Tenth Meeting of the Health Effects Advisory Committee (HEAC) for Permissible Exposure Limits for Airborne Contaminants in the Workplace
California Code of Regulations, Title 8, Section 5155
March 5, 2019
Elihu Harris State Building, 1515 Clay Street Oakland, California

Division of Occupational Safety & Health

Panel: Garrett Keating, Chris Kirkham
Notes: Keummi Park

HEAC Members Present

Eric N. Brown, Dr. PH, CIH, CSP, SCS Engineers (Industrial Hygiene)
Michael Bates, PhD, UC Berkley School of Public Health (Epidemiology)
William Forest, MPH, Santa Cruz County Department of Public Health (Epidemiology/Toxicology)
Bob Harrison, MD, MPH, School of Medicine, University of California, San Francisco (Occupational Medicine)
Sarah Janssen, MD, PhD, MPH, Occupational Medicine Department, Kaiser Permanente (Occupational Medicine)
Patrick Owens, MSPH, CIH, Shell Oil Martinez Refinery (Industrial Hygiene)
Kent E. Pinkerton, PhD, UC Davis (Pathology/Inhalation Toxicology)
James Unmack, CIH, Unmack Corp. (Industrial Hygiene)

Public and Interested Parties

Dan Leacox, Leacox and Associates
Bob Nocco, Chevron
Kashyap Thakore, California Department of Public Health, HESIS
Jennifer McNary, California Department of Public Health, HESIS
Tom Hmiel, American Chemistry Council
Lindsay Stovall, American Chemistry Council
Mike Geyer, KERNTEC Engineering
Michael Horowitz
Peter Scholz, DOSH
Jim Kegebein
Aryan Kumali, Southern California Edison
Josh Potocko
Norman Wright
Anthony Boone, San Francisco Department of Public Health
Maggie Robbins, Worksafe
Harvard Fong, California Department of Pesticide Regulations
Ryan Guinness
Natalie Rainer, Keller and Heckman
Shanon Winston, Contra Costa County
David Ross, California Department of Transportation
Elisa Koski, Occupational Safety and Health Standards Board
Below are detailed notes of the advisory meeting. These notes do not represent a transcript of the meeting, and are simply a summary of the notes taken by the people conducting the meeting.

Garrett Keating and Chris Kirkham opened the meeting. Kirkham introduced the committee members and staff, covered housekeeping items and explained the agenda and handouts. Keating, further explained agenda items and plan for the meeting. Asked for input from stakeholders on usage etc. Described some of the handouts in more detail.

**N-, Tert-Butanol – Final Review**

Keating summarized the corrections made to the draft Cal/OSHA PEL recommendation summary from the last meeting for butyl alcohols and explained that they are on this agenda for final review. Opened the floor to the committee. Mike Cooper asked Keating to explain the rationale for why the limit was lowered for n-butanol by approximately a factor of three. Keating said it was based on reinterpretation of the human irritation data and that he would clarify this in the presentation to the Standards Board.

Dan Leacox, asked if when Keating said lowered by a factor of 3, he meant that a safety factor was employed, or lowered from another OEL?

Keating explained its a factor of approximately 3 reduction from the current PEL based on the human subject data. Irritation effects were observed at 50 ppm but not 20 ppm. He will clarify this in the presentation to the board.

David Ross, Cal Trans, asked when California changes a PEL, what is done with the SDS that is typically based on federal regulations. He asked about what one does when people use the federal PELs in California.

Kirkham explained that SDSs must contain federal PELs but wasn’t sure whether SDSs must contain the Cal/OSHA PELs. If employees fall under Cal/OSHA jurisdiction, then the Cal/OSHA PELs rather than the federal PELs apply to them.

Keating reminded that often a lower limit, such as in ACGIH TLV, is already on the SDS.

