

Computer-derived exposure lists for common contact dermatitis antigens

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An established computer file was searched for lists of products containing 45 antigens recognized as causes of allergic contact dermatitis. The final lists included over 8000 products. The problem, potential and limitations of such lists are discussed.

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Physicians and medical centers doing patch testing have long recognized the need for more complete exposure lists for those antigens commonly found to be causes of contact dermatitis. Many centers have developed such lists for distribution to patients or for physician reference. In our complex society it is recognized that these lists are always incomplete and require constant revision and updating. Thus, use of computer technology should be considered and explored as one means of improving these lists. Identification of the offending antigen(s) is only the first step for the patient with allergic contact dermatitis. The physician must work further with the patient to make him aware of the ways, often diverse, by which he may encounter the antigen(s) to which he is allergic.

Following the lead of the International Contact Dermatitis Group, a North American Contact Dermatitis Group was formed in 1970. This group has developed a standard screening series of antigens useful for testing in North America. These antigens,

in appropriate concentrations, have been made available to dermatologists in the United States. Special screening series of antigens, such as those for patients in whom preservative or fragrance allergy is suspected, are under study.

Under the sponsorship of the North American Contact Dermatitis Group, the authors have undertaken a search in an established computer file of information about consumer products to explore how a data bank of this type might provide useful information for physicians doing contact work and their patients. It is the purpose of this paper to report our methods and results.

Materials and Methods

The first step towards utilization of the computer bank was the determination of appropriate key words, i.e., synonyms, for the various antigens and their cross-reactants (see reference list for major reference sources used).

Each antigen name (and synonym) was

Table 1. Three sample key word lists for contact dermatitis antigens

Potassium dichromate	Formaldehyde	Thiuram mixture
potassium dichromate	formaldehyde	A. <i>Primary List</i>
potassium chromate	formalin	TMTD
potassium chrome alum	paraformaldehyde	tetramethylthiuram disulfide
chromate salts	trioxymethylene	thiram
chromates	methenamine	thiuram
chrome	hexamethylenetetramine	
chrome green	urea formaldehyde	B. <i>Cross reactants</i>
chrome orange	melamine resins	ziram
chrome oxide	resorcinol formaldehyde	zinc dimethyl
chrome yellow	resins	dithiocarbamate
chrome acid		zineb
chromic salts		zinc ethylene dithio-
chrome salts		carbamate
chrome sulfate		ferbam
chromium salts		ferric dimethyldithio-
chromium		carbamate
zinc chromate		maneb
lead chromate		manganese ethylene
dichromates		dithiocarbamate
sodium chromates		dithane
Portland cement		dithiocarbamates
hydrate chromium oxide		disodium ethylene
		bisdithiocarbamate

then checked against a computer file entitled *Clinical Toxicology of Commercial Products - Key Word List for Section 5*, located at the University of Rochester. This file was produced at the University of Rochester Medical Center by a group under the leadership of M. N. Gleason and H. C. Hodge. Key words found listed in the file were arranged under the appropriate antigen heading or subheading derived from the present North American Standard Patch Test Series and from the preservative and fragrance screening series currently under study. Sample key word lists for three antigens (potassium dichromate, formaldehyde, and thiuram mixture) are given in Table 1.

The key word lists were then converted to computer readable form, and the individual data files were entered into the Dartmouth College computer system for storage (Kiewit Center). After careful proofreading,

the files were transferred to punch cards in a format used at the Rochester Computer Center. From these cards the Rochester computer compiled lists of all commercial products in its files containing each of the antigens. These lists were arranged in two ways: alphabetical lists and use lists.

Results

The lists derived for the 22 antigens in the present North American Standard Patch Test Series, 15 preservatives and eight fragrances, generated approximately 8000 product listings from the computer bank. Sample pages of the alphabetical and use lists for formaldehyde are given in Tables 2 and 3.

