

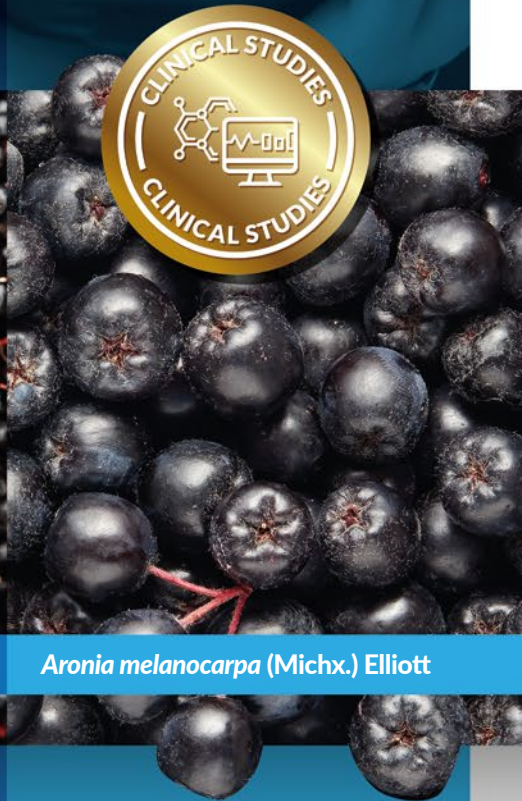


**FENACTIVE**<sup>®</sup>  
by Greenvit<sup>®</sup>

# Antiviral support



*Sambucus nigra L.*



*Aronia melanocarpa (Michx.) Elliott*

**IMMUNITY  
COLD AND FLU  
INFECTIONS**



[fenactive.com](https://fenactive.com)



**FENACTIVE**<sup>®</sup>  
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# What is FENACTIVE®

FENACTIVE® is a standardized complex of plant extracts, rich in polyphenols, designed to support and restore the body's immunity, in particular against upper respiratory tract infections (URTI) of viral and bacterial origin. *Aronia melanocarpa* (Michx.) Elliott + *Sambucus nigra* L. contain a broad range of anthocyanins. The combination of these two extracts results in a complex with enhanced anthocyanin diversity. As a result of our own laboratory work on the formulation, we have obtained an innovative specific complex with an extended, synergic spectrum of biologically active ingredients

Plant (fruit)	Dominant anthocyanin fraction
<i>Aronia melanocarpa</i> (Michx.) Elliott (Aronia berry)	cyanidin-3-O-galactoside cyanidin-3-O-arabinoside cyanidin-3-O-xyloside
Aronia + Elderberry	cyanidin-3-O-glucoside
<i>Sambucus nigra</i> L. (elderberry)	cyanidin-3-O-sambubioside-5-O-glucoside cyanidin-3,5-di-O-glucoside cyanidin-3-O-sambubioside

Table 1.

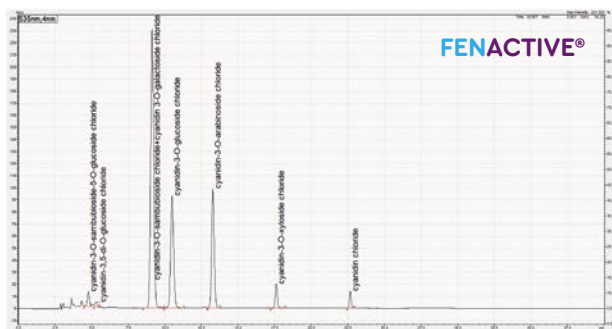


Figure 1.

## Specification

The FENACTIVE® *Aronia melanocarpa* (Michx.) Elliott + *Sambucus nigra* L. complex has been standardised simultaneously regarding the content of:

- anthocyanins (HPLC)
- polyphenols (UV)

It is patented in-house production from selected raw materials. Thanks to contracted, local sources of raw ingredients we guarantee full control over the origins and quality of the extracts. **The FENACTIVE® (10) complex contains at least 10% anthocyanins and at least 15% polyphenols.**

## Recommended use and dosage

FENACTIVE® is available as a purple to dark violet powder. It is convenient to produce formulations, suitable for capsules, tablets, liquid forms. Suggested dosage: 200-250 mg, once daily.

