

IODINE SANITIZING WATER WASH: A FAILED STRATEGY FOR FORMALDEHYDE REPLACEMENT IN TRADITIONAL EMBALMING.

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Iodine sanitizing washes are the most recent attempts as a substitute for traditional formaldehyde arterial injection and cavity treatment. They definitely achieve the intended goal of sanitation action, but they will be profoundly unadopted and rejected as a replacement for traditional, rockhard, dehydration style formaldehyde embalming. The results are nowhere close to what a traditionalist embalmer expects and demands in embalming results. What is iodine anyway, and how would it work and perform in embalming? What are the implications of the eventual banning of formaldehyde embalming in Europe? Will this ever be a natural/green alternative? What formaldehyde replacement strategies do and will work? These and other questions will be answered in our current article. As always, brutal honesty and unapologetic commentary abounds. Be certain to read the end of this article, wherein I address and attest to these very things.

Shrouds and their intrinsic mysteries only work in the dimmest of light.

-JHB

Eliminating toxic and carcinogenic formaldehyde in embalming is a good idea. The funeral industry should have left most of formaldehyde in the dust long ago, but the reality is — we love it — and we'll embalm with it until you pry our cold dead hands off that Index 50 Cavity fluid bottle. For an industry that embraces all kinds of needless and high exposure toxic chemicals for everyday, commonplace use — this stance is not surprising. Anecdotal how-to embalming articles and traveling seminars actively suggest ridiculous and dangerous chemical exposures such as high index formaldehydes, paraformaldehyde powders, formaldehyde sprays, chlorinated solvents that are massive environmental pollutants, ground up mothballs, gasoline-based drywash/shampoo and kerosene (for those pesky maggots), and the safety recommendations are — try not to get too much on yourself or down the drain and just soak it up with cotton, instead. You can despise my humorous mockery of the situation but you cannot deny the brutal truths that I bring to light.

This untenable situation was never embraced by myself and The Champion Company and we have always been the first to plow-the-road toward overall toxic exposure reduction in embalming operations while still achieving reasonable embalming results. With Champion's Third Generation Millenium New Era chemicals, easily 90 to 100% of total formaldehyde exposure and usage can disappear overnight coupled with drastic overall reduction in total chemical exposure during typical modern embalming procedures. And, you'll hardly notice any difference in embalming results if you have an open mind. Significant formaldehyde reduction/formaldehyde elimination is available at this very moment, you just have to embrace it.

There are, however, other attempts out there at formaldehyde elimination that have been or are being made (tannic acid/alcohol cavity fluid being just one example of a phenomenal flop), with iodine-based sanitizing washes being just another failed attempt in the pipeline. There are a couple of other far-fetched and feeble

examples that are not really even worth discussing, so we will move on. Most all the attempts are poorly thought out formulations with lackluster results that are unappreciated and unadopted by embalmers. Iodine sanitizing wash was developed in Europe a few years ago, in anticipation of the banning of formaldehyde-based embalming, and these types of replacement embalming products are now being marketed and tried in the U.S. This alternative will be profoundly unadopted in the U.S., as the results in no way duplicate or even come close to traditionalist formaldehyde-style embalming. At any rate, let's investigate iodine and its uses and how and why it could be formulated into a post-mortem embalming style treatment for the funeral industry.

Iodine is a chemical element, in the same family as chlorine and bromine, that was discovered in 1811. In pure form, it exists as a dark violet solid that readily sublimates. In some lab instances, it can appear more dark/bluish reddish brown in color. It has several uses in medicine, photography and dyes. It is usually found concentrated in seawater and is notable as being the heaviest element necessary for human life. Its antiseptic properties were noted early on and was used for wound treatment in 1839 and saw much battlefield usage during the American Civil War. Tinctures of iodine have been employed for decades as a skin antiseptic, being a 10% iodine dissolved in alcohol. Lugol's solution is a nonalcohol iodine solution that utilizes water as the solvent. It is actually a complex mixture of elemental iodine, iodides and triiodides, that are readily soluble. Tinctures and iodine solutions are now getting hard to obtain as new government DEA restrictions are in place, due to the fact that 2.2% iodine solutions are methamphetamine precursor chemicals in illicit manufacture.

