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Danuta Zwolińska

Rational phytotherapy as an alternative treatment for acute respiratory tract infections

Racjonalna fitoterapia jako alternatywna metoda w leczeniu ostrych infekcji dróg oddechowych

Department of Paediatric Nephrology, Wroclaw Medical University, Wrocław, Poland
Correspondence: Professor Danuta Zwolińska, MD, PhD, Department of Paediatric Nephrology, Borowska 213, 50-556 Wrocław, Poland, tel.: +48 71 736 44 00, fax: +48 71 736 44 09, e-mail: danuta.zwolinska@umw.edu.pl

ORCID iD
Danuta Zwolińska https://orcid.org/0000-0002-6714-3992

Abstract

Acute respiratory tract infections in children are the most common reason for primary care appointments. Although the vast majority of cases are viral, antibiotic therapy, which involves more risks than benefits in these patients, is still overused, contributing to antibiotic resistance and adverse effects. Almost all recommendations indicate avoiding such approach and use symptomatic treatment supplemented with plant-based formulations instead. There is abundance of different medicinal plants that contain compounds with proven antiviral, antioxidant and immunomodulatory properties, which effectively support the combat against respiratory infections, especially if combined in one product (synergism). Contemporary rational phytotherapy assumes a scientific approach to plant-derived formulations, and it should be emphasised that the registration of herbal medicines is subject to the same restrictions as in the case of synthetic drugs. The paper discusses the composition and activity of compounds contained in medicinal plants and their role in the treatment of respiratory tract infections, with main focus on *Pelargonium sidoides* and elderberry, the properties of which have so far been the most thoroughly investigated and described. Their efficacy and safety in different forms of respiratory tract infections were discussed, showing that the use of products based on these plants significantly reduces disease duration and severity of clinical symptoms, as well as the need to use other agents, including antibiotics. The reasons for the use of *Pelargonium sidoides* preparations in the prevention and treatment of COVID-19 were also presented.

Keywords: phytotherapy, respiratory tract infections, *Pelargonium sidoides*, elderberry, COVID-19

Streszczenie

Ostre infekcje dróg oddechowych u dzieci są najczęstszym powodem wizyt u lekarza podstawowej opieki zdrowotnej. W zdecydowanej większości przypadków są to zakażenia wirusowe, a mimo to nadal zbyt często stosuje się antybiotyki, które w takich sytuacjach nie tylko nie pomagają, ale wręcz szkodzą, przyczyniając się do rozwoju antybiotykooporności i wystąpienia działań niepożądanych. W niemal wszystkich zaleceniach wskazuje się na konieczność zaniechania takiego postępowania i stosowania leczenia objawowego oraz preparatów pochodzenia roślinnego. Bardzo duża liczba różnych roślin leczniczych zawiera związki o udowodnionym działaniu przeciwwirusowym, antyoksydacyjnym oraz immunomodulującym, które skutecznie wspierają zwalczanie infekcji dróg oddechowych, zwłaszcza jeśli występują łącznie w jednym preparacie (synergizm działania). Współczesna racjonalna fitoterapia zajmuje się w sposób naukowy preparatami roślinnymi, przy czym należy podkreślić, że rejestracja leków roślinnych podlega takim samym restrykcjom jak rejestracja leków syntetycznych. W pracy omówiono skład i działanie związków zawartych w roślinach leczniczych i ich znaczenie w leczeniu infekcji dróg oddechowych, skupiając się głównie na pelargonii afrykańskiej i czarnym bzie, których właściwości zostały dotąd najlepiej przebadane i opisane. Omówiono ich skuteczność i bezpieczeństwo stosowania w poszczególnych postaciach zakażeń dróg oddechowych, wykazując, że stosowanie preparatów na bazie tych roślin w istotny sposób przyczynia się do skrócenia czasu trwania choroby, redukcji ciężkości objawów klinicznych oraz zmniejszenia potrzeby stosowania innych leków, w tym antybiotyków. Omówiono także przesłanki do wykorzystywania preparatów pelargonii afrykańskiej w prewencji i leczeniu choroby koronawirusowej 2019 (COVID-19).

Słowa kluczowe: fitoterapia, infekcje dróg oddechowych, pelargonia afrykańska, czarny bez, COVID-19

INTRODUCTION

Respiratory tract infections (RTIs) are common and are the main reason for primary care appointments. It is estimated that the number of infections in children attending nurseries-kindergartens may be as high as 10 per year[1,2]. According to German data, the mean incidence of RTIs in the first 12 years of life is 22 episodes per year[3]. Although RTIs mostly occur during the autumn-winter period, they can be encountered in other seasons of the year.