## What makes FENACTIVE® unique?

Fusion of the health benefits of two traditionally used fruits with the highest ORAC\* scale indices – aronia berry and elderberry - the innovative, standardised composition of FENACTIVE® supports the body's natural defensive functions, ensuring i.a.:

- effective prevention and/or treatment of **respiratory infections caused by viruses** (blocking adhesion of the virus to host cells, inhibiting its replication and transmission from cell to cell, and stimulating the response from the immune system) **and/or bacteria**,
- preventing conditions resulting from oxidative stress or supporting their treatment (restoring balance between antioxidative and prooxidative processes; **reducing inflammation in the body**).

\* ORAC (Oxygen Radical Absorbance Capacity) – antioxidants' ability to absorb reactive oxygen species

## Target group

The FENACTIVE® complex is recommended for use by the general population. It is particularly beneficial for the population of children (frequent respiratory infections) and seniors (natural aging of the immune system induces chronic inflammatory processes underlying a number of serious diseases).

# FENACTIVE® trademark and formulation

The **FENACTIVE®** registered trademark belongs to **GREENVIT®**. Its use is exclusively related to the purchased complex of extracts. The use of the **FENACTIVE®** trademark in finished products containing this complex mixed with other ingredients belonging to the same botanical family is not permitted.

## Studies devoted to *Aronia melanocarpa* (Michx.) Elliott + *Sambucus nigra* L.

There is no fully effective drug or vaccine against viruses causing human respiratory infections, including influenza (1). Moreover, these infections make patients, especially in the high-risk group, more prone to secondary bacterial infections, which often have a much more severe clinical course than the primary viral infection (2). Therefore, efforts are undertaken towards the development of effective, alternative and safe forms of prevention and/or treatment (1,3), which would provide simultaneous, two-way protection against viral and bacterial infections (3).

Elderberry and aronia berry fruits, containing a number of health-promoting ingredients, stand out thanks to their high, multi-directional biological activity. They are an extremely rich source of polyphenols, especially anthocyanins. Due to their strong antioxidant effect, these compounds largely determine the health-promoting properties of these raw materials, including their antiviral, antibacterial, immunomodulating and anti-inflammatory properties (4,5,6).

A meta-analysis of four clinical studies conducted by Hawkins et al. (7) confirmed that supplementation with preparations containing elderberry right after the appearance of upper respiratory tract symptoms has a moderate to large beneficial effect on the duration and intensity of infection.

**Antiviral properties of elderberry and aronia berry are most often attributed to the following mechanisms:**

- blocking of hemagglutinin (HA), which prevents adhesion (8,9) and penetration (8) of the virus into host cells,
- inhibiting reproduction of the virus (9,10),
- preventing further transmission of the virus from cell to cell (8), by inhibiting neuraminidase (11).

Active antiviral agents include various polyphenolic compounds such as cyanidin-3-glucoside present in both elderberry (8,12) and aronia berry (13), and cyanidin-3-sambubioside present in elderberry (11,13). An equally important, indirect, mechanism of combating viral infection – present both in elderberry (8) and aronia berry – is the **stimulation of the immune system response**.



