

Biatain[®]

Diabetic foot ulcers – prevention and treatment

A Coloplast quick guide

Biatain[®] – the simple choice



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Introduction

Diabetic foot ulcers have a considerable negative impact on patients lives, and are highly susceptible to infection that all too often leads to amputation. It is essential that diabetic foot ulcers receive the best possible wound management. Successfully treating a diabetic foot ulcer requires a comprehensive understanding of the wound: its cause, progression, risk, and treatment. But more than this, it takes a cross functional approach, where the patient also has an active role in the treatment process.

The information provided here is intended as a general guideline. Please consult diabetic foot ulcer guidelines applicable in your area. For further study, please refer to the International Consensus on the Diabetic Foot, 2011.²

We hope that this quick guide will help you diagnose, assess and treat diabetic foot ulcers in clinical practice, as well as identify opportunities for prevention and minimising the risk of infection and amputation.

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This Coloplast quick guide was updated in March 2012 in collaboration with Dr. Christian Münter.

“I marvel that society would pay a surgeon a fortune to remove a person’s leg – but nothing to save it!”

George Bernard Shaw

The diabetic foot – a clinical challenge

Diabetes is a serious chronic disease that needs attention. Approximately 15% of all people with diabetes will be affected by a foot ulcer during their lifetime.¹

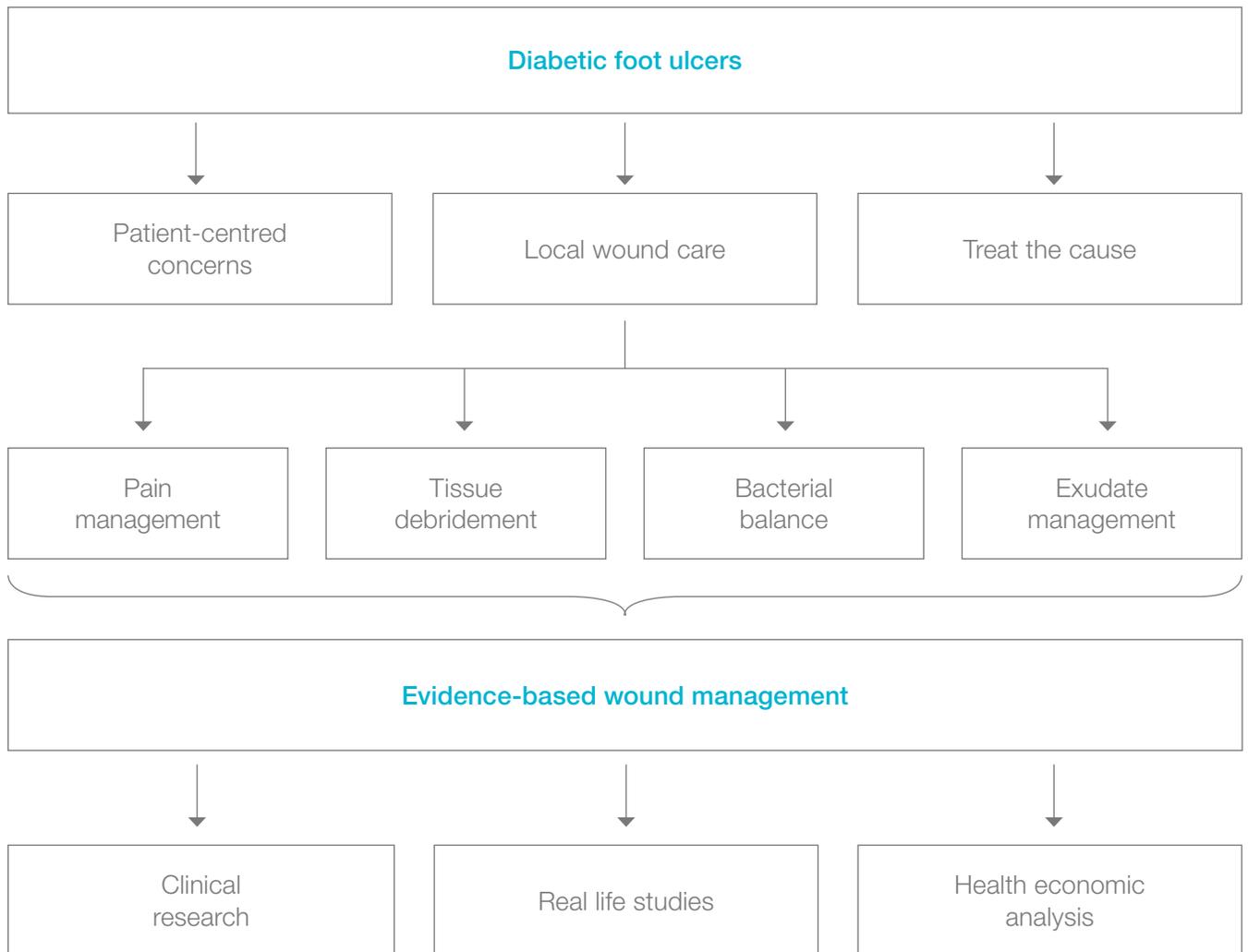
Diabetic foot ulcers (DFUs) often co-exist with vascular insufficiency and are the major cause of gangrene and amputation in people with diabetes. Risk of developing diabetic foot ulcers is greatly increased by reduced sensation and blood pressure.