AETIOPATHOGENESIS AND COURSE OF RESPIRATORY TRACT INFECTIONS

The high prevalence of RTIs is due to the multitude and variety of viruses that are their main causative agent (up to 90% of cases). The most common are rhinoviruses, adenoviruses, coronaviruses, influenza and parainfluenza viruses, and respiratory syncytial virus (RSV). At the end of 2019, this group was joined by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the development of coronavirus disease 2019 (COVID-19). Bacteria are rarely the primary cause of RTIs (about 10% of cases), but mainly develop as a superinfection once the viruses pave the way. These usually include *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. Bacterial infections are more severe than viral ones, which are usually mild and self-limiting[1,4,5]. Fungal infections, which are fortunately rare and mainly affect children with primary and secondary immune disorders, are also severe. RTI risk factors include immune deficiencies, air pollution, especially exposure to tobacco smoke, contact with peers in educational institutions, poor diet (deficiencies of zinc, vitamins D and C), and bad hygiene habits. The child's age has a great impact on the course of infection, and the younger the patients, the more turbulent their symptoms are, which is caused by the different anatomy of the airways compared to older children. Infants in particular have narrow airways with a high laryngeal position and long epiglottis. On the other hand, infection-promoting lymphoid hypertrophy is observed in preschool and early school children. Furthermore, younger children have weaker cough reflex, which prevents proper evacuation of secretions[1–3].

Once the virus has entered the system, vascular phase (hyperaemic/oedematous/exudative) characterised by fever, pain (pharyngeal, ear or head), dry cough, watery nasal discharge and nasal congestion begins. About 5 days later, the cellular phase (thick mucus phase) begins, when symptoms such as pain, fever and nasal congestion subside, followed by thick nasal discharge and a wet cough. This phase also lasts about 5 days, and is most often followed by a period of recovery or, much less often, bacterial superinfection. Depending on the location, many forms of RTIs can be distinguished, such as otitis media, rhinitis, sinusitis, acute tonsillopharyngitis, epiglottis, laryngitis, tracheitis, bronchitis, bronchiolitis and pneumonia. However, isolated forms are rare as opposed to the coexistence of even a few of the above-mentioned forms[1,2,6]. Nasopharyngitis, included in the ICD-10 system (International Classification of Diseases, 10th Revision) as "a common cold," is an example[7].

TREATMENT GUIDELINES FOR RESPIRATORY TRACT INFECTIONS

According to the 2016 Recommendations of the National Medicines Institute, a stepwise approach should be adopted in the diagnosis and treatment of RTIs[8]. After general diagnosis, the first step is to perform a differential diagnosis for aetiology and to assess potential indications for hospital stay. In everyday practice, the nature of symptoms and the rate of their resolution as well as rapid diagnostic tests may be helpful in differentiating viral from bacterial infections. Although most RTIs are viral, nearly 70% of patients receive antibiotic therapy, which is unjustified as there is no evidence that its use will prevent bacterial superinfection. Such irrational therapy can even lead to harm as it contributes to increased antibiotic resistance and exposes patients to adverse effects[9–11]. Symptomatic treatment with antipyretic and analgesic agents, antitussives, expectorants, mucolytics and decongestants is recommended for viral infections. Medications to stimulate the immune system and inhibit viral penetration and multiplication in host cells are also important[8]. This study indicates that these requirements are met by plant-derived medications (phytotherapeutics). Modern herbal medications occupy a high position in conventional medicine in many European countries (Germany, France, Switzerland, Austria). The World Health Organization (WHO) strategy 2014–2023 aims to integrate traditional medicine, including herbal medicine, within the national healthcare systems[12]. Herbal medications also slowly gain in importance in Poland.

THE PLACE OF PHYTOTHERAPY IN THE TREATMENT OF RESPIRATORY INFECTIONS

Phytotherapy is a branch of medicine and pharmacology involved in the production of medications based on natural or processed compounds obtained from medicinal plants and their use in the prevention and treatment of various types of diseases. It originates from herbalism, which is based on tradition and folk beliefs. Medicinal plants have been used since the earliest times, as evidenced by, among other things, records from ancient Egypt and China. Hippocrates classified over 450 medicinal plants and was the author of papers on their use. Until the end of the 19th century, plants were the main source of medications, with dried and fragmented plant parts, i.e. herbs, being their oldest form. The term "phytotherapy" was first used by Henri Leclerc (1870–1955), a French physician who was also the author of the first textbook on this subject[3,13].