Modern uses in medicine include radio-opaque contrast dyes in X-rays, angiography and CT scans. Silver iodide is employed in photography and Tungsten iodide is found in incandescent light bulb filaments as a stabilizer. Iodine tablet disinfection of drinking water in emergency situations is also seen, but much less now that effective and safer methods are available. Iodine concentrations in drinking water sanitizing are very low at 8-10 PPM for final doses. Iodine is an essential trace element in humans for the production of thyroid hormones. The FDA recommended daily allowance is 150 mcg/day for adults. Natural iodine sources include drinking water, kelp, sealife, certain seafoods (clams, lobster, oysters, sardines and ocean fish) and plants and fruits grown in iodine rich soils. The upper limit of safe daily consumption is 1100 mcg/day for adults. 6 grams/day of iodine ingestion is usually toxic. Iodized salt is usually the highest typical values for humans from consumption and the reason iodine deficiency is so rare today. Iodine deficiency, hypothyroidism, results in fatigue, goiter, lower metabolic rate and other symptoms. Radioisotopes of iodine (I123 and I125) are used in medical procedures as tracers for thyroid metabolism studies. Potassium iodide is famous as antiradiation pills to block the short-term uptake of radioactive I(131) after a terrorist/nuclear attack or nuclear disaster. Ingestion of iodine in large amounts is deadly with a fatal dose in humans of 2-3 grams. Exposure limits for airborne iodine is a low .1 PPM for such a volatile, and 2 PPM is considered the IDHL (Immediately Dangerous to Health and Life) exposure limit for iodine.

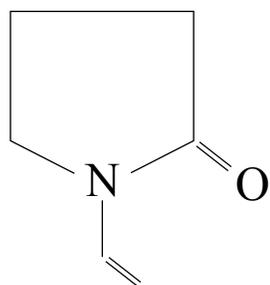
Iodine exists in seawater as an iodide (usually bioaccumulated by kelp and algae). Yearly 400,000 tons of iodine escapes the ocean as iodide in seaspray or as iodide, hydroiodic acid and methyl iodide from marine organisms. It enters the atmosphere, becomes deposited on land and enters the biocycle. Iodine does occur in some minerals, such as alutarite from Chile and iodargyte found in Colorado, Nevada and New Mexico. It can also be found in naturally occurring oil brines. After precipitation or application into the water table or soil, iodine combines with organic matter and remains for very long times. Plants absorb

iodine from these soils and then cattle and animals eat, absorb and accumulate iodine. Average iodine levels in vegetation is a very low .4 ug/g and average soil concentrations are 1.2 ug/g which is also the typical levels found in groundwater aquifers. Iodine in surface water volatilizes back to the atmosphere. Iodine, as an iodophor (such as PVP-I) has been added in the past to cattle feed as an additive and extensively used as a dairy farm disinfectant/sterilizer of milking equipment. But, in the 1970's, in fact, iodine usage was seriously curtailed due to major concerns about concentrations and bioaccumulative effects in dairy milk and other products. On another front, methyl iodide is now seen as an ill-fated, toxic, probably carcinogenic and horrible replacement as a soil injection fumigant pesticide for methyl bromide, which is now essentially banned in most countries.

