Distribution and risk factors for the occurrence and development of recurrent equine uveitis

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Abstract. The polyetiological nature of uveitis, the role of systemic mechanisms and the impact of environmental factors (improper operation, horse feeding) in its development and course determine the complex nature and complexity of the problem of this disease. The latter is directly related to the lack of knowledge of the predisposing triggering factors of the immunological mechanisms in the development of uveitis. Despite the high frequency of this pathology in horses, the spread and risk factors for the occurrence and development of uveitis have not been determined, the diagnostic criteria and the prognostic significance of clinical signs have not been studied. All of the above dictates the urgent need to develop a system of evidence-based approach to the diagnosis, treatment and prevention of uveitis. In this regard, it is very relevant to study the immunological mechanisms of the course of ERU, control over their condition and targeted impact on the prevention of complications.

1. Relevance
The study of diseases of the uveal membrane of the eye in horses is one of the fundamental problems of veterinary ophthalmology. The solution of this problem is particularly relevant at the present time, since with the development of horse breeding and equestrian sports, the frequency of this pathology in horses increases [1,2]. At the same time, the most common disease is recurrent equine uveitis (ERU), the peculiarity of the course of which is expressed in repeated exacerbations. The disease is caused by a chronic relapsing course, the severity of outcomes and insufficiently effective therapy. The relevance of the problem of recurrent equine uveitis is determined by the significant frequency of vision loss, with particularly severe forms of the disease, blindness in one or both eyes reaches 90% [3].

The polyetiological nature of uveitis, the role of systemic mechanisms and the impact of the external environment (improper operation and feeding of animals) in the development and course of RUL, determine the complex nature and complexity of the problem of uveitis. The latter is directly related to the lack of knowledge of the predisposing triggering factors of the immunological mechanisms in the development of uveitis [4,5,6].

Despite the high frequency of this pathology in horses, the spread, risk factors for the occurrence of the disease and the development of complications associated with the formation of synechiae and conglomerates, in the early period of the disease and the development of chronic inflammation, the
occurrence of sluggish, torpid forms of inflammation to the treatment carried out, have not been determined.

2. Materials and research methods

The study of the spread of recurrent equine uveitis is based on the material of 850 heads of horses examined in Moscow and the Moscow region. Examination of horses located at the Ramenskoye Racetrack, the CSKA Equestrian Complex, the 1st Stud Farm, the Sokoros equestrian complex, the Central Moscow Hippodrome, the Izmailovo equestrian Complex, the Skryabin Moscow State Medical University Vivarium, the Bitsa equestrian complex, the Novy Vek equestrian complex, as well as private stables.

All the horses were sports-oriented and had similar feeding and maintenance conditions. Young horses, usually in training, older horses, from 12 years and above, did not carry a large load.

When identifying certain forms of uveitis, data on the maintenance, feeding and operation of the diseased animal, the time of occurrence of pathological changes and the presence of repeated cases, the rate of increase and decrease of clinical signs, as well as previous therapeutic measures were collected from the owners or caregivers.

Devices for the study of the pathological process zone: Heine forehead magnifier, Heine slit lamp and Heine ophthalmoscope.

3. Research results and their discussion

The presence of various clinical forms of uveitis with different terms after the occurrence of uveitis in 126 heads of horses was established.

In 36 horses (28%), an ophthalmological examination diagnosed acute uveitis, subacute uveitis in 28 horses (22%), chronic course – 30 heads (23%), 32 horses (25%) had a clinical picture of subatrophy of the eyeball without periods of exacerbation.

Thus, of the 850 horses we examined, 126 (14%) had some or other forms of uveitis.

It is established that uveitis affects horses of both sexes and different colors. 111 horses (80%) were males, of which 90 horses (81%) were geldings, and 21 horses (19%) were stallions. 15 heads (20%) were mares. The differences in the quantitative composition of the sexes were unreliable (p<0.05), since male horses (stallions and geldings) are mainly used in sports.

The clinical signs and development of the inflammatory process in the vascular tract did not differ depending on the breed and color. However, as shown in table 1, uveitis is more common in young animals: from 1-4 years 34 horses (26.2%), from 5-10 years 72 horses (57%), 11 – 15 years 12 horses (9.5%), 15 years and older 8 horses (6.3%).

![Table 1](https://example.com/table1)

| Age           | Number of sick eyes abs. | Relative number of diseased eyes (%) |
|---------------|--------------------------|-------------------------------------|
| 1-4 years     | 34                       | 26.2                                |
| 5-10 years    | 72                       | 57                                  |
| 11-15 years   | 12                       | 9.5                                 |
| 15 years and older | 8               | 6.3                                  |
| Total         | 126                      | 100%                                |

Russian horses, Akhal-Teke, Holstein, Arab, Oldenburg, Oryol, Russian trotting breeds, etc., as well as ponies, are affected by uveitis, as well as horses of the Traken, Russian riding, Akhal-Teke, Holstein, Arab, Oldenburg, Oryol, and Russian trotting breeds. The breed composition of horses with recurrent uveitis is shown in table 2.
Table 2. Breeds of horses with recurrent uveitis.

| Breeds                  | Number of sick eyes abs. | Relative number of diseased eyes (%) |
|-------------------------|--------------------------|-------------------------------------|
| Trakenen                | 24                       | 19.0                                |
| Russian trotter         | 30                       | 23.8                                |
| Russian horse riding    | 20                       | 15.8                                |
| Budenovskaya            | 10                       | 7.9                                 |
| Anglo-Budenovskaya      | 6                        | 4.7                                 |
| Holstein                | 6                        | 4.7                                 |
| Akhal-Teke              | 8                        | 6.3                                 |
| Arabic                  | 6                        | 4.7                                 |
| Ponies                  | 3                        | 2.3                                 |
| Home page               | 4                        | 3.1                                 |
| Other breeds            | 9                        | 7.1                                 |

Horses imported from stud farms and from abroad, who live in a private stable for a long time, are equally ill. For the first time, the occurrence of uveitis was noted after the flu, carrying out planned anti-epizootic measures, moving in horse-drawn wagons for long distances. The data of many foreign and domestic authors on the phenomenon of uveitis as a symptom of a complex of leptospirosis infection are confirmed (table 3).

Table 3. Factors contributing to the occurrence of uveitis.

| Factors                               | Number of sick eyes abs. | Relative number of diseased eyes (%) |
|---------------------------------------|--------------------------|-------------------------------------|
| Planned anti-epizootic measures       | 24                       | 19.0                                |
| Long-term transportation              | 16                       | 12.6                                |
| Heavy physical activity               | 12                       | 9.5                                 |
| Transferred general somatic and infectious diseases, including | 52                       | 41.2                                |
| Leptospirosis                         | 44                       | 34.9                                |
| Flu                                   | 8                        | 6.3                                 |
| Not installed                         | 22                       | 17.4                                |

However, it would be wrong to assume that leptospirosis is the main cause of recurrent uveitis in horses. An example would be the epizootological situation at the private stable "Russian product", located in the city of Lytkarino MO. Of the 11 horses that had leptospirosis in an asymptomatic form, only two had clinical signs of uveitis. The rest of the animals did not have any clinical signs characteristic of uveitis.

Analyzing the risk factors in the development of this ophthalmopathy, it was found that for the treatment of uveitis, as a rule, homeopathic, tissue preparations, as well as laser therapy are used, regardless of the nature of the course of the disease. In this regard, attention was paid to the traditional methods of providing veterinary care, considering: the duration of treatment, medications, as well as the results of treatment. It was found that the use of glucocorticosteroids and cytostatics was carried out haphazardly, without determining the scheme, duration and adequacy of the use of drugs in various forms and at different stages of the inflammatory process. In addition, the sick horse did not change the diet, maintenance and load. Vet. specialists, as a rule, managed to stop the inflammatory process in uveitis at the first attack, but the exacerbations following the period of remission left irreversible changes associated with the formation of conglomerates, synechiae and cataracts, and, as an outcome, the occurrence of pupil occlusion and atrophy of the eyeball, the development of toxic cataracts in a short time.
An important factor in the development of irreversible changes is the late diagnosis of uveitis. During the study period, 62 horses were blind in one or both eyes at the time of examination. Analyzing the risk factors that reflect the diet of sick horses, its imbalance in accordance with consumption was established. Tables 4 and 5 show the diet and feeding standards of a sports horse that receives a load for 2 hours or more, as well as the diet of sick horses that do not receive such a load.

As you know, the nutritional value of feed is estimated in terms of metabolic and productive energy. The exchange energy is used to maintain life, i.e. to ensure the work of internal organs, maintain temperature, as well as to restore changes as a result of the active work of the body's tissues. Therefore, the greater the difference between the substances received from the feed and synthesized in the body, as well as the need, the more nutrients oxidized in the cells during the exchange process are released from the body in the form of heat as a result of the active work of the body's tissues. The efficiency of the conversion of physiologically useful metabolic energy in the cells of the body to the needs of the body depends on the correspondence of the composition of the formed tissues. Therefore, the greater the difference between the substances received from the feed and synthesized in the body, as well as the need, the more nutrients oxidized in the cells during the exchange process are released from the body in the form of heat.

In the analysis, the amount of feed consumed in all affected horses was significantly higher than the nutritional requirements: oats by 3-4 kg, corn by 0.500.7 kg, premix 0.1 kg, wheat bran by 1-1.5 kg, carrots by 1 kg. The excess in the diet of raw protein was 25%, fat-25%, fiber-26%, BEV-30%.

Such an imbalance of the diet in accordance with consumption leads to an overabundance of heat substances.

Table 4. Approximate diet of a sports horse (1 head/ 1 day) receiving loads for 2 hours or more.

| Indicators               | Weight 500 kg |
|--------------------------|---------------|
|                          | Performance period | Rest period |
| Grain-legume hay (kg)    | 7             | 8           |
| Oats (grain) (kg)        | 7             | 5           |
| Corn (grain) (kg)        | 1             | -           |
| Premix (kg)              | 0.1           | 0.1         |
| Wheat bran (kg)          | -             | 0.5         |
| Table salt (g)           | 66            | 33          |
| Carrots (kg)             | 3             | 3           |
| The diet contains        | 14.0          | 11.8        |
| Dry substance            | 12.8          | 9.32        |
| Feed units               | 134.0         | 97.0        |
| Exchange energy (MD)     | 1610          | 1287        |
| Raw protein (g)          | 988           | 873         |
| Digested protein (g)     | 61.4          | 48.7        |
| Lysine (g)               | 2640          | 2500        |
| Crude fiber (g)          | 72.0          | 64.0        |
| Ca (g)                   | 44.2          | 36.0        |
| P (g)                    | 24.2          | 25.1        |
\[
\begin{array}{lll}
\text{Mg (g)} & 8227 & 9091 \\
\text{Fe (mg)} & 111.8 & 91.6 \\
\text{Cu (mg)} & 373.7 & 294 \\
\text{Zn (mg)} & 6.2 & 5.6 \\
\text{Co (mg)} & 841 & 713 \\
\text{Mn (mg)} & 6.42 & 5.57 \\
\text{I (mg)} & 125 & 67.5 \\
\text{Carotene (mg)} & 50 & 27.0 \\
\text{Vitamin A (retinol) (thousand IU)} & 5,5 & 2.7 \\
\text{D (calciferol) (thousand IU)} & 430 & 390 \\
\text{E (tocopherol) (mg)} & 49 & 35.0 \\
\text{B1 (thiamine) (mg)} & 40 & 60.5 \\
\text{B2 (riboflavin) (mg)} & 125 & 96.0 \\
\text{B4 (choline) (mg)} & 6100 & 1520 \\
\text{B3(niacin) (mg)} & 180 & 101.3 \\
\text{B6 (pyridoxine) (mg)} & 47.5 & 29.7 \\
\text{B12 (cyanocobalamine) (mg)g} & 76.0 & 70.0 \\
\text{B c (folic acid)} & 31.3 & 16.6 \\
\end{array}
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In the body, the synthesis of intercellular matter is disrupted, there is an accumulation of uric acid, ketone bodies, urea, and the load on organs and tissues increases.

**Table 5.** The approximate diet of a horse that has a disease of the RUE, and not receiving loads.

| Indicators          | Weight 500 kg Diet of sick animals | Consumption rate |
|---------------------|-----------------------------------|------------------|
| Grain-legume hay (kg) | 7                                 | 7                |
| Oats (grain) (kg)    | 6-7                               | 1-2              |
| Corn (grain) (kg)    | 1                                 | -                |
| Premix (kg)          | 0.1                               | -                |
| Wheat bran (kg)      | 1.2-2                             | 0.5              |
| Table salt (g)       | 30                                | 23               |
| Carrots (kg)         | 3                                 | 2                |

Irrational use of energy leads to obesity. The body is forced to fight with metabolic products, there is not enough protein, and therefore, there is a shortage of transport proteins, cell renewal is slow. As a result, protein metabolism changes, in particular, protein synthesis is disrupted, and protein consumption by tissues slows down.

4. **Conclusion**

As a result of the conducted studies, the factors contributing to the occurrence of recurrent equine uveitis were identified: planned anti-epizootic measures, long transportation, heavy physical exertion, general somatic and infectious diseases, including leptospirosis and influenza.
The clinical justification for the development of recurrent equine uveitis is the following risk factors: delayed diagnosis. Insufficient qualified and untimely assistance. Carried out without taking into account the clinical signs and general condition of the horse's body, insufficient anti-inflammatory treatment or short-term inadequate use of anti-inflammatory drugs. An important factor that often remains undervalued is the nutrition that does not meet the body's need for the nutrients that come with the feed and are synthesized in the body.

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