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What is the difference between traditional herbal products and modern phytotherapy products? The main difference is that the latter are prepared from good quality raw materials. They have a specific chemical composition and a specific action, and most importantly, full scientific, pharmacological and clinical documentation based on clinical trials. The efficacy and safety of phytotherapy are also documented, and its products have the status of herbal medicines. The registration process for these medications is the same as for synthetic agents. A characteristic feature of herbal medicines is that they are not pure, but contain natural chemical compounds. It is estimated that there are about 400,000 plant species in the world that have beneficial effects on human metabolism, only about 40,000 of which are used for medicinal purposes[3,13,14]. There are even fewer plants with scientific documentation, i.e. about 200 species.

In practice, phytotherapeutics are used in almost every branch of medicine. However, they are most often (in up to 25% of cases) used in RTIs as medicinal plants contain substances that have a beneficial effect in their treatment. Many of them show antiviral, antibacterial, immunostimulatory, antioxidant, antipyretic, expectorant, antitussive properties as well as reduce mucosal oedema and bronchospasm. This is mainly due to the presence of organic substances, such as flavonoids, alkaloids, coumarins, anthocyanins, essential oils, organic acids, vitamins and mineral salts[13]. The choice of a herbal product that will meet our expectations from the abundance of medicinal plants is a certain dilemma. Obviously, medicinal products with efficacy and safety proven in randomised, double-blind, placebo-controlled trials are selected. This condition is also met by South African geranium (*Pelargonium sidoides*).

SOUTH AFRICAN GERANIUM – CHARACTERISTICS AND MEDICINAL PROPERTIES

South African geranium (*Pelargonium sidoides*), a relative of our popular pelargonium, belongs to the geranium family (*Geraniaceae*). This plant, grown on South African mountain plantations, has been used by the local population for centuries, mainly for respiratory symptoms, but also for gastrointestinal infections, acne and gonorrhoea. The word *umckaloabo*, which in the Zulu language means "heavy cough," clearly indicates the primary use of this plant by the natives[15].

Pelargonium sidoides is a bulbous perennial with round or heart-shaped leaves and tubular, dark red flowers. Its root, which was used by local healers to make a mixture, is of particular therapeutic significance. *Pelargonium sidoides* was introduced to Europe in the late 19th century by Charles Henry Stevens, who, having been cured of tuberculosis in South Africa, popularised the root extract of this plant in Britain. This formulation was used to treat this then deadly disease until the emergence of antibiotics. The anti-mycobacterial effects of *Pelargonium sidoides* were confirmed in the 20th century by Adrien Sechehaye, a Swiss physician who treated hundreds of patients with its root extract, and who published treatment outcomes of 65 patients cured of tuberculosis in 1929. *Pelargonium sidoides* was forgotten in the years that followed, with its true renaissance after 1970, when chemical compounds with medicinal properties were isolated from this plant[15,16]. *Pelargonium sidoides* found its way into medicine in the 1980s in the form of an 11% ethanolic extract (EPs® 7630), which was registered in many countries around the world.

Coumarins, particularly umcaline, which accounts for 40% of these compounds, are the main active substances with therapeutic properties contained in *Pelargonium sidoides*. Other substances include flavonoids, phenolic acids, proanthocyanidins, coumarin glycosides, mono- and polyunsaturated fatty acids. Although these compounds differ in their mechanisms of action, they show synergism when combined in an extract, which translates into significantly better therapeutic outcomes[4,17].

It has been shown that the antibacterial effects of *Pelargonium sidoides* are directed not only against tuberculosis, but also against *Staphylococcus aureus*, group A streptococci, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Haemophilus influenzae*, *Escherichia coli*, and even *Pseudomonas aeruginosa*[3,17]. Many studies have found that it shows particularly high antimicrobial efficacy against microbes with affinity for the respiratory system. *Pelargonium sidoides* exhibits equally versatile antiviral effects[18,19]. In 2011, Michaelis et al. demonstrated that the plant shows such activity against the majority of respiratory viruses (RSV, coronavirus, *Coxsackie*, rhinovirus, influenza viruses: H1N1 and H3N2)[19].

The compounds contained in *Pelargonium sidoides* have a multidirectional mechanism of antiviral and antibacterial action. Among other things, they increase the secretion of interferon and other pro-inflammatory cytokines, stimulate phagocytosis and the release of oxygen free radicals and nitric oxide. There is also evidence that the root extract of this plant exerts a direct antiviral effect[18]. As a result of these effects, pathogens cannot adhere to the surface of respiratory epithelial cells and therefore cannot multiply in the cells; the ciliary movement activity also increases, which facilitates the evacuation of secretions from the airways[20]. The immunomodulatory properties of polyphenols and flavonoids contained in *Pelargonium sidoides* also reinforce the host's defences against infection[13,16,17].

PELARGONIUM SIDOIDES IN THE TREATMENT OF ACUTE RESPIRATORY TRACT INFECTIONS

The properties of compounds contained in *Pelargonium sidoides* were the basis for the use of its root extract in in adults and children with acute RTIs. Many randomised clinical trials have been conducted to confirm the efficacy and safety of the preparations used[21].

 DOI: 10.15557/PiMR.2022.0020

Acute bronchitis

In 2010–2012, Kamin et al. conducted three studies in a total of 820 paediatric patients aged 1–18 years[22–24]. All these were randomised, double-blind, placebo-controlled trials with similar protocols. Children received *Pelargonium sidoides* root extract (EPS® 7630) at various doses (30 mg, 60 mg, 90 mg). Assessments were performed three times: at baseline, at 3–5 days and after 7 days of treatment (final visit). The Bronchitis Severity Scale (BBS) was used to assess changes in the severity of clinical symptoms, including cough, secretions, auscultation phenomena, chest pain when coughing and dyspnoea. It was found that children receiving *Pelargonium sidoides* presented with a reduction in the severity of clinical symptoms already at the second visit, especially in terms of cough and auscultatory findings, which was significant compared to patients receiving placebo. It should be noted, however, that only patients receiving doses of 60 mg and 90 mg showed improvement. The effect of the lower dose did not differ from that seen with placebo. Additionally, it was found that shorter duration of the disease allowed for an earlier return of the children to kindergarten or school, which certainly translated into very positive results of the questionnaire assessing satisfaction of their parents/guardians. The formulation was well tolerated; the incidents and the severity of adverse effects were comparable to those in the placebo group. Based on this research and other studies confirming these observations, the European Respiratory Society recognised geranium root extract as a natural agent for the treatment of acute bronchitis.

Pelargonium sidoides in the treatment of non-beta-haemolytic streptococcal acute tonsillopharyngitis

The efficacy of *Pelargonium sidoides* root extract (EPs) in children with non-streptococcal acute tonsillitis has been documented, among others, in three well-designed, randomised, placebo-controlled trials. Two of them included 346 children aged 6–10 years[25,26]. Treatment duration was 6 days as in accordance with a protocol similar to the one used in previously reported studies. Changes in symptom severity based on the Tonsillopharyngitis Severity Score (TSS), which included 15 clinical symptoms, including fever, sore throat, salivation, redness of the throat, difficulty swallowing, tonsillar and nodal oedema, were considered the endpoint. Both studies showed a significant reduction in TSS values at days 2 and 4 of treatment ($p < 0.001$ and $p < 0.0001$, respectively)[25]. The percentage of children who did not need bed rest was also significantly higher in the EPs group compared to placebo (87.7% and 38.6%, respectively). Furthermore, Berezhnoi et al. demonstrated lower paracetamol use in the group receiving EPs[26]. This effect was also confirmed by other researchers[27]. The aim of the third study, which was conducted in a similar group of children, was to determine the percentage of patients with therapeutic success (i.e. TSS reduced to at least 4) at 4 days of treatment. EPs was also highly effective (90% for EPs vs. 44.7% for placebo). No serious adverse effects were observed in any of these studies and the preparation was well tolerated.

Pelargonium sidoides in other forms of respiratory infections

Many studies have shown the beneficial effects of EPs in alleviating the symptoms of common cold and uncomplicated upper respiratory tract infections in children[21,28]. They demonstrated a significant reduction in the severity of symptoms (rhinitis, cough, headache and pharyngeal pain) and a shorter disease duration. To confirm this, it is worth referring to one of the more recent (2021) randomised placebo-controlled studies, which included 164 children aged 1–18 years. It was shown that after 7 days of EPs therapy, the symptom severity score was significantly improved compared to placebo, especially in terms of the frequency and shorter duration of dry tiring cough, fever and sneezing, which are considered very troublesome symptoms[29]. The paper on the efficacy of EPs in relieving asthmatic attacks in children with mild asthma complicated by viral infection is also important[30]. The study was conducted in 61 1–14-year-olds, with half of them receiving EPs for 5 days. Not only was EPs shown to significantly reduce cough and rhinitis symptoms, but also to significantly reduce the number of asthma attacks compared to placebo (6 vs. 15; $p < 0.05$).

Acute rhinosinusitis, most often preceded by acute rhinitis, affects approximately 16% of the paediatric population annually and may last for up to 4 weeks. Since viruses are the causative agent in 90% of cases, symptomatic and supportive treatment should be used. Unfortunately, the vast majority of patients receive antibiotics; therefore, it does not come as a surprise that rhinosinusitis ranks high in the list of conditions for which antibiotics are most often prescribed. Bacterial superinfection may occasionally develop, and should be considered if symptomatic treatment is not effective within 10 days or if symptoms, pain and facial oedema in particular, worsen after 5–7 days[3,31].

Pelargonium sidoides root extract has been the subject of many randomised, placebo-controlled trials on rhinosinusitis. It has been indisputably proved that disease duration and symptom severity are significantly reduced as early as at 3–7 days of EPs therapy. Patients also reported significantly improved quality of life, with adult patients reporting faster work resumption[32]. In 2020, Perić et al. investigated the effects of *Pelargonium sidoides* also in amoxicillin-treated patients with bacterial rhinosinusitis. The authors showed a significant reduction in the total symptom score (TSS) compared to placebo, with rhinorrhoea being the only exception. At the same time, the safety and tolerance of the product were confirmed[33]. Based on these results, *Pelargonium sidoides* preparations were recommended for

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the treatment of rhinosinusitis, and the strength of this recommendation turned out to be higher than in the case of antihistamines[34].
Herbal medicinal products were also included in Polish recommendations[3].

The role of *Pelargonium sidoides* in reducing antibiotic use

Reduction of the amount of antibiotics prescribed further in the course of an illness is an important aspect of drug use in RTIs. Many publications have confirmed this effect for various medicinal plants, emphasising the differences depending on the type of plant. This has been shown by, among others, Martin et al.[35], who investigated many different phytopharmaceuticals in this respect in a group of nearly 120,000 adult and paediatric patients with RTIs. A similar number of patients were included in the placebo group. Of the many herbal products assessed, *Pelargonium sidoides* root and thyme extracts showed the highest efficacy in adults, while *Pelargonium sidoides*, thyme and ivy extracts were the most effective in children. It was also shown that phytopharmaceuticals reduced disease duration in both age groups; the strongest effect was found for quinols contained in eucalyptus and for EPs.

SYNERGISM BETWEEN MEDICINAL PLANTS

Medicinal plants contain a variety of bioactive substances with different target points which, acting together, enhance the therapeutic effect (synergy). Therefore, modern phytotherapy is very often based on complex formulations, developed on the basis of several plants. There are many such products available on the Polish market, in the form of both syrups and tablets[13]. Plants used for RTIs include elderberry, *Verbena officinalis*, acerola, denseflower mullein, echinacea, thyme, marshmallow, coltsfoot, tilia, and *Plantago lanceolata*. They are combined in various configurations in complex formulations. Black elderberry (*Sambucus nigra*), whose efficacy has been demonstrated in many well-planned trials, is particularly noteworthy.

Black elderberry (*Sambucus nigra*)

Black elderberry is globally a very common plant. It also grows in Poland in the form of a shrub or a tree. Its healing properties were already known in antiquity, as evidenced by the notes of Hippocrates, who recommended this plant for different conditions, including burns, diabetes mellitus, kidney diseases, and rheumatism. Most often, however, elderberry is used in RTIs[36].
Both flowers and fruits of this plant are used in medicine. Elderberry is commonly believed to be poisonous as it contains sambunigrin and prunasin – toxic cyanogenic glycosides. They can cause food poisoning, manifested by vomiting, diarrhoea, and weakness. However, thermal treatment inactivates these substances, thereby preventing intoxication. Similarly to *Pelargonium sidoides*, black elderberry shows, among others, antiviral, antibacterial, antioxidant, anti-inflammatory and immunomodulatory activity. This multidirectional action is related to the content of many bioactive compounds, which mainly include flavonoids, phenolic acids, anthocyanin glycosides, triterpenes, sterols, and essential oils. Elderberry is also a source of tannins, mineral salts and vitamins[37]. There is ample evidence for the efficacy of elderberry in combating viral respiratory infections. These data are summarised in a review of five studies conducted in 2020 by Harnett et al.[38]. These trials were conducted in patients with common cold, influenza-like symptoms and patients with identified viral aetiology (influenza A and B viruses, parainfluenza viruses, RSV, adenoviruses). Commercial fruit extracts in the form of syrups (four studies) or tablets (one study) were used, with treatment onset no later than on day 2 of infection. Symptoms such as fever, myalgia, nasal congestion, cough and mucus production were improved compared to placebo group. There was also up to 50% reduction in disease duration. Two studies also assessed the effects of black elderberry on reducing the intake of other medications, showing significantly lower use of analgesics, nasal sprays and antibiotics[39,40]. Elderberry preparations can also be used in the form of rinses for oral, pharyngeal and tonsillar inflammation[3].