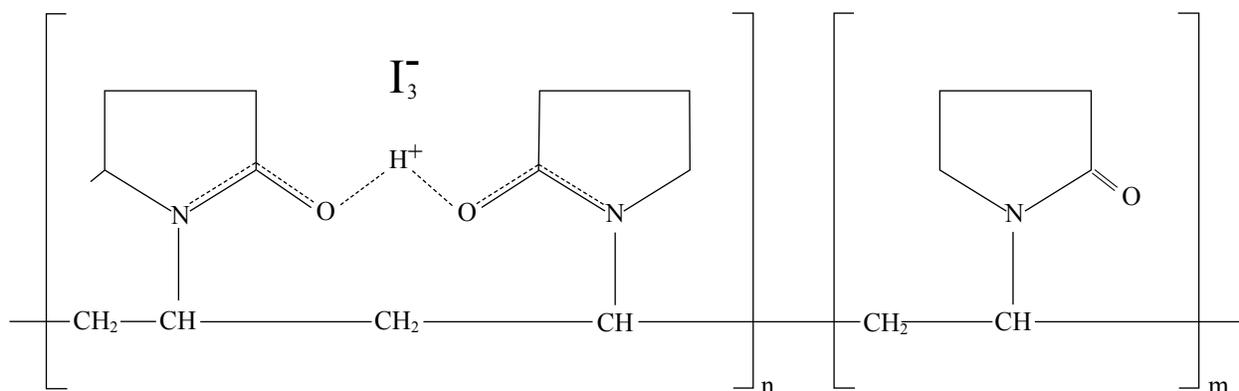
Iodine had its problems as a skin antiseptic in the early days. Pain, burning, irritation, toxicity and skin discoloration were common problems. With the arrival of the iodophors in 1949, most of these drawbacks were eliminated. The two most popular are PVP-I (polyvinylpyrrolidone-iodine), also called povidone-iodine and cadexomer-iodine (which is iodine combined with beads of dextrin and epichlorhydrin). N-vinylpyrrolidone is an interesting chemical developed in the late 1930's, early 1940's from acetylene chemistry investigation. As a monomer it is extremely toxic and carcinogenic, but essentially safe when polymerized and has many medical and industrial uses (Figure 1). Iodophors work by complexing iodine in a chemical matrix with the result being a slow sustained release of elemental iodine, the active disinfectant. Betadine, available OTC in the drugstore is a widely used example of PVP-I or povidone-iodine. Dosages are almost always listed as 10% or 7.5%, which delivers a final concentration of active iodine of 1% or less. In some instances, chlorhexidine is a preferred skin antiseptic for blood culturing, as contact times can be much less than for povidone-iodines. Povidone-iodine is available in many forms for external antiseptic use including topical wipes, sprays, gels, foams, shampoos and douches. It should never be ingested and is very toxic if swallowed, with sodium thiosulfate being the chemical antidote. In addition, avoid eye contact as it can be extremely irritating. Occasionally skin rashes and pruritis occurs in a few patients after continued use. In serious burn victims, occasional systemic absorption has occurred with resulting iododerma, metabolic acidosis and renal impairment. Vaginal use in douching can significantly increase iodine serum concentrations and expression in breast milk in pregnant females.

The mechanism of iodine disinfection action is not well understood, but is assumed to be the result of multiple disruptive effects of cells by loose binding to proteins, nucleotides of DNA/RNA and interaction with certain fatty acids. Iodine probably alters protein structure by oxidizing reaction with sulfhydryl (S-H) bonds of amino acids (such as cysteine and methionine), interaction with tyrosine phenolic groups and N-H groups of arginine/histidine/lysine to block hydrogen bonding. Similar hydrogen bonding blocking occurs when iodine reacts with adenine, cytosine and guanine nucleotides. Membrane structure is assumed to be altered in cells by interaction with C=C bonds in fatty acids. Iodine and iodophors exhibit consistently effective, broad action against bacteria, mycobacteria, fungi, viruses, protozoals and viruses. Its overall sporicidal activity is also excellent. Povidone-iodine is generally safe, if used in moderation, as a wound treatment, skin antiseptic and disinfectant for inert surfaces. Possible chemical incompatibilities are adverse reactions with ammonias and peroxides.

So that's the story on povidone-iodine. It's an excellent skin antiseptic and has numerous disinfectant/sanitizing medical uses. So, can it translate to embalming and replace formaldehyde and deliver traditionalist hardening/dehydration effects that all embalmers expect and demand? No, it can't. Lab bench tests with



N-VINYL PYRROLIDONE



Povidone - Iodine (PVP-I)
A TRIIODIDE COMPLEXED HOMO POLYMER

Figure 1

injection and immersion studies confirm for me that protein precipitation action is at an absolute minimum and any fixation that results is mostly reversible and hydrolyzable. Lab comparisons show, really, little difference between dilute iodine treatment and straight-up alcohol immersion. You might as well just use a bottle of drugstore rubbing alcohol, the result is about the same. These types of iodine wash products will be profoundly unaccepted in the U.S. for formaldehyde-replacement embalming. They are excellent sanitizers and seemingly fulfill the embalming tenet of sanitation, but that's where the story ends. With microbiocidal/microbiostatic action only and vigorous aldehyde/phenolic protein precipitant action virtually missing, the result is a barely reasonable cosmetic holding of the infused corpse for a few days and possibly/probably requiring refrigeration/cooling/icing as an enhancement. In addition, time consuming and laborious mandatory multi-point injection is highly recommended, by the manufacturer themselves, for successful embalming fluid distribution/saturation.