**Benzophenone (BZP) – Discussion**

Keating noted that benzophenone is one of the remaining priority 1 substances from the current list, and that the documents presented are the first draft of a new format that was suggested by committee members to tabulate health effects information as a summary for the first presentation. The draft consists of tabulated cancer, reproductive, and endocrine data with brief summary conclusions. BZP has very few OELs at this time. There is a WEEL for this compound but no recommended PEL yet in this document. Keating sought guidance from this committee on where to focus the health effects review. There are multiple endpoints to consider, but the committee needs to select one for the basis for hazard assessment. Reproductive/developmental with BZP studies are basically negative. The carcinogenicity data is more relevant in that renal tumors are seen in multiple species with significant dose response data within those groups. Mutagenicity is mostly negative. BZP itself seems not to be mutagenic or an endocrine disrupter, but a metabolite is. 4-Hydroxy BZP is mutagenic and estrogenic, however there is not good toxicokinetic data on BZP in either animals of humans.
Sarah Janssen asked about whether there were any endocrine receptor (ER) beta studies found given that these studies are relatively old, and the binding assay was for ER-alpha but there is also ER-beta.

Keating replied that he was not sure, but he would look into it.

Janssen volunteered to look more into BZP. BZP is used broadly in many personal care products such as sunscreens, and that there was a biomonitoring study of firefighters showing elevated levels, so should not discount endocrine disruption potential.

Keating replied that this brings him to his point in that this substance should be further discussed in a subcommittee to evaluate the endpoints and bring it back to this committee. Janssen volunteered for the committee. Keating noted that there was one hazard assessment using rat kidney data and that would be the place to start, but wants to review all data with a subcommittee first. Keating also invited HESIS to sit on the subcommittee as has been done for other compounds.

Kent Pinkerton asked Janssen about the firefighter study she mentioned. Janssen replied that it was a 2016 firefighter study from Southern California and that she would pass it around to the committee.

Keating continued discussing the handouts. He mentioned that Cal/OSHA provided usage data from the CERS database showing most usage in personal care products, a major UV filter in paint, and as a UV filter in paper.

Kirkham asked about the usage data table in the handout on page 3. Keating clarified that all the data was from CERS and includes SIC code, number of users, and quantity in gallons on site.

Keating then described the document discussing epidemiology. There is a number of epidemiology studies primarily focusing on endocrine endpoints. He said he would review with the subcommittee all of the tables in the substance sheet to fine-tune them.

Michael Bates asked about the section on endometriosis that appears to describe effects from 2-4 BZP, but does not see the data. Keating replied that 2-4 BZP is a metabolite of a BZP derivative and is not the target compound for this project so he did not include the table. Much of the literature on the estrogenic effects for BZP refers to BZP derivatives such as BZP 2 and BZP 3 which generate a different metabolic profile than BZP and are clearly estrogenic. Keating asked for stakeholder input.

Will Forest commented that Hawaii is banning sunscreen primarily due to environmental concerns. Keating replied that many of the endocrine studies are environmental exposures. Janssen indicated that it is also added to prolong shelf life.

Keating concluded that BZP will be coming back to committee when we have more information.

Sulfur Dioxide (SO₂) – Discussion

Keating briefed the SO₂ summary. ACGIH recommendation is to do away with the 8-hour TLV and adopt a 15-minute STEL at 0.25 ppm based on effects in asthmatics. At the previous meeting, there were questions about the controlled human studies with asthmatics so Keating included some additional studies on that. Keating reviewed the slides and presented the tables discussing the various studies and the endpoints used to demonstrate clinical effects in the subjects. The two endpoints presented were forced expiratory volume in 1
second (FEV1) and specific airway resistance (SRaw). Keating invited feedback on the tables presented (see handouts).

Patrick Owens asked about what the duration of exposure was in the study. Keating replied that he thought it was 15 minutes, but that he would track down that study and check. Owens asked if these were un-medicated subjects. Keating replied that oral medication was withheld for 48 hours and inhaled medication for 12 hours prior to testing.

