

A dentist in a clinical setting, wearing a white surgical mask, safety glasses, and blue nitrile gloves, is performing a procedure on a patient. The patient is reclined in a dental chair, wearing a white protective bib and a clear oxygen mask. The dentist is using a dental instrument to work on the patient's teeth. The background is a clean, clinical environment with a white wall and a dental unit visible.

**Ansell**

# **CHEMICAL SPLASH GUIDE FOR DENTAL GLOVES**

# Ansell has developed this guide to help dental professionals better understand how different gloves protect against common chemicals used in dental environments.

When reviewing the following recommendations, remember that tests are conducted under laboratory conditions, and that actual workplace conditions usually dictate a combination of performance capabilities.

Ansell's dental splash guide is presented on the following pages as an aid in determining the general suitability of various products for use with specific chemicals. In view of the fact that the conditions of ultimate use are beyond our control, and because we cannot run permeation tests in all possible work environments and across all combinations of chemicals and solutions, these recommendations are advisory only.

## Definition of Key Terms:

**Permeation** is a process by which a chemical can pass through a protective film without going through pinholes, pores, or other visible openings. Individual molecules of the chemical enter the film, and pass between the molecules of the glove compound or film. In many cases the material that chemicals have permeated through may appear unchanged to the human eye. Chemical permeation can be described in simple terms by comparing it to what happens to the air in a balloon after several hours. Although there are no holes or defects, and the balloon is tightly sealed, the air gradually passes through (permeates) its walls and escapes. This simple example uses gas permeation, but the principle is the same with liquids or chemicals.

Permeation data are presented in two values: **Breakthrough** time and **Rate**. Breakthrough times (min.) are the times observed from the start of the test to first detection of the chemical on the other side of the sample. These times represent how long a glove can be expected to provide effective permeation resistance when totally immersed in the test chemical. Permeation rates are the highest flow rates recorded for the permeating chemicals through the glove samples during a six-hour or eight-hour test. These qualitative ratings are comparisons of permeation rates to each other.

**Degradation** is a reduction in one or more physical properties of a glove material due to contact with a chemical. Certain glove materials may become hard, stiff, or brittle, or they may grow softer, weaker, and swell to several times their original size after exposure to a chemical.

If a chemical has a significant impact on the physical properties of a glove material, its permeation resistance is quickly impaired. Please note, however, that permeation and degradation do not always correlate.

Key points to note about chemical permeation:

1) Gloves made of different polymers will have different chemical resistance properties. Latex, nitrile and Neoprene each have their strengths and weaknesses when exposed to different types of chemicals.

2) Chemical resistance depends on:

- Polymer formulation and manufacturing process
- Thickness of the glove
- Composition of the product or concentration of the chemicals
- Frequency and duration of contact with the chemical(s)
- Nature of contact – total immersion or splash only
- Environmental conditions (temperature, humidity, etc.)

3) Gloves made of the same polymer and with similar thickness may not always have the same chemical resistance as the formulation and manufacturing process of the two gloves may not be similar.

4) The suitability of a glove in protecting against a chemical/ mixture must be determined by testing the specific product against the specific chemical/ mixture in order to accurately determine how well a given glove will protect.

