John MacDonald

Supplement ~ September, 2021

The Non-Toxic Studio

In nearly every painter's studio sit tubes, cans, and jars of pigments, mediums, varnishes and cleaners. We paint with the pigments, use mediums to thin the paints or create glazes, let varnishes bring out sunken areas of color or provide protection to the surface, and use cleaners to remove pigments from our brushes, palettes, and, far too often, ourselves.

Until recently, all four were usually either entirely toxic or contained toxic ingredients. Many artists today are becoming more health conscious and environmentally aware and moving away from toxic materials.

In 2014, for the health of my body and the environment, but also from the sticker shock of an estimate to install a heat-exchange ventilation system for my studio, I decided to move to as toxic-free a studio as possible.

In response to the many inquiries I've received about the specifics of how I eliminated toxic materials, I've assembled this mini-newsletter. I hope it encourages you to consider moving toward a healthier way of working. Life is short, they say. Why shorten it further by unnecessarily using dangerous materials in your studio?

The products and techniques suggested here are just a few of the options for creating a non-toxic studio. However you set up your studio, any viable solution to the problem of toxicity must deal with these four commonly used products:

Pigments
Mediums
Varnishes

Sources • Caveats • Disclaimers

This information was compiled from previous newsletters, individual pdfs on specific topics, hours of online research, and discussions with other artists. However, I'm not an expert on the toxicity of artist materials nor is this intended as a comprehensive review of the problems, materials, or issues involved. The suggestions I make are based on personal experience. I use the techniques and materials listed here because they work for me and, I believe, are better for my health. If you have specific concerns or serious health issues please consult with your physician or other health professionals.

PIGMENTS

It's not difficult to find methods or materials that allow artists to rid their studios of solvents. Replacing pigments–finding non-toxic alternatives to the paints we rely on–can be trickier. Sometimes the pigments of non-toxic substitutes lack the quality or characteristics that make their deadly cousins so desirable. Sometimes we get lazy and don't want to invest the time in learning how to work with new paints. Before looking for alternatives to the pigments you're currently using, first determine their toxicity. They may be harmless. If they're toxic, visit the websites of paint companies and online art supply retailers for non-toxic alternatives. Lastly, consider mixing your own non-toxic substitutes, as I did with Cadmium Yellow light (see below).

Toxicity: Forget Brands–Think Chemistry.

For some pigments, such as the cadmiums, the ingredient is in the name and the names run consistently across brands. But for others, different brands use different names for the same pigment or, just as confusing, the same name for different pigments. For instance, below are the variety of pigments (listed by their given Color Index) that are used in several brands of what the manufacturers call *Indian Yellow*:

Winsor & Newton: PY139 + PR101
Williamsburg, Gamblin, and Daniel Smith: PY83
Utrecht: PY153 + PR101
Old Holland: PY95 + PY129

Names can't be trusted. If you want to know if a pigment you're using is toxic, you need to know the designated Color Index rather than relying on a brand or the name of the paint.

Below is my favorite site listing the toxicity of artist pigments. Created by a fellow artist, David G. Myers, the amount of information on every pigment is astonishing. (Thank you, David!)

http://www.artiscreation.com/Color_index_names.html#

As an example, here's the information for Indigo Blue. Its toxicity is listed in the second to last column.

Natural Blue - Color Index Name: NV

Historic Blue Pigments Without C.I. Names | CI Natural Blue | CI Pigment Blue | Page Top^

Color Index Generic Name	CI Common or Historical Name	Common, Historic and Marketing Names	C.I. Constitution Number	Chemical Composition	Color Description † = Long Term Effects of Light	Opacity 1 = opaque 4 = trans.	Light Fastness I = excell. IV=Fugitive	Oil Absorption g/100g	☠	Side Notes
NB1	Indigo	Baghdad Indigo; C.I. Natural Blue 1 (natural); C.I. Pigment Blue 66 (synthetic); Dyer's woad; Indaco; Inde Blew; Inde Blue; Indian Blue;	75780	Natural Indigotin; Fermented extract from the leaves of Indigofera tinctoria or Baphicacanthus cusia (Ref Pigment Extraction Techniques from the Leaves of Indigofera tinctoria, CMU. Journal (2002) Vol. 1, p.149)	Dark Greenish to reddish Blue † Fades	4	III	-	A*	The dye used for blue jeans ** Natural Indigo may be slightly toxic (Ref at Blick Art Materials)

