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## **Facial bacterial abscesses and dermatitis in rabbits**

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**Skin and subcutaneous abscesses are frequently observed in rabbits. Abscesses result from damage to the skin, followed by the attack of pyogenic microorganisms or fungi that leads to cell destruction and invasion deeper in the tissue.**

Rabbits lack pus liquefying enzymes, resulting in a thick, dense exudate in the abscess pocket. Indeed, rabbit heterophil cells (rabbit equivalent of neutrophils) contain a very low level of the enzyme

myeloperoxidase, as compared in other animals (dogs, cats) or man. As a result, digestion and liquefaction of the material contained in the abscess is slow and pus remains thick and sticky (Figures 2, 3). The



**Figure 1:** Joey Ang Bun, a neglected rabbit with a facial abscess that burst open. This rabbit got the needed care after being rescued.

exudate is composed of dead phagocytic white blood cells, necrotic cells, and live or dead bacteria. As the quantity of pus increases, the pocket grows larger and isolates itself from the surrounding tissues and the blood circulation (encapsulation), rendering treatment difficult. An abscess that is left untreated will continue to grow (Figure 1, 2). Although uncommon in rabbits, it cannot be excluded that the capsule surrounding a mature abscess will rupture spontaneously inside the body or on the surface of the skin (Figure 1). This stage is particularly painful and dangerous, triggering the release of microorganisms, and possibly toxins, into the blood circulation. It can also lead to secondary infections, e.g. septic arthritis. Bacterial septic arthritis is, indeed, a pathology caused by the presence of microorganisms in the synovial fluid that surrounds and lubricates the joints of the limbs.

Abscesses are typically found on the head, along the jaw line, and in the neck and shoulder regions, but can also affect other parts of the body such as internal organs and bones. According to their location on the cheeks or the chin, abscesses can indicate the presence of a dental issue, e.g., a dental root infection, and even be indicative of which tooth is problematic. It must, however, be taken into account



**Figure 2:** Rex rabbit suffering from a non-dental chin abscess that is almost bursting and showing the presence of thick pus and cavity after removal of the pus.



**Figure 3:** Thick, dense pus is due to a very low level of the enzyme myeloperoxidase in heterophil cells (rabbit equivalent of neutrophils), as compared to other animals or man.

that fistula may develop; a swelling under the chin can rarely result from an upper cheek tooth problem.

When palpated, the mass feels as a hard lump or as a soft, doughy swelling; it can, at times, be moved under the skin or it is firmly attached to the surrounding tissue. The presence of an abscess is usually not associated with pain and pyrexia in rabbits, unlike in other animals.

Possible causes of abscesses in rabbits are:

- Spreading of a primary bacterial infection into other locations in the body through, e.g., grooming, blood circulation;
- Friction, urine scald, maceration, e.g., when the rabbit lives in a damp hutch;
- Nasolacrimal or dental problems;
- Surgery;
- Bites from insects, birds of prey, or other animals;
- Scratches, punctures, or tears to the skin from sharp edges of a cage, claws, or hay splinters and other foreign bodies that can embed in the gums, soles of the feet, or anal glands. Cat bites can be particularly dangerous, often causing *Pasteurella multocida* related diseases and infections;
- Trauma.

Rabbits that suffer from chronic abscesses typically have a history of infections caused by *Pasteurella multocida*, *Staphylococcus aureus*, *Streptococcus* sp., *Pseudomonas* sp., *Fusobacterium* sp., *Corynebacterium pyogenes*, *Klebsiella* sp., or *Escherichia coli*.

**Clinical features**

There are no clinical manifestations specific to the presence of a skin abscess. Clinical signs include the presence of a lump, an unusual swelling, reduced appetite, and increased water intake. When an abscess ruptures and bacteria reach the blood circulation, fever will develop, accompanied by septicemia. Internal abscesses are more difficult to diagnose.

Secondary signs that are associated to the presence of an abscess are:

- Surface crusts – resulting from damage to the skin;
- Exophthalmia – induced by apical or periapical problems or by the presence of a retrobulbar abscess;
- *Otitis media* or *interna* – caused by bacteria or yeast entering the middle or inner ear after rupture of the eardrum, or when the rabbit licks an open abscess or an infected wound, leading to transmission of bacteria from the wound into the oral cavity whence they travel to the inner ear via the Eustachian tube;



**Figure 4:** Alien Baby, a young rescued rabbit presenting facial abscesses (here after debridement) and bacterial infection of the skin, here the basis of the ear pinna.

- Dyspnea – caused by an advanced stage abscess in the lungs or by septicemia from bacteria and toxins present in the bloodstream;
- Chronic dacryocystitis – due to tear duct blockage by a maxillary incisor or a cheek tooth root abscess;
- Limping and pain – when an abscess extends to or is located near the joints or

has caused septic arthritis or osteomyelitis.

Abscesses of the head of a rabbit should be differentiated from other causes of swelling such as a tumor, a bone cyst, or resulting from a traumatic event.

### **Diagnosis**

Skin abscesses are characterized by the presence of thick, caseous pus. A sample must be taken for a bacterial culture and an antibiogram. The scraping is best obtained from the abscess wall; when the sample represents the content of the cavity, culture results often return negative, without bacterial growth.

When a staphylococcal infection is present, the abscess usually contains deposits composed of an outer band of granular eosinophilic material that surrounds a core of bacterial colonies, necrotic tissue, and large quantities of immunoglobulins or Splendore-Hoeppli material.

Abscesses should be differentiated from tumors, cysts, eosinophilic granuloma, foreign bodies such as polyps, and botfly myiasis. When an abscess is located near a major blood vessel, it must be differentiated from aneurysm. Abscesses of fungal origin (in hypha or yeast form) should also be considered in the differential diagnosis.

Occasionally, a jaw abscess accompanied by osteomyelitis of the underlying bone can mimic osteosarcoma. Diagnosis can be difficult and requires precise differentiation between infective, tumoral, and metabolic



**Figure 5:** Flora developed a mandibular abscess that was surgically excised. Abscess capsule after surgical excision of the abscess.

diseases of the bone. The causing agent must be isolated and identified and malignant features of osteosarcoma, e.g., cellular pleomorphism and abnormal cell division activity (mitosis) should be ruled out. It is, therefore, important that the specialized laboratory to which the sample is sent has experience in analyzing material collected from rabbit tissues.

### **Treatment options**

The treatment of abscesses is difficult and requires long-term commitment from the owner. Even after a prolonged systemic



**Figure 6:** Rabbit face after surgical debridement and cleaning of the facial abscesses. Picture: anonymous

antibiotic treatment, complete recovery cannot be guaranteed and recurrence is frequent. Prognosis in rabbits is, thus, guarded.

The treatment of choice remains complete surgical excision of the abscess cavity and, when necessary, of the surrounding tissues to remove the fibrous, fistular channels that reach deeper into the tissue.

Different surgical approaches are available, depending on factors such as the type of abscess and its location. If the abscess is not fixed in place and is detached from surrounding tissues, the procedure is similar to the complete surgical excision of a tumor, with a safe margin. If the abscess is anchored in place, care should be taken to limit contamination of the surrounding tissues and the blood circulatory system. It is recommended to incise the pocket and

remove as much pus as possible. After debridement of the primary cavity, it is important to check that no fibrous channels leading to secondary abscess cavities remain deeper in the tissue (Figure 5). If present, the secondary cavities must be flushed with an antiseptic solution (e.g., chlorhexidine or povidone-iodine) using a catheter tube.

When surgery is not possible due to poor health or to the location of the infection, the abscess cavity is lanced or incised after local anesthesia of the skin. The tissue around abscesses is acidotic, which decreases the effectiveness of the lidocaine anesthetic. It must, therefore, be ascertained that a sufficient quantity of anesthetic has been given prior to incising. Once open, the cavity is debrided and flushed with an antiseptic solution (e.g., chlorhexidine, povidone-iodine) to remove as much pus as possible.

Subsequent to the procedure, the lesion can be:

- Sutured shut after placement of a drain to facilitate daily flushing and care;
- Marsupialized (marsupialisation): the anterior wall of the cavity is resected and the incised edges are sutured to the edges of the adjacent skin to convert the enclosed cavity into a pouch, thereby keeping the wound open (Figures 4, 6).

The chosen therapeutic approach must be accompanied by a strict daily care routine (the same as for post-surgical care) to avoid necrosis of surrounding tissues. In addition to the topical and/or systemic antibiotics, the daily regime should include drainage of the fluid buildup, flushing of the abscess cavity with a disinfecting solution, and application of an antiseptic cream (e.g., a neomycin-based cream or an antimicrobial *Aloe vera*/quaternary amines/bis-n-tributyltin oxide based cream).

Depending on their location, primary abscess cavities can be packed with an antiseptic impregnated medium. Different types of packing methods are available for use in rabbits:

- Permanent placement of antibiotic impregnated polymethyl methacrylate (PMMA) beads. The effectiveness of PMMA beads in the treatment of larger abscesses depends on different factors, including the size of the implanted beads, the quantity used, and the size and location of the abscess. Penicillin, cephalosporin, clindamycin, and gentamicin are the broad spectrum antibiotics of choice due to good elution from the beads, in contrast to chloramphenicol and tetracycline that do not elute well. The diffusion of antibiotics appears limited and may not reach over a distance longer than 5 mm; additionally, scar tissue grows rapidly and blocks the diffusion within 3 to 4 weeks.

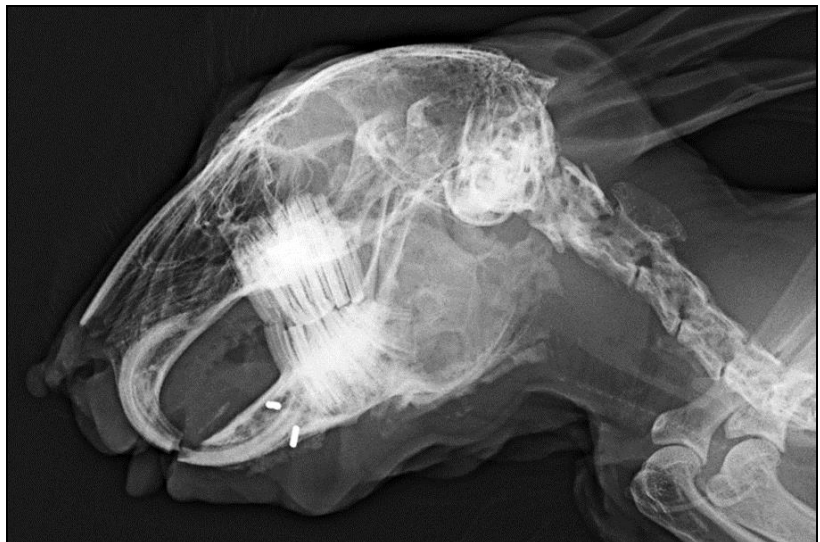
Consequently, there is a risk that the antibiotics might not reach the wall of the abscess cavity where the bacteria are located. It is necessary to suture the surgical incision carefully to prevent leakage of the antibiotics from the cavity onto the skin, where they can be licked off by the rabbit and, depending on the antibiotic used (e.g., clindamycin), can cause severe disruption of the intestinal bacterial flora and life-threatening diarrhea. Preventive administration of probiotics is recommended to relieve side-effects related to antibiotic leakage out of the cavity and grooming activity/ingestion.

- Temporary filling with antibiotic impregnated gelatin or oxidized regenerated cellulose sponge. It has been suggested that the highly concentrated antibiotics used to impregnate the sponge can leak into the blood stream; however, the studies proposing this examined the diffusion of drugs from soft tissue, bones, or tumors into the blood circulation. If the concentration of the antibiotics is determined correctly, it can lead to rapid death of the bacteria, preventing the onset of resistance and the survival of organisms concealed in fissures in the abscess wall. Antibiotics used to impregnate the sponge include clindamycin, gentamicin, neomycin, bacitracin, and tetracycline. The dressing must be changed daily or every second day to prevent necrosis of surrounding tissues.
- Temporary filling with an amorphous hydrogel. The high water content of these gels promotes autolysis of necrotic tissue by keeping the wound well hydrated and preventing bacterial growth. The packing needs to be changed daily.
- Temporary filling with a wet-to-dry hygroscopic and bactericidal sugar

dressing, e.g., 50% dextrose or manuka or other types of honey, prepared for medical use. Due to its richness in sugars, honey has a hygroscopic effect on the wound, preventing bacterial development. Honey will, furthermore, acidify the wound, accelerating the healing process. The honey should be sterilized by gamma-rays, but never boiled; boiling destroys the bacteriostatic/bactericidal properties. Commercial honey should be avoided as it may contain clostridial bacteria.



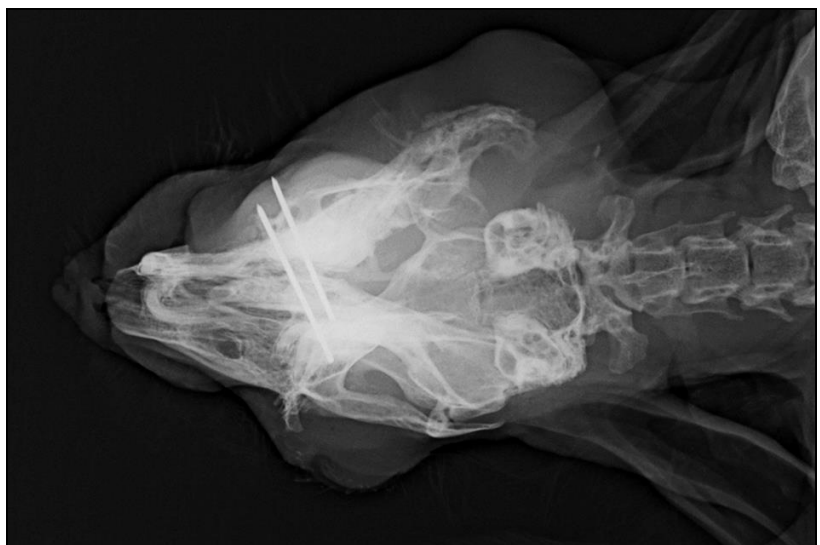
The advantages of using honey are that the product is non-toxic and no side-effects have been observed after ingestion through grooming. Treatment can be continued over a long period of time. The use of this type of preparation has the additional benefit of absorbing the unpleasant smell of ammonium and sulfur compounds that are released as a result of bacterial breakdown of the rabbit's serum or cell proteins.



This treatment must be continued over an extended period of time.

- Penicillin or clindamycin injected or inserted, respectively, directly into the cavity.

Penicillin injected directly into abscesses has shown some success, leading to reduction in the abscess



**Figure 7:** Peep suffering from a mandibular abscess and x-rays showing dental malformations and bone lysis.



size. The introduction into the cavity of a clindamycin capsule that has been punctured to enable gradual diffusion of the antibiotic has also shown positive results. As with PMMA beads, careful suturing and preventive administration of probiotics are advisable. The treatment needs to be aggressive and long.

- Daily topical application of an antimicrobial *Aloe vera* cream containing third generation quaternary amines combined with bis-n-tributyltin oxide, accompanied by systemic antibiotics and analgesia.

In rare cases the abscess ceases to grow; it is then sometimes opted not to treat or to restrict the treatment to long-term antibiotic therapy. If the abscess is accompanied by osteomyelitis, administration of systemic broad spectrum antibiotics is necessary to minimize bone destruction. Antibiotics of choice comprise those that penetrate the bone or joints, including: chloramphenicol, fluoroquinolones (e.g., enrofloxacin or ciprofloxacin), penicillins (e.g., a combination of penicillin G benzathine and penicillin G procaine) or penicillinase-resistant semisynthetic penicillins (e.g., members of the cephalosporin antibiotic group), and metronidazole. Alternatively, antibiotic impregnated PMMA beads can be implanted near the infected bone. Antibiotics include gentamicin or tobramycin (1g/20g PMMA), cephalotin or cefazolin (2g/20g PMMA); amikacin (1.25g/20g PMMA); or ceftiofur (2g/20g PMMA).

If the antibiotic treatment is not successful or if large parts of the bone have been destroyed, radical debridement will be necessary. If fungal organisms are identified, antifungal drugs must be given. The treatment needs to be aggressive and long.

When the abscess and osteomyelitis have extended to the roots of the incisors or

cheek teeth or in cases of significant loss of mass to the mandibular bone and/or its perpendicular portion (ramus), surgical removal of the affected section of the mandible (partial hemimandibulectomy) is an option. This invasive approach should be weighed carefully; it is best reserved for patients in which the treatment methods discussed earlier in this section were not successful. The pertinence and applicability of the hemimandibulectomy procedure should be carefully assessed in relation to the condition of the patient and the commitment of the owner. It is important to analyze the clinical situation by means of high resolution radiographs and CT scans. Due to the invasive nature of this surgical procedure, digitalized CT scans are of extreme importance; unlike conventional two-dimensional X-ray images, this technique produces cross-sectional images that help visualize blood vessels, early changes or damage in the soft tissue or bone, or reveal the presence of internal injuries or bleeding (Figure 7). A three-dimensional computer assisted reconstruction provides, furthermore, delineation of the pathology and indications regarding the perspective and stereoscopic depth of the lesion as well as its texture.

This information will help determine the best therapeutic approach, taking into account prognosis and the quality of life of the rabbit after the procedure.

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