Diabetic foot ulcers represent a huge risk to the patients quality of life, escalating wound/infection management and costs, and account for a large proportion of all national healthcare budgets

- Five-year recurrence rates of foot ulcers are 70%²
- Up to 85% of all amputations in relation to people with diabetes are preceded by a foot ulcer¹⁻²
- People with diabetes with one lower limb amputation have a 50% risk of developing a serious lesion in the second limb within 2 years³
- People with diabetes have a 50% mortality rate in the 5 years following the initial amputation⁴

It is possible to reduce amputation rates by 49-85% through a care strategy that combines prevention, the interprofessional diabetes care team, appropriate organisation, close monitoring and education.¹

Pathway to clinical care and clinical evidence



How to prevent DFUs

Prevention and education

“49-85% of all diabetic foot related problems are preventable.”

Spraul, M., 2000.⁶

“This can be achieved through a combination of good foot care, provided by an interprofessional diabetes care team, and appropriate education for people with diabetes.”

Modified from Bakker, K. et al., 2005.¹

“Education of patients, carers, and healthcare providers is an essential component of an effective, interprofessional team approach, ...but effective systems and structures for screening, provision of chiropody and footwear, and prompt treatment when required must be in place.”

Modified from Spraul, M., 2000.⁶

“The most important aspects, for example, danger signs which require prompt action by the patient, should be summarized and repeated.”

Spraul, M., 2000.⁶

“Successful diagnosis and treatment of patients with chronic wounds involve holistic care and a team approach. The integration of the work of an interprofessional care team that includes doctors, nurses and allied health professionals with the patient, family and caregivers offers an optimal formula for achieving wound resolution.”

Sibbald, R.G., et al, 2001.¹⁸

Prevention of ulcer formation

People with diabetes must inspect their feet regularly, or have a family member or care provider do it on their behalf. Daily inspection is the foundation of diabetic foot ulcer prevention. All wounds and sores should be taken seriously early on.

Regular, gentle cleansing with soapy water, followed by the application of topical moisturizers, helps to keep the skin healthy and better able to resist breakdown and injury.

Shoes should be checked to ensure that they fit properly and offer adequate support. Consider athletic/sports shoes and thick, padded socks. Diabetic socks (unrestrictive on circulation) are also available. In the case of foot deformities or special support needs, custom shoes should be considered.

Minor foot injuries and infections, such as cuts, scrapes, blisters and tinea pedis (athletes foot), can be unintentionally worsened by home treatments that impede healing. Patients should be reminded to avoid hot soaks, heating pads and harsh topical agents such as hydrogen peroxide, iodine and astringents. A moist wound environment will help prevent ulcer formation. Minor wounds should be gently cleansed and treated with topical antiseptics. In addition, a physician should inspect any minor wounds that do not heal quickly.

