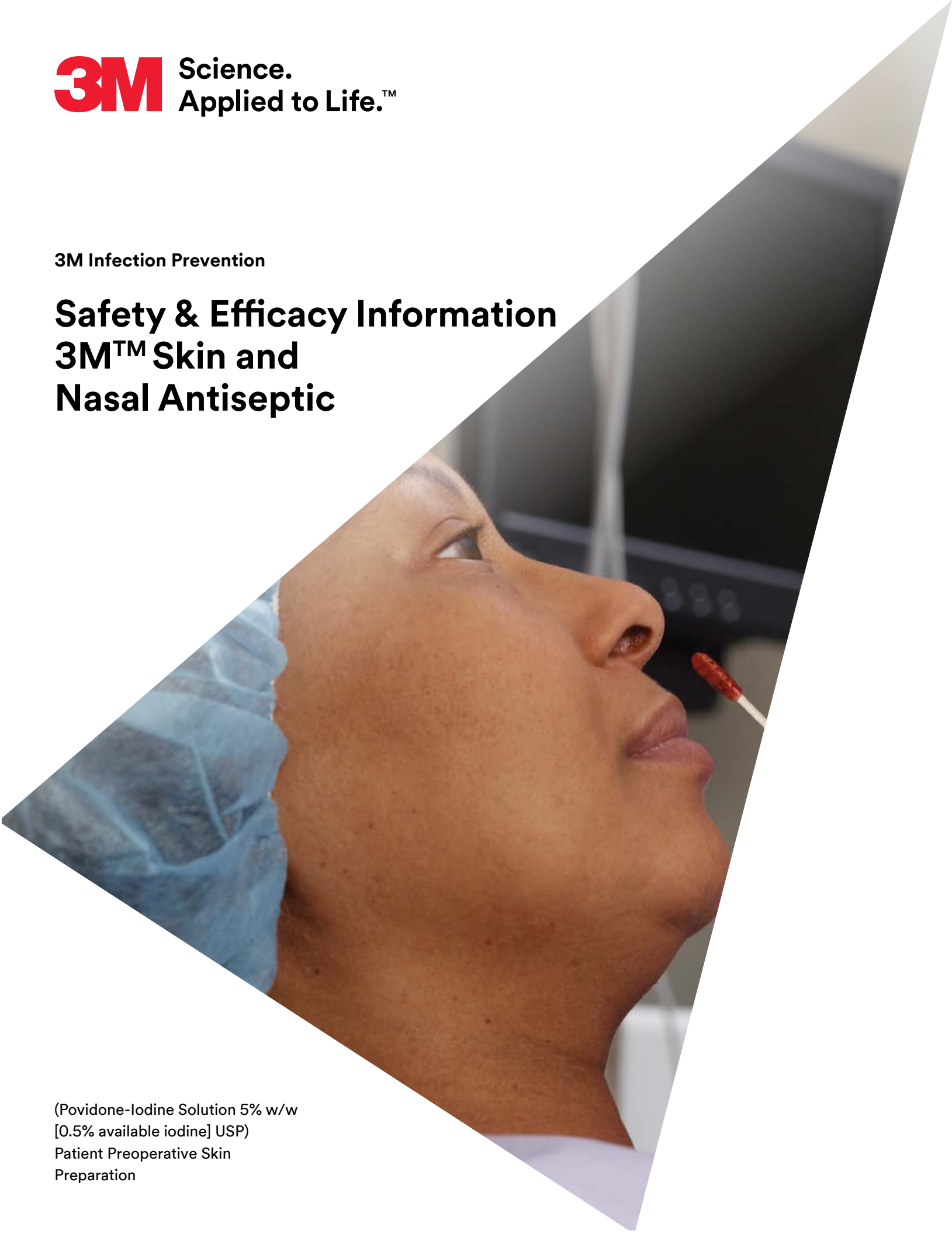
3M Science. Applied to Life.™

3M Infection Prevention

Safety & Efficacy Information 3M™ Skin and Nasal Antiseptic



(Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP)
Patient Preoperative Skin Preparation

S. aureus is the leading cause of surgical site infection.[1]

Approximately 30% of the population are colonized with *S. aureus* in the nares.[2]

80% of *S. aureus* infections are caused by the patient's own (clonal) nasal flora.[3-5]

Nasal carriage of *S. aureus* is a significant risk factor for developing SSI.[4-7]

3M™ Skin and Nasal Antiseptic reduces bacterial counts in the nares in one hour including *S. aureus* by 99.5% and maintains this reduction for at least 12 hours.[8]

3M™ Skin and Nasal Antiseptic helps reduce the risk of SSI when part of a comprehensive preoperative protocol.[8-15]

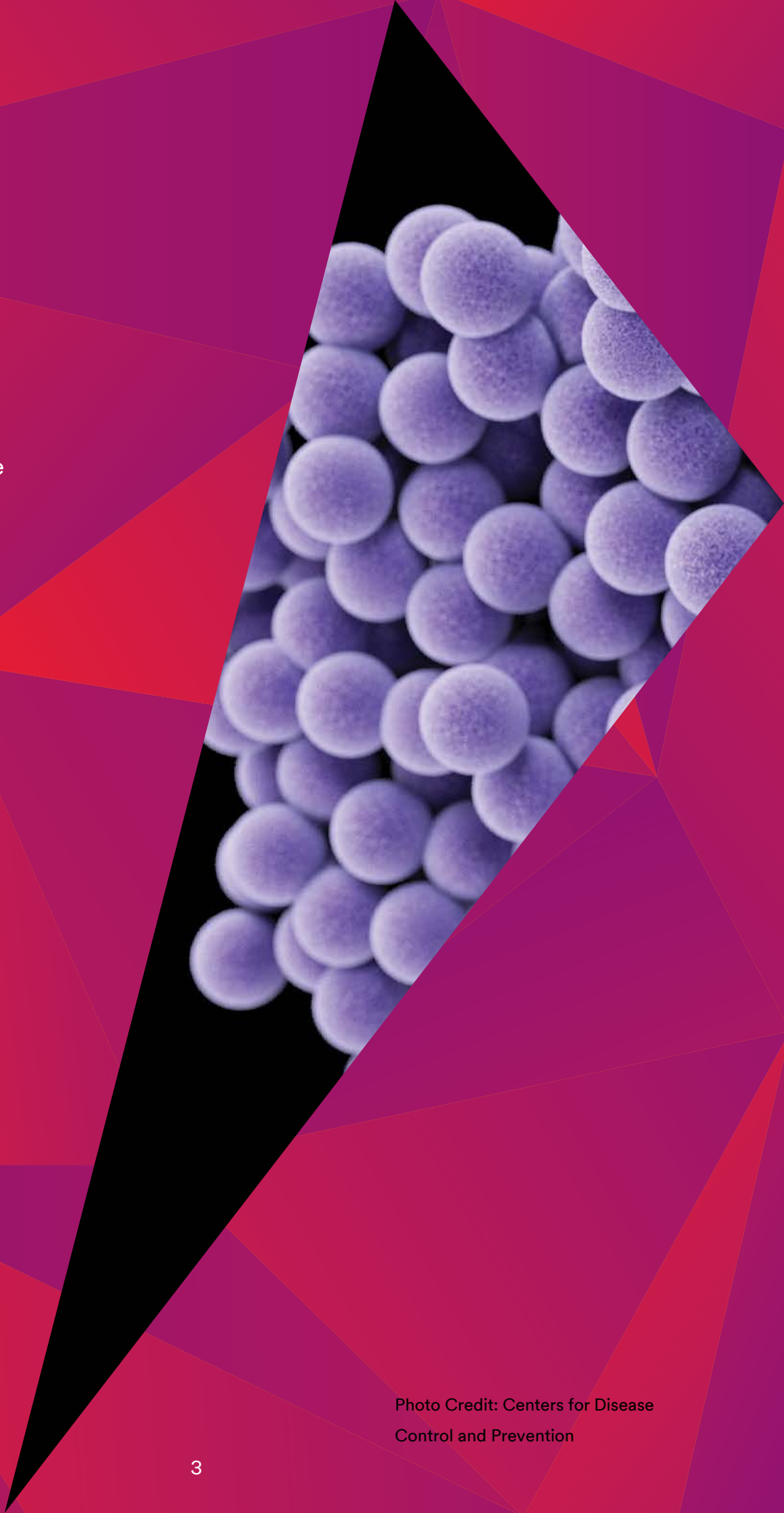


Photo Credit: Centers for Disease Control and Prevention

3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation was specifically developed by 3M to help address the rising concern of surgical site infections that can be caused by bacteria in the nares.

Effective	One-time application helps reduce the risk of surgical site infections when part of a comprehensive preoperative protocol.[8-15]
Innovative	The film-forming, patented formula was specifically designed to work within one hour and maintain at least 12 hours of persistence.[8]
Science	Solution is pH balanced to be non-irritating, thickened to sustain bactericidal activity and designed to address the unique physiology of the nose.[16]
Assurance	3M™ Skin and Nasal Antiseptic has demonstrated efficacy against antibiotic resistant strains of MRSA and has not been shown to lead to resistance†, supporting your antibiotic stewardship efforts.[17-20]
Compliance	Directly observed application of 3M™ Skin and Nasal Antiseptic ensures compliance, unlike other methods addressing nasal decontamination.[9]
Easy	The broad-spectrum, fast-acting antiseptic allows for wider implementation than selective treatment and fits easily into your preoperative process.[10]
Comfort	The film-forming, patented formula is designed not to drip, does not contain alcohol and has demonstrated excellent acceptability when used on nasal tissue.[8, 16]

Safety

Safety Assessment of Active Ingredient

Based on in vitro and in vivo work with povidone-iodine (PVP-I) in human nares, the maximum concentration that has been used in clinical studies without adverse health effect was at a maximum dosage concentration of 5% PVP-I

Iodine is a trace element essential to life and present throughout the body. True allergy to iodine does not exist. A very small number of patients who are extremely predisposed to allergy may exhibit sensitivity to various skin preparations.

Safety Testing — Clinical study[16] (Expert Grader Safety Assessment)

Purpose: The objective of the study was to assess the safety (irritation) of 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation compared to a control after two applications in each nostril.

Method: Using a light scope, both nostrils of 30 subjects were assessed by an Expert Grader of skin irritation who was blinded to the study design. The level of erythema and edema were assessed using the Draize scale. Each subject was randomized to either 3M™ Skin and Nasal Antiseptic (n = 20) or 0.9% saline control (n = 10). The subject's nostrils were prepped for 30 seconds each, two times each, using four separate foam-tipped applicators saturated with the pre-determined solution. After 60 minutes, the same blinded Expert Grader, using a light scope, assessed both nostrils of the 30 subjects for the level of erythema and edema.

Results: The mean primary irritation scores obtained were 0.0 and −0.2 for the 3M™ Skin and Nasal Antiseptic and saline control groups, respectively. The primary irritation index (PII) is the difference in mean primary irritation score between the 3M™ Skin and Nasal Antiseptic and control groups. Therefore the estimated PII value is 0.0 – (−0.2) = 0.2. This value falls in the category of nonirritating. 3M™ Skin and Nasal Antiseptic was found to be nonirritating after two applications in each nostril.

Efficacy Studies Conducted

The efficacy of 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation has been verified in many studies.

The studies included were conducted in the laboratory (in vitro studies), on healthy human volunteers (in vivo), or on clinical patients. Summaries of each study are provided.

Efficacy

Log Reduction Overview

The number of bacteria represented by log reduction is dependent upon the number of bacteria present initially (baseline). For example, if the baseline is 4 logs and the reduction is 3 logs, only 1 log of bacteria remains which is equal to 10 colony forming units (CFU). However, if the baseline is 6 logs and the reduction is 3 logs, 3 logs of bacteria remain which is 1000 CFUs.

Logs	Number of Bacteria
1	10
2	100
3	1,000
4	10,000
5	100,000
6	1,000,000

Logs	% Reduction of Bacteria
1	90
2	99
3	99.9
4	99.99
5	99.999
6	99.9999

Efficacy In vitro Microbiology†

In vitro Time-Kill Assay of 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation[20]

Purpose: The objective of this study was to assess how rapidly 3M™ Skin and Nasal Antiseptic produces its effect on a wide variety of organisms.

Method: Known populations of the microorganisms were applied to the surface of duplicate membrane filters for each contact time. 3M™ Skin and Nasal Antiseptic (0.5 mL) in a 1:10 dilution was applied to the filters for one minute, three minutes, and five minutes. The activity of the prep was stopped (neutralized) at each time point. Surviving bacteria were enumerated and the $\log_{10}$ reduction from the initial population was calculated.

Results: 3M™ Skin and Nasal Antiseptic demonstrated rapid bactericidal activity against a broad range of microorganisms. It demonstrated bactericidal activity against aerobic gram-positive and gram-negative bacteria including antibiotic-resistant strains such as methicillin-resistant *Staphylococcus aureus* (including CA-MRSA and HA-MRSA), methicillin-resistant Staphylococcus epidermidis (MRSE) and vancomycin-resistant Enterococcus faecium and Enterococcus faecalis (VRE) and yeast. See Table 1 for complete results.

Table 1: Time Kill Study

Microorganism	1 Minute	3 Minutes	5 Minutes
Candida albicans (ATCC 10231)	99.999	99.999	99.999
Enterococcus faecalis (ATCC 29212)	99.953	99.999	99.999
Enterococcus faecalis (VRE) (ATCC 51299)	99.979	99.999	99.999
Enterococcus faecium (MDR) (ATCC 51559)	83.571	99.999	99.999
Escherichia coli (ATCC 11229)	99.999	99.999	99.999
Escherichia coli (ATCC 25922)	99.999	99.999	99.999
Klebsiella pneumoniae (ATCC 11296)	99.999	99.999	99.999
Micrococcus luteus (ATCC 7468)	99.999	99.999	99.999
Pseudomonas aeruginosa (ATCC 15442)	99.999	99.999	99.999
Pseudomonas aeruginosa (ATCC 27853)	99.999	99.999	99.999
Serratia marcescens (ATCC 14756)	99.999	99.999	99.999
Staphylococcus aureus (ATCC 6538)	99.999	99.999	99.999
Staphylococcus aureus (ATCC 29213)	99.999	99.999	99.999
Staphylococcus aureus (MRSA) (ATCC 33592)	99.999	99.999	99.999
Staphylococcus aureus (MRSA) (ATCC 43300)	99.999	99.999	99.999
Staphylococcus aureus (MRSA) (BAA-811)	99.999	99.999	99.999
Staphylococcus aureus (CA-MRSA USA300) (BAA-1556)	99.999	99.999	99.999
Staphylococcus aureus (HA-MRSA USA100) (NRS 382)	99.999	99.999	99.999
Staphylococcus epidermidis (ATCC 12228)	99.999	99.999	99.999
Staphylococcus epidermidis (MRSE) (ATCC 51625)	99.999	99.999	99.999
Streptococcus pyogenes (ATCC 19615)	99.999	99.999	99.999
Candida albicans (ATCC 10231)	99.999	99.999	99.999

CA: community associated
HA: healthcare associated
MRSA: methicillin-resistant *Staphylococcus aureus*
MRSE: methicillin-resistant Staphylococcus epidermidis
MDR: multi-drug resistant (ampicillin, ciprofloxacin, gentamicin, rifampin, teicoplanin, vancomycin)

In vitro Minimum Bactericidal Concentration Study of 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation[21]

Purpose: The purpose of this study was to determine the minimal concentration (in micrograms per milliliter) of 3M™ Skin and Nasal Antiseptic resulting in complete kill of microorganisms after a 30 minute contact time.

Method: The method used in this study incorporated the National Committee for Clinical Laboratory Standards "Methods for Dilution Antimicrobial Susceptibility Test for Bacteria that Grow Aerobically".[22] 3M™ Skin and Nasal Antiseptic was tested at twofold serial dilutions and the lowest concentration that resulted in complete kill of the organism was recorded as the Minimum Bactericidal Concentration (MBC) for iodine.

Results: Fifty-seven ATCC and clinical isolates (including strains of CA-MRSA, HA-MRSA, MRSE and VRE) were tested.

Table 2: Organisms Tested with MBC range (µg/mL)

Microorganism	ATCC Strain	MBC (µg/mL)	Clinical Isolate ID	MBC (µg/mL)
Acinetobacter baumannii (MDR)	BAA-1605*	0.25 – 0.5	032107Ab7*	0.25 – 1
Bacteroides fragilis	25285	0.25	042006Bf11	>64
Burkholderia cepacia	35254	0.5	051707Bc6	1
Haemophilus influenzae	33391	≤0.063 – 0.125	071906Hi8	0.125
Enterobacter cloacae	13047	0.25	111705Ecl13	0.5
Escherichia coli	11229	0.5	111705Ec22	0.5
Escherichia coli	25922	0.125 – 0.5	NA	NA
Klebsiella oxytoca	15764*	0.25 – 0.5	111705Ko19	0.25 – 0.5
Klebsiella pneumoniae	11296	1	111705Kpn8	0.25
Pseudomonas aeruginosa	15442	0.5 – 1	112905Pa7	0.5 – 1
Pseudomonas aeruginosa	27853	0.25 – 0.5	NA	NA
Proteus mirabilis	29906	0.25 – 0.5	112905Pm23	0.5
Serratia marcescens	14756	0.5	112905Sm26	0.5
Staphylococcus aureus	6538	0.25 – 0.5	NA	NA
Staphylococcus aureus	29213	0.25 – 1	NA	NA
Staphylococcus aureus (MRSA)	33592*	0.125 – 0.25	120607MRSa47*	0.125
Staphylococcus aureus (MRSA)	43300*	0.5	NA	NA
Staphylococcus aureus (CA-MRSA or HA-MRSA)	BAA-1556* USA300	0.25	042508NRSa382* USA100	0.5
Staphylococcus aureus (MRSA)	BAA-811*	0.25 – 0.5	NA	NA
Staphylococcus epidermidis	12228	0.25	112905Se25	0.125 – 0.25
Staphylococcus epidermidis (MRSE)	51625*	0.125	NA	NA
Staphylococcus hominis	27844	0.25 – 1	010606Sho39	0.5 – 1
Staphylococcus haemolyticus	29970	0.125 – 0.25	122305Sha44	0.25 – 0.5
Staphylococcus saprophyticus	15305	≤0.063 – 0.25	122305Ss46	0.125 – 0.5
Micrococcus luteus	7468	1	071906Ms11	0. 25
Streptococcus pyogenes	12344	0.5	071906Spy4	0.5 – 1
Enterococcus faecalis	29212	0.5 – 1	071906Efs7	0.5
Enterococcus faecalis (VRE)	51299*	0.5 – 1	NA	NA
Enterococcus faecium	19434	0.5 – 1	071906Efm5	1
Enterococcus faecium (MDR)	51559*	0.25	NA	NA
Streptococcus pneumoniae	33400	64	011706Spn17	0.5
Candida albicans	18804	2	011706Ca26	2
Candida tropicalis	42678	2	011706Ct2	2
Candida tropicalis	42678	2	011706Ct2	2

* Antibiotic resistant organism CA: community associated MRSA: Methicillin-resistant *Staphylococcus aureus* NA = Not applicable HA: healthcare associated MRSE: Methicillin-resistant Staphylococcus epidermidis MDR: multi-drug resistant VRE: Vancomycin-resistant Enterococcus

Karau M, Ballard A, Schmidt-Malan S, et al. 3M™ Skin and Nasal Antiseptic and 3M™ DuraPrep Surgical Solution Bactericidal activity against methicillin-resistant *Staphylococus aureus*. American Society for Microbiology General Meeting, Boston, MA, May 2014.