A = Low hazard, but do not handle carelessly;
B = Possible hazard if carelessly handled, ingested in large amounts or over long periods of time;
C = Hazardous, use appropriate precautions for handling toxic substances;
D = Extremely Toxic, only attempt working with these pigments (especially the dry form) in laboratory like conditions

How Do We Poison Ourselves? Let Me Count The Ways.

A good friend is a recently retired chemistry prof from Williams College, in my home town of Williamstown, Mass. His speciality is toxicology. Below is a summary of his comments from a discussion we had about Cadmium pigments. It applies to most toxic pigments.

Toxins enter our system through **inhalation**, **ingestion**, and **absorption**.

Inhalation is the most dangerous. Dry particles are easily absorbed directly into the blood stream through the lungs. Volatile solvents, whether "odorless" or not, present the same hazard. They're only marginally safer. You simply can't smell them while they're poisoning you.

Absorption through the skin occurs when artists clean off pigments from their skin using solvents or detergents. Because most naturally occurring toxins in nature are water-based, our skin evolved to have a layer of oil that acts as a barrier and prevents toxins from penetrating the skin to the capillaries directly beneath. When using solvents or detergents to clean off toxic pigments from our skin, we're destroying the oily layer and creating breaches in the barrier that allow the absorption of the toxins from both the pigments AND the solvents. Wipe the pigments off thoroughly, then use soap and water. NEVER use solvents to remove paint from skin.

Ingestion, surprisingly, this is the least harmful of the three in regard to heavy metals such as cadmium, chromium, cobalt, etc. Being highly insoluble in water, our digestive systems aren't designed to break down and absorb the heavy metals, most of which will be excreted. (However, that's not to say that eating a 150 ml tube of Cadmium Yellow is a good idea.)

As for solvents, ingesting *any* amounts is to be strictly avoided.

How often do you paint? A few, brief exposures are rarely dangerous but even low level and constant exposure over long periods of time can create serious health problems. Even if you paint only occasionally, why gamble with your health?

Pigments in my Original Palette

At the time I began searching for safe pigments, this was my favorite limited palette:

White. [PW6, PW4] (Winsor and Newton Winton, Soft Mixing White.)
Cadmium Yellow Light (Pure) [PY37] (Utrecht)
Dioxazine Purple [PV23] (Utrecht)
Payne's Grey [PB29 + PBk9] (Old Holland)
Permanent Alizarin Crimson [PR177] (Winsor & Newton)
Prussian Blue [PB27] (Winsor & Newton)
Raw Umber [PBr7] (Vasari)

Among these pigments,I was thrilled to discover that only the Cadmium Yellow Light was considered toxic and, because it's nearly insoluble in water, its toxicity is limited. Still, I wanted to avoid using it. My goal was to rid my palette of any toxic pigments.

Replacing Cadmium Yellow Light

Finding a substitute for Cad Yellow Light wasn't easy. An online search turned up several non-toxic replacements but none was close to the hue of the Cad Yellow. There was no commercially available pigment that could adequately replace it. With no choice but to create a mixture, I eventually discovered a blend that is nearly indistinguishable in hue from Utrecht's Cadmium Yellow Light and is completely non-toxic: Winsor & Newton's "Winsor Yellow" and "Indian Yellow" in a ratio of approximately 1 part Winsor Yellow to 1/3 part Indian Yellow.