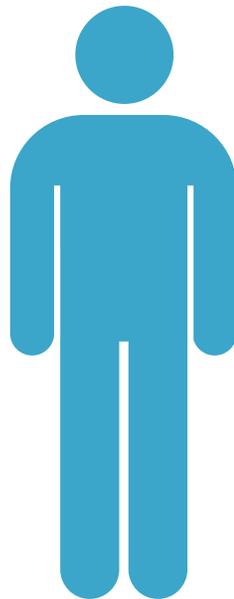
By reinforcing preventive advice and inspecting the patient's feet at routine follow-ups, the physician can help the patient develop and maintain good foot-care practices.

An interprofessional team approach

- Dietitian
- Diabetologist
- Pharmacist
- Family doctor/General practitioner
- Orthopaedic surgeon
- Rehabilitation team:
 - Occupational therapist
 - Physiotherapist or
 - Specialised physician
- Interventional radiologist
- Vascular surgeon
- Community nurse
- Dermatologist
- Orthotist
- Footcare specialist: Podiatrist

Others

- Diabetes educator
- Psychologist
- Social worker
- Neurologist



The involvement of the patient as a member of the healthcare team improves patient care outcomes

The patient's role

Patient self-exam needs to be part of diabetic foot care and follow-up

Education of patient, family and healthcare providers, such as using an easy to understand patient leaflet for education, must be a priority.

- Any cut or open skin should be treated by a qualified healthcare provider immediately
- Inspect and examine the feet and shoes on a daily basis
- Appropriate footwear
- Nails should be cared for by a qualified foot specialist (podiatrist or related disciplines)
- Dry skin should be treated with appropriate moisturizing, such as (humectant) creams containing urea or lactic acid¹⁸
- Fungal infections, especially of the toe webs require topical antifungal agents

Patients should always remember to remove socks and shoes for regular inspection of both feet

Consider the whole patient to ensure effective care of the foot ulcer

Past history, medications and allergies	Check for medications that may inhibit healing (i.e. steroids, immunosuppressants)
Check for other complications	Neurological, eye, heart, kidney, vascular
Glycaemic* control	Hb (Haemoglobin) A1c < 7.5% (depending on the specific situation of the patient, e.g. medication, risk of hypoglycemia, body weight)
Hypertension* control	< 140/90 mmHg
Clinical obesity* control	BMI < 30 kg/m ²
Hyperlipidemia* control	Cholesterol < 5,2 mmol/L (200 mg/dL)

*All 4 are associated with the metabolic syndrome and type 2 onset diabetes. Optimal control of diabetes will improve patient care outcomes.

Disclaimer:

These are general guidelines. Please check local treatment recommendations applicable for your country or healthcare institution.

How to diagnose and assess a diabetic foot ulcer

“The VIPS”^{7,8} of diabetic foot management to ensure outcomes

- V** Vascular supply is adequate
- I** Infection control is achieved
- P** Pressure offloading/downloading
- S** Sharp/surgical debridement has been considered

Diabetic foot ulcers typically have a thick rim of keratinized tissue surrounding the wound⁹



Blisters are associated with friction and shear



Callus is associated with increased pressure and haemorrhage

Local wound assessment¹⁰

History	<ul style="list-style-type: none"> · Previous ulcer(s), amputations
Local skin assessment	<ul style="list-style-type: none"> · Oedema · Colour · Temperature · Callus
Vascular examination	<ul style="list-style-type: none"> · Check for peripheral arterial disease Symptoms are often not found, but the following signs may be present: cold feet, blanching on elevation, absent hair growth, dry, shiny and atrophic skin⁹ · Palpate and check for dorsalis pedis, posterior tibial, popliteal and femoral pulses⁹ · Measure the ankle brachial pressure index (ABPI) Toe pressure or transcutaneous oxygen may be assessed, because arterial calcification can cause falsely elevated ABPI results⁹
Neuropathy^{8,11}	<ul style="list-style-type: none"> · Sensory – loss of protective sensation · Autonomic – lack of sweating that results in dry, cracked skin that bleeds and creates a portal of entry for bacteria · Muscular – loss of reflexes or atrophy of muscles that leads to foot deformities
Deformity and footwear	<ul style="list-style-type: none"> · Charcot foot · Hammer toes, claw toes, bunions · Check the deformity and address inappropriately fitted shoes

