

# Characteristic of Inflammatory Airway Disease in Japanese Thoroughbred Racehorses

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*Inflammatory airway disease (IAD) is a common cause of poor performance, interruption of training and premature retirement in racehorses. It is also reported that up to 80% of horses are affected at some point in the first years of training in UK and Australia. However, no studies with regard to the information on occurrence of IAD in Japanese Thoroughbred racehorses have been reported. To investigate the occurrence and the characteristics of IAD, epidemic research including endoscopic examination of the airway tract and trachea wash was conducted for Thoroughbred racehorses presenting coughs or poor performance which airway tract disease was suspected stalled in training facility managed by Japan Racing Association. Fifty-six out of 76 Thoroughbred racehorses (73.7%) presenting coughing or poor performance were diagnosed as IAD. Mean incidence rate of IAD was 0.3% and it has been confirmed that constant number of IAD exists in Japan. Up to 35.7% of IAD horses showed upper airway abnormalities in some extent. There was a trend for IAD horses to use wood shavings for bedding and fed hay from the ground compared with the control group. Therefore, improvement of stabling environment may aid in preventing IAD. This study demonstrated that Japanese Thoroughbred racehorses are affected by IAD likewise other countries as well as demonstrated the characteristics of IAD which may contribute to the clarification of the pathogenesis of IAD.*

**Key words:** *etiology, inflammatory airway disease, poor performance, thoroughbred racehorse*

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Inflammatory airway disease (IAD) is a common cause of poor performance, interruption of training and premature retirement in racehorses [2, 3, 6, 10]. IAD is considerably more common than signs of upper respiratory disease in young racehorses and is often recurrent [4]. Therefore, studies have shown that IAD is the most important form of respiratory disease in young racehorses in flat training yards [4, 14, 15]. Clinical signs associated with IAD include coughing, increased amounts of mucus visible in the trachea after exercise and increased proportions of inflammatory cells [13]. More than 20% of neutrophils in tracheal wash (TW) fluid and 5% in bronchoalveolar lavage

(BAL) fluid is a useful indicator in diagnosis of IAD [13].

Epidemiological studies have shown that IAD is found in Thoroughbred racehorses [4], Standardbred racehorses [7], sport horses [8] and National Hunt horses [1] however, the etiology and pathogenesis of IAD are poorly defined and is probably multifactorial. Studies focusing on individual agents suggests that the possible involvement of viral infection, bacterial infection, environmental loading of the respiratory system and dysregulation of inflammatory process [4, 13, 15]. The aim of this study is to investigate the occurrence of IAD in Japanese thoroughbred racehorses and to demonstrate the characteristics of IAD, which will aid in the clarification of the pathogenesis of IAD.

**Table 1.** Mean nucleated cells of 76 studied horses

|                          | IAD group (56 horses) | Non IAD group (20 horses) |
|--------------------------|-----------------------|---------------------------|
| Mean nucleated cells (%) |                       |                           |
| Neutrophils              | 55.7 ± 26.3           | 5.5 ± 4.5                 |
| Macrophage               | 33.0 ± 20.7           | 85.1 ± 7.4                |
| Lymphocyte               | 11.1 ± 8.1            | 9.4 ± 5.6                 |
| Eosinophils              | 0.1 ± 0.4             | 0                         |

Tracheal aspirates containing more than 20% neutrophils were diagnosed as IAD.

## Material and Methods

Research was conducted from July to December 2001 for Thoroughbred racehorses that visited Racehorse Hospital of Japan Racing Association (JRA) stalled in training facility managed by JRA. Endoscopic examination of the respiratory tract, TW and questionnaire survey regarding stable environments including feeding manners were conducted to 76 Thoroughbred racehorses (2.39 ± 0.5 years old) presenting coughs or poor performance under major complaint which airway tract disease was suspected.

For total nucleated cell counts, samples were prepared rapidly using a simple method of cytocentrifugation (Shandon Cytospin3, Thermo Bioanalysis, Japan) and a commercial stain (Hemacolor, MERCK, Japan). Total nucleated cell counts were determined manually, using hemocytometer. Differential cell counts were determined by examination of 300 cells on a representative area, and percentages of neutrophils, lymphocytes, eosinophils, macrophages, and respiratory tract epithelial cells were recorded. Tracheal aspirates containing more than 20% neutrophils were diagnosed as IAD (IAD group).