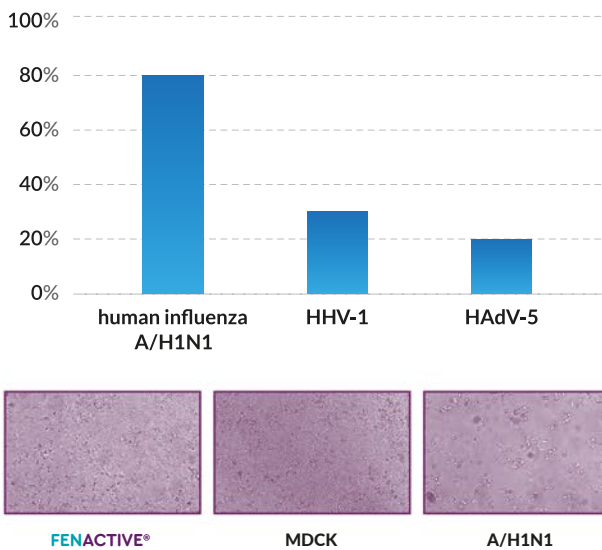
**FENACTIVE®** is an innovative formulation based on natural plant extracts, whose uniqueness has been confirmed by **Polish patent PL245254B1**. Our formula, legally protected in Poland, combines a **2:1 ratio of black elderberry (*Sambucus nigra*) extract and aronia berry (*Aronia melanocarpa* (Michx.) Elliott) extract**, ensuring a high content of anthocyanins (10-30%) and polyphenols (15-50%) – key compounds with strong antioxidant and antiviral properties.

Thanks to its patented formula, **FENACTIVE®** supports the immune system and can be used in the fight against viral infections, including coronaviruses. Its effectiveness and unique composition are the result of extensive research and innovation, confirmed by an official patent granted in Poland.

## Own studies devoted FENACTIVE®

Studies (19) to determine antiviral properties of the **FENACTIVE®** complex were conducted in the reference Laboratory of Virology of the Institute of Immunology and Experimental Therapy of the Polish Academy of Sciences. The following test viruses were used in the experiments: **A/H1N1** human influenza virus type A, Orthomyxoviridae, **HHV-1** human herpesvirus 1 (Herpesviridae), **HAdV-5** human adenovirus type 5 (Human adenovirus 5; Adenoviridae). Concentrations CC50, IC50 were determined and selectivity index was specified. After establishing non-toxic concentrations of the **FENACTIVE®** composition, antiviral assays (AVAs) for antiviral activity against test viruses were performed on cell cultures of the MDCK and A549 cell lines. Evaluation of antiviral activity was performed in a variant of incubation of cells with **FENACTIVE®** composition after viral infection. Positive controls were antiviral drugs appropriate for each virus: ribavirin (RBV), acyclovir (ACV), cidofovir (CDV), oseltamivir (OSV).

**Figure 2. FENACTIVE® – inhibition of replication of tested viruses**



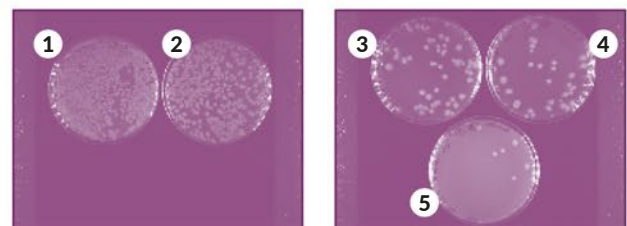
**Figure 3. Antiviral activity of the FENACTIVE® composition**  
 Description: Cytopathic effects of influenza A/H1N1 virus are shown in the images above (A/H1N1) versus control (MDCK). Inhibitory effect of FENACTIVE® on influenza virus replication is shown for MNCT (Maximum Nontoxic Concentration).

After conducting experiments according to the study protocol, it was found that FENACTIVE® showed significant antiviral activity, inhibiting the replication (multiplication) of the influenza A/H1N1 virus by 80%. Moreover, FENACTIVE® inhibited replication of herpesvirus HHV-1 and adenovirus HAAdV-5. The study compared the maximum non-toxic concentration (MNCT) of FENACTIVE®, which inhibited the proliferation of influenza A/H1N1 virus, to single doses of elderberry and aronia berry extracts alone. The results indicate that it is the appropriately selected extract content of the FENACTIVE® composition that allows it to maintain high antiviral activity at generally lower concentrations. The use of single extracts does not bring synergistic effects.

In order to confirm immunostimulating effect of the FENACTIVE® composition and to compare the effect of single elderberry and aronia berry extracts, tests were performed on PBMC (peripheral blood mononuclear cells) (20). The results indicated a significant increase in IL-6 and TNF- $\alpha$  production in PBMC cells after incubation with FENACTIVE® composition compared to control PBMC cells. Standardized aronia berry extract increased IL-6 and TNF- $\alpha$  production in PBMC cells.

