Currently, Atrophic Rhinitis (AR) in domestic pigs is an underdiagnosed disease, probably because it is not a priority in the list of infectious diseases affecting the performance of pigs. For many veterinarians it is not an important disease, although *Bordetella bronchiseptica* (Bb) and *Pasteurella multocida* (Pm) are very often involved in respiratory disorders in nursery and growing pigs.

The diagnosis of AR is based on the evaluation of clinical signs in live animals and in the post mortem identification of lesions in the nasal turbinates and nasal septum. In addition, laboratory diagnostic tests are used to identify the presence of the bacteria that are causing the disease.

### 1. Symptoms

**Suckling piglets**
- Sneezes, cough, wheezing and dyspnoea.
- Tear staining.
- Nasal discharges.

**Weaners and growers**
- Nasal discharges, epistaxis (Figure 1).
- Sneezes, cough, wheezing and dyspnoea.
- Tear staining.
- The nose twists, shrinks and wrinkles (Figure 2).
- Weight gain and daily growth decrease.
- Feed conversion ratio increases.
- Increase in respiratory diseases.
- The respiratory signs can be more severe in the case of co-infections.

*Figure 1.* Nursery pig with epistaxis. Picture taken from the field (HIPRA).

*Figure 2.* Fattening pig with deviated snout. Picture taken from the field (HIPRA).
2. Lesions

The most characteristic lesion of AR is **atrophy of the nasal turbinates** that may or may not be accompanied by lateral or superior facial shortening and deviation. Different degrees of atrophy of the turbinates have been described, the most severe being when all the structures disappear completely (1).

**Routine evaluation of the nasal turbinates in the slaughterhouse and in nursery animals** (Figure 3) is now the best way of confirming or ruling out Progressive (PAR) or Non-Progressive AR (NPAR), respectively.

For a correct assessment of the lesions, snouts should be transversely sectioned at the level of the first/second upper premolar; sectioning cranial to this may give a false-positive result (1).

There are different methods of evaluating and grading nasal turbinate lesions; the **guidelines of the European Pharmacopoeia** (Figure 4) are based on giving each scroll a score from 0 (completely healthy, no disappearance of bone) to 4 (scroll completely destroyed, complete disappearance of bone) and giving the nasal septum a score from 0 (healthy septum) to 2 (severe deviation of the septum). The scores for the 4 scrolls and the septum are then added together, with the maximum achievable score being 18 (2). Lesions with a score of between 0 and 4 (grade 1) are regarded as mild, of between 5 and 8 as moderate (grade 2) and above 8 as severe (grade 3). Several examples are shown below (Figures 5-7).

It should also be mentioned that microscopic lesions in the nasal cavity are characterised by hyperplasia, metaplasia and disappearance of the cilia in the nasal epithelium, and by the presence of neutrophilic infiltrate. Replacement of the bone trabeculae by connective tissue can also be observed. Although the lesions are obvious, it is not a routine laboratory technique and it is expensive and laborious (1).
Atrophy of the scrolls of the ventral nasal turbinate  
(0-4 for each scroll)  
× 4 scrolls

**Maximum score: 16 points**

- **Maximum** 16
- **0**: No atrophy
- **1**: Mild atrophy (less than half the scroll lost)
- **2**: Moderate atrophy (more than half the scroll lost)
- **3**: Severe atrophy (the scroll bone is straight)
- **4**: Very severe atrophy (the scroll has completely or almost completely disappeared)

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Septal deviation  
(0-2)

**Maximum score: 2 points**

- **Maximum** 2
- **0**: No deviation
- **1**: Mild deviation
- **2**: Severe deviation

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*Figure 4. European Pharmacopoeia method of assessing the turbinate lesions (2).*
WHAT IS HIDING UP YOUR PIGS’ SNOUTS?

Figure 5. Assessment of nasal lesions in the case of a healthy animal.

Figure 6. Assessment of nasal lesions in the case of an animal affected by moderate AR.