Endoscopic examination of the respiratory tract was performed in a stall with nose twitched to the level of carina was then performed with a tracheal wash sample being collected transendoscopically by instilling 30 ml of sterile saline into the distal trachea and then immediately aspirating it. Samples were stored in same amount of preservative fluid (Shandon Cytospin Collection Fluid, Thermo Electron Corporation, USA) until processed. Upper airway findings were scored for the following in to three categories, none (score 1), mild (score 2) and moderate or marked (score 3): epiglottis abnormality (EA), pharyngeal lymphoid hyperplasia (PLH), laryngeal hemiplegia (LH) and dorsal displacement of soft palate (DDSP). Fisher's exact test was performed for statistical difference

between IAD group and Non IAD group.

Questionnaire survey was performed to the trainer or the stable staff using question sheet at the time of endoscopy. Questionnaire items were existence of coughing during rest or training, existence of poor performance, materials of the bedding and position of the hay.

Numbers of incidence are showed by monthly and incidence rate was calculated by dividing the number of horses by mean total number of racehorses registered in the training center. Mean total number of registered racehorses was calculated by averaging the daily total number of registered horses month by month. Pearson's  $\chi^2$  test was performed to compare number of incidence with the mean number of incidence.

The relationships of feeding manners and material for bedding with IAD horses were analyzed using Fisher's exact test. Questionnaire survey on feeding manners and material for bedding was randomly performed at 232 stables with healthy horses in training facility managed by JRA as a control. Statistical significance was set at  $P < 0.05$ .

## Results

Fifty-six out of 76 Thoroughbred racehorses (73.7%) presenting coughing or poor performance had increased amounts of mucus visible in the trachea and contained more than 20% neutrophils in the tracheal aspirates and diagnosed as IAD (Table 1).

Various upper airway abnormalities were observed in both IAD and Non IAD group. Mean scores of EA, PLH, LH, DDSP in IAD group and Non IAD group are 2.0 ± 1.0, 1.8 ± 0.8, 1.3 ± 0.7, 1.7 ± 0.5 and 1.7 ± 0.6, 1.6 ± 0.8, 1.0 ± 0, 1.7 ± 0.5, respectively (Table 2). There was no significance difference between the two groups.

Number of incidents and incidence rate of IAD is in Table 3. Mean incidence rate of IAD was 0.3%. There were no significant difference in the number of

**Table 2.** Mean score of upperairway endoscopic findings of 76 studied horses

| Upperairway abnormality            |                        | IAD group (56 horses) | Non IAD group (20 horses) |
|------------------------------------|------------------------|-----------------------|---------------------------|
| Epiglottis Abnormality             | 1 (None)               | 51                    | 18                        |
|                                    | 2 (Mild)               | 1                     | 2                         |
|                                    | 3 (Moderate or marked) | 4                     | 0                         |
|                                    | Mean                   | 1.2 ± 0.5             | 1.1 ± 0.3                 |
| Pharyngeal Lymphoid Hyperplasia    | 1 (None)               | 36                    | 14                        |
|                                    | 2 (Mild)               | 13                    | 4                         |
|                                    | 3 (Moderate or marked) | 7                     | 2                         |
|                                    | Mean                   | 1.5 ± 0.7             | 1.4 ± 0.7                 |
| Laryngeal Hemiplegia               | 1 (None)               | 55                    | 20                        |
|                                    | 2 (Mild)               | 0                     | 0                         |
|                                    | 3 (Moderate or marked) | 1                     | 0                         |
|                                    | Mean                   | 1.0 ± 0.3             | 1.0 ± 0                   |
| Dorsal Displacement of Soft Palate | 1 (None)               | 49                    | 15                        |
|                                    | 2 (Mild)               | 7                     | 5                         |
|                                    | 3 (Moderate or marked) | 0                     | 0                         |
|                                    | Mean                   | 1.1 ± 0.3             | 1.3 ± 0.4                 |

**Table 3.** Number of incidents and incidence rate of IAD during July to December 2001

|           | IAD (horses) | Number of registrated horses | Incidence rate (%) |
|-----------|--------------|------------------------------|--------------------|
| July      | 19           | 1,992                        | 1.0                |
| August    | 4            | 1,800                        | 0.2                |
| September | 10           | 2,712                        | 0.4                |
| October   | 9            | 3,401                        | 0.3                |
| November  | 6            | 3,820                        | 0.2                |
| December  | 8            | 4,089                        | 0.2                |
| Total     | 56           | 17,814                       | 0.3                |