Types of neuropathy¹⁰

Etiology	Sensory neuropathy	Autonomic neuropathy	Motor neuropathy
Characteristics	<ul style="list-style-type: none"> · Loss of protective sensation · No perception of shoes rubbing or temperature changes 	<ul style="list-style-type: none"> · Reduced sweating results in dry cracked skin · Increased blood flow leads to a warm foot 	<ul style="list-style-type: none"> · Dysfunction of the motor nerves that control the movement of the foot. Limited joint mobility may increase plantar pressure · Foot deformities develop · Hammer toes
Clinical presentations	<ul style="list-style-type: none"> · Unaware of a foot ulcer or lack of discomfort when a wound is being probed 	<ul style="list-style-type: none"> · Dry skin with cracks and fissures · Bounding pulses · Dilated dorsal veins · Warm feet 	<ul style="list-style-type: none"> · High medial longitudinal arch, leading to prominent metatarsal heads and pressure points over the plantar forefoot · Clawed toes · Altered gait
			

10g monofilament testing

The 10g monofilament testing is recommended as a screening tool to determine the presence of protective sensation in people with diabetes.¹¹⁻¹³

Places for testing

- Plantar surface of the metatarsal heads (min. 3 metatarsal heads)^{12,13}
- The great toe/first toe¹²
- The medial and lateral sides of the plantar aspect of the midfoot¹³
- The plantar area of the heel¹³
- The dorsal aspect of the midfoot¹³



The pictures show testing sites

"There is no clear evidence on how many negative response sites equals an at-risk foot. Some literature shows that even one site with a negative response on each foot may indicate an at-risk foot."

Baker, N. et al., 2005.¹²

Areas at risk for neuropathic, ischaemic and neuro-ischaemic ulcers

In a cross-sectional, population-based study the proportion of the lesions were*2



Neuropathic ulcers
55% of total diabetic
foot ulcers



Ischaemic ulcers
10% and
neuro-ischaemic
ulcers 34% of total
diabetic foot ulcers

“Recent experience from our clinic indicates that the frequency of neuropathic ulcers has decreased, and the incidence of ischaemic and neuro-ischaemic ulcers has increased, equaling 50-50%.”

Mike Edmonds, 2005.

*1% of the ulcers were considered not to be diabetes-related.

Clinical symptoms of neuropathic and ischaemic foot ulcers¹⁴

Clinical signs	Neuropathic ulcer 	Ischaemic ulcer 
Foot deformities	Clawed toes, possible high arch, possible Charcot deformities	No specific deformities. Possible absent toes/forefoot from previous amputations
Foot temperature/footpulse	Warm, palpable pulse	Cold or decreased temperature, pulse may be absent or reduced
Skin colour	Normal or red	Pale/bluish. Pronounced redness when lowered (dependent rubor), blanching on elevation
Skin condition	Dry skin due to decreased sweating	Thin, fragile and dry
Ulcer location	On the plantar aspects (forefoot 80%) of the foot/toes	Distal/tips of the toes, heel, or margins of the foot
Callus present	Commonly seen on the weight-bearing areas and is generally thick	Not usually. If present, distal eschar or necrosis
Ulcer characteristics	Usually painless, with a “punched out” appearance (granulation or deeper base) surrounded by callus	Painful, especially with necrosis or slough
Sensation	Reduced or absent sensation to touch, vibration, pain, and pressure	Sensation may be present but decreased if there is associated neuropathy
Ankle reflexes	Usually not present	Usually present
Foot pulses	Present and often bounding. Dilated, prominent veins	Absent or markedly reduced

Ulcer assessment

Neuropathic pain	Burning, stinging, shooting and stabbing (non-stimulus dependent)
Local pain	Deep infection or Charcot joint
Size	Length, width, depth and location, preferably with clinical photograph
Wound bed	Appearance <ul style="list-style-type: none"> · Black (necrosis) · Yellow, red, pink · Undermined
Infection signs	Odour Be aware that some signs (fever, pain, increased white blood count/ ESR) may be absent. Evaluate the ulcer for signs of infection, inflammation and oedema. For more information, please see page 20
Exudate	Copious, moderate, mild, none
Wound edge	Callus and scale, maceration, erythema, oedema