On the other hand, cells cultured in the presence of standardized elderberry fruit extract did not show any significant increase in cytokine production. It has been confirmed that immunostimulating effect of the appropriately selected complex of FENACTIVE® is stronger (more beneficial) than that of the individual elderberry and aronia berry extracts.

**Antibacterial effect of elderberry** is attributed to the presence in its composition of flavonoids (5,7,3,4-tetra-O-methyl-quercentin and dihydromyricetin-3-O 3,4,5-trihydroxy-cyclohexanecarboxylate), triterpenes, lectins, oligosaccharide fragments (15) or ursolic acid (16,17). Available publications demonstrate, among others, the ability of extracts from *S. nigra* gained under laboratory conditions to inhibit the growth of *Staphylococcus aureus* MRSA, *Bacillus cereus* (15), *Escherichia coli* (15,18), *Enterococcus faecalis*, *Pseudomonas fluorescens* (18). **Also aronia berry extracts showed antibacterial effect** against *B. cereus* and *S. aureus*, and also *Pseudomonas aeruginosa*. Due to the possibility of synergic interactions between different active substances contained in different raw materials, the activity of standardized mixture of aronia berry and elderberry extracts (FENACTIVE®) was tested *in vitro*. The combination of extracts from aronia berry and elderberry fruits was tested for their antibacterial activity against pathogenic bacteria: *Staphylococcus aureus* and *Escherichia coli*. In the tests, antibacterial effect of the extracts was observed in different concentrations. The results indicate that inhibition of *S. Aureus* is concentration-dependent.

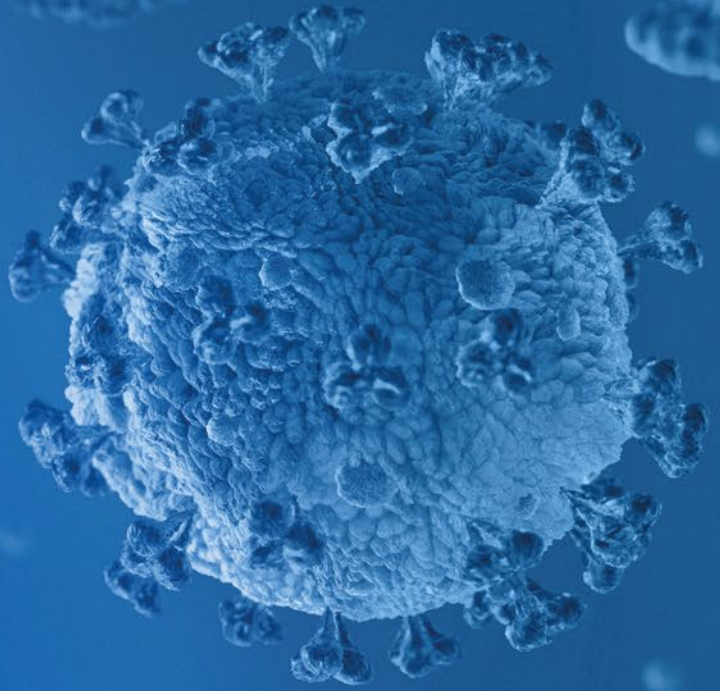


**Figure 4. FENACTIVE® concentration and the number of *S. aureus* bacteria**  
 [mg/ml]: 1-50, 2-25, 3-12.5, 4-6.25, 5-3.125.