Harrison commented that the US EPA and California Air Resources Board (CARB) set 1-hour and 24-hour standards for SO2 at 0.25 ppm for 1-hour and 0.04 ppm for 24-hours, and they have comprehensive literature reviews that document and support those numbers, so the committee should start there. He asked whether there is a reason why the committee doesn’t go from the community to workplace for sensitive populations. He proposed a small sub-committee to look at the environmental studies and look at the applicability to workplace. Keating responded that one of the issues is the exposure to multiple ambient air pollutants in the community–based studies.

Owens asked if the studies were based on elderly or children. Keating replied that the ambient studies are based on asthma reports, ER reports, and not controlled studies. There are many factors that go into those EPA community studies so we can look into those and get direction.

Pinkerton stated he assumes that SO2 exposures are primarily due to coal burning where there are high levels of sulfur in the environment. He asked about where the exposures come from in the workplace.

Harvard Fong, Department of Pesticide Regulation, answered that SO2 is a “dual use” material in that it has a pesticidal activity (grape fumigation, wine barrel fumigation, fermentation termination in the wine industry, and in field packaging of grapes). Keating added that it is used in flat glass manufacturing and water treatment. Owens added that it is produced at refineries, and its an intermediate.

Keating continued reviewing the studies.

Bates asked if the study subjects were exposed to the methacholine and SO2 at the same time. It looks like they were not at the same time.

Forest mentioned that 22.6% were methacholine positive in the German study and asked if that is representative of the asthmatics in the adult U.S. population. Forest stated that the assumption is they were not exposed to metacholine and SO2 at the same time. He asked whether the subjects were workers and Keating stated he would check but he thought it was the general population. Pinkerton replied that in some populations you might get as high as 22%, but more typical would be 10 to 15%.

Harrison asked what the current PEL is. Keating replied that the current 8-hour PEL is 2 ppm, and we are looking at setting a new STEL. Kirkham indicated that if we were to adopt a STEL that is lower than the PEL, it would make the PEL irrelevant. Consensus from Harrison, Unmack, Owens, etc. is that it would not make sense to set the STEL at a level so much lower than the PEL. Keating brought it back to looking for direction on what end point to work with. Reviewed Labor Code section 144.6 which requires the standard, to extent feasible, assures that no employee suffer material impairment.

Owens brought up that “material impairment” is sort of a grey area. Forest replied that for asthmatics it is a material impairment because they can’t breathe. Janssen agreed. Unmack asked what the recovery period is,
and whether it means that you cannot return for your next shift, or that you cannot complete your shift.

Owens mentioned that the odor threshold is just below 0.2 ppm, and it’s an irritant, so he doesn’t think people would be working for long at these levels.

Keating said he would bring this back with more information.

Bates went back to material impairment. He indicated that he just looked it up, it is essential, important, relevant. Keating agreed. Owens said that to this group, if it is an asthma attack, it is significant and important.

Kirkham mentioned that terms like these have been debated by the federal courts in relation to federal rulemaking and can be found in the preamble of current federal rulemaking projects.

Eric Brown asked if a 10% change in volume (FEV) is equivalent to an asthma attack. He does not think so. Not sure if this study is applicable to rulemaking that would move to material impairment.

Keating said he would look at the EPA data that Harrison mentioned, ventilation rates and how they apply to the occupational setting, and reproductive effects.

**Di-(2-Ethylhexyl)-Phthalate (DEHP) - Discussion**

Keating introduced the discussion of DEHP. HEAC had discussed DEHP in 2010 and 2012 and in one of this committee’s previous meetings. Several issues brought up in that meeting were on phthalate usage in California, in what workplaces are phthalates used, and since phthalates are not particularly volatile, how and when does DEHP air contamination occur in the workplace. Keating spent some time looking into anecdotal usage by looking at specific industry categories such as medical device makers or other plastic manufacturers in the California Environmental Reporting System (CERS) data set. Keating also showed data on phthalate emissions in the Chemical Toxic Inventory (CTI) from CARB. Forest indicated that neither of these sources are a good reflection of usage. Keating agreed, but explained these are the best we have at this time. CERS seems to be the better indicator of workplace use, and Keating discussed several users as identified in CERS. As an example of differences, Keating mentioned that one automotive manufacturer that reported phthalate emissions in their CTI report, but did not report the same phthalate in their CERS data.