Percentages of active elemental iodine, the sanitizing species, is relatively low with final arterial dilutions down to 1/2 of 1% or less and full-strength cavity at less than 2%. This would equilibrate to less than 1/3 ounce of active ingredient in a 16 ounce cavity fluid bottle used in the U.S. (the rest basically water), a shockingly low amount for a cavity chemical. In an entire arterial solution of approx 2 1/2 gallons, there is barely 1 1/2 ounces of active iodine. Over 90-95+% of the final recommended solution/dilution is water, with approx 1%? being alcohol and the rest being various salts, surfactants and thickener (sodium alginate, a seaweed based thickening agent). Apparently, even sodium alginate has now been removed from the

latest formulations. There is nothing else, that's it. This is a cosmetic/sanitizer water wash and nothing else. Strangely enough, the isopropyl alcohol has disappeared from the latest MSDS, so now there is no alcohol in the formulation. More about that later. In addition, the iodine staining effect is also problematic and shelf life is less than desired, compared to traditional embalming agents. Particularly troublesome would be above ground interments such as family and garden style mausoleums where decomposition and miasmatic events (foul odors and leakage of putrid fluids) are already a problem with even traditional formaldehyde embalmings. Good luck in the U.S. market, it will be profoundly unadopted and unaccepted. Traditionalist embalmers in the U.S., unfortunately, would rather don the moon suits and gas masks instead, so as to avoid parting with their beloved formaldehyde in its many forms.

The better, safer and more practical solution is, however, implementation of glutaraldehyde/phenolics in moderating amounts with near elimination of toxic, carcinogenic formaldehyde in modern embalming chemicals. If you are a traditionalist embalmer, then the logical and practical choice is minimization/near elimination of formaldehyde by embalming with Champion Third Generation Millennium/New Era chemicals, where toxic exposures are significantly reduced and solid traditional results are possible with only a whiff of formaldehyde, as a supplemental. This realizes the best of both worlds — drastic overall reduced toxic exposures and an effective embalming with results acceptable to a traditionalist embalmer, in all respects.

There is, however, a good chance these types of iodine products will experience a modicum of success in Europe as very soon, the choice will be between them and nothing, as formaldehyde will, in all likelihood, be banned and rapidly disappearing from embalming products. What little pseudo-embalming is done in the EU will have to be justified as amounting to something, so alternative iodine/water washes will, no doubt, for better or worse, be done and touted as having some marginal value. One of the marketing ploys for these products revolves around the contention that they are, somehow, a cost-effective or desirable alternative to refrigeration/cooling/dry ice technology that has been embraced for decades in Europe. Embalming is basically unaccepted/unadopted in Europe, except, possibly and slightly, in the UK and Ireland and is rather ill-defined, variable, haphazard, optional and even illegal in most places. The overblown sanitation arguments for embalming that are being used to market these products, are seen in Europe as ridiculous, as Europe has effectively dealt with its dead for centuries without any embalming, whatsoever. Add all of those factors up and you arrive at the conclusion that, in Europe, as in the past, the methodology will be conventional ice, refrigeration, cooling boards and dry ice. Nothing new about that.

As a final note, I am quite surprised that these iodine wash products are being touted as "green" and suitable for natural burial and are being actively marketed to this segment of the industry in the U.S. How they ever got a supposed free-pass in England is beyond me. Yes, they do, technically, fulfill a sanitation function and generate a cosmetic effect with temporary holding, but that's not the point — they fail on first principles alone. There is no way that they meet the criteria of nontoxic, non-hazardous, fully disclosed, environmental safe formulations. Iodine, despite being usually and relatively safe in most uses, is still a confirmed toxic with hazardous properties and has mandatory reportable exposure limits and safety/use protocols and mandatory hazard warnings.