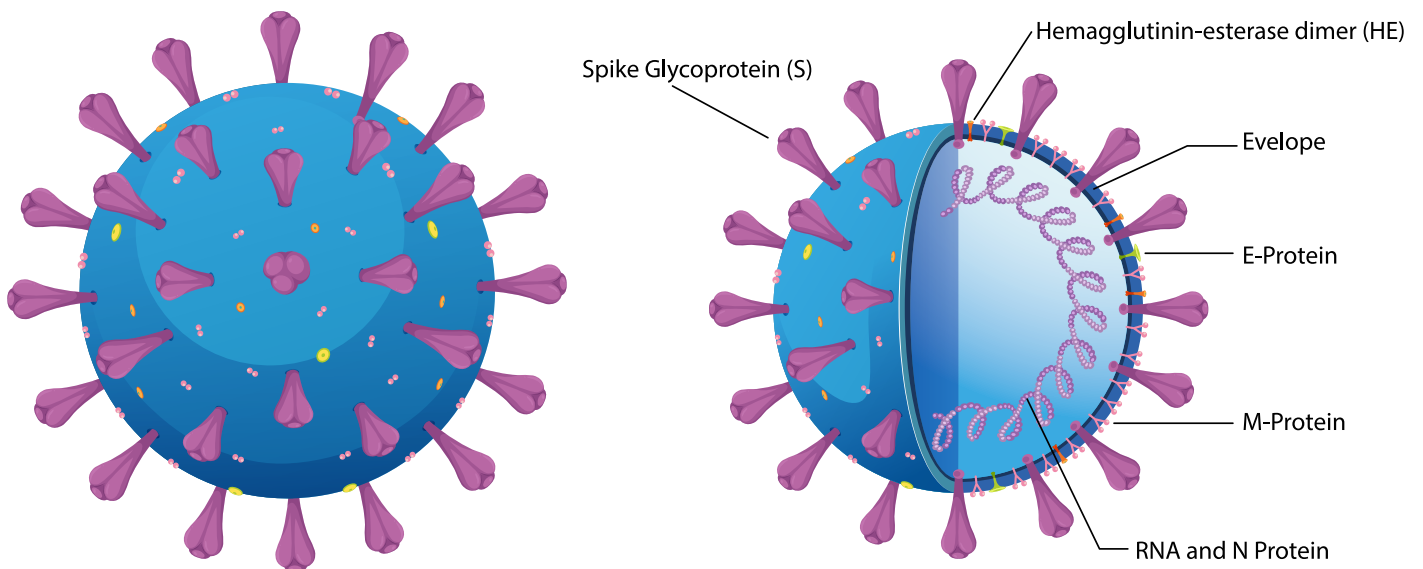
**FENACTIVE**<sup>®</sup>  
by Greenvit<sup>®</sup>

**Natural Protection  
Against Viruses**



## Human Coronavirus Structure

Figure 5.



## Introduction

Many antiviral drugs are available on the market, but their effectiveness is often limited due to the emergence of new, drug-resistant virus strains. Natural plant compounds with antiviral properties, such as extracts from aronia berry (*Aronia melanocarpa* (Michx.) Elliott) and elderberry (*Sambucus nigra* L.), are gaining increasing importance.

**FENACTIVE®** is a patented formula containing standardized extracts of these plants, designed to combat respiratory viruses, including the **influenza A/H1N1 virus** and **HCoV-OC43 coronavirus**.

## Scope of Studies on FENACTIVE®

Studies conducted at the Independent Virology Laboratory of the **Institute of Immunology and Experimental Therapy, Polish Academy of Sciences in Wrocław** aimed to assess:

- ✓ The virucidal effect of **FENACTIVE®** and individual extracts (test viruses: **HHV-1, HAdV-5, A/H1N1**).
- ✓ The impact of the preparation on **virus replication** and determination of effective inhibitory concentrations (**IC50**).
- ✓ The **selectivity index** of the preparation.
- ✓ The effectiveness of **FENACTIVE®** against **HCoV-OC43 coronavirus**.
- ✓ The ability of **FENACTIVE®** to **inhibit virus replication after infection**.

## Research Methodology

Tests were conducted on various **cell lines**, including **A549** (human lung epithelium), **MDCK** (canine kidney – influenza viruses), and **HCT-8** (human cancer cell line – coronaviruses). To evaluate the antiviral activity, the following methods were used:

- ✓ **Cytotoxicity tests** (assessment of the preparation's impact on cell viability).
- ✓ **MTT assays** (measurement of cell survival after virus exposure).
- ✓ **Cytopathic effect (CPE) tests** (microscopic observation of virus-induced cellular changes).
- ✓ **Immunoperoxidase assays (IPA)** – confirmation of **HCoV-OC43 replication**.