PHYTOPHARMACEUTICS IN THE PREVENTION AND SUPPORTIVE TREATMENT OF COVID-19

The COVID-19 pandemic has become a global challenge for scientists around the world. The extremely virulent SARS-CoV-2, resistant to conventional antiviral agents, has caused millions of deaths. Natural substances contained in plants were considered in the search of new therapeutic solutions. Due to their antiviral and immunomodulatory properties, they are potentially effective in COVID-19[41,42]. Their properties can be used both in the prevention and alternative supportive treatment of the active disease. From the beginning of the pandemic, the WHO encouraged research in this direction. Many plant products have been tested for their ability to inhibit viral entry into respiratory epithelial cells. The best documented effect was achieved in the research on *Pelargonium sidoides* and *Glycyrrhiza glabra* (liquorice), a plant widespread in Asia and the Mediterranean regions[43]. The results of an *in vitro* study conducted by an international team of researchers on SARS-CoV-2-infected human lung cells are very promising[44]. The aim of this study was to investigate the effects of EPs on the inhibition of viral entry and multiplication, as well as on the body's immunomodulatory capacity. EPs was used at two concentrations (10 μg/mL and 100 μg/mL). Human lung cells infected with similar viruses (SARS-CoV and Middle East respiratory syndrome coronavirus, MERS-CoV) were used as a reference group. Inhibitory effects of EPs on viral

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penetration and multiplication in all cell types were demonstrated, with effective lower dose of EPs only in the case of SARS-CoV-2. This effect is probably due to flavonol polymers that block the ACE2 receptor of the airway epithelium responsible for the entry of the virus into the cell by endocytosis. Presumably they also block the transmembrane protease, serine 2 (TMPRSS2) and cathepsin L, which inactivates the S2 subunit of the S protein and viral entry virus into cells[45]. The authors also found a significant reduction in the release of pro-inflammatory cytokines such as interleukins IL-8, IL-13, tumour necrosis factor α (TNF-α), chemokines (CXCL9, CXCL10) and growth factors (platelet-derived growth factor, PDGF; vascular endothelial growth factor A, VEGF-A; CD40 ligand, CD40L) via a process independent of reduced viral penetration. IL-6, the release of which was increased in infected cells, was an exception. The presented results are very promising, but should be confirmed *in vivo*.

CONCLUSIONS

Acute respiratory infections are in most cases caused by viruses, whereas bacterial superinfections are relatively rare. The use of antibiotics in such situations is therefore unjustified and even harmful. The therapy should be based on medications that control the symptoms of infection and rational phytotherapy as an alternative and supportive method. This approach is recommended in many countries for both adults and children. Medicinal plants, rich in bioactive compounds with multidirectional activity, including antiviral and immunomodulatory effects, are useful in combating viral RTIs. Formulations composed of several plants are recommended due to the synergistic effect of the substances they contain. Currently, a large number of such products are available on the Polish market. *Pelargonium sidoides* and elderberry occupy a special place in RTI-targeted phytotherapy. Their effectiveness in reducing disease duration, the severity of clinical symptoms and the use of other medications, including antibiotics, has been proven in numerous randomised trials. Safety and good tolerance of herbal products have also been demonstrated, both in children and adults. Studies from the last 2 years have also shown that in the times of the COVID-19 pandemic, phytotherapeutic agents can play a supplementary, supporting role in both prevention and treatment of this disease.

Conflict of interest

The author does not claim any financial or personal relationships with other persons or organisations that could negatively influence the content of the publication and claim rights to this publication.

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