

UDC 615.281.8:615.322

## THE STUDY OF THE ANTI-INFLUENZA ACTIVITY OF ALTABOR SUBSTANCE

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**Abstract:** the antiviral activity of Altabor substance has been studied in the experiments *in vitro* and *in ovo*. The substance of Altabor actively inhibits the influenza virus reproduction in the doses from 100 µg/ml to 6,75 µg/ml by 7,5-3,0 lg of ID<sub>50</sub>, drug in the dose of 100 µg/embryo inhibits the replication of the influenza virus by 5,5 lg of EID<sub>50</sub>, and it confirms the presence of the antiviral activity of the drug.

**Key words:** altabor, antiviral activity, influenza.

According to the WHO 5 – 30% of the population in the world is ill with the influenza and influenza-like illnesses representing up to 500 million people, 2 million of them die. If we assume that a person has flu and acute respiratory infections (ARI) on average once or twice per year, then according to statistical studies, every fourth - fifth inhabitant of the planet is in epidemic process [1,2]. However, these figures are greatly reduced because of incomplete registration of influenza and ARVI. More accurate methods for detection of influenza illnesses by means of selective medical checkups and regular surveys of population groups have shown that, according to the experience of the United States, on average one person has 3 cases of disease [3,4]. According to the published data, annually the flu can affect from 1 to 26% of people aged 18-84 years. Every flu season is accompanied by an increased level of death of patients. Rates of death from influenza in the world are 0.01-0.2%, while the average annual losses reach tens of thousands of people in different countries, including mostly children during the first years of life (up to 2 years old) and elderly (over 65) [3,4].

The impact of morbidity on the national economy during outbreaks of influenza is very significant. The amount of damage caused by influenza to the population and the economies of developed countries can be compared only with cardiovascular diseases and malignant tumors [4]. Distribution of influenza and ARVI greatly exceeds the sum of all human infectious diseases. The threat of influenza epidemics dramatically increases a massive blow to the health and economy of the country. In a short period of 3-4 weeks the disease disables up to 30 and even 50% of all child and adult urban population. Statesmen and manufacturers constantly count losses caused by decline of the economy, the absence of people at work, intensive use of drugs, etc. Healthy adults that form the basis of workforce in the country become ill. Among them 50% of the total number of employees seek medical advice, and 25-30% of them are hospitalized. According to statistics, 10% of all causes of absence at the workplace

accounts for influenza. Annually about \$ 15 billion is spent on the treatment of influenza and ARVI in the world.

Influenza has severe economic consequences. For enterprises, it is reduction in income as a result of decline in production, the failure of plans, non-fulfillment of agreements with partners, disruption of production; payment of additional funds to healthy employees for extra work and sick leaves to workers during their illness or illness of their children; decrease in work efficiency due to increased load on healthy staff, etc. Intangible losses include also worsening of work performance (a person after sick leave works for a short time with 50% efficiency). In addition, there is a risk of making incorrect decisions by a worker with diminished attention or not healthy enough.

For employees, it is the loss of working ability from 1 to 4 weeks, decrease in financial income for the period of illness, expenses for medical care and medicines, increased load at work after illness, disruption of work plans and the possibility of losing their jobs and so on. The workload of the medical staff during outbreaks of influenza is also exceeding. Each outbreak increases the workload on the original chain of health care by 30-50%, the number of visits to emergency rooms and hospitalizations increases more than twice.

Thus, it may be concluded that the flu is a dangerous disease that is widespread and with a high level of lethality, it intoxicates the body significantly and has a lot of complications, causes great damage to both people and the economy. Therefore, the search for new drugs to treat influenza and viral infections are relevant and promising [5,6].

**The aim of the work** was to study the anti-influenza activity of Altabor substance obtained from the collective fruit of black alder (*Alnus glutinosa*) and grey alder (*Alnus incana*) at the "Borschagovsky Chemical and Pharmaceutical Plant".

### Materials and methods

The study of the anti-influenza activity of Altabor substance was conducted in experiments *in vitro* and *in ovo*.

The study of the anti-influenza activity *in vitro* was carried out on the model of influenza infection. For this purpose, MDCK cell culture (dog kidney cells) was used. Altabor in doses ranging from 100 to 1,6 µg/ml was introduced into well plates where the cells were grown. In 1 h the influenza virus in the dose of 100 ID<sub>50</sub> (immunizing dose) was introduced into the wells treated and untreated with the drug. In 72 h of incubation of cells at 37°C the culture fluid was collected, and the activity of hemagglutinin and the infectious titer of influenza virus were determined with subsequent titration in cell culture.