Wound bed



Necrosis



Maceration



Sloughy



Unhealthy wound edge

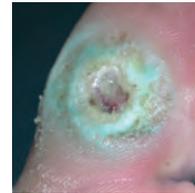


Wound undermining, deep tissue infection

Superficial and deep infection symptoms^{10,15,16}

Superficial (local) – Treat topically

- Non-healing
- Exuberant friable granulation tissue
- Bright red discoloration of granulation tissue
- Increased exudate
- Malodour
- New slough in wound base



Topical antimicrobial treatment may be considered for superficial/local infection, dependent on the assessment that will direct the treatment. Superficial/local infection may, however, require systemic antibiotics. For further details and updates, please see the International Consensus on the Diabetic Foot, 2011.²

Deep – Treat systemically

- Pain
- Probes to bone (increased risk in the presence of osteomyelitis)
- New areas of break-down
- Warmth
- Erythema, oedema



Signs of local and deep infection are potentially limb and/or life threatening. These clinical signs and symptoms require urgent medical attention¹¹

Wagner classification

Grade	Ulcer appearance	Grade	Ulcer appearance
Grade 0 	No open lesions; may have deformity or cellulitis	Grade 1 	Superficial diabetic ulcer (partial or full thickness)
Grade 2 	Ulcer extension to ligament, tendon, joint capsule, or deep fascia without abscess or osteomyelitis	Grade 3 	Deep ulcer with abscess, osteomyelitis, or joint sepsis
Grade 4 	Gangrene localised to portion of forefoot or heel	Grade 5 	Extensive gangrenous involvement of the entire foot

Further reading:
International Consensus on the Diabetic Foot, The International Working Group on the Diabetic Foot, 2011²; www.iwgdf.org

How to treat a diabetic foot ulcer

Treatment of diabetic foot ulcers

Vascular	<ul style="list-style-type: none">· If inadequate circulation, refer to vascular assessment and investigations· Consider angioplasty, bypass or amputation
Infection	<p><i>Bacterial swabs help to identify organisms and sensitivity, but do not diagnose infection in isolation from clinical features</i></p> <ul style="list-style-type: none">· Superficial/local – consider topical antimicrobial treatment (e.g. sustained silver releasing dressings). However, it may need systemic antibiotic therapy. The general treatment may also include debridement of devitalized tissue, pressure relief, optimising metabolic control and vascular intervention²· Deep – requires systemic antibiotic therapy to initially cover Gram-positive, Gram-negative and anaerobic organisms. Subsequently, systemic antibiotic therapy can be modified according to the results of the culture. In addition, it is essential to consider the need for surgical debridement, drainage of infection alongside pressure relief and optimising metabolic control· Topical antimicrobial (e.g. sustained silver-releasing dressings) may give added benefit together with systemic coverage for deep infection
Pressure	<ul style="list-style-type: none">· Appropriate offloading must be provided· Total contact cast or pneumatic walker· Deep toed or special shoes and orthotics

Frequent (dependent on the clinical situation) inspection of the diabetic foot ulcer is vital due to the increased risk of infection

Disclaimer: These are general guidelines. Please check local treatment recommendations applicable for your country or healthcare institution.

Local wound treatment

Tissue debridement	<ul style="list-style-type: none"> · Sharp surgery preferred · Hydrogels, alginates and enzymes · Biosurgery
Infection	<p>Dependent on the outcomes of the wound assessment:</p> <ul style="list-style-type: none"> · Topical antimicrobials (e.g. sustained silver releasing dressings) · Systemic antibiotic therapy
Exudate management	<ul style="list-style-type: none"> · Foams, alginates
Management	<ul style="list-style-type: none"> · The treatment of the edge depends on the outcomes of the assessment of the edge of the wound. In general, healthy wounds have a pink woundbed and an advancing wound margin, while un-healthy wounds have a dark and undermined wound margin¹¹
Neuropathic pain	<p>Occasionally, neuropathy can be associated with pain. For people with painful diabetic neuropathy, consider the following treatment:</p> <p>Tricyclic antidepressants^{7,17} (TCAs):</p> <ul style="list-style-type: none"> · Second generation TCA agents¹⁷ e.g. duloxetine · First generation TCA agent^{7,17}: amitriptyline · Anticonvulsants: pregabalin¹⁷

