



BIOCIDIN® LSF



Supplement Facts		
Serv. Size: 0.5 mL (1 Pump)	Amount	Daily
Serv. Per Container: 100	Per Serv.	Value
Proprietary Herbal Blend	50mg	**
Bilberry fruit extract (25%anthocyanosides), Noni, Milk Thistle seed, Echinacea root (purpurea & angustifolia), Goldenseal root, Shiitake mushroom, White Willow bark, Garlic bulb, Grape seed extract (min 90% polyphenols), Black Walnut hull and leaf, Raspberry leaf, Fumitory aerial parts, Gentian root, Tea Tree leaf oil, Galbanum resin oil, Lavender plant and flower oil, Oregano plant and flower oil		
Proprietary Herbal Blend	44mg	**
(from purified Sunflower seed lecithin)		
**Daily Value (DV) not established		
Other Ingredients: Water, Glycerin, Ethanol, Vitamin E (d-alpha tocopheryl polyethylene glycol 1000 succinate)		

Biocidin® LSF is a proprietary blend of potent botanicals that addresses the body's microbial balance. The powerful botanical extracts and essential oils in our formula boost the body's immune defense, target harmful microbes, and eradicate biofilms, which frequently accompany chronic infections and impede successful pathogen clearance.

THE ROLE OF BIOFILMS IN PERSISTENT INFECTIONS

The National Institutes of Health (NIH) reports that a shocking 80 percent of human infections are caused by biofilms.¹ Biofilm is a consortium of microorganisms coexisting in a sticky extracellular matrix. The sticky matrix creates a physical barrier that shields microbes from antibiotics, greatly reducing their susceptibility to this class of drugs.

A growing body of research indicates that attempting to kill pathogens with antibiotics, without also targeting biofilms, may represent a futile effort and facilitate the establishment of persistent infections in the body.² If biofilms aren't addressed in patients with chronic infections such as Lyme disease, MARCoNS, MRSA, and gastrointestinal pathogens, they will continue to fight an uphill battle for their health.^{3,4,5,6,7} While conventional medicine offers few solutions for disrupting biofilms, the natural world offers an abundance of botanicals with anti-biofilm and antimicrobial properties that can help establish a healthy microbial balance.

BIOFILM-BUSTING BOTANICALS TO ADDRESS CHRONIC INFECTIONS

Bilberry

Bilberry (*Vaccinium myrtillus*) is a shrub native to northern Europe, North America, and Canada that sports small blue fruits similar in appearance to blueberries (*Vaccinium corymbosum*). However, bilberries are richer in anthocyanin pigments than their blueberry cousins and have long been used as food and medicine.

Berry phenolics, such as those found in bilberry, demonstrate antimicrobial activity against a variety of periodontal and intestinal pathogens, including *Staphylococcus*, *Salmonella*, *P. gingivalis*, *Fusobacterium nucleatum*, and *Prevotella intermedia*.^{8,9} Bilberry phenolics also strengthen the gut barrier and protects against intestinal oxidative stress.^{10,11,12}

Noni Extract

Noni (*Morinda citrifolia*) is a fruit-bearing tree in the *Rubiaceae* (coffee) family that grows throughout Southeast Asia. It has direct antimicrobial activities and stimulates the immune system, fortifying the body's internal defenses against pathogens.¹³

Noni impedes parasite growth while also reducing the cytokine storm activated by microbial infection.¹⁴ It also inhibits periodontal pathogens and has antifungal activity against *Candida albicans* and *Aspergillus nidulans*, inhibiting the proliferation of fungal hyphae.^{15,16} The antimicrobial properties of noni are attributed to the presence of phenolic compounds, such as ferulic acid.¹⁷

Milk thistle

Milk thistle, or *Silybum marianum*, is a revered member of the traditional herbal medicine compendium, used by herbalists for over 2,000 years for its remarkable hepatoprotective properties.¹⁸ Featuring a prickly flower head and purple tubular flowers, this distinctive plant has been extensively studied in the scientific literature and found to support liver function, antioxidant activity, and immunity. However, it also exerts powerful antimicrobial and biofilm-disrupting activities in a variety of microbes, including *Candida albicans* and *Gram-positive bacteria*.