Figure 7. Assessment of nasal lesions in the case of an animal affected by severe AR.
3. Laboratory diagnosis

There are several laboratory techniques for the detection of the causative agents (direct diagnosis) or which provide evidence of the animal’s contact with them (indirect diagnosis):

3.1. Direct diagnosis (detection and characterisation of antigens):

**Bacterial isolation:** This is based on microbiological culture on agar, inoculated with a swab from the tonsils, the nasal cavity or tracheobronchial washes from the affected animals. When severe PAR is detected with facial deformation, the infection undoubtedly occurred weeks or even months before the development of the lesion, and it is virtually impossible to isolate toxigenic Pm. For this reason, in these cases it is recommended that less affected animals are examined and samples taken from them (1).

Bacterial isolation has some **limitations**, such as the time required to confirm positive cultures, the laborious nature of confirming the identity of the bacteria and the requirement for qualified personnel who are familiar with the appearance and characteristics of the growth of the bacteria involved, and which requires the use of selective culture media to limit the growth of other contaminating bacteria that are present in the secretions from which the samples have been taken. Express shipment (<24h) with the samples refrigerated (4-8 ºC) is also necessary in order to inhibit bacterial proliferation.

The isolation of Pm is not sufficient for diagnosis of the disease. Other laboratory tests are also needed (experimental infection, cell culture, ELISA, molecular techniques) for the detection of the dermonecrotic toxin and to provide evidence of the toxigenic capacity of the strains that are isolated (1).

**PCR:** PCR (conventional or real-time) is a rapid molecular test that is sensitive and highly specific, based on the detection of the genetic material of the causative agents of the disease in clinical samples or microbiological cultures suspected of being positive. PCR can therefore be carried out on nasal or tonsil swabs, *in vivo* oral fluid, or bacterial strains isolated *in vitro*.

The **oral fluid** taken from a group of animals housed in the same pen is a collective sample that represents that group and is obtained by a passive, non-invasive and “voluntary” procedure on the part of the animal.

The collection method reduces the stress caused to the animals during sampling and allows a more representative sample to be obtained from them (larger number of animals sampled than collecting nasal swabs from selected individuals). Therefore, the sample obtained is more reliable and cost-effective.

Recent studies (Maldonado, J *et al*, IPVS2014, APVS2017) show that the OF sample has a good correlation with the nasal swab sample for the detection of the causative agents of atrophic rhinitis by real-time PCR. It was observed that the level of detection of both PmT and Bb was actually similar, leading to the conclusion that OFs are as valid as nasal swabs for the detection of the disease, with the advantages of less invasiveness and greater representativeness (3) (4).

However, as can happen with any detection method, a negative result in the PCR or in the microbial isolation does not irrefutably mean that the disease is not present; it is therefore recommended that the result should be confirmed by evaluation of the nasal turbinates in the slaughterhouse or during the nursery phase, in combination with the clinical follow up of consecutive batches of pigs on the farm during production.
3.2. Indirect Diagnosis (detection of antibodies):

**Serology:** serology is of **limited value** in the diagnosis of AR owing to the fact that infection in the domestic pig caused by Bb and Pm can be endemic in many cases. On the other hand, the detection of generic antigens is of low specificity because of possible cross-reactions with non-toxigenic strains of Pm that share these antigens. For the case of Bb, the serology is not standardised in a kit, so there are no standards for the performance of the assay. This is in addition to the fact that Bb is highly prevalent, even in healthy animals, and natural infection cannot be distinguished from vaccination by serology (5).

Finally, it is important to bear in mind that although atrophic rhinitis is fairly characteristic in its clinical presentation, and there are not too many similar pathologies, a differential diagnosis must be established against some conditions such as inclusion body rhinitis caused by porcine cytomegalovirus, that as in the case of non-progressive atrophic rhinitis, does not cause facial deformation or lesions in the turbinates or nasal septum, but does cause rhinitis in young pigs (6). This is why inspection of the turbinates is necessary, as well as demonstration of the presence of the bacterium for a correct diagnosis, leading to control of the disease in successive batches of animals.

**REFERENCES**

4. Maldonado, J et al. Improvement of surveillance of atrophic rhinitis in pigs by using qPCR on oral fluid samples from individual and grouped pigs. IPVS 2014.
7. Straw, B et al. 1999. Pig diseases; 477-500. Inter-médica. ASÍS.