Numbers of products identified as containing each of the antigens in the current North American Standard Patch Test Series

Table 2. Sample alphabetical list page: formaldehyde

AMWAY ALLANO HAND AND BODY LOTION
Amway Corp.
AMWAY DISH DROPS
Liquid detergent concentrate
Amway Corp.
AMWAY FLOOR POLISH - DETERGENT-RESISTANT
Amway Corp.
AMWAY FLOOR WAX
Amway Corp.
AMWAY FURNITURE POLISH
Amway Corp.
AMWAY KOOL WASH
Liquid detergent
Amway Corp.
AMWAY L.O.C. HIGH SUDS
Liquid detergent
Amway Corp.
AMWAY MAGIC FOAM
Aerosol upholstery shampoo
Amway Corp.
AMWAY METAL CLEANER
Abrasive paste cleaner
Amway Corp.
AMWAY RUG AND UPHOLSTERY SHAMPOO
Liquid detergent
Amway Corp.
AMWAY VINYL TOP DRESSING
Vinyl car top dressing
Amway Corp.

are stated in Table 4. Similar members are given for 15 preservative and eight fragrance antigens in Table 5.

An attempt was made to arrange one of the longer lists, the one for formaldehyde, in a condensed form which would be practical for the use of the physician and his patients (Table 6).

Discussion

This study raises many questions and is regarded as a tentative exploration of an es-

ADHESIVES	CARTER'S MUCILAGE	Carter's Ink	
ADHESIVES	ELMERS WATERPROOF GLUE	Borden Chem.	
AEROSOL	AMWAY MAGIC FOAM	Amway Corp.	Aerosol upholstery shampoo
AEROSOL	AMWAY VINYL TOP DRESSING	Amway Corp.	Vinyl car top dressing
AEROSOL	BUG-OFF	Rudd	Paint protector for car finish
AGRICULTURAL	VINELAND FORMALDEGEN	Vineland Poultry	For fumigating poultry equipment
AIR	RAWLEIGH FLORAL AIR	Rawleigh	
	FRESHENER		
ANALGESIC	DONNASEP	Robins	Urinary antiseptic, analgesic, anti
ANALGESIC	DONNASEP-MP	Robins	Urinary antiseptic, analgesic, anti
ANALGESIC	RENALTABS	Fellows-Testagar	Urinary anti-infective, analgesic,
ANALGESIC	T-M	Friendly Labs.	Diuretic-analgesic-bacteriostatic for
ANALGESIC	URAMAN WITH AZO TABLETS	Moffet Pharm.	Urinary antiseptic, analgesic
ANALGESIC	URITRAL CAPSULES	Central Pharmacal Co.	Urinary antiseptic, analgesic
ANTI-INFECTIVE	MANESE	Tutag	Urinary anti-infective

(continued)

Table 3. Sample use list page: formaldehyde

(Table 3. continued)

ANTI-INFECTIVE	RENALTABS			Urinary anti-infective, analgesic
ANTI-INFECTIVE	THIACIDE		Fellows-Testagar	For urine acidification & recurrent
ANTI-INFECTIVE	UROTHYN IMPROVED		Beach Pharm.	Urinary anti-infective
ANTIBACTERIAL	HEXALET TABLETS		Tutag	Urinary infection, antibacterial
ANTIBACTERIAL	MANISUL 30		Wampole Labs.	Urinary tract antibacterial for dog
ANTIBACTERIAL	MANISUL MINITABS		Burns-Biotec	Urinary tract antibacterial for dog
ANTIBACTERIAL	MANISULTAB		Burns-Biotec	Urinary tract antibacterial; veteri
ANTIBACTERIAL	PROV-U-SEP FORTE		Burns Pharmaceuticals, In	Anticholinergic sedative, urinary a
ANTICHOL-			Reid-Provident	
INERGIC	PROV-U-SEP FORTE		Reid-Provident	Anticholinergic sedative, urinary a
ANTICHOL-				
INERGIC	URITIN		Direct Labs.	Urinary antiseptic, anticholinergic
ANTIPERSPI-				
RANT	PEDI-DRI FOOT POWDER		Pedinol	Antiperspirant, deodorant, fungicid
ANTISEBOR-				
RHEIC	MAZON SHAMPOO		Mitchum-Thayer	Antiseborrheic shampoo
ANTISEPSIS	RENO-SED TABLETS		Vita Elixir Co.	Genito-urinary antiseptis and sedat
ANTISEPTIC	BURISEPT		Burns-Biotec	Treatment of genito-urinary infecti
ANTISEPTIC	CYSTEX		Knox	Urinary antiseptic
ANTISEPTIC	CYSTOLITHIA		Whorton	Urinary antiseptic, demulcent
ANTISEPTIC	CYSTORRHOL TABLETS, PURPLE		Durst	Vesical antispasmodic, urinary anti
	OR GREEN			
ANTISEPTIC	CYSTRENE		Pediatric Drug	Urinary antiseptic and diuretic
ANTISEPTIC	DONNASEP		Robins	Urinary antiseptic, analgesic, anti

