotics are **not indicated** in most cases but they may be considered for severe or systemic disease.
- Reduction of lymph node size (no REDUCTION in the duration of symptoms) has been demonstrated with a 5-day course of azithromycin and may be considered in patients with severe, painful lymphadenopathy.
- Immunocompromised patients should be treated with antibiotics:
 - Trimethoprim-sulfamethoxazole, Gentamicin, Ciprofloxacin, Rifampin
- *B. henselae* is generally resistant to penicillin & amoxicillin

F) *Streptobacillus moniliformis*

Rat bite fever

- Caused by *Streptobacillus moniliformis*
- A major cause of Rat Bite Fever (*Spirillum minus* occurs mostly in Asia).
- Normal commensal of rodent oropharynx also in ferrets, weasels, gerbils.
- Transmission: bite/scratch from rat, mice, squirrels--also cats, dogs, pigs.
- Symptoms:
 - Fever,
 - Chills,
 - Headache,
 - Nausea/Vomiting,
 - migratory arthralgias,
 - leukocytosis (~30K).
 - nonpruritic maculopapular, petechial, or pustular rash (palms soles, extremities). May be purpuric/confluent (day 2-4).



F) Streptobacillus moniliformis

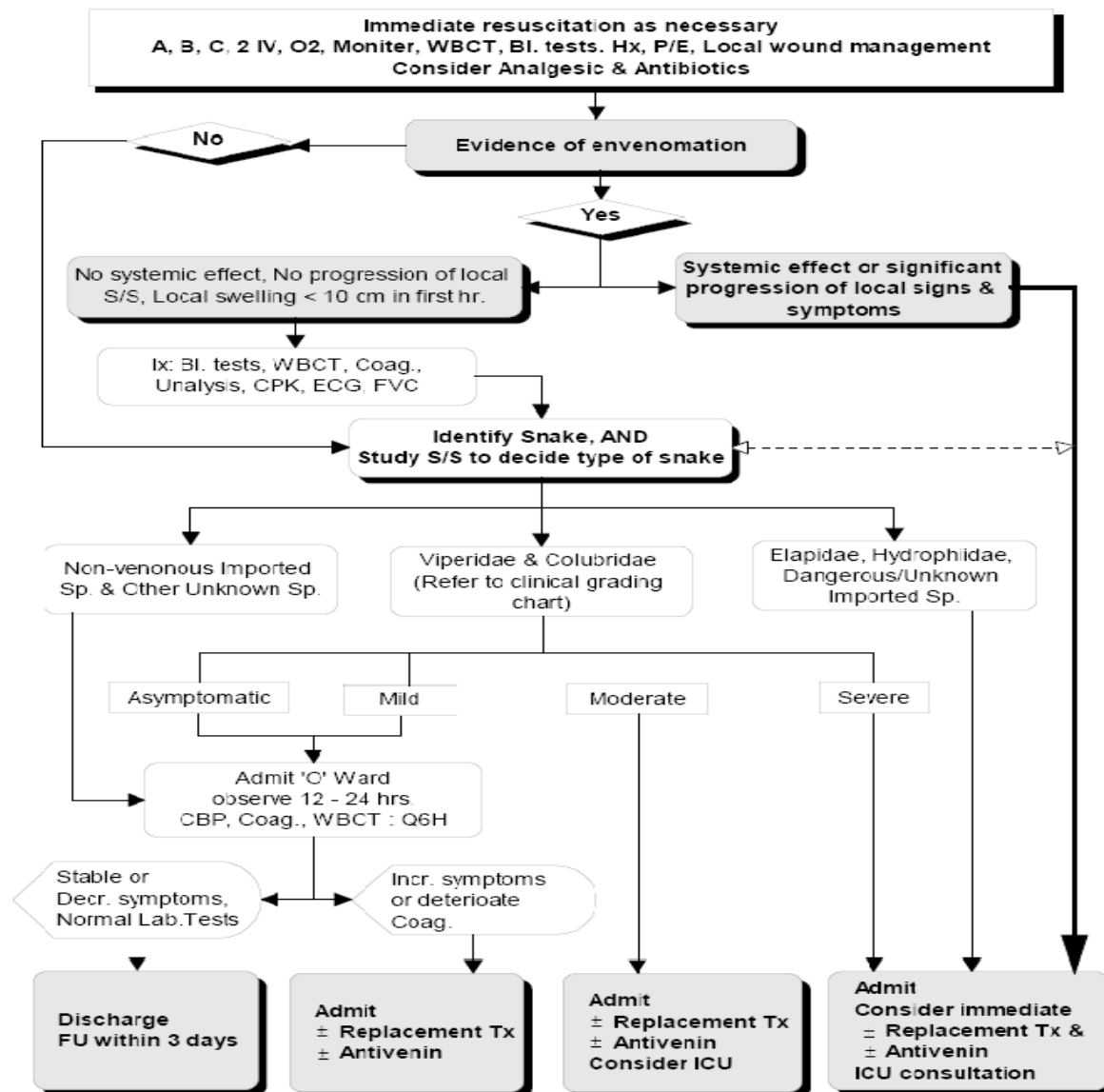
Rat bite fever

- **Diagnosis**
 - Gram or Giemsa stain blood, joint fluid, pus.
 - Culture
 - Serology (sero-negative within 5 months-2yrs)
 - PCR
- **Treatment**
 - Penicillin , ceftriaxone, clindamycin