Application of moisture retentive dressings in the context of ischaemia and/or dry gangrene can result in a serious life-or-limb-threatening infection¹¹

Infection control is of paramount importance in DFU treatment because of its strong association with amputation. A study of 1,666 patients with diabetes found that foot infection increased the risk of amputation by 155 times¹⁹

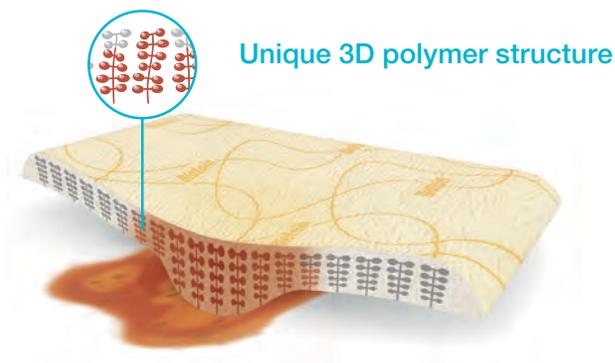
Disclaimer: These are general guidelines. Please check local treatment recommendations applicable for your country or healthcare institution.

Coloplast solutions for diabetic foot ulcers

Biatain® – superior absorption – faster healing

Biatain is a soft and conformable foam dressing that effectively absorbs and retains wound exudate.^{20,21}

This ensures a moisture balance that is optimal for healing of exuding wounds.^{22,23}



Biatain® Non-Adhesive – superior absorption for wounds with extra fragile skin

Biatain Non-Adhesive is a soft and flexible absorbent polyurethane foam dressing with bevelled edges



Biatain® Silicone – superior absorption for general purposes

Biatain Silicone is a soft and flexible absorbent foam dressing with a gentle silicone adhesive



Biatain® Soft-Hold – superior absorption for wounds that are difficult to bandage

Biatain Soft-Hold has a gentle adherent layer covering less than 50% of the foam surface allows both hands to be free during dressing application and removal



Biatain® Alginate - superior absorption for sloughy wounds and cavity filling

Highly absorbent alginate dressing for moderately to heavily exuding wounds of any size and shape. Faster wound healing by conforming to any wound shape and by debridement of slough



Purlon® Gel – faster wound healing by effective and gentle debridement

- Fast and effective debridement
- High cohesion – the gel stays in place



Atrac-Tain® moisturizing cream

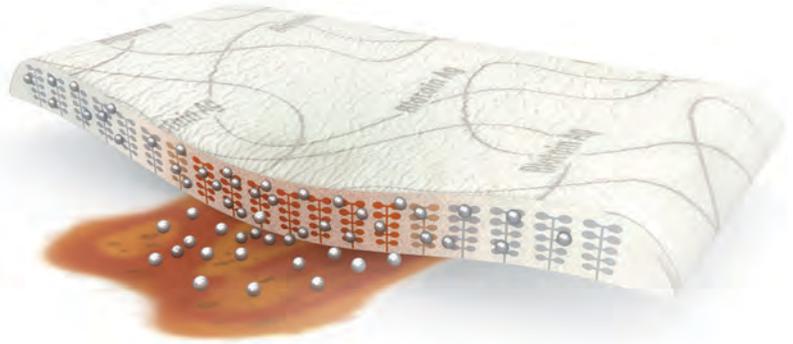
Atrac-Tain moisturizing cream is beneficial in the treatment of moderate-to-severe xerosis of the feet in patients with diabetes²⁴

Coloplast antimicrobial dressings for infected diabetic foot ulcers and ulcers at risk of infection

Biatain® Ag – superior absorption for infected wounds

Sustained release of silver during the entire wear time (up to 7 days)²⁵

- Optimal healing environment²⁶⁻²⁸
- Rapid killing of bacteria²⁹
- Designed to prevent wound infection



Biatain® Ag Non-Adhesive – superior absorption for infected wounds with extra fragile skin

Biatain Ag is a soft and conformable silver foam dressing that is proven to help infected wounds heal faster²⁶⁻²⁸



Biatain® Silicone Ag – superior absorption for infected wounds

Biatain Silicone Ag is a soft and flexible absorbent silver foam dressing with a gentle silicone adhesive border



Biatain® Alginate Ag – superior absorption for infected sloughy wounds and cavity filling

Highly absorbent antimicrobial alginate dressing for moderately to heavily exuding infected wounds or wounds at risk of infection. Faster wound healing by conforming to any wound shape and by debridement of slough.

- Designed to fight cavity wound infection
- Effect on a broad range of bacteria

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Biatain® - Superior Absorption for Faster Healing

Non-infected wounds

Biatain Silicone

Size (cm)	Product Code	Units per box
7½x7½	33434	10
10x10	33435	10
12½x12½	33436	10
15x15	33437	5
17½x17½	33438	5

Biatain Silicone Lite

Size (cm)	Product Code	Units per box
7½x7½	33444	10
10x10	33445	10
12½x12½	33446	10

Biatain Non-Adhesive

Size (cm)	Product Code	Units per box
5x7	6105	10
10x10	3410	10
10x20	3412	5
15x15	3413	5
20x20	3416	5

Biatain Soft-Hold

Size (cm)	Product Code	Units per box
10x10	3470	5
10x20	3472	5
15x15	3475	5

Biatain Adhesive

Size (cm)	Product Code	Units per box
7½x7½	3462	10
10x10	3430	10
12½x12½	3420	10
18x18	3423	5
17x17 Sacral	3483	5
23x23 Sacral	3485	5
19x20 Heel	3488	5

Biatain Alginate

Size (cm)	Product Code	Units per box
5x5	3705	30
10x10	3710	10
15x15	3715	10
3x44 Rope	3740	6

Biatain Super

Size (cm)	Product Code		Units per box
	AD	NA	
10x10	4610	4630	10
12.5x12.5	4612	4632	10
12x20	4625	4645	10
15x15	4615	4635	10
20x20	4620	4639	10

Adhesive (AD)
Non-Adhesive (NA)

Infected wounds

Biatain Silicone Ag

Size (cm)	Product Code	Units per box
7½x7½	39636	5
10x10	39637	5
12½x12½	39638	5

Biatain Ag Non-Adhesive

Size (cm)	Product Code	Units per box
5x7	5105	5
10x10	9622	5
10x20	9623	5
15x15	9625	5
20x20	9626	5

Biatain Ag Adhesive

Size (cm)	Product Code	Units per box
7½x7½	9631	5
12½x12½	9632	5
18x18	9635	5
23x23 Sacral	9641	5
19x20 Heel	9643	5

Biatain Alginate Ag

Size (cm)	Product Code	Units per box
5 x 5	3755	10
10 x10	3760	10
15 x 15	3765	10
3 x 44 Rope	3780	10

Painful wounds

Biatain Ibu Non-Adhesive

Size (cm)	Product Code	Units per box
10x10	4110	5
10x20	4112	5
15x15	4115	5
20x20	4120	5

Biatain Ibu Soft-Hold

Size (cm)	Product Code	Units per box
10x10	4140	5
10x20	4142	5

With the Biatain portfolio you can manage **90% of all wounds**

Other Products

Purilon® Gel (Sterile)

Size (cm)	Product Code	Units per box
0.28oz/8g	3906	10
0.5oz/15g	3900	10

AtracTain® Cream

Size (cm)	Product Code	Units per box
2 g sachet	1843	300
60 ml	1802	12
140 ml	1814	12

Comfeel Plus Transparent

Size (cm)	Product Code	Units per box
5x7	3530	10
5x15	3547	10
5x25	3548	10
10x10	3533	10
9x14	3536	10
9x25	3537	5
15x15	3539	5
9x11 Contour	3283	5

After 30 years in wound care, we at Coloplast believe that absorption is the key to faster healing. Our Biatain® portfolio brings superior absorption to daily wound care needs, making Biatain the simple choice.

Ostomy Care
Urology & Continence Care
Wound & Skin Care

Coloplast develops products and services that make life easier for people with very personal and private medical conditions. Working closely with the people who use our products, we create solutions that are sensitive to their special needs. We call this intimate healthcare. Our business includes ostomy care, urology and continence care and wound and skin care. We operate globally and employ more than 7,000 people.

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