Dan Leacox asked if there are processes where phthalates are produced as a byproduct but are not stored. Keating indicated that he did not think so.

Forest asked if the CERS data was always reported as a maximum daily amount. Keating said that sometimes it is a daily average and sometimes daily maximum.

Keating discussed looking at data for plastisol usage as well.

Dave Ross, Cal Trans, asked if plastisol would be considered an article, because in federal codes they do not have to list what is in it if it is an article. Kirkham replied that if it is a drum of liquid it could not be considered an article. Owens indicated that if in the SDS the material has <1% phthalate they do not have to report it in CERS. Keating said that CERS may be under reporting phthalate usage.

Janssen stated that medical devices use DEHP. PVC-based IV bags and tubing include DEHP to make the plastic softer. Not allowed for neonatal use. Approximately 30-40% of the tubing is phthalate (DEHP in particular).
Unmack indicated that meat cutters’ gloves are about 50% phthalate. Janssen replied that it is not unique to medical device industry. Dairy industry uses a lot of plastic tubing as well, so it is likely that a lot of PVC based plastic tubing has phthalates.

Keating indicated that it seems that DEHP usage is coming down and being replaced with other phthalates, but is still in use. Question is whether it is an inhalation hazard. Janssen commented that there were some other studies that looked at rubber workers that have high levels of DEHP, and asked if Keating had looked at those. Keating replied that he has not yet. This discussion is a prelude to prioritization that will be talked about in the afternoon. One criteria for prioritization is whether new significant health effects have been found and Keating believes that is the case with phthalates. Keating mentioned that the ACGIH 2019 notice of intended changes lists drop him from 5 to 0.5 mg/m³ for DEHP, so believes that this is a good time to look at DEHP.

Keating asked the group what endpoint the committee should be looking at. Janssen indicated that the Consumer Products Safety Commission had done a cumulative risk assessment for phthalates, and the EPA has a draft that has not been finalized, and the National Academy of Sciences has developed a methodology to look at a particular group of phthalates that have the same mode of action.

Harrison asked if setting a more protective workplace standard helps drive safer substitutes because there are phthalate-free manufacturers. Phthalates are more consumer and environmentally driven right now, but if we set a lower PEL that helps to push toward phthalate free products, he would be in favor of that. But, he is also interested in who manufacturers, who uses, what products it ends up in, etc. Janssen indicated that the CPSC looked at this and the use of DEHP is going down and the use of DINP and DIDP is going up.

Tom Hmiel, American Chemistry Council, stated that the exposures shown by the CPSC for DINP were significantly lower than any of the other phthalates. DIDP and DINP were specifically looked at. DEHP is not permitted to be used in toys because there is a toy ban. By itself, DINP did not reach the level of regulation, but the CPSC decided to regulate DINP based on cumulative exposure. DIDP was determined by the CPSC to be safe, and is permitted for use in toys. DINP and DEHP have significantly different tox profiles so be cautious that when talk about phthalates that don’t lump them together. There is a significant difference in toxicity when the carbon backbone is 6 carbons or lower versus 6 carbons or higher. ACC phthalates panel could provide some information on use data that could be helpful. In response to some of the previous discussion, Hmiel stated that there may not be CERS data from some of these users because they may be using plastic film, cutting it, and plastic film is already plasticized, so there is no inhalation exposure there. To get to an exposure, they would have to bring the plastic compound to an elevated temperature e.g. laminating, you have to get to a boiling point or at least to a temperature where get a fume because not particularly volatile.