Purpose: The purpose of this study was to assess the in vitro activity of 3M™ Skin and Nasal Antiseptic against 24 vancomycin-intermediate methicillin-resistant *Staphylococcus aureus* (MRSA) isolates and 20 mupirocin non-susceptible MRSA isolates from Mayo Clinic and NARSA culture collections.

Methods: Minimum bactericidal concentrations (MBC) were determined using a microdilution method, modified from the Clinical and Laboratory Standards Institute (M26-A,1999). Previously tested *S. aureus* ATCC isolates 29213 (vancomycin-, methicillin-, and mupirocin-susceptible) and 43300 (methicillin-resistant, vancomycin- and mupirocin-susceptible) were included as controls. At 24 h, the well with the lowest concentration of antiseptic remaining clear was recorded as the MBC. Results are based on the amount of available iodine in the product required to kill the bacteria. The MBC range, MBC required to kill 50% of organisms (MBC_{50}), and MBC required to kill 90% of organisms (MBC_{90}) were calculated.

Results: The 20 mupirocin non-susceptible MRSA isolates tested against the 3M™ Skin and Nasal Antiseptic had a MBC range of ≤0.06 to 0.25 µg/ml, and both MBC_{50} and MBC_{90} values of 0.25 µg/ml. The control MBCs were 0.25 and 0.125 µg/ml for ATCC 29213 and 43300, respectively. The 24 vancomycin-intermediate MRSA isolates tested against the 3M™ Skin and Nasal Antiseptic had a MBC range of ≤0.06 to 0.25 µg/ml, and MBC_{50} and MBC_{90} values ≤0.06 and 0.25 µg/ml, respectively. The control MBCs were ≤0.06 and 0.125 µg/ml for ATCC 29213 and 43300, respectively.

Conclusions: 3M™ Skin and Nasal Antiseptic had bactericidal activity against vancomycin-intermediate and mupirocin non-susceptible MRSA isolates.

Table 3: Mupirocin non-susceptible MRSA minimum bactericidal concentration (MBC) of 3M™ Skin and Nasal Antiseptic

Isolate	3M Nasal and Skin Prep MBC (ug/ml)
IDRL 9680	≤0.06
IDRL 9681	0.125
IDRL 9682	0.25
IDRL 9683	0.25
IDRL 9684	0.25
IDRL 9685	0.25
IDRL 9686	0.25
IDRL 9687	0.25
IDRL 9688	0.125
IDRL 9689	0.25
IDRL 9690	0.25
IDRL 9691	0.25
IDRL 6092	0.25
IDRL 6117	0.25
IDRL 5964	0.125
IDRL 6169	0.125
IDRL 9665	0.125
IDRL 9667	0.125
IDRL 9671	0.25
NRS107	0.125
ATCC 43300	0.25
ATCC 29213	0.125
Summary	**n=20**
	Range ≤0.06-0.25
	MBC_{50} 0.25
	MBC_{90} 0.25

Table 4: Vancomycin-intermediate MRSA minimum bactericidal concentration (MBC) of 3M™ Skin and Nasal Antiseptic

Isolate	MBC (ug/ml)
IDRL 5976	0.25
IDRL 5977	0.25
IDRL 6373	0.25
IDRL 6707	0.25
IDRL 8686	0.25
IDRL 8768	0.25
IDRL 9006	0.25
IDRL 9007	0.25
IDRL 9008	0.125
IDRL 9010	0.125
IDRL 9011	≤0.06
IDRL 9692	≤0.06
IDRL 9705	≤0.06
IDRL 9706	≤0.06
IDRL 9707	0.125
IDRL 9708	≤0.06
IDRL 9709	≤0.06
IDRL 8609	≤0.06
NRS1	≤0.06
NRS56	≤0.06
NRS403	≤0.06
NRS404	≤0.06
NRS402	≤0.06
NRS118	≤0.06
ATCC 43300	≤0.06
ATCC 29213	0.125
Summary	**n=24**
	Range ≤0.06-0.25
	MBC_{50} ≤0.06
	MBC_{90} 0.25

Bacterial Resistance†

Assessment of the Potential for Development of Bacterial Resistance to 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation[17]

Purpose: Antiseptics are extensively used in hospitals and other health care settings for a variety of topical applications. Antibiotics are also used in healthcare and have been shown to induce antibiotic resistance in many organisms. The widespread use of antiseptics has prompted some speculation on the development of microbial resistance similar to what is seen with antibiotics. The purpose of this study was to screen 3M™ Skin and Nasal Antiseptic against various strains of methicillin-resistant *Staphylococcus aureus* (MRSA) to assess the development of resistance of the organisms to the antiseptic.

Method: This study tested 11 strains of MRSA versus 3M™ Skin and Nasal Antiseptic in an agar-dilution procedure to determine the Minimum Inhibitory Concentration (MIC) of the test product, and subsequently, to screen for the development of resistance. The challenge strains were 10 NARSA (Network on the Antimicrobial Resistance in *Staphylococcus aureus* [Herndon, VA]) clinical isolates and 1 ATCC (American Type Culture Collection) strain. Testing was performed using a modification of the agar-dilution procedure outlined in CLS Document M7-A7, Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that Grow Aerobically, Seventh Edition. The MIC of the test product versus each challenge strain was reported as the lowest concentration of test product (i.e., highest dilution) that completely inhibited growth. This MIC determination procedure was repeated over the course of a 2.5-week period (five complete test cycles) to determine if any increase in microbial resistance was inducible by repeated exposure to the test product.

Results: Under the conditions of this evaluation, the Minimum Inhibitory Concentrations (MIC) of the test product, expressed as product dilutions, at Test Cycle #1 and Test Cycle #2, ranged from 1:16 (v/v) to 1:32 (v/v) versus each of the test strains and continued at 1:16 (v/v) versus all challenge strains (Test and Control) during Test Cycle #3, Test Cycle #4, and Test Cycle #5. An increase in microbial resistance was not detected in any of the 11 strains of MRSA when tested against 3M™ Skin and Nasal Antiseptic.

Table 5

Drug Resistant Strain of methicillin resistant Staphylococcus aureus	Increase in Resistance detected with 3M™ Skin and Nasal Antiseptic
ATCC #33592	None detected
Clinical Isolate; NARSA Strain NRS383; USA 200	None detected
Clinical Isolate; NARSA Strain NRS384; USA 300	None detected
Clinical Isolate; NARSA Strain NRS385; USA 500	None detected
Clinical Isolate; NARSA Strain NRS386; USA 700	None detected
Clinical Isolate; NARSA Strain NRS643; CA-127	None detected
Clinical Isolate; NARSA Strain NRS654; CA-548	None detected
Clinical Isolate; NARSA Strain NRS683; GA-298	None detected
Clinical Isolate; NARSA Strain NRS694; GA-92	None detected
Clinical Isolate; NARSA Strain NRS703; MN-095	None detected
Clinical Isolate; NARSA Strain NRS739; TN-74	None detected

Efficacy In vivo Microbiology

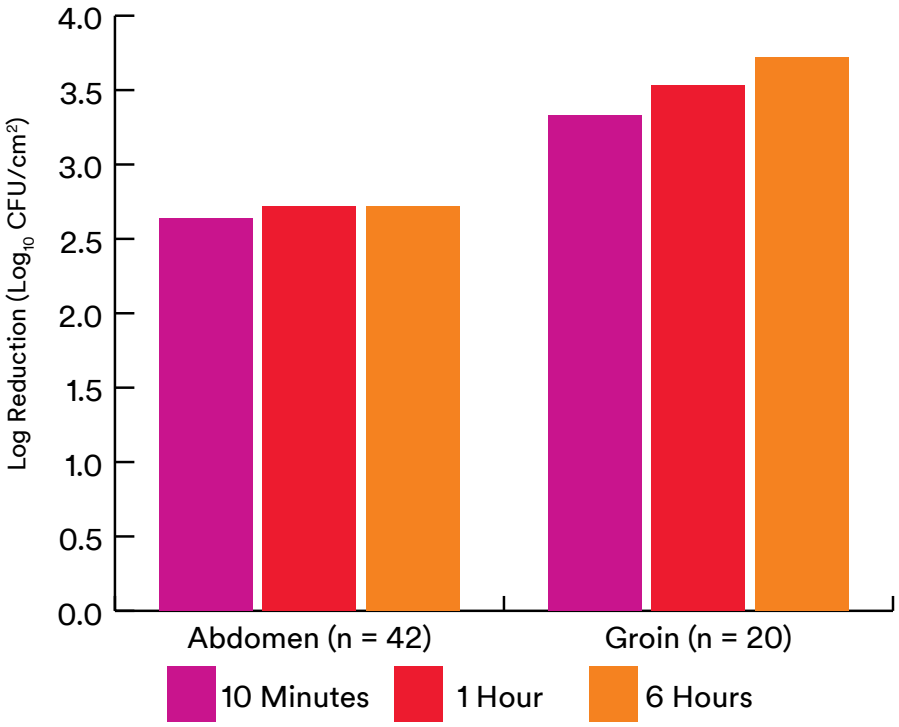
Antimicrobial Effectiveness Against Resident Human Skin Flora on Abdomen and Groin Sites[23]

Purpose: The primary objective of this study was to assess the bactericidal effect of 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation on the abdomen and groin. The study was conducted using the methodology described in the Tentative Final Monograph for Health-Care Antiseptic Drug Products[24] to show efficacy on the skin of healthy volunteers.

Method: Baseline samples were taken before the application of the prep. One at a time, the foam-tipped applicators were saturated with the appropriate solution using a vigorous stirring motion in the bottle for at least 10 seconds. 3M™ Skin and Nasal Antiseptic was applied to the abdomen (n = 42) and groin (n = 20) test sites for two minutes with one applicator followed by a second applicator for an additional two minutes (total prep time = 4 minutes). Post-prep samples were taken at 10 minutes, one hour, and six hours from the abdomen and the groin.

Results: 3M™ Skin and Nasal Antiseptic meets the TFM requirements of producing a 2 log reduction in bacteria on the abdomen and a 3 log reduction on the groin at ten minutes post-prep, and maintains these log reductions for at least six hours post-prep.

Figure 1: Reduction of Resident Flora on Abdominal and Groin Sites



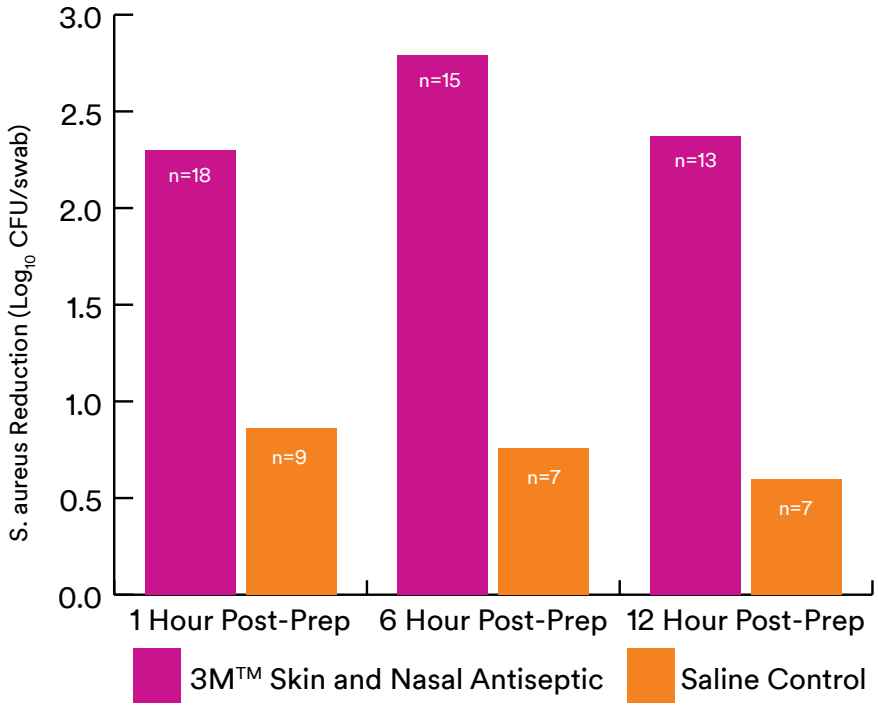
Antimicrobial Effectiveness Against Resident Human Nasal Flora, Mainly *Staphylococcus aureus*, vs. a Saline Control[8]

Purpose: The purpose of this study (completed in 2009) was to assess the antimicrobial efficacy of 3M™ Skin and Nasal Antiseptic on the nasal flora of healthy volunteers versus a saline control. The study measured the reduction of *S. aureus* at 1, 6, and 12-hours post treatment application. The reduction of total bacteria was also measured at these time points. Product acceptability data was collected from the subjects using a questionnaire.

Method: Thirteen to eighteen subjects (depending on time point) applied 3M™ Skin and Nasal Antiseptic following the instructions for nasal application. Seven to nine subjects (depending on time point) applied the 0.9% saline control. One at a time, the foam-tipped applicators were saturated with the appropriate solution using a vigorous stirring motion for at least 10 seconds. The subject's nostrils were prepped for 30 seconds each using separate applicators. This process was then repeated using two additional applicators for a total application time of 1 minute per nare (2 minutes total). Post-prep samples were taken at 1-hour, 6-hours, and 12-hours from the nares. Baseline samples were taken before the application of the prep or control.

Results: 3M™ Skin and Nasal Antiseptic killed 99.5% of *S. aureus* within 1-hour and maintained the 99.5% kill for at least 12-hours post-prep (Figure 2). 3M™ Skin and Nasal Antiseptic killed 99.2% of the total bacteria within 1-hour and maintained a 98.8% kill for at least 12-hours post-prep. The *S. aureus* count and the total bacterial count for 3M™ Skin and Nasal Antiseptic were significantly different from baseline using a paired t-test (P-value ≤ 0.0004). 3M™ Skin and Nasal Antiseptic showed significantly more *S. aureus* reduction as well as more total bacterial reduction than control using a 2-sample t-test (P-value ≤ 0.02).

Figure 2: 3M™ Skin and Nasal Antiseptic *S. aureus* Reduction in the Nares Post-prep for Subjects with Baseline Counts of at least 3.7 Log_{10}



Acceptability

Acceptability as Rated by Study Subjects[8, 16]

Purpose: The objective of two clinical studies was to assess the subject acceptability of 3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation and the nasal prepping procedures after two applications in each nostril.

Method: Subjects applied 3M™ Skin and Nasal Antiseptic with foam-tipped applicators saturated with the prep solution using the following procedures: Each nostril was prepped two times for 30 seconds each time, using a separate foam-tipped applicator for each application. Subjects were then asked to fill out a questionnaire answering questions about their experience after each dose (76 questionnaires completed).

Results: 96% of the subjects rated the overall acceptability of 3M™ Skin and Nasal Antiseptic as acceptable or very acceptable when used for nasal prepping (Figure 4).

Figure 3: Application Questionnaire Response of Subjects Prepped with 3M™ Skin and Nasal Antiseptic

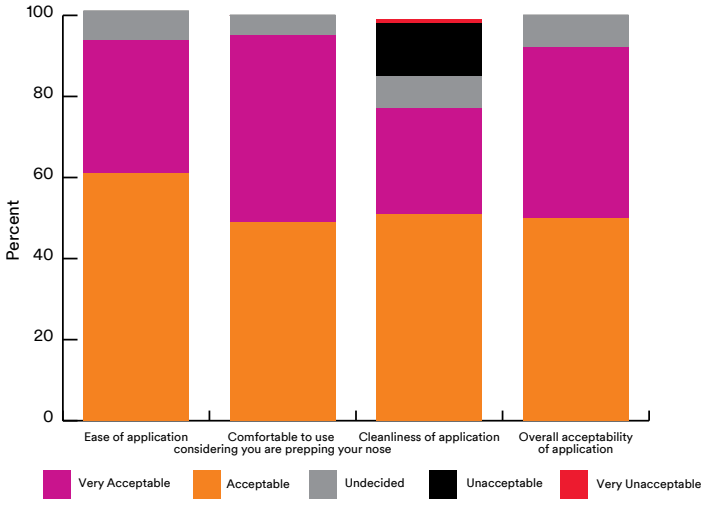
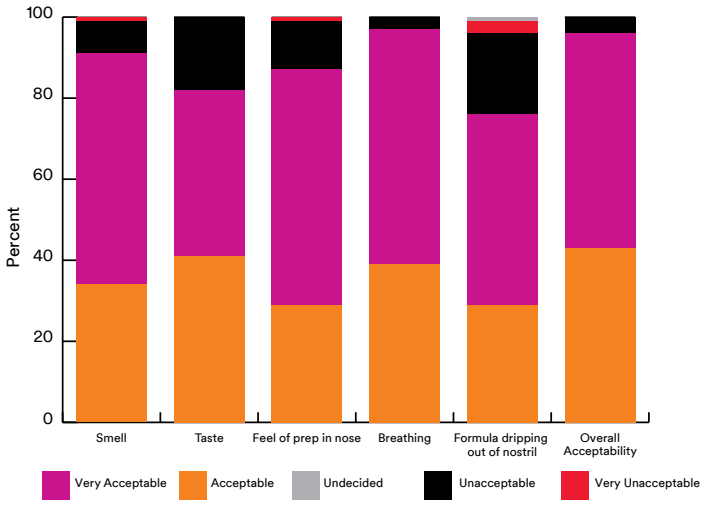


Figure 4: 3M™ Skin and Nasal Antiseptic Questionnaire Response of Subjects Prepped



Clinical Efficacy

Refer to the published article for complete study details: Phillips M, Rosenberg A, Shopsin B, et al. Preventing surgical site infections: A randomized, open-label trial of nasal mupirocin ointment and nasal povidone-iodine solution. *Infect Control Hosp Epidemiol* 2014;35(7):826-832.

Purpose: *Staphylococcus aureus* decolonization before surgery reduces the risk of surgical site infection. The use of nasal mupirocin ointment and topical chlorhexidine gluconate, although effective, may present barriers including cost and patient compliance. The purpose of this study was to determine whether nasal povidone-iodine solution is an effective alternative to mupirocin.

Methods: This randomized trial compared deep SSI within 90 days after arthroplasty or spine fusion surgery. The study evaluated twice daily application of nasal mupirocin ointment (Bactoban Nasal®, mupirocin calcium ointment 2%; GlaxoSmithKline) during the 5 days prior to surgery compared to a one-time application of povidone-iodine solution (3M™ Skin and Nasal Antiseptic (povidone-iodine solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation) within 2 hours of surgical incision. Both nasal treatments were paired with the use of chlorhexidine washcloths (Sage® 2% Chlorhexidine Gluconate cloths) for use the evening prior to and the morning of surgery.

Results: The modified intent to treat (MITT) analysis included 1697 subjects and the per protocol (PP) analysis included 1539 subjects. In the MITT analysis, deep SSI occurred in 14 of 855 surgeries in the mupirocin group and 6 of 842 surgeries in the povidone-iodine group (*P* = 0.1). Deep *S. aureus* SSI developed in 5 subjects in the mupirocin group and 1 in the povidone-iodine group (*P* = 0.2).

Figure 5: Overall Infection Rate

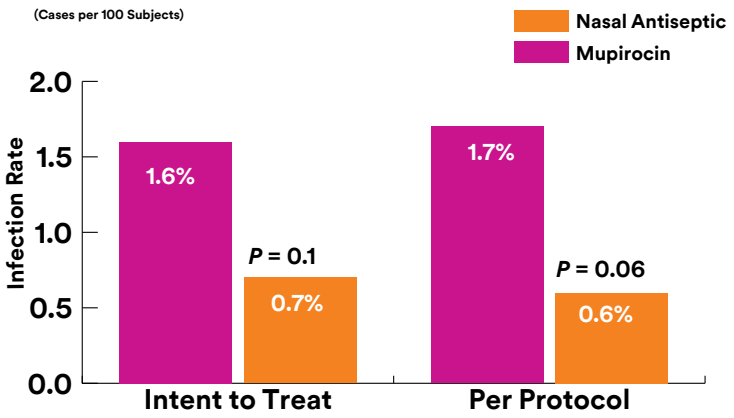
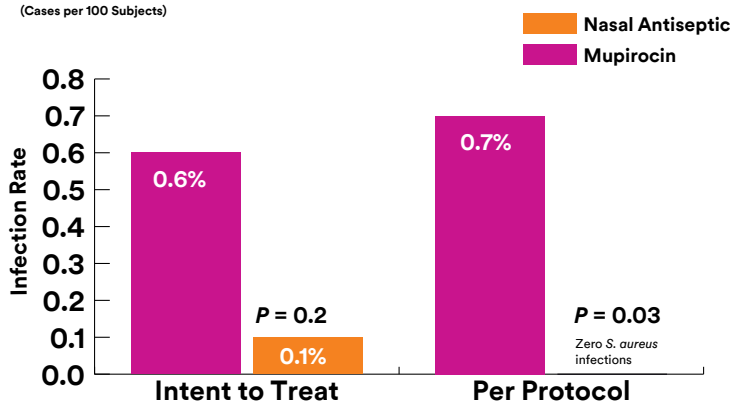


Figure 6: *S. aureus* Infection Rate



In the PP analysis, deep SSI occurred in 13 of 763 surgeries in the mupirocin group and 5 of 776 surgeries in the povidone-iodine group (*P* = 0.06). Deep *S. aureus* SSI developed in 5 subjects in the mupirocin group and none in the povidone-iodine group (*P* = 0.03).

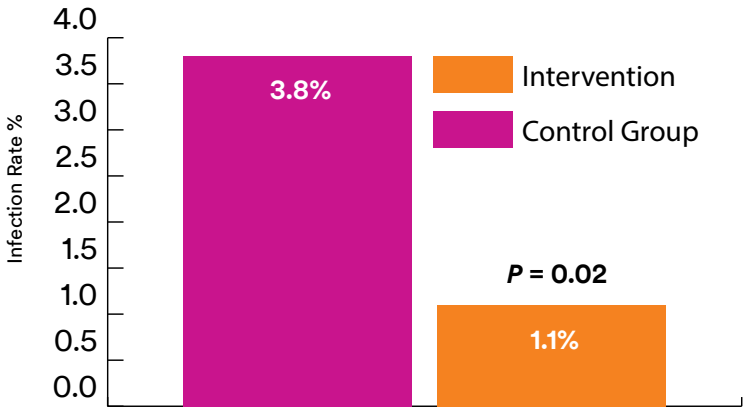
Significantly more treatment-related symptoms were reported by patients in the mupirocin group (8.9%) than patients in the povidone-iodine group (1.8%) (*P* = 0.05).

Conclusions: Significantly fewer deep *S. aureus* SSI occurred in the povidone-iodine group in the PP analysis. "Nasal povidone-iodine solution may be considered as an alternative to mupirocin in a multifaceted approach to reduce SSI."

Refer to the following published article for complete study details: Bebko SP, Green DM, Awad SS. Effect of a preoperative decontamination protocol on surgical site infections in patients undergoing elective orthopedic surgery with hardware implantation. *JAMA Surg.* **March 04, 2015. doi:10.1001/jamasurg.2014.3480.**

Purpose: The purpose of this study was to examine the effect of a decontamination protocol on SSIs in patients undergoing elective orthopedic surgery with hardware implantation.

Figure 7: Surgical Site Infection Rate Reduction



Methods: Time periods defined the control group from October 1, 2012 to April 30, 2013, and the intervention group from May 1, 2013 to December 31, 2013. The primary outcome was occurrence of an SSI within the 30-day postoperative period.

The decontamination protocol consisted of chlorhexidine washcloths (Sage® 2% Chlorhexidine Gluconate cloths), oral rinse (Peridex™ Oral Rinse, 0.12% chlorhexidine gluconate) and intranasal povidone-iodine solution (3M™ Skin and Nasal Antiseptic (povidone-iodine solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation). The washcloths and the oral rinse were both used once the night before and the morning of surgery. The Skin and Nasal Antiseptic was applied once in the morning on the day of surgery. The patients in both the control and intervention group received standard perioperative preventative measures.

Results: A total of 709 were included in the data analysis. The SSI rate in the intervention group was significantly lower (1.1%; 4/365 patients) than the control group (3.8%; 13/344 patients) (*P*=0.02). The decontamination protocol was identified by multivariate logistic regression as a significant independent predictor of not developing an SSI (adjusted odds ratio (OR), 0.24 [95% CI, 0.08-0.77]; *P*=0.02).

Conclusions: The study demonstrated that the universal low-cost decontamination protocol with chlorhexidine washcloths, oral rinse and intranasal povidone-iodine [3M™ Skin and Nasal Antiseptic] decreased the SSI rate by more than 50%.

References

1. Sievert DM, Ricks P, Edwards JR, et al. Antimicrobial-resistant pathogens associated with healthcare-associated infections: Summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2009–2010. *Infect Control Hosp Epidemiol* 2013;34(1):1-14.
2. Kuehnert MJ, Kruszon-Moran D, Hill HA, et al. Prevalence of *Staphylococcus aureus* nasal colonization in the United States, 2001–2002. *J Infect Dis* 2006;193(15 January): 172-179.
3. Perl TM, Cullen JJ, Wenzel RP, et al. Intranasal mupirocin to prevent postoperative *Staphylococcus aureus* infections. *N Engl J Med* 2002;346(24):1871-1877.
4. Kalmeijer MD, van Nieuwland-Bollen E, Bogaers-Hofman D, et al. Nasal carriage of *Staphylococcus aureus* is a major risk factor for surgical site infections in orthopedic surgery. *Infect Control Hosp Epidemiol* 2000;21:319-323.
5. Kluytmans JAJW, Mouton JW, Ijzerman EPF, et al. Nasal carriage of *Staphylococcus aureus* as a major risk factor for wound infections after cardiac surgery. *J Infect Dis* 1995;171:216-219.
6. Kalra L, Camacho F, Whitener CJ, et al. Risk of methicillin-resistant *Staphylococcus aureus* surgical site infection in patients with nasal MRSA colonization. *Am J Infect Control* 2013;41:1253-1257.
7. Levy PY, Ollivier M, Drancourt M, et al. Relation between nasal carriage of *Staphylococcus aureus* and surgical site infection in orthopedic surgery: The role of nasal contamination. A systematic literature review and meta-analysis. *Orthopaedics & Traumatology: Surgery & Research* 2013;99(6):645-651.
8. 3M Study-05-011100
9. Phillips M, Rosenberg A, Shopsin B, et al. Preventing surgical site infections: A randomized, open-label trial of nasal mupirocin ointment and nasal povidone-iodine solution. *Infect Control Hosp Epidemiol* 2014;35(7):826-832.
10. Bebko SP, Green DM, Awad SS. Effect of a preoperative decontamination protocol on surgical site infections in patients undergoing elective orthopedic surgery with hardware implantation. *JAMA Surg*. Published online March 04, 2015. doi:10.1001/jamasurg.2014.3480.
11. Flynn N, Carr M. Skin and Nasal Antiseptic use in the prevention of post-operative infections. Presented at the SHEA Conference, Orlando, FL, May 2015.
12. Brown L, Shelly M, Greene L, et al. The effect of universal intranasal povidone iodine antisepsis on total joint replacement surgical site infections. Presented at the APIC National Conference, Anaheim, CA, June 2014.
13. Waibel ML. Revisiting process improvement for total joint arthroplasty SSI. Presented at the APIC National Conference, Fort Lauderdale, FL, June 2013.
14. Hogenmiller JR, Hamilton J, Clayman T, et al. Preventing orthopedic total joint replacement SSIs through a comprehensive best practice bundle/checklist. Presented at the APIC National Conference, Baltimore, MD, June 2011.
15. Osborn N, Reynolds L. Embedding an Infection Preventionist (IP) in the OR. Presented at the AORN Surgical Conference and Expo, Denver, CO, March 2015.
16. 3M Study-05-011017
17. 3M Study-05-011322
18. Anderson MJ, David ML, Scholz M, et al. Efficacy of skin and nasal povidone-iodine preparation against mupirocin resistant methicillin-resistant *Staphylococcus aureus* and *S. aureus* with the anterior nares. *Antimicrob Agents Chemother* 2015;59:2765-2773.
19. Karau MJ, Ballard A, Schmidt-Malan S, et al. 3M™ Skin and Nasal Antiseptic and 3M™ DuraPrep Surgical Solution bactericidal activity against methicillin-resistant *Staphylococcus aureus*. Presented at the American Society for Microbiology General Meeting, Boston, MA, May 2014.
20. 3M Study-05-010944
21. 3M Study-05-010943
22. National Committee for Clinical Laboratory Standards. 2000. Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that Grow Aerobically; Approved Standard. M7-A5 Vol. 20 No. 2. *National Committee for Clinical Laboratory Standards*, Wayne, PA.
23. 3M Study-05-010945
24. Health-Care Antiseptic Drug Product Tentative Final Monograph, Proposed Rule, 59 Federal Register, p. 31402-31452 (Friday, June 17, 1994).

The combination of 3M™ Skin and Nasal Antiseptic with Bactroban Nasal® in vitro †, does not result in inactivation of 3M™ Skin and Nasal Antiseptic, and also does not reduce antimicrobial efficacy compared with that of 3M™ Skin and Nasal Antiseptic alone. There is no known safety concern with the use of these products in combination.*

† The clinical significance of in vitro data is unknown.
* Data on file at 3M.

Ordering Information

Catalog Number	Description	Pouch Contents	Pouches/Box	Boxes/Case
192401	3M™ Skin and Nasal Antiseptic (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) Patient Preoperative Skin Preparation	1 Bottle 0.14 fl oz (4mL) 4 Sterile Swabs	12	4

Drug Facts

Active Ingredient ***Purpose***
Povidone-Iodine USP, 5% (0.5% Available Iodine) ..... Antiseptic

Uses
- For preparation of the skin prior to surgery
- Helps reduce bacteria that potentially can cause skin infections

Warnings
For external use only.

Do not use if you have a known sensitivity to iodine or any other ingredient in this product. Do not use in eyes. If product gets into eyes, flush immediately with water. Do not use on infants less than 2 months old due to the risk of increased blood iodine levels.

Stop use and ask a doctor if significant irritation, sensitization or other allergic reactions occur.

Keep out of reach of children. If swallowed, get medical help or contact a Poison Control Center right away.

Directions
- Open package and remove bottle and swabs
- Unscrew cap by turning cap counter-clockwise

Skin Application:
1. Apply to clean dry skin.
2. Dip one swab into solution and stir vigorously for 10 seconds. Withdraw the swab slowly to avoid wiping solution off during removal.
3. Scrub prep site for 2 minutes working from clean to dirty using both sides of the swab.
4. Repeat steps 2 & 3 using second swab.
5. Allow prep solution to dry. Do not blot.

Nasal Application:
1. Use a tissue to clean the inside of both nostrils including the inside tip of nostril. Discard.
2. Tilting the bottle slightly, dip one swab into solution and stir vigorously for 10 seconds. Withdraw the swab slowly to avoid wiping solution off during removal.
3. Insert swab comfortably into one nostril and rotate for 15 seconds covering all surfaces. Then focus on the inside tip of nostril and rotate for an additional 15 seconds. (swab 1)
4. Using a new swab: Repeat steps 2 & 3 with the other nostril. (swab 2)
5. Repeat the application in both nostrils using a fresh swab each time. (swabs 3 & 4)
6. Do not blow nose. If solution drips out of nose, it can be lightly dabbed with a tissue.

Other information • Store at 20-25°C (68-77°F)

Inactive Ingredients: lactic acid, lauramidopropylamine oxide, malic acid, polyquaternium-10, PPG-5-ceteth-10 phosphate, sodium hydroxide, sodium iodide, steareth-100, water, xylitol

Questions?
Call 1 800-228-3957 (Monday to Friday 7 am to 6 pm CST) www.3M.com

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