Table 4. Numbers of products found to contain antigens in North American Standard Patch Test Series

Antigen	Numbers of products
Nickel sulfate	4
Potassium dichromate	177
Neomycin sulfate	140
Ethylenediamine	393
Balsam of Peru	1408
Thimerosal	62
Ammoniated mercury	297
Paraben mixture	404
Formaldehyde	218
p-Phenylenediamine	105
Turpentine	1491
Caine mixture	629
Wool alcohols	4
Mercapto mixture	18
Thiuram mixture	242
Naphthyl mixture	0
PPD mixture	7
Carba mixture	0
Epoxy resin	41
Lanolin	625
p-tert-Butylphenol	3
p-Chloro-m-xyleneol	45

established computer bank for the generation of lists of consumer products containing antigens important as causes of contact dermatitis. Many problems are evident.

The first problem relates to key words and synonyms. For certain antigens such as nickel and potassium dichromate the problem seems minimal. However, for a substance such as balsam of Peru, which is a complex mixture, an adequate synonym and cross-reactant list presents a major challenge. Our key word list for balsam of Peru is given in Table 7. It is almost certainly incomplete.

The limitations of the computer bank utilized in this study must be recognized. This file was not established for the purpose of this study. It contains a total of somewhat more than 50,000 product entries. Thus, the lists generated cannot be con-

Table 5. Numbers of products found to contain preservative and fragrance antigens

Preservatives	Numbers of products
Butylated hydroxyanisole	29
Butylated hydroxytoluene	25
Ethylenediamine tetra-acetic acid	155
Imidazolidinyl urea (Germall-115)	54
p-Chloro-m-cresol	6
Sorbic acid	8
Dichlorophene (G-4)	332
2-Bromo-2-nitropropane 1,3-diol (Bronopol)	8
Polyethylene glycol 400 (PEG-8)	152
Stearyl alcohol	35
Quaternium-15 (Dowicil 200)	7
Captan (Vancide-89 RE)	120
Triclosan (Irgasan DP)	10
Phenylmercuric acetate	69
Benzalkonium chloride	184
Fragrances	
Cinnamic aldehyde	10
Methyl salicylate	339
Benzyl benzoate	20
Benzyl alcohol	66
Eugenol	34
Coumarin	29
Hydroxycitronellal	16
Oil of sandalwood	6

sidered complete, even for North America, and reflect only the quality and the deficiencies of the existing file. Nondisclosure of ingredients by manufacturers is one example of the problems encountered. We are not aware of better files for this purpose, but comparable ones may exist and could be expected to yield items that we have missed.

The very size of certain lists presents a major problem relating to practical use. The organization of lengthy lists presents a challenge we have not solved. It would seem desirable to develop a standard form for use-lists that could be applied to each antigen. Ideally, there should be general agreement among workers in the field, both nationally and internationally, regarding the

Table 6. Formaldehyde

The following products and types of products have at one time contained formaldehyde and may contain formaldehyde. Their use should be avoided by those having known formaldehyde sensitivity.