When mixing the paints, use a swatch of true Cad Yellow Light for reference. If the mixture is too orange, add more Winsor Yellow; if too lemony, add more Indian Yellow. Although the hue is nearly a perfect match, this substitute differs from pure cadmium in four ways: it is very slightly less saturated (lower chroma), it is more transparent, it has less tinting strength, and it dries more quickly. All of these are differences I found more advantageous than the original pigment. It's a perfectly adequate, high quality, non-toxic substitute.

Winsor & Newton "Winsor Yellow:"

PY74 = Arylide Yellow 5GX, often labeled as a form of **Hansa Yellow**.

Winsor & Newton "Indian Yellow:"

PY139 = Isoindoline Yellow. A transparent, lightfast yellow orange.
PR101 = Synthetic Iron Oxide Red.

Above: using a dab of Cadmium Yellow Light as a guide, I add the two yellows in a ratio of approximately 1:1/3 and adjust the mixture as needed.

Right: The two colors are nearly indistinguishable. (The Cadmium Yellow Light is on the left.) Because of the limitations of computers and monitors, it's unlikely you're seeing the actual hue but it's the comparison that's important–they're nearly identical.

Solvents, Mediums and Varnishes

Until recently, nearly all solvents, mediums and varnishes were based on or included petroleum products. Their toxic ingredients usually enter our bodies through respiration (as they evaporate) or through the skin (through casual contact or when used to remove paint from skin). Solvents are use primarily to thin paints and clean brushes. Mediums and varnishes are used for modifying the pigment, for glazing, for oiling-out, and for protecting the final paint surface.

Oil for thinning pigments

As explained below, I don't use a medium when mixing paints on the palette. If the pigment is stiff and needs to be thinned slightly, I use a small amount of oil (safflower and linseed in a 50/50 mixture) to increase the ease of brushing. (According to a conservator at the Clark Museum, working in thin layers with approximately the same amount of oil in the paint in each layer, is perfectly archival. If you painting thickly, be certain to use consistent amounts of oil!)

An oil/wax based medium/varnish, *mostly* non-toxic, for glazing, oiling-out, and varnishing

Source:

The medium was based on the research of Don Jusko. (Sadly, his extensive table of mediums, their mixtures and their uses is no longer available online). I altered his formula to fit my needs.

Attributes:

As a standard medium, it can be used to thin paints and increase the transparency of the pigment. Being similar to a retouch varnish, it can be used to "oil out" sunken areas of color, restoring their original color. And when applied as a final varnish, it creates a uniform, satin finish on the surface. It doesn't give the painting the complete protection of a traditional final varnish (which usually contains Damar), but it will afford the painting some protection. I always apply a final coat to the painting to ensure a uniform surface. And with its satin finish, it's also easier to view and photograph the painting.

Ingredients for a 16oz. jar:

1 part linseed oil
1 part safflower oil
1/2 part stand oil
1/2 part Dorlands Wax ***CONTAINS MINERAL SPIRITS***
1 1/2 teaspoons Cobalt or Japan drier. ***CONTAINS PETROLEUM DISTILLATES***.

Using a standard 16 oz jar, such as a clean salsa or peanut butter jar, place a piece of masking tape up the side of the jar and mark off 1" increments, dividing the top segment in half. (See photo below.) Pour safflower oil up to the first 1" mark, linseed oil up to the second mark, stand oil up to the 1/2 mark and Dorland's Wax to the top mark. With the lid on the jar, *gently* heat it. You can immerse it in a pan of hot water. I use a Mr. Coffee mug warmer–much easier! When the wax has completely melted, shake the jar vigorously for about 30 seconds, then add 1 teaspoon of Cobalt drier. Immediately cap it and shake it again thoroughly. Do NOT add the drier before the heating process. It's toxic and highly volatile.

When the mixture cools, the consistency will be that of soft, room temperature butter. When applied, it immediately becomes semi-liquid, with the viscosity of a syrup. With the addition of the dark-colored drier, the medium will darken slightly but it will not darken the painting.