Peter Sholtz, DOSH, asked about a dust exposure because of workers compounding phthalate materials. Hmiel replied that in some cases where you are using a dry blend, which is before its put into an extruder, there could be some exposure if there is not good dust control. This is typically the step where the dry blend is compounded before it is extruded into pellets or film. Also, when extruding or molding a part, there is elevated temperature so there can be some off-gassing there.

Keating asked if the ACC had commented on the ACGIH TLV reduction proposal. Hmiel stated that they represent higher (C9-10) level phthalates, so they did not comment on that proposal.

Keating wrapped up the morning session, there were no other questions or comments.
LUNCH BREAK

PEL Prioritization - Discussion

Keating introduced the topic of prioritization. HEAC likes to maintain a list of approximately 10 chemicals as priority 1 (P1) that the committee will address over the next HEAC cycle. It helps the Division plan internally and alerts stakeholders to the substances that will be coming up for review. SO2, benzophenone, and turpentine are the last three on the current P1 list, so the P1 list needs to be updated. The Division has some internal procedures and criteria that it applies, HESIS has some recommendations, and the Division solicits recommendations from stakeholders about substances that should be on P1.

Keating stated that he would introduce some chemicals today, give a quick synopsis of the reasons why they were put on the list. HESIS will explain their recommendations, and then he will open the floor for discussion. Keating began by reviewing the PEL prioritization handout which describes procedures for developing a list of substances for review and how substances the will be ranked (see priority list handout). Kirkham pointed out that on the table, the absence of usage data does not mean there is no use, just that the Division has not acquired that data yet.

Bates asked about what the notation “10-50M” indicates on the table. Keating replied that it is EPA usage numbers in million pounds of chemical, and that he does not have it for every substance. Keating continued to review the list.

Leacox asked about IVF [sic] note at the end of the list. Kirkham answered that it is an ACGIH notation that stands for inhalable fraction vapor (IFV), that the chemical may be present as a vapor and aerosol, and it cautions that you may need to sample for both the vapor and aerosol.

Keating continued by presenting the proposed DOSH recommendations for P1 consideration. They included phthalic anhydride (highest ratio), butane (interesting because of its use in the cannabis industry), monochloroacetic acid (significant ratio and high usage), benzaldehyde (same), bisphenol A (BPA) or 1-bromopropane (high ratio), DEHP (current PEL based on outdated toxicology), titanium dioxide ultrafine <100nm (nanomaterial), and cyclopentadiene/dicyclopentadiene (ACGIH is adopting one TLV for both). Keating noted that a major toxicological assessment of BPA is scheduled to be released in August 2019 that would take some time to interpret, so he did not recommend putting BPA on the P1 list at this time.

Brown asked why benzaldehyde was recommended, was not able to find much information on it. Keating said it had high CERS usage and no current OSHA limit.

Forest asked why titanium dioxide was singled out as the nano particle to look at. Keating replied that it was from a NIOSH recommendation at 0.3 mg/m3. Bob Nocco, Chevron, added that it is listed under IARC as well. Pinkerton stated that TiO2 was considered a nuisance dust, but now that it is ultrafine, there have been studies that show a high degree of toxicity. Unmack added that he believes this is getting the attention because it is a manmade ultrafine and specifically designed for high surface area. There are a lot of naturally occurring ultrafine particles as well.

Brown asked where diesel exhaust was. Kirkham mentioned that there is an MSHA standard and that ACGIH considered a TLV years ago but it had fallen off of their list. Also, HESIS has proposed a limit. Forest asked if the MSHA standard is based on carbon, because diesel exhaust is a mixture. Kirkham said that he believes that the MSHA is based on total carbon. Keating reminded that it was brought up about a year ago and it was decided then that it was too complex an issue for HEAC, so it was suggested to be put to a special committee.
Harrison asked if we have jurisdiction for benzene in upstream oil and gas, because the benzene standard exempted oil and gas. Concern is that when they open the tank hatches there can be very high readings of benzene at the top of the tanks. There was an exemption for upstream oil and gas at 10 ppm, where general industry is at 1 ppm. If that is still the case, he asked whether HEAC has any jurisdiction to review that number. Kirkham added that he is looking at our benzene standard and sees the 10 ppm exemption for cleaning of barges and tanks. Typically, HEAC reviews levels presented in 5155. Harrison indicated that this has been an issue for him that this has never been adjusted. Stakeholder (formerly from Chevron) asked if we have seen employers allowing employees to work in those conditions. Harrison replied that he has talked to several people in industry and IHs and that they say they are using the 0.5 level even though they technically do not have to. He is concerned that that is not the case across the board and it would be highly satisfying to remove that exemption.