## Results

The antiviral activity of **FENACTIVE®** against **herpes virus (HHV-1) and adenovirus (HAdV-5)** was weak due to a low selectivity index (2.1 for HHV-1 and 1.2 for HAdV-5). Based on previous research, scientists focused on **influenza A/H1N1 and betacoronavirus HCoV-OC43**, which are epidemiologically more relevant. (21)

Clinical observations confirmed that both viruses cause flu-like symptoms, usually mild to moderate. However, **co-infection** can lead to **serious complications**, particularly in the presence of bacterial infections.

## Key Findings

- ✓ **FENACTIVE® inhibits A/H1N1 replication** by interfering with its **replication cycle and viral release from infected cells**.
- ✓ The likely mechanism involves inhibition of **neuraminidase activity**, preventing virus spread.
- ✓ Single extracts of **aronia and elderberry showed weak activity, while FENACTIVE® reduced HCoV-OC43 replication by 50% (SI = 4.6)**.
- ✓ **Maintaining high antiviral activity while reducing toxicity** was a key advantage of the EAM-ESN blend.
- ✓ The **synergistic effect** of anthocyanins and polyphenols **enhanced inhibitory action**, supporting their role in immune defense. (22)



**FENACTIVE**<sup>®</sup>  
by Greenvit<sup>®</sup>

**Immunity Support  
– from the Youngest  
to the Elderly**

## Studies on the Effectiveness of Berroxin<sup>®</sup> Immuno Syrup – based on FENACTIVE<sup>®</sup>

The latest observational study has confirmed the effectiveness of Berroxin<sup>®</sup> Immuno syrup based on FENACTIVE<sup>®</sup> in relieving cold symptoms in preschool and early school-aged children. Thanks to its unique formula based on FENACTIVE<sup>®</sup> – a standardized extract from *Aronia melanocarpa* (Michx.) Elliott (aronia berry) and *Sambucus nigra* L. (elderberry) – the syrup significantly supports children's immunity.

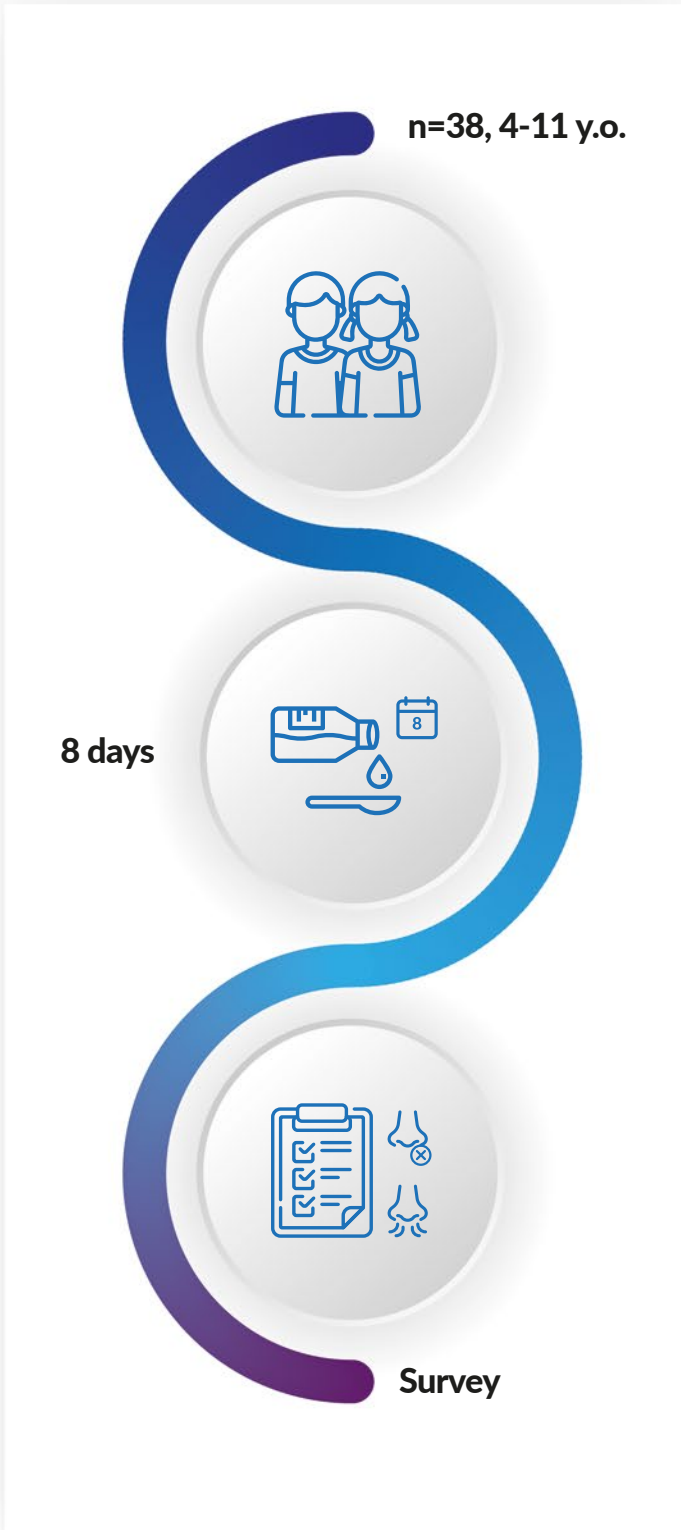
- ✓ Significant improvement observed after just 4 days of use
- ✓ Natural support in fighting runny nose, cough, and sore throat
- ✓ A safe and effective choice for children

Children are particularly susceptible to infections – they experience an average of **6-8 colds per year**, making parents constantly seek natural and effective solutions. FENACTIVE<sup>®</sup> provides valuable polyphenols and anthocyanins with



antioxidant, anti-inflammatory, antiviral, and antibacterial properties, supporting the body's natural immune defense. Polyphenols and anthocyanins play a crucial role in treating and preventing infections due to their properties. Incorporating them into the diet, both through natural sources and supplementation, can support the immune system and improve overall health, aiding in the fight against infections. (23)

## Methodology



## Results

Summary of the Results Regarding the Effectiveness and Satisfaction of **Berroxin**<sup>®</sup> Immuno syrup Supplementation

**74%**

of the study participants believe that **Berroxin**<sup>®</sup> syrup **definitely reduced cold symptoms**. 26% believed it helped slightly.

**63%**

of the study participants will **definitely recommend Berroxin**<sup>®</sup> **syrup for friends and family**. 37% will probably recommend.

**100%**

of the study participants believe that **Berroxin**<sup>®</sup> **syrup is better than other products they have used in the past**.

**100%**

of the study participants **would purchase the Berroxin**<sup>®</sup> **syrup for their child**.

**Berroxin**<sup>®</sup> Immuno syrup based on **FENACTIVE**<sup>®</sup> due to its composition (a blend of double-standardized extracts from *Aronia melanocarpa* (Michx.) Elliott and *Sambucus nigra* L., meets the criteria for a product that can be used as an adjunctive (supplementary) treatment for infections.



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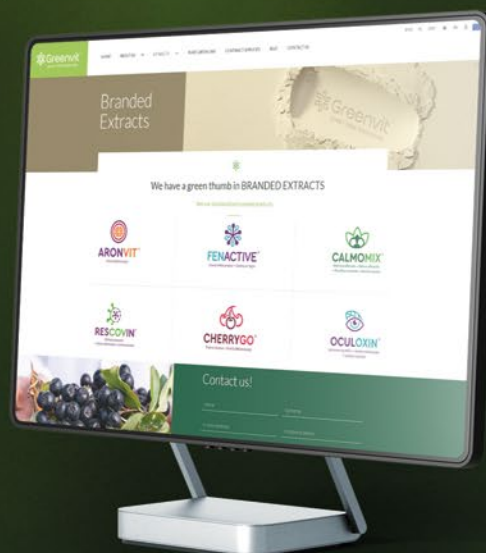
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