# Practical Use of Ventilators in Avian Anaesthesia

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Historically avian anaesthesia has been fraught with difficulties but with the arrival of isoflurane it has become routine to use general anaesthesia for both simple diagnostic techniques such as blood sampling and for longer surgical procedures with good results. Isoflurane has both a rapid induction and recovery time due to its low blood:gas coefficient. There is a reduction in both cardiovascular and respiratory depression over other anaesthetic agents and a significant interval between respiratory and cardiac arrest producing a high margin of safety in the avian patient.

Despite its usefulness isoflurane does have a hypotensive effect and this is more severe in birds spontaneously breathing compared with those with assisted ventilation. As isoflurane has a low blood solubility higher vaporizer settings are required which could predispose to apnoea and cardiac problems. Isoflurane has also been found to cause a transient hypocalcaemia in the avian patient potentially a problem in the grey parrot that suffers from disorders of its calcium metabolism. It has been suggested that due to the unusual anatomy of the avian respiratory system healthy birds will not adequately oxygenate themselves when anaesthetized and placed in dorsal recumbency. Larger avian patients fail to adequately ventilate themselves due to the size of their pectoral muscle mass.

Due to the potential problems of apnoea, inadequate ventilation and oxygenation that could occur with the avian patient a ventilator (Vetronics, Torquay UK) designed for use in small animals was used in the practice for the majority of avian anaesthestics.

All birds were anaesthetized using either isoflurane or sevoflurane. They were intubated and artificially ventilated using the Vetronic ventilator. The respiratory rate was set to the average respiratory rate for the species of bird involved. The trigger pressure was adjusted from a basal value of 4cmH20 to a value which produced adequate ventilation. In practice this value was 8cmH20 in the majority of species irrespective of size.

If the procedure involved the head and neck region then the patient was intubated by air sac tube. The ventilator was connected to the air sac tube and adjusted as for tracheal

intubation. Air sac ventilation was found to be satisfactory and produced excellent PO2 figures.

The ventilator was found to be simple to use. Potential problems would occur if the system was not air tight necessitating the use of self cuffing endotracheal tubes. During abdominal operations the ventilator was still functional if the surgeon did not need to open the thoracic air sacs. During endoscopy procedures occasionally ventilation would cease depending on which air sac was entered. This could be rectified by applying manual pressure to the incision site creating the seal once again. The ventilators would have a useful life of around 400 patients before a full service was required. If fluid was aspirated from the endotracheal tube into the ventilator it would have to be replaced. During the last 2 years two blue and gold macaws developed tracheal strictures after endotracheal intubation and artifical ventilation. Tracheal strictures in macaws is reported as a problem in the species. It is not known whether this was attributed to the use of IPPV, a reaction to the silicone tube or a genetic problem. This is being assessed and it may indicate that all macaws should be air sac intubated in future. In birds with chronic respiratory abscesses the ventilator was found to be very useful although higher trigger pressures were required to create adequate ventilation it was felt that these cases would die if they were left to spontaneously breathe. In several cases the surgeon felt able to make a qualified decision to euthanase birds with chronic problems which in the past would simply have died under the anaesthetic. Although the outcome is the same it is obviously better to make these decisions in a controlled way.

## Results

Pulse oximetry was used on birds that were both artificially ventilated and those that were left to spontaneously breathe. A review was undertaken of the anaesthetic death rate in the practice over the last 6 years in both artificially ventilated and non-ventilated birds. The anaesthetic death rate at the practice in all avian patients 1997-2000 (n=973) was 4.65% in non-ventilated birds. The anaesthetic death rate at the practice 2001-2002 (n=771) was 0.75% in ventilated birds.

The average PO2 in non-ventilated birds (n=10) was found to be 92.56% compared with the average PO2 in ventilated birds was 98.75%. It was noticed that non-ventilated birds

frequently had PO2 values below 90% during procedures. A PO2 below 90% would be considered a cause for concern.

**Discussion**

The ventilator was found to be simple to use and made difficult anaesthetics more routine. It was found to be especially useful if the patient had chronic respiratory pathology. It was also useful if the birds were hyperventilating on induction as the ventilator could override this behaviour (a common problem in goshawks).

The ventilator is also used in the practice for reptile anaesthesia and in small animal work. (such as ruptured diaphragms in cats and other thoracic surgery).

The results would appear to fully justify the use of artificial ventilators in avian surgery.It was calculated that the use of ventilation increased the cost of anaesthesia by around £1 per bird.