Harrison asked Keating about whether the Division had looked back at the HESIS OEHHA report that did a systematic analysis of environmental verses occupational standards to be sure that we are not missing any P1s. Kirkham asked the name of the report and Harrison answered that it is the Sarah Hoover report on their website. Harrison added that he wanted us to look at any major carcinogens or reproductive toxicants on the Prop 65 list from OEHHA to see if they should be considered.

Keating introduced Kashyap Thakore, CDPH/HESIS, to present their recommendations. Thakore presented the hand out from HESIS that shows their recommendations for the priority list. HESIS has seven chemicals listed and provides the priority basis for these chemicals. Thakore mentioned that Keating has already covered three of them, BPA, 1-bromopropane, and TiO₂. In addition to those three, HESIS recommends PCBTF (now being considered as a carcinogen), DIDP (is reported on prop 65 as a developmental carcinogen), and isoprene (now OEHHA has designated as a carcinogen, IARC as a 2B). Keating pointed out that PCBTF has particularly high usage, and asked if there has been a completed cancer study. Thakore replied that it has been considered by OEHHA, IARC and NTP currently, but they are waiting for final documents.

Keating pointed out some of the California Toxics Inventory numbers listed are not usage, but are based on stack emissions; he doesn’t think one can base usage on this data. Brown commented that this is not research-derived, it is amounts reported to the database.

Forest indicated that he is a little skeptical of butane. It is a flammable and explosive hazard being used in marijuana growing, but other than flammable and explosive workplace hazards, he asked about whether there is a reason to pursue that. Keating said he was looking at the ACGIH STEL of 1000 ppm with a CNS endpoint, not really a chronic effect. The current 8-hour PEL is 800 ppm. Kirkham added that it is far below the LEL, and the ACGIH has the EX notation to indicate the risk of explosion. Forest stated that it doesn’t seem to him to rise to the level of importance of anything on the HESIS list, or many other substances for that matter.

Keating stated that we would post the proposed P-1 list as soon as possible after reviewing the comments. Forest stated that he does not agree with the list on the screen. Pinkerton commented that since cannabis has been decriminalized, he knows that there are at least 10,000 farms in Humboldt County and none of the cannabis workers have much in terms of protections, so if butane is an issue and is used frequently it may deserve some attention at least for the workers in the cannabis industry. Brown commented that butane may not be used in the cannabis growing operations but more likely in THC extraction operations.

Nocco commented that a lower PEL for butane may have prevented the incidents of tank hatching that Harrison was referring to earlier.
Mike Geyer, Kerntec Consulting, has spent a lot of time in the agriculture industry and wanted to say that a greenhouse operation is a greenhouse operation whether it is growing flowers, strawberries, ornamental etc. it is really no different. The processing side is perhaps where the butane comes into play, not the growing operation.

Leacox added as a process point that we have this list that we presented and talked about so if we want to add additional substances, they need to be brought up to the committee as proposed additions before finalizing the list to give an opportunity for comment.

Geyer indicated that he wants additional usage data before determining priority.

Owens asked if we were looking at one PEL for both cyclopentadiene and dicyclopentadiene. Keating replied yes, that is the proposal. ACGIH is adopting one TLV for both.

Keating wrapped up the discussion on prioritization.

Wildfire Smoke- Update

Keating introduced Eric Berg to give an update on the status of wildfire smoