

## Comprehensive pathology

### Forensic case

You are a veterinary pathologist working in a diagnostic center. You receive a young purebred English bull dog that was brought to the veterinarian for castration but died during the recovery phase of the anesthesia. Before you start the necropsy the owner has a question for you.

#### Question 1:

The owner wonders whether death following surgery in dogs is common. What can you tell him about the overall rate of peri-anesthetic mortality in dogs? Mark the appropriate box.

- ☒ A. 1%
- ☐ B. 5%
- ☐ C. 10%

**Correct answer : A**

The owner asks you to perform the necropsy and first you notice that there is a pneumothorax. You know that the clinician has attempted cardiopulmonary resuscitation (CPR).

#### Question 2:

A. What is the most common cause of antemortem spontaneous pneumothorax in dogs?

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B. How would you check for this cause during necropsy?

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#### Answers :

A. Rupture of pulmonary blebs or bullae (accept any answer relating to this pathogenesis, partial credit if association with inflammatory, infectious or neoplastic lung disease)

B. Submerging the entire lung in water and injecting air into the trachea to inflate the lung while observing for air bubble escape into the surrounding liquid (accept any

other technique enabling to demonstrate air permeability of pleura. In case most common cause cited in A is wrong, partial credit given to a technique which aligns with answer given in A).

**Source :** Perianesthetic mortality in Domestic Animals, Vet Pathol 53(5) 1078-1086, 2016

The lungs tested negative for pneumothorax but appeared diffusely mottled and consolidated on gross evaluation. Histopathological examination of a representative section of the lung revealed the findings depicted in Figure 1.

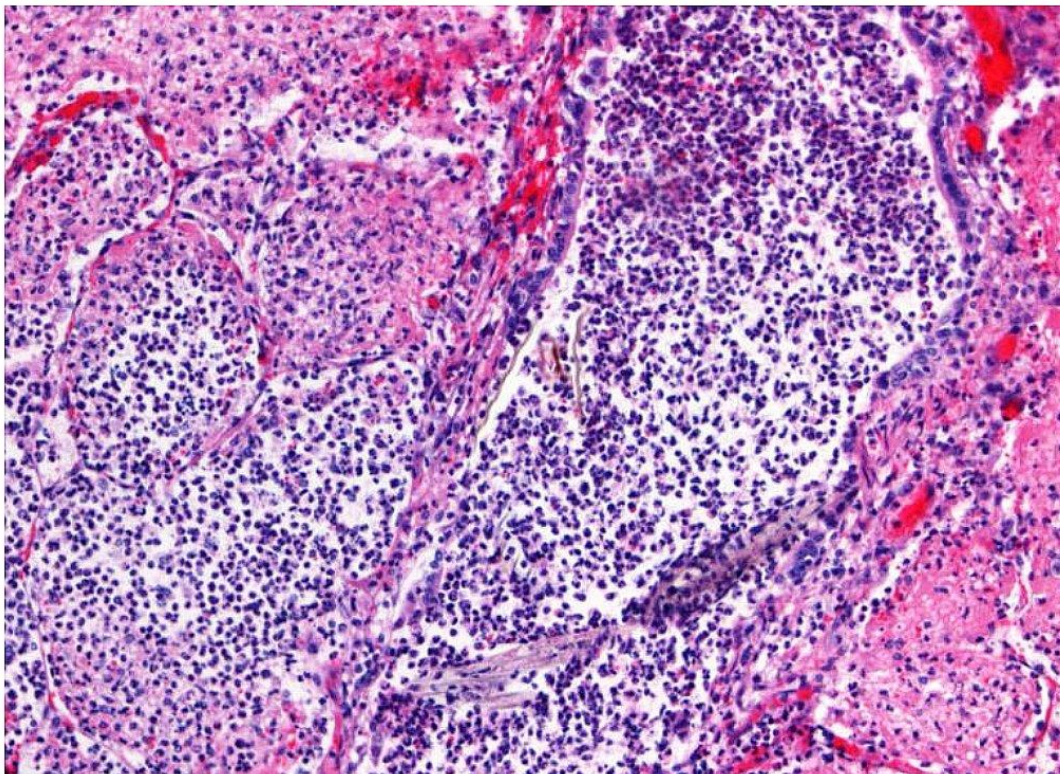


Figure 1 – H&E stained lung section

**Question 3:**

What is your morphological diagnosis (not a description)?

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**Answer :**

Acute fibrosuppurative bronchopneumonia with bronchiolar foreign body material

**Question 4:**

What is your conclusion regarding the cause of death of this dog ?

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**Answer :**

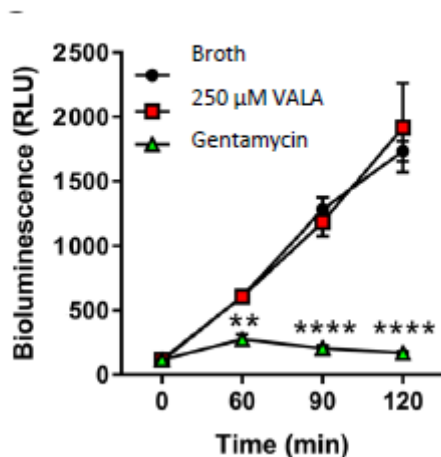
Undiagnosed bronchopneumonia resulted in compromised lung function and respiratory failure due to anesthesia. The degree of inflammation suggests the pneumonia has been established for several days and thus inhalation of the foreign material (foodstuff ?) is likely to have occurred before rather than during anesthesia.

## Data analysis

You are assisting an early discovery team within your pharmaceutical company in their search for novel antimicrobial compounds. Through computer modelling the team have identified a promising candidate, VALA.

To test the efficacy of VALA against methicillin-resistant *S. aureus* (MRSA) they supplement cultures of bioluminescent MRSA with either VALA or gentamycin (50 µg/ml) and monitor bacterial growth. To further investigate the effects of VALA they treat cutaneous fibroblasts with VALA for 16 hours and then infect them with a bioluminescent MRSA strain.

A



B

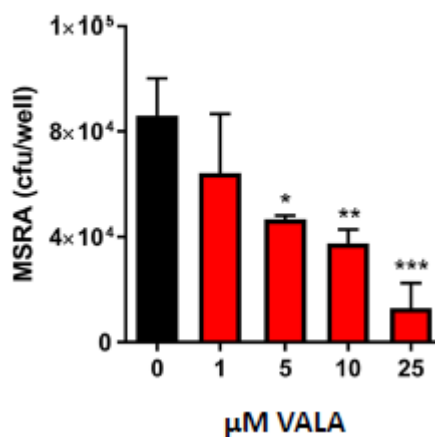


Fig A : Bioluminescent MRSA are treated with unmedicated broth (black circles), 250µM VALA (red squares) or gentamycin (green triangles).

Fig B: Fibroblasts treated with various doses of VALA and infected with MRSA. CFUs were counted 2h after infection.

### Question 1:

Briefly describe the results depicted in figure A and B and give an overall interpretation of these findings

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**Answer :**

Fig. A

Description : bioluminescence increases with time in a similar pattern with either unmedicated broth or 250µM VALA. There is no increase in bioluminescence with gentamycin treatment.

Fig. B

Description : there is a decrease in MSRA CFU correlating with increasing concentrations of VALA, reaching statistical significance at ≥5µM in fibroblast cultures.

Interpretation : VALA, unlike gentamycin, is not directly bactericidal. Fibroblasts treated with VALA (≥5uM) exhibit bactericidal activity suggesting that VALA has an indirect antimicrobial effect

**Question 2:**

Suggest a hypothesis to explain the mechanism of action of VALA and give one further experiment and techniques which could be used to investigate your hypothesis.

Hypothesis : \_\_\_\_\_

Experiment : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Answer :** there is no single answer to this question. Any answer which makes scientific sense will be accepted. For example:

Hypothesis : VALA exerts its antibacterial effects by upregulating cellular production of antimicrobial factors such as antimicrobial peptides (AMPs).

Experimental techniques : ELISA measurement of selected AMPs in supernatant of fibroblasts with or without VALA **OR** measurement of cellular expression levels or AMP RNA using RT-PCR...