# Methodology

## Permeation Testing



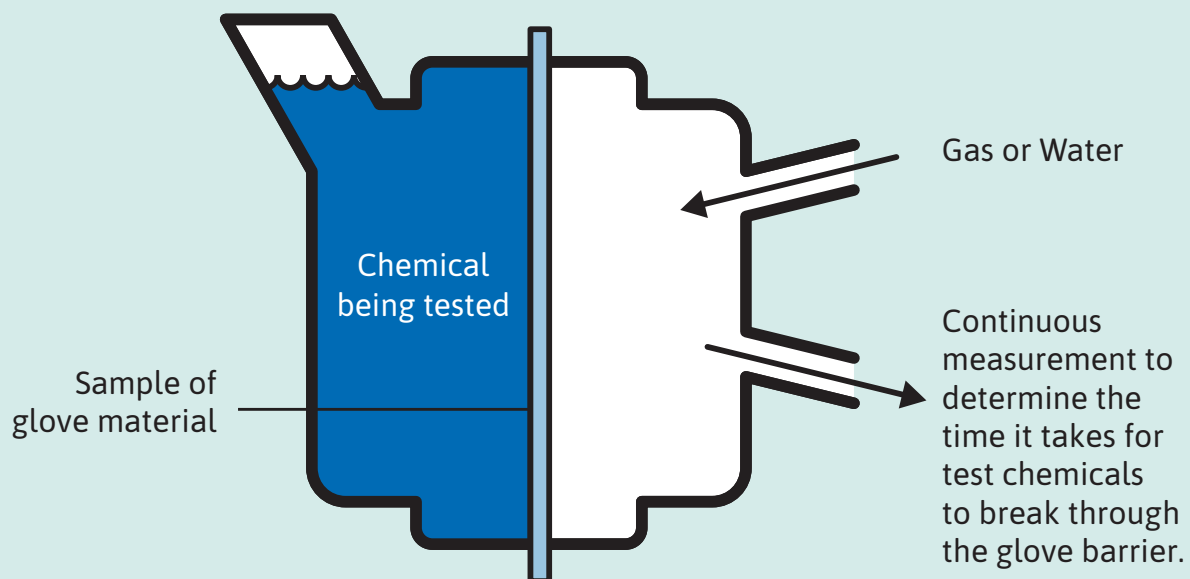
Ansell conducts permeation testing in accordance with both ASTM F739 and EN ISO 16523-1 and can provide test results based on the preference of customers in different regions. Permeation testing is conducted by cutting a specimen from the gloves and clamping it into a test cell as a barrier membrane (see illustration). The “exterior” side of the specimen is exposed to a hazardous chemical. At timed intervals, the unexposed “interior” side of the test cell is checked for the presence of the permeated chemical and the extent to which it may have permeated the glove material.

The EN and ASTM standards allow for variety in analysis and collection media. At Ansell, dry nitrogen is the most common medium and gas chromatography with Flame Ionization Detectors (FID) is the most common analytical technique. Our Research Department also uses liquids such as distilled water and hexane as collecting media, and techniques such as conductivity, colorimetry, and liquid chromatography for analysis of the collecting liquid.

## Degradation Testing

Degradation is performed by cutting patches of material from a glove that become the test material. These patches are weighed and measured, and then completely immersed in the test chemical for 30 minutes. The percentage of change in size is determined, and the patches are then dried to calculate the percentage of weight change. Observed physical changes are also reported. Degradation ratings are based on the combined data.

## HOW CHEMICAL PERMEATION TESTS WORK





# Splash rating was calculated by taking into account the following factors:

**A** Risk Rating (RR) ranging from 1 (greatest risk) to 4 (least risk), based on EU Hazard Ratings in **“Quick Selection Guide to Chemical Protective Clothing/ Krister Forsberg, Ann Van den Borre, Norman Henry III, James P. Ziegler, Hoboken, NJ: Wiley, 7th Edition, 2020”:**

- 1 Highly toxic and/or highly corrosive (Tx, Cx)
- 2 Toxic and/or corrosive (T, C)
- 3 Harmful and/or irritant (X, Xi)
- 4 No risk

*Risk Ratings for compounds not listed in Forsberg and Mansdorf were estimated from toxicity data in other sources.*

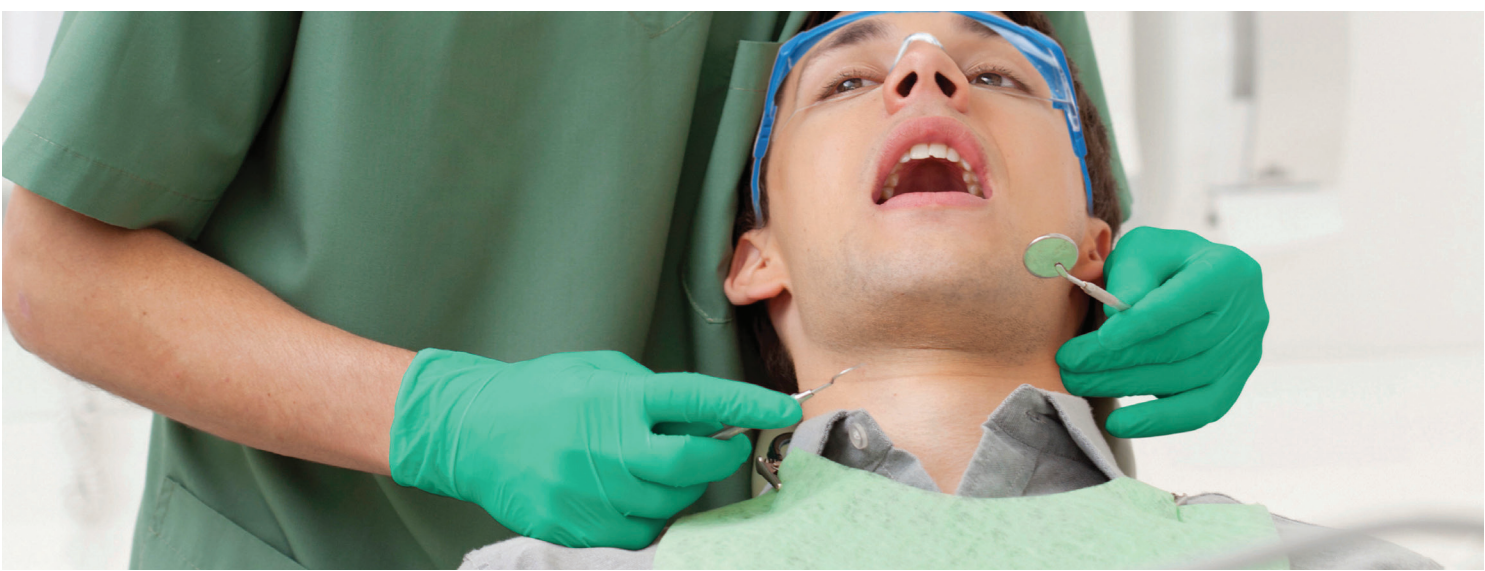
**B** Breakthrough time in minutes, EN ISO 374 permeation test.

**C** Volatility Rating (VR)

Rating	
1	slightly volatile
2	moderate volatile
3	highly volatile

## Note on the Data and Recommendations






Many of the breakthrough times in the table below have been estimated using data for similar glove/chemical combinations, or are based on EN ISO 374 test data. Recommendations are based on extrapolations from laboratory test results and information regarding the composition of chemicals and may not adequately represent specific conditions of end use. Synergistic effects of mixing chemicals have not been accounted for. Due to these reasons, and because Ansell has no detailed knowledge of or control over the conditions of end use, any recommendation must be advisory only and Ansell fully disclaims any liability including warranties related to any statement contained herein.



# Splash Guide for Dental Gloves




## Splash Guide






- Recommended Splash Rating
- : The glove is very well-suited for splash protection against that chemical.
- Caution Splash Rating
- : The glove can be used under carefully controlled conditions, and as a precautionary measure consider replacing the glove if chemical splash/spills occurs.
- Not Recommended Splash Rating
- : Avoid exposure of the gloves to that chemical.

Chemical Name		CAS Number	Conc. (%)					
				MICROFLEX® Ultraform™ UF-524	MICROFLEX® Soft White Nitrile TQ-601	MICROFLEX® MidKnight™ Touch 93-732	MICROFLEX® XCEED® 93-833.XC-310	MICROFLEX® NEOGARD™ 73-847.C52
1	3-Methacryloxypropyltrimethoxysilane	2530-85-0	100					
2	Acetic Acid	64-19-7	100					
3	Ammonium Hydroxide	1336-21-6	20					
4	Ammonium Hydroxide	1336-21-6	28					
5	Ethyl Alcohol	64-17-5	100					
6	Ethylene Glycol	107-21-1	100					
7	Formaldehyde	50-00-0	37					
8	Glutaraldehyde, Aqueous Solution	111-30-8	25					
9	Glycerine	56-81-5	100					
10	Glycolic Acid, Aqueous Saturated Solution	79-14-1	70					
11	Heptane	142-82-5	100					
12	Hydrochloric Acid	7647-01-0	37					
13	Hydrogen Peroxide	7722-84-1	30					
14	Isopropanol	67-63-0	10					
15	Isopropanol	67-63-0	100					
16	Mercury	7439-97-6	100					
17	Methyl Ethyl Ketone	78-93-3	100					
18	Methyl Methacrylate	80-62-6	100					
19	Naphtha	8030-30-6	100					
20	n-Hexane	110-54-3	100					
21	Nitric Acid	7697-37-2	70					
22	Petrolatum	8009-03-8	100					
23	Phosphoric Acid	7664-38-2	85					
24	Propylene Glycol	57-55-6	100					
25	Rosin Modified	65997-06-0	100					
26	Sodium Bicarbonate, Aqueous Solutions	144-55-8	99					
27	Sodium Fluoride, Aqueous Solutions	7681-49-4	4					
28	Sodium Hydroxide	1310-73-2	40					
29	Sodium Hypochlorite, Aqueous Solution	7681-52-9	8					
30	Sulfamic Acid	5329-14-6	20					
31	Sulphuric Acid	7664-93-9	50					
32	Sulphuric Acid	7664-93-9	96					
33	Toluene	108-88-3	100					
34	White Mineral Oil (Petroleum), Light	92062-35-6	100					
35	12149/ 12150/ 12151/ 12154 3M™ ESPE™ VANISH™ 5% NaF WHITE VARNISH WITH TCP							
36	Biflourid 10							
37	Calasept							
38	Calcicur							
39	Calcimol LC							
40	Calmix							
41	Calxyl							
42	Canal Plus							
43	Canal Pro EDTA 17%							
44	Caries Finder™ Red							
45	Cavicide™							
46	Cavicide™ AF							
47	Cavidry (Aka Methyl Ethyl Ketone)	78-93-3	100					
48	Clorox® Germicidal Bleach							
49	Clorox® Regular-Bleach							
50	Composite Wetting Resin							

# Splash Guide for Dental Gloves

## Splash Guide

	Recommended Splash Rating	: The glove is very well-suited for splash protection against that chemical.
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	Not Recommended Splash Rating	: Avoid exposure of the gloves to that chemical.

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51	Consepsis, Consepsis V							
52	Eugenol	97-53-0	100					
53	FL BOND II "BONDING AGENT"							
54	Fortify Plus / Modeling Resin							
55	Henry Schein Antimicrobial Skin Cleanser							
56	High Spot Moisturizing Spray, Clean and Lube and Clean and Lube Wipes							
57	Hyde-Out Aldehyde Neutralizer							
58	HypoPure							
59	IRM LIQUID - Zinc Oxide Eugenol							
60	IRM Powder Zinc Oxide Eugenol							
61	MaxiCide Plus							
62	MI Varnish							
63	Mikrozyd AF wipes							
64	Monobond Etch & Prime							
65	NOGENOL (Non-Eugenol Temporary Cement; Base)							
66	Opal™ Band™ Cement - Catalyst							
67	Optim 1 Wipes							
68	Optim Blue							
69	Orange Guard							
70	Oraseal™ Caulk, Oraseal™ Putty							
71	Orotol® plus Disinfection of suction system							
72	PermaQuick® Bonding Primer							
73	Porcelain Etch							
74	Preline Base Paste							
75	Premium Dispersed Phase Alloy – Regular Set							
76	Provicol							
77	Pulp Canal Sealer™ Liquid							
78	Purevac Evacuation System Cleaner							
79	QUATTROcare plus Spray AMERICA 2141							
80	SmearClear™ Mix							
81	Sterilex Ultra Disinfectant Cleaner Solution 1							
82	Super Sani-Cloth Germicidal Wipe							
83	Topex® Durashield 5% Sodium Fluoride Varnish							
84	Ultra Blend Plus							
85	UltraCal™ XS							
86	Ultradent™ Citric Acid Solution							
87	Ultradent™ EDTA 18% Solution							
88	Ultra-Etch							
89	Ultra-Etch & Opal Etch							
90	Woolite Carpet & Upholstery Cleaner (8352)							
91	Woolite Carpet & Upholstery Cleaner, or Fabric & Upholstery Cleaner							

### Abbreviation

Conc.

### Note on the Data and Recommendations

The Splash Rating was calculated based on chemical permeation breakthrough time, its volatility and health hazard. The breakthrough time is based on EN ISO 374 test data. Recommendations are based on extrapolations from laboratory test results and information regarding the composition of chemicals and may not adequately represent specific conditions of end use. Synergistic effects of mixing chemicals have not been accounted for. For these reasons, and because Ansell has no detailed knowledge of or control over the conditions of end use, any recommendation must be advisory only and Ansell fully disclaims any liability including warranties related to any statement contained herein.

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