1. Embalming fluids
2. Medical and veterinary urinary tract anti-infectives and diuretics
3. Polishes and cleaners
 - Amway Dish Drops (Amway)
 - Amway Floor Polish-Detergent-Resistant (Amway)
 - Amway Floor Wax (Amway)
 - Amway Furniture Polish (Amway)
 - Amway Kool Wash (Amway)
 - Amway L.O.C. High Suds (Amway)
 - Amway Magic Foam (Amway)
 - Amway Metal Cleaner (Amway)
 - Amway Rug and Upholstery Shampoo (Amway)
 - A&P Acrylic Floor Finish-Self-Polishing (Great Atlantic)
 - C-Z Whiff with Chlorophyll & X-ON (Toilet bowl cleaner) (C-Z Chem.)
 - Dewitt 13D60 (Dewitt Chem.)
 - Haggerty Silversmiths' Polish (Haggerty, W. J.)
 - I.C.U. Boat Bright (Livingston)
 - I.C.U. Plasticoat Auto Polish (Livingston)
 - Intex Commercial One Shot Bowl Cleaner (Intex)
 - McAlleer Polish and Cleaner (McAlleer)
 - Parko Anti-Static Plastic Polish (Park Chem.)
4. Oral and dental products
 - Bestol Mouthwash (Etna Chem.)
 - Blue Cross Mouth Wash (Blue Cross)
 - Dr. Buckley's Formocresol (Crosby Labs)
 - Dr. Buckley's Paraformol Paste (Crosby Labs)
 - Dr. Buckley's Zinc Oxide Resin Compound Powder (Crosby Labs)
 - Horton & Converse Zinc Chloride Mouth Wash (Horton & Converse)
 - Thermodent Tooth Paste (Ieeming Div.)
 - Watkins Mouth Refresher (Watkins Products, Inc.)
5. Personal use items and toiletries
 - Amway Allano Hand and Body Lotion (Amway)
 - Cenol Foot Joy (Cenol)
 - Cenol Foot Powder (Cenol)
 - Dr. Scholl's Bromhidrosis Powder (Scholl)
 - Dr. Scholl's Foot Magic (Scholl)
 - Dr. Scholl's Shoe Deodorizer and Fungicide (Scholl)
 - Duo-WR Wart Remover (Whorton)
 - Helene Curtis Cream Rinse (Curtis, H.)
 - Inoseptol (Astringent deodorant) (Clafin)
 - Lily Cream (Ohio Valley)
 - Mazon Shampoo (Mitchum-Thayer)
 - Mitchum Dandruff Shampoo (Mitchum-Thayer)
 - Mycomist (spray for shoes) (Gordon Labs)
 - Pedi-Dry Foot Powder (Pedinol)
 - Smartee Nail Polish (Cameo Inc)
 - Suave Cream Rinse (Curtis, H.)
 - Suave Shampoo with Egg (Curtis, H.)
 - Synthaloids (for throat irritation) (Tilden-Yates)
 - Vi-Jon Wave Set (Vi-Jon)
6. Home and commical germicides, fungicides, deodorants and fumigants
 - Blue Flyte Lock-On (Hysan)
 - C-Z Whiff with Chlorophyll & X-On (C-Z Chem.)
 - Del Deodorant Blocks (Del Chem Corp.)
 - De-Scent Pet Deodorant (Lambert-Key)
 - Detrex-Eaton Kobo (Detrex)
 - DeWitt 13D60 (DeWitt Chem.)
 - Di-Gas (Chester Chem.)
 - Dow-Hex Solution (Amer. Mach. Corp.)
 - Dr. Scholl's Shoe Deodorizer and Fungicide (Scholl)
 - Endew (Clark, John, & Co.)
 - Foremost Sani-Trol (Delta Chem. Corp.)
 - Formide (Glando-O-Lac)
 - Fum-O-Mor Incubator Fumigant (Hilltop)
 - Fyte 7 (Hysan)
 - Fyte 60 (Hysan)
 - Glan-O-Lac Incubator Fumigant (Glan-O-Lac)
 - Gordon's Formalin Solution Scented (Gordon Labs)
 - Hilltop Poultry House Fumigant (Hilltop)
 - Intex Commercial One Shot Bowl Cleaner (Intex)
 - Intex 8051 Porcetex (Intex)
 - Mildewicide (Vapor Products)
 - MP-10 (Chemical Processors)
 - Munichem Deodorant Blocks (Munichem)
 - Mycomist (shoe spray) (Gordon Labs)
 - NuAir Space Deodorizer (Lester Labs)
 - Parispray (House of Gabler)
 - Parsons Formaldehyde Solution (Parsons Chem.)
 - Parsons Seed Saver Dust (Parsons Chem.)
 - Rawleigh Antiseptic Solution (Rawleigh)
 - Rawleigh Floral Air Freshener (Rawleigh)