**Table 4.** Relationships of feeding manners and material for bedding with IAD

|                              | n   | Feeding manners of hay |                                 | Fisher's exact test P-value | Bedding materials |              | Fisher's exact test P-value |
|------------------------------|-----|------------------------|---------------------------------|-----------------------------|-------------------|--------------|-----------------------------|
|                              |     | Ground                 | Basket positioned at head level |                             | Rice straw        | Wood shaving |                             |
| Coughing or Poor performance |     |                        |                                 |                             |                   |              |                             |
| IAD                          | 56  | 35(62.5%)              | 21(37.5%)                       | P<0.05                      | 32(57.1%)         | 24(42.9%)    | P<0.05                      |
| Healthy horses               |     |                        |                                 |                             |                   |              |                             |
| Control                      | 232 | 105(45.3%)             | 127(54.7%)                      |                             | 189(81.5%)        | 43(18.5%)    |                             |

incidents and incidence rates compared with each average.

Table 4 describes the relationships of feeding manners and material for bedding with IAD. Regarding feeding manners, 62.5% of the IAD horses were fed hay from the ground and 37.5% from the basket positioned at head level whereas the ratio was 45.3% and 54.7% for the control group, respectively. Percentage of IAD horses fed hay from the ground was

significantly higher compared to horses fed hay from the basket positioned at head level.

Regarding materials for bedding, 57.1% of the IAD horses used rice straw and 42.9% used wood shavings whereas the ratio was 81.5% and 18.5% for the control group, respectively. Percentage of IAD horses using wood shavings for bedding was significantly higher compared to horses using rice straw.

## Discussion

Fifty-six out of 76 Thoroughbred racehorses (73.7%) suspected to have respiratory problem was diagnosed as IAD. Previous studies have shown that IAD is considerably more common than signs of upper respiratory disease in young racehorses and that IAD is the most important form of respiratory disease in young racehorses in flat training yards [4, 14, 15]. Our result supports the previous studies as well as demonstrated that likewise racing Thoroughbred populations such as U.S.A., U.K. and Australia, Thoroughbred racehorses in Japan are affected by IAD.

Various upper airway abnormalities were observed in both IAD and Non IAD group and there were no significant difference among two groups. This result supports the report by Holcombe *et al.* [5] that although no correlation between upper airway inflammation score and lower respiratory tract cytology however, young horses in training frequently have upper airway inflammation. Since the mean age of studied Thoroughbred racehorses was  $2.39 \pm 0.5$  years old, this result also supports the study that younger horses are at increasing risk of suffering episodes of clinically apparent respiratory disease [11].

Mean incidence rate of IAD was 0.3% and there were no significant difference in the number of incidents and incidence rates compared with each average. Burrell *et al.* [4] reported that mean monthly prevalence and incidence of IAD are 12% and 10 cases/100/horses/months. Since clinically apparent cases were studied in this research, the monthly prevalence and incidence may have been relatively lower compared to the previous study which includes sub clinical cases. Also, environment such as well controlled hygiene and well maintained training and stabling facility provided by JRA may have contributed to the reduction in the occurrence of IAD.

There was no significant difference in the number of incidents and incidence rates compared with each average. From this result, it was revealed that there was no seasonality in the occurrence of IAD in Japan.

The percentage of IAD horses using wood shavings for bedding or fed hay from the ground were significantly higher than horses using rice straw for bedding or horses fed hay from the basket positioned at head level. Therefore, high rate of IAD horses used wood shavings for bedding or fed hay from the ground. Since straw beddings are considered to contain more respirable endotoxins and organic dusts capable of

inducing airway inflammation [9, 16], and there is a report which confinement with the horses head elevated can result in significant bacteria contamination and multiplication with the lower respiratory tract due to the interference of postural drainage[12], we speculated that horses using rice straw for bedding and fed hay from the basket positioned at head level were higher risk in developing IAD. In this study, wood shavings for bedding material and feeding hay from the ground did not contribute in preventing the occurrence of IAD. The reason for this contradiction may attribute to the difference in respirable endotoxins and organic dusts content between straw and rice straw. Also, factors of the feeding manners and bedding materials may be less important in a well managed environment.

In conclusion, it has been demonstrated that Japanese Thoroughbred racehorses are affected by IAD likewise other countries such as U.S.A., U.K. and Australia as well as demonstrated the characteristics of IAD which may contribute to the clarification of the pathogenesis of IAD.

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