Trying to spin the nontoxic argument by saying povidone-iodine is somehow a nontoxic/non-hazardous form of iodine is absolutely false. Povidone-iodine is just a modified slow-release medical delivery system for iodine and the toxicity warnings for iodine as an evolver from povidone-iodine should be clearly stated

in good faith in an MSDS. It's the iodine in PVP-I, not the PVP, that's the problem. Yes, it can be argued that technically PVP-I has its own CAS# and therefore, no established limits that are required by law on MSDS's, but that just begs the question. The reporting is all over the place and confusing on PVP-I MSDS's. Some list the CAS#, others don't, some list iodine limits, some don't, some report no established limits and nothing else, some report no limits and reference iodine limits in the notes/precautions section and others mention almost nothing. For every MSDS you can find that doesn't mention iodine hazards and reporting limits, I can show you one that does. In fact, to their credit, the manufacturer of the European iodine embalming chemicals we are talking about does clearly reference and list iodine's toxic exposure level limits in their MSDS's. So does the manufacturer of Betadine, the skin antiseptic. To their discredit, however, are the marketing claims of the embalming chemicals that profess, incorrectly, complete and total safety and nontoxicity/non-hazardous/non-ecoimpact.

Of course, Betadine and other iodine products are reasonably safe to use in a medical setting — the point is that some toxicity/exposure concerns persist and cannot be ignored and there is definite environmental impact with their use and disposal, because iodine, being an element, does not degrade or just go away and the environmental impact can be very long-lasting and possibly indefinite. Retention times for iodines in soil are estimated from 80 years to a shocking 800+years at soil depths of 1 and 3 feet (approx. 1 meter) respectively and only 1% ever revolatilizes to the atmosphere and instead remains to eventually enter the groundwater system or be partially uptaken by vegetation. The amount of iodine used in just one body burial (2 ounces, or so, we would hope, if not, then some of it ended up as a toxic effluent from the embalming room) is equivalent to that found in 63 tons of soil at natural levels and there is absolutely no pathway for biodegradation, only extreme persistence and eventual migration to the ground water table. Looked at another way, the amount of elemental iodine that would be delivered in a natural burial is equivalent to the amount of iodine deposited in a typical methyl iodide soil pesticide application onto 30 square feet of topsoil and a one foot depth. That's larger than the average surface dimensions of a grave site. That's something to seriously ponder. My opinion — the enviro-impact is significant, indeed.

Essentially, this whole argument about povidone-iodine is an artifact of technical MSDS reporting regulations in the U.S. and the EU and nothing more. Using this technicality as a free pass, hydroxymethyl glycinates, tris (hydroxymethyl) nitromethane (the active component of TrisNitro), Quaternium-15 and the Diazolidinyl and Imidazolidinyl Ureas could all be listed on an embalming chemical MSDS as being relatively safe and having no reportable limits despite the fact that they are all vigorous formaldehyde-releasers, were invented for that specific purpose and action and should be treated as a significant source of formaldehyde, and are definitely toxic and sensitizing to humans and probably, if not certainly, carcinogenic. And that's just the formaldehyde-releaser category, a myriad of other seriously biocidal and toxic chemicals generate what seems to be a rather safe and innocuous MSDS with no or low reporting limits. Examples would be alcohols and various tinctures, numerous quats (Benzalkonium chlorides, Cetylpyridinium chlorides and Benzethonium chloride), chlorhexidine gluconate, octenidine dihydrochloride, 2-phenoxyethanol, Triclosan, Dibromol, Boric acid (active ingredient in roach tablets), hydrogen peroxide, and chlorine bleaches. The list can go on and on. As you can see, it is relatively easy to create a veritable witches' brew of very problematic chemicals and generate an MSDS that appears relatively safe. Being technically correct is one thing and being honest, transparent and truthful is something entirely different. Welcome to the real world.

At any rate, besides all this, isopropyl alcohol (is?/was) present in these embalming chemicals, which has reportable limits, is a VOC (volatile organic chemical) and carries significant warnings and mandatory, reportable exposure limits. At least this was the case, until very recently, when isopropyl alcohol just disappeared from the EU MSDS's. Most interesting, indeed. By pulling a named reportable toxic off the MSDS you can much better engineer a clean-sheet looking MSDS in the U.S. This certainly makes the MSDS look much better to an untrained observer. The problem, however, with iodine does not go away. And, as Kermit would say — it's tough being green. At any rate, however, in addition, there are undisclosed salts, activators, buffers, surfactants, perfuming agents, etc., that are present and not listed on the MSDS. They are all pulled from a laundry list of possible additives that are listed in the original patent literature. A very undisclosed and undesirable situation for a supposedly "green" product. In no way is this even close to a clean-sheet, full-disclosure MSDS (alcohol or no alcohol).

Yes, of course, a safe embalming can be done with appropriate protective gear, but that's not the point. Shockingly, some users we have come across (in Canada, for example) of these products, don't even have the MSDS, or never read it, and have no idea what they are using or that a toxic with mandatory reporting criteria is the sole active/evolver ingredient. Somehow, they think it is some kind of a harmless, miracle embalming water wash. Oh, well, considering the situation and circumstances of the funeral industry, not at all unexpected. Bottom line, I just don't see how a biocidal, such as this, is acceptable for natural/green burial, let alone the extremely long and uncertain soil retention times and unresearched bioaccumulative effects and unknown soil impact determinations. Elements, in general, and iodine is no exception, are non-biodegradable and bio-persistent in the extreme. In no way, shape or form is this a nontoxic, non-hazardous and of no environmental impact embalming chemical mixture.

So, will there ever be a workable, reasonable alternative for natural/green disposition, ecocremation and extreme reduced hazard embalming? Champion is working diligently on the creation of a truly "green" acceptable alternative to traditional embalming that delivers results that embalmers will be able to accept and still present a completely clean-sheet full-disclosure MSDS with absolute and documentable, minimal exposure/environmental impact as an end result. Champion's Enigma chemicals will guarantee no toxics, no toxic-evolvers, no reporting limits of exposure, no secret ingredients, no undisclosed ingredients and full documentation of environmental impact and fate. To this end, the Enigma Line of Chemostasis Infusion Factor chemicals of the Fourth Generation of Champion Ecobalming chemicals will redefine what embalming really is and radically alter the landscape of the funeral industry. Enigma Ecobalming chemicals will truly deliver on our promises of non-toxicity, safety of use, full-disclosure and well-documented environmental fate and impact studies. Enigma is on the horizon and, very shortly from now, the future will be upon us and it will be bright, indeed.

There is an immense amount of information available regarding iodine and iodophors, such as povidone-iodine. Numerous sources on the internet are readily available for your perusal. Wikipedia is a good start. Clinical Microbiology Reviews of Jan. 1999 has an excellent article on antiseptics/disinfectants in use in medical practice. The CDC, through the ATSDR arm of the U.S. Dept. of HHS, has a wealth of research

on iodines. Betadine MSDS sheets are useful information. Of course, product info, patent literature, MSDS sheets, etc., are available on the European embalming products that we have discussed. The biocidal and pesticide uses of iodines is well researched. The scientific facts are the facts, they are documented and unassailable. They speak for themselves. The decisions and choices about what to do about it are, of course, yours. Choose wisely.

And finally, the humor, personal opinions and caustic commentary, is, of course, mine and mine alone and not that of The Champion Co. or anyone else and you may feel free to condemn me for it. It's purpose is to controversially shine a bright light into the dark corners of the industry, awaken us from our slumber and wipe away the fog from the mirror of introspection and observe the newly illuminated reflection of reality that awaits and shocks us. If this is disturbing and unsettling, then I have accomplished my task.

From the polemical commentary of some, the fear and loathing regarding this is quite palpable. The fears seem to be twofold: if there is not a formaldehyde preserved corpse present, then everything else we do is meaningless and we will just vanish into thin air and, secondly, if we don't keep everything about the funeral industry a secret and make sure the public is not informed, then the end is near. If you sincerely believe that the elimination of any one unnecessary product, any one dangerous/toxic/carcinogenic chemical, any one outdated/unwanted service offering, or any one antiquated, but dearly held, belief will somehow permanently derail and destroy this industry — then we are, by our inherent archaism in thought and deed, truly doomed. And finally, as always, embalm smart, embalm safe. Something, sadly, we have chosen not to do for a very long time now and much to our detriment as a viable and sustainable entity. Let us hope that changes very soon. The formaldehyde hourglass has been turned.