^{19,20,21,22,23,24,25,26}

APPLICATIONS & BENEFITS:

- Antibacterial activity ^{8,9,15,17,24,29,30,32,34,37,38,43,44,48,51,52,63,65,70}
- Antifungal activity ^{16,25,30,33,45,64,67,72,73}
- Antiviral activity^{23,30}
- Antiparasitic activity^{14,58}
- Increases host immune defenses against harmful microbes^{13,22,31,35,36}
- Support a healthy gut microbiome^{10,56}
- Breaks down biofilm, enhancing the efficacy of antimicrobials^{26,46,47}
- Antioxidant effects^{11,21,39}
- Anti-inflammatory effects^{40,41,54,60}
- Supports bile flow, liver function, and detoxification^{18,19,20,59}

Milk thistle thus offers multifaceted benefits in the treatment of infections by targeting harmful microbes, reducing pathogen-induced inflammation, and facilitating detoxification processes that eliminate pathogens and their harmful byproducts.

Echinacea purpurea & Echinacea angustifolia

Echinacea is a genus of flowering plants in the daisy (*Asteraceae*) family that are commonly referred to as “coneflowers.” *Echinacea purpurea* is native to eastern North America, while *Echinacea angustifolia* grows in abundance throughout the great plains. Echinacea species were traditionally used by Native Americans and early American physicians for the treatment of wound infections, burns, snake bites, tonsillitis, and septic conditions. When modern medicine caught wind of Echinacea, it began to explore the possible uses of the plant as a remedy for the common cold; unfortunately, the resulting studies have shown little effect of Echinacea on the duration and severity of the common cold.²⁷ However, this route of scientific exploration is misdirected, as it has sought to capitalize on a minor benefit of Echinacea – its mild antiviral properties – while ignoring the powerful, traditional uses of the plant as an immune modulator and “blood purifier” in cases of bacterial and fungal illnesses.²⁸

Fortunately, scientists have continued to explore Echinacea, revealing a variety of healing properties in this potent plant. Echinacea extracts inhibit a wide range of opportunistic bacteria and pathogens, including *Candida albicans*, *Bacillus subtilis*, *Staphylococcus aureus*, and antibiotic-resistance *Enterococcus faecalis*.^{29,30} Echinacea polysaccharides also increase the body’s internal resistance against pathogens by modulating the immune system and enhancing the activity of monocytes and natural killer cells.³¹

Goldenseal

Goldenseal is a small perennial plant with thick, knotted roots rich in the orange alkaloid pigment berberine. Berberine offers antibacterial, antifungal, and biofilm-disrupting properties.^{32,33} Goldenseal also contains other beneficial phytochemicals that inhibit efflux pumps in bacterial cells, reducing the ability of pathogens to clear antimicrobial compounds to which they have been exposed, impairing their survival.³⁴

Shiitake Extract

Shiitake (*Lentinula edodes*) has been prized in traditional Chinese medicine (TCM) and other Asian herbal medical traditions, for millennia.³⁵ Shiitake contains lentinan, a polysaccharide that boosts host immune defense against a stunning array of pathogens, including bacteria, fungi, parasites, and viruses, by enhancing T effector cell function and improving gut mucosal immunity.³⁶ Shiitake also has direct antimicrobial effects against several human pathogens and opportunists, including *Salmonella enterica* and *Streptococcus mutans*, and is a source of potent antioxidant extracts.^{37,38,39}

White Willow Bark

White willow bark comes from the beautiful, graceful white willow tree (*Salix alba*) native to Europe and western and central Asia. White willow bark is rich in salicin, a powerful anti-inflammatory phytochemical that served as the original “molecular inspiration” for acetylsalicylic acid, the active component of aspirin.⁴⁰ White willow bark is generally standardized for its salicin content, though other polyphenols and flavonoids likely play important roles in its anti-inflammatory actions.⁴¹

Garlic

Garlic (*Allium sativum*) has been used since time immemorial for supporting the health of the human body. The Sumerians utilized garlic for its healing properties as far back as 2600 to 2100 BC, while the ancient Egyptians fed garlic to their slaves tasked with building the pyramids to keep them strong. Garlic has also been used throughout the ages as a protective agent against various infectious diseases, including influenza, typhoid fever, and diphtheria.⁴²

Modern-day research strongly supports the therapeutic benefits of garlic in infectious diseases. Garlic has antibacterial activities against *Borrelia burgdorferi*, the causative bacterium in Lyme disease.⁴³ Garlic extract and oils also have antimicrobial activities against *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans*.^{44,45} Ajoene, one of the organosulfur compounds found in garlic, inhibits quorum sensing, a biochemical process that allows bacteria to communicate with one another and initiate the formation of biofilm.⁴⁶ Whole garlic extracts also inhibit biofilm formation, indicating that this pungent vegetable is a potent biofilm-fighting agent.⁴⁷