The study of the anti-influenza activity of the substance *in ovo* was performed using chicken embryos. In the allantoic cavity of 10-11 day embryos Altabor was injected in the dose of 100 µg per embryo. In 1 h chicken embryos were infected by influenza virus in the allantoic cavity in the dose of 100 EID<sub>50</sub>. In 72 h of incubation of embryos at 37°C the allantoic fluid was collected, and the activity of hemagglutinin and the infectious titer of the

virus were determined with subsequent titration on chicken embryos.

The results of the studies concerning the anti-influenza activity of Altabor substance in experiments *in vitro* and *in ovo* are given in Tables 1 and 2.

## Results and Discussion

**Table 1 - The effect of Altabor substance on the influenza virus in experiments *in vitro***

The dose, µg/ml	Titer of hemagglutinins, HGA (hemagglutination assay)		Infection titer of the virus, lg of ID <sub>50</sub>	Index of inhibition, lg of ID <sub>50</sub>
100	-		0	7,5
50	-		0	7,5
25	64	32	3,5	4,0
12,5	128	64	4,0	3,5
6,75	128	128	4,5	3,0
3,37	128	128	6,5	1,0
1,6	128	128	6,5	1,0
Control of the virus	256		7,5	-

Analyzing the given data it should be noted that Altabor substance actively inhibits the influenza virus repro-

duction in the doses from 100 µg/ml to 6,75 µg/ml by 7,5-3,0 lg of ID<sub>50</sub>, and it indicates a strong anti-influenza activity of the drug.

**Table 2 - The effect of Altabor substance on the influenza virus in experiments *in ovo***

Conditions of the experiment	A dose on the embryo, µg	Titer of hemagglutinins, HGA	Infection titer of the virus, lg of EID <sub>50</sub>	Index of inhibition, lg of ID <sub>50</sub>
Substance Altabor, 100 µg	1 batch	0	2,0	5,5
	2 batch	0	2,0	5,5
	3 batch	0	2,0	5,5
Control of the virus	-	512	7,5	-

The data presented in Table 2 indicate that the drug in the dose of 100 µg/embryo inhibits the replication of the influenza virus by 5,5 lg of EID<sub>50</sub>, and it confirms the presence of the antiviral activity of the drug.

## Conclusions

The results of the studies on the antiviral activity of Altabor substance in the experiments *in vitro* and *in ovo* have shown that the drug has a pronounced anti-influenza activity.

## Prospects for further development

The results of the anti-influenza activity of Altabor substance obtained make possible to develop drugs based on it to treat influenza and flu-like infections.

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УДК 615.281.8:615.322

## ИЗУЧЕНИЕ ПРОТИВОГРИППОЗНОЙ АКТИВНОСТИ СУБСТАНЦИИ АЛЬТАБОР

Рыбалко С.Л.<sup>1</sup>, Крутских Т.В.<sup>2</sup>, Шаламай А.С.<sup>3</sup>

**Резюме:** в опытах *in vitro* и *in ovo* изучена противовирусная активность субстанции Альтабор. Субстанция Altabor активно ингибирует размножение вируса гриппа в дозах от 100 мкг/мл до 6,75 мкг/мл на 7,5-3,0 lg от ID<sub>50</sub>, препарат в дозе 100 мкг/эмбрион ингибирует репликацию вируса гриппа на 5,5 lg от EID<sub>50</sub>, что подтверждает наличие противовирусной активности препарата.

**Ключевые слова:** альтабор, противовирусная активность, грипп.

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## ВИВЧЕННЯ ПРОТИГРИПОЗНОЇ АКТИВНОСТІ СУБСТАНЦІЇ АЛЬТАБОР

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**Резюме:** в дослідях *in vitro* та *in ovo* вивчена протівірусна активність субстанції Альтабор. Субстанція Altabor активно інгібує розмноження вірусу грипу в дозах від 100 мкг/мл до 6,75 мкг/мл на 7,5-3,0 lg від ID<sub>50</sub>, препарат в дозі 100 мкг/ембріон інгібує реплікацію вірусу грипу на 5,5 lg від EID<sub>50</sub>, що підтверджує наявність протівірусної активності препарату.

**Ключові слова:** альтабор, протівірусна активність, грип.

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