(continued)

(Table 6. continued)

- Rawleigh Waterless Hand Cleaner (Rawleigh)
 Steridol No. 3 Coolant Germicide (Dodge)
 Sun Fresh (Chemical Processors)
 Sun Pac (Chemical Processors)
 Vineland Formaldegen (Vineland Poultry)
 Vineland Sani-Squad (Vineland Poultry)
 Wizard Wick Deodorizer (Boyle Midway)
7. Photographic products
 Anscochrome Developing Outfits (GAF)
 Edwal Hypo-Check (Edwal)
 Kodak Prehardener SH-5 (Eastman Kodak)
 Kodak Special Hardener SH-1 (Eastman Kodak)
8. Inks
 Blak-Ray Fluorescent Inks (Ultraviolet)
 Carter's Writing Inks (Carter's Inks)
9. Adhesives
 Carter's Mucilage (Carter's Ink)
 CICO Liquid Paste (Carter's Ink)
 Duo Adhesive (Mitchum-Thayer)
 Elmer's Waterproof Glue (Borden Chem.)
 Weldwood Phenol Resorcinol Glue (U.S. Plywood)
 Weldwood Plastic Resin Glue (U.S. Plywood)
 Weldwood Resorcinol Glue (U.S. Plywood)
 Wilhold Waterproof Glue (Wilhold Glues, INC.)
10. Miscellaneous
 Amway Vinyl Top Dressing (Amway)
 Benzaloids (Jenkins)
 Bug-Off (Rudd)
 Etrex-Eaton Eccosize (Detrex)
 Enterprize Epox-eze (Enterprize Paint Mfg.)
 Glosstex Laundry Starch (Tidy House)
 Magicolor New Look Epoxy Finish (Enterprize Paint Mfg.)
 Man-O-War Vet. Gall Lotion (Man-O-War)
 Permanite (M.A. Knight)
 Prang Textile Colors (Inmont Corp.)
 Sunoco Radiator Sealer (Sun Oil)
 Synvarol WR-513 (Synvar)
 Thoroughbred Thrush Medicine (Man-O-War)
 Vaxco Preservative (Va. Chem. Co.)
 Veritas Vaginal Kreml (Veritas Prod.)

Table 7. Key word list for balsam of Peru

- | | |
|------------------------------------|---------------------------|
| A. Balsam of Peru | |
| Peruvian balsam | |
| balsam Peru | |
| B. Other balsams | |
| balsam Tolu | |
| Tolu balsam | |
| Tolu syrup | |
| balsam copaiba | |
| balsam of fir | |
| balsam of poplar buds | |
| Canada balsam of fir | |
| C. Rosin | |
| rosin | |
| abietic anhydride | |
| gum rosin | |
| tall oil | |
| D. Coal tar | Wood tar |
| coal tar | wood tar |
| tar | wood creosote |
| resorcinol | pine tar |
| anthracene | juniper tar |
| pyridine | cresol |
| phenols | cade oil |
| liquor carbonis | beechwood creosote |
| | cresylic acid |
| E. Ingredients and cross-reactants | |
| benzaldehyde | vanillin |
| benzyl benzoate | clove |
| benzyl alcohol | cinnamon oil |
| cinnamic alcohol | cassia |
| cinnamic aldehyde | oil of orange |
| pinene | oil of lemon |
| terpene | poplar buds |
| benzoin | acacia |
| styrax | eugenol |
| styrene | almond oil (benzaldehyde) |
| | absinthium |
| gum benzoin | wormwood |
| benzoic acid | |

format of these use-lists before further work is done.

Since the length of these complete lists (over 1700 computer print-out pages for a complete set of alphabetical and use-lists for the 45 antigens) makes them impractical except for a few medical centers, consideration should be given to establishing central registries for various regions or countries. Physicians might then call these registries for the detailed information which they

would periodically require. The organization of poison information centers now functioning in the United States might serve as a partial model for a system of this type.

Finally, consideration must be given to the need for constant updating of any central registry computer bank and the financing of this facility on a continuing long-term basis. This may require sponsorship and a continuing financial commitment by both national and international organizations concerned with the problem of allergic contact dermatitis.

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