Grape Seed Extract

Grape seed extract, a derivative of whole grape seeds, is rich in proanthocyanidins with a variety of health-promoting properties. Grape seed extract inhibits the growth of *S. aureus*, *E. coli*, *Pseudomonas aeruginosa*, possibly by impairing the integrity of bacterial cell walls and has antifungal activity against *Aspergillus niger* and *Fusarium oxysporum*.^{48,49} Grape seed extract includes polyphenolic compounds with antioxidant properties that promotes the growth of beneficial gut bacteria, such as Lactobacillus, increasing the intestine’s resistance to pathogens.⁵⁰

Black Walnut

The blackened, dried hulls of Black walnut (*Juglans nigra*) have been used for centuries in herbal medicine. The astringent, bitter hulls are rich in polyphenolic compounds, including bitter water-soluble tannins, with antibacterial and antiparasitic effects. Black walnut exerts antibacterial activity against antibiotic-resistant *S. aureus*, possibly by reducing binding to bacterial DNA and reducing its transcription and translation.^{51,52} Black walnut has also demonstrated strong antibacterial activity against *Borrelia burgdorferi*, the causative agent in Lyme

disease.⁵³ Fascinatingly, Black walnut also inhibits LPS-induced inflammation, and may thus help quench the inflammatory response triggered by intestinal and systemic bacterial infections.⁵⁴

Raspberry

Raspberry (*Rubus idaeus*) isn't just a delicious summer fruit; it also contains bioactive polyphenols, such as ellagitannins and anthocyanins, with antioxidant properties.⁵⁵ In preclinical studies, the consumption of raspberry also boosts beneficial gut bacteria and may create a microbiome with more resilient defenses against opportunistic and pathogenic bacteria.⁵⁶

Fumitory

Fumitory (*Fumaria indica*) is an annual herb with a long-standing history of use in European medicine for the remediation of "toxic blood." Research indicates that it has antiparasitic, antiprotozoal, and antibacterial effects, which are believed to be mediated by its phenolic acid content.^{57,58}

Gentian

Gentian is the quintessential bitter herb, used for centuries as an aid to the liver and gallbladder. Two of gentian's bioactive compounds, gentiopicoside and gentiolactone, have been found to protect the liver from cholestasis-induced liver damage, inhibit LPS-induced toxicity, and upregulate antioxidant enzyme activity.^{59,60,61}

ESSENTIAL OILS: POTENT ANTIMICROBIALS AND BIOFILM DISRUPTORS

A wide range of plants produce essential oils, organic hydrophobic liquids secreted from tiny structures within the plant's fruits, leaves, stem, and other structures. Essential oils defend plants against pests and predators, and modern-day research indicates that they can also help defend the human body against infections.

Tea tree oil is one of the most well-studied plant essential oils. It is obtained through steam distillation of leaves of the *Melaleuca alternifolia* tree, native to Australia. It has antibacterial activity against a wide range of pathogens, including *E. coli*, *S. aureus*, *S. epidermidis*, *E. faecalis*, *P. aeruginosa*, *M. avium*, *H. influenzae*, *S. pyogenes*, and *S. pneumoniae*.^{62,63} Tea tree oil also has potent antifungal activity against fluconazole-resistant *Candida albicans*.⁶⁴

Galbanum oil is steam distilled from *Ferula gummosa*, an umbelliferous plant with delicate yellow flowers. Galbanum oil has antimicrobial activity against several mycobacteria, *Gram-positive and Gram-negative pathogens*, and *Candida albicans*.^{65,66}

Lavender oil is derived from beautiful, fragrant lavender flowers (*Lavandula*). The delicate appearance and lovely smell of lavender belie its potent antimicrobial activities. Lavender essential oil has antifungal activity against *Fusarium* species and *Candida albicans* and antibacterial activity against *Staphylococcus aureus*.^{67,68}

Oregano oil comes from fragrant oregano (*Origanum vulgare*), best known as an ingredient in Italian cooking. However, oregano does far more than just make food delicious; it has potent antibacterial and anti-biofilm effects. Oregano oil exerts antimicrobial activity against multidrug-resistant bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa*, by damaging bacterial cells and disrupting biofilm structure.⁶⁹ Oregano oil also demonstrates antimicrobial effects against *Borrelia burgdorferi*, *Bartonella henselae*, multiple *Candida* species, and opportunistic bacteria that affect the female reproductive tract.^{70,71,72,73} Furthermore, oregano oil does not appear to trigger resistance development in bacteria, a common problem with antibiotics that has led to the explosion of antibiotic-resistant bacterial strains.

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