F) Snake bites



Snakebite Management Flowchart



Legend :WBCT – Whole blood clotting time
Coag – Coagulation study (PT, APTT, Fibrinogen, FDP)
CPK – Cardiac enzyme
FVC – Force vital capacity
BI – Baseline investigations

Table 1 : Assessment of severity of envenomation based on local swelling and reaction.

Degree	Clinical features	Treatment
No envenomation Asymptomatic	Fang marks, but no local or systemic features after 6 hours from time of accident.	Observe for 12 hours (from time of accident) in Observation Ward. Baseline investigations.
Mild	Fang marks, pain, minor local swelling and discomfort (e.g.: do not cross one major joint in the limb such as wrist, elbow) on presentation and no significant progression after 6 - 12 hrs. No significant systemic symptoms.	Observe for 24 hours. Baseline investigations. Repeat tests 4-6 hours later if evidence of progression.
Moderate	Fang marks, moderate pain, progression of swelling beyond area of bite (e.g.: cross more than one major joint of the limb but not involved the whole limb). May have petechiae or ecchymosis of bite area. Occasional minor systemic symptoms. May have minor laboratory abnormalities.	Admit into Observation Ward or Hospital for close observation and supportive treatment. Suggest Antivenom treatment.
Severe	Marked progressive swelling and pain. Early Ecchymosis and blistering. Necrosis. Systemic symptoms and coagulation defects..	Admit into Hospital or Emergency Ward for observation and treatment, preferably in ICU / or with close monitoring. Need Antivenom Tx

F) Features of Envenomation

- More than 20% of the bites are dry bite, ie no envenomation occurred.
- Fang marks may be multiple or absent. Presence of fang mark does not imply significant envenomation.
- Pain or local swelling may be absent or just minimal especially after Krait bite.
- Venom is a mixture of many substances. Usually each family of venoms has its characteristic clinical effects affecting predominately one system. However, other body systems may also be affected to different extents.
 1. Venoms of Viperidae are primarily cytotoxic, vasculolytic and haemotoxic but neurotoxicity (rarely) can occur. Acute renal failure is common in Russell's viper.
 2. Venoms of Elapidae are mainly neurotoxic, but cardiotoxicity can occur and local tissue damage is common in Cobra.
 3. Venoms of Hydrophiidae usually cause generalised rhabdomyolysis resulting in myoglobinaemia, hyperkalaemia and renal failure.
 4. Colubridae bites usually cause localised painful swelling, but severe defibrination syndrome, haemolysis and renal failure can occur.
- Anaphylactic reaction can result from venom injection and is a particular risk in individuals with history of snake bite before (eg snake shop worker). Clinical features include hypotension, shock, angio-edema and bronchospasm, and cardio-respiratory arrest

F) Antivenoms

- Most are horse serum products. Skin test is neither necessary nor useful in predicting occurrence of anaphylaxis. Local experience show that both immediate reaction and serum sickness are not common when using the commonly used antivenoms - Agkistrodon Halys purified (SIBP), Green Pit Viper Antivenom (TRCS) and Cobra Antivenom (TRCS). Although a case report of anaphylaxis in a child after test dose of Agkistrodon Halys purified was recently published.
- When indicated, antivenom should be given as early as possible.
- Oxygen, adrenaline, vasopressor, tourniquet, and intubation equipment should be immediately available.
- Pretreatment with IV antihistamine and hydrocortisone is recommended. Adrenaline infusion standby may be necessary. For patient with hypotension or history of anaphylaxis, may consider pre-treatment with S.C. adrenaline 0.5 mg.
- If signs or symptoms of allergy develop, stop the antivenom infusion and give fluid anaphylaxis. Resume the infusion when the conditions improve. Subsequent need for further antivenom should be guided by clinical examinations and laboratory tests. Watch out for serum sickness that may develop after 5-7 days if multiple doses were given.

Resources and References

1. A&E clinical guidelines on management of snake bites, rabies and tetanus infection from HA internet website
<http://www3.ha.org.hk/idctc/default.asp>
2. Zoonoses from cats and dogs. <http://www.uptodate.com>
3. Companion animals and human health risk: Animal bites and rabies.
<http://www.medscape.com>
4. Animal bites from Merck Manual professional
<http://www.merck.com/mmpe/index.html>
5. Tetanus from ICU website of PWH
6. Capnocytophaga canimorsus, Francisella tularensis, Pasteurella multocida, Streptobacillus moniliformis, Bartonella species from John Hopkins antibiotic guidelines <http://www.hopkins-abxguide.org/>

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Table 2

Thank you!