Using the medium:

Traditionally, a medium is used *during* color mixing: a small amount is mixed into each pile of pigment on the palette while painting. Instead, I prefer a technique learned from Bela Petheo:

After blocking in a painting (without any medium) and letting it dry, scoop out a liberal amount of the medium and apply, using a paper towel or cloth, to either the entire painting or a chosen section. With the side of a roll of paper towels, wipe off the excess to leave a thin, even layer of the medium on the surface. It should glisten but not run. Paint directly into the wet medium. After finishing the painting session, allow the painting to dry completely, which usually requires three or four days. The process is then repeated for each painting session until the painting is finished.

Using the medium as a glaze:

The medium works perfectly for glazing. It can be applied in one of two ways:

1. For touching up a small area on the canvas, apply the medium as described above, then use a brush to work in a very small amount of a transparent pigment into the medium. If the color is too strong, simply wipe it off. If more is needed, use more pigment. The medium will remain workable for several hours.

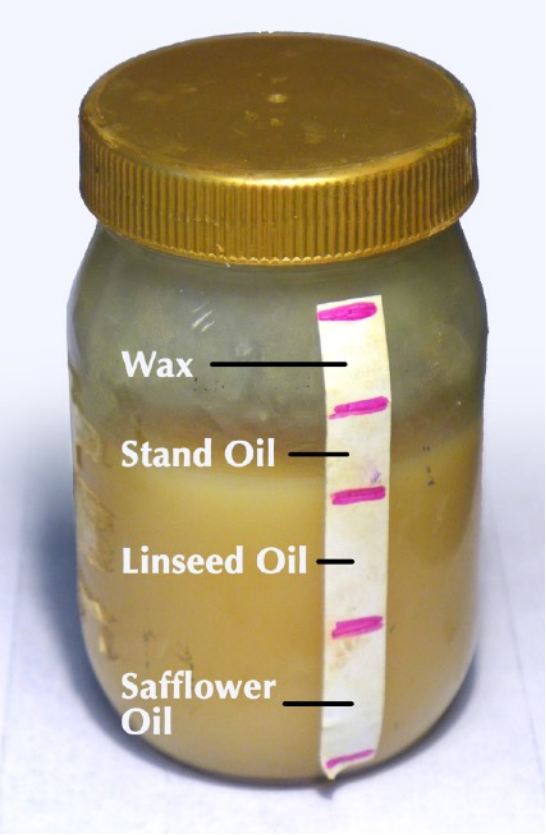
2. To apply a color (or a gradient involving one or more colors) to the entire painting or a large area of the painting, place a scoop of the medium on the palette, mix the pigment(s) into it, then apply the mixture to the surface of the painting with a cloth or large, soft brush.

TIPS:

• By adding more or less wax, it's possible to control the satin/glossy quality of the finish. More wax results in a more mat finish, less will create a more glossy finish.

• When a mistake is made while painting and corrected by wiped off the paint, the medium will also be removed. Don't reapply the medium. Simply continue to paint until the end of the session and allow the painting to dry. If the painting is finished, any mat areas can be touched up with the medium. If unfinished, any mat areas will be brought back to life when the medium is applied prior to painting again.

• It's not necessary to cover an entire painting before starting a session. For example, when beginning a painting session, if I know I will only be working on a section of the painting, I'll apply the medium only to that area. This avoids having several layers of medium upon medium on the painting, which can complicate the drying process.



Right: The medium jar showing the tape with divisions. (In this photo, nearly half of the medium has been used. When freshly mixed, it will fill to the top line.)

CLEANING BRUSHES~*Skip the Solvents*

Several years ago, I overheard the daughter of the founder of Rosemary Brushes talking to an artist about cleaning brushes. She said, "Oil dissolves oil." What an epiphany! I immediately realized that *solvents–and even soap and water–aren't needed to clean brushes!* And because at the time I wasn't using solvents to thin my paints, I could then avoid solvents entirely, which not only eliminated the risks to my health but also any need to ventilate the studio–an advantage given cold New England winters. Here's how to clean brushes without solvents or soaps:

1. Wipe the brushes. Use a paper towel to gently work out as much of the pigment from the bristles as possible. Avoid pulling the bristles.

2. Remove the pigment. Dip the tip of the brush into a jar containing any artist grade oil (I use safflower and linseed in a 50/50 mixture), being careful to coat the bristles with oil without allowing any pigment to get into the jar. Lightly brush the bristles back and forth on the palette, as if gently painting. The pigment will bleed into the oil. After a few seconds, use a paper towel to remove the pigment and oil and repeat the dipping, brushing, and wiping until the oil coming from the bristles is clear and clean.

3. Store in oil. Place the brushes upright in a jar containing just enough safflower oil to cover the bristles. When it's time to resume painting, wipe off the excess oil and get to it!

TIPS:

• Storing the brushes upright works best for stiff bristle brushes. Soft brushes will be damaged if left upright for long periods. For soft brushes, use a shallow dish, such as a glass pie plate, filled with 1/4" of oil and lay the brush down sideways, with the bristles in the oil and the handle resting on the rim of the dish. This takes the pressure off the soft bristles and will preserve their shape.

• When the oil used for cleaning becomes cloudy with pigment, usually within a month or two, replace it with clean oil.

• Solvents and detergents strip oil from natural bristles, making them fragile and stiff. Cleaning them only with oil will keep them pliable and can significantly increase their lifespan.

Commercially Available Non-Toxic Substitutes

Thankfully, some companies are beginning to offer non-toxic products that can replace traditionally toxic materials. Though still few in number, it's likely we'll see more products entering the market in the future. Other than CitraSolv, I have not used any of these products and so can't vouch for their quality or ease of use. But many artists use them and report good results.

As always, read labels carefully and do the research. Some products (Galkyd and Liquin, for instanc) release VOC's–Volatile Organic Compounds. Though much less harmful than mineral spirits or natural Turpentine, these may bother sensitive individuals.

Lastly, search the web for *"non-toxic artist materials."* There are many blogs and websites that offer information on products, materials, and techniques for creating a non-toxic studio.

Solvent-Free Painting Mediums

Gamblin offers both a Solvent-Free Gel Medium and a Solvent-Free Fluid medium. From what I've heard, both work well and are quality substitutes for traditional mediums.

Water Miscible Oils

There are various brands of solvent-free, water miscible oil pigments available. But don't forget to check the toxicity of the pigments themselves. A Cadmium, water miscible pigment is still toxic!

Citrus Based Cleaners

For nearly a year, I experimented with using Citro-Solve as both a paint thinner and brush cleaner. As a thinner, it worked well but I found it much too harsh as a brush cleaner or when accidentally spilled on my skin. Still, it's better than turps!

Curt Hanson (1949–2017)

If I sound a little strident in my advocating for a toxic-free studio, it's because it's a personal issue. In October, 2017, I lost a friend, a painting companion, and a mentor to leukemia and acute anemia. Curt was a painter to whom painting was *everything*–it was his life. A deeply spiritual, kind, and gentle man, he painted with a laser eye and a soft, open heart. He died at 68.

Several years before his death, Curt had begun using naphtha as both a paint solvent and brush cleaner. He spoke to me about how he preferred its almost instant drying qualities when blocking in a painting. Despite my misgivings–where were those evaporates going if not into his lungs?–I said little. He treated me as a colleague but he was really a mentor. A good student doesn't challenge the teacher, was my thinking. I now wish I'd said more.

After he died, I researched naphtha. One of its ingredients is benzene. According to the science, a consequence of long term exposure to benzene is leukemia and acute anemia.

I visited Curt when he was bed-ridden in the hospital. He was pale and weak but his usual cheerful self and couldn't wait to get back to the studio to paint. As I was leaving, he asked me to talk to him after his return home about creating a non-toxic studio. "It's a good idea," he said. It was the last time I saw him. On my way out of the hospital, I ran into the physician who was treating Curt and mentioned his long term use of naphtha. He paused, then commented, "I know naphtha. It's nasty stuff." It's time we artists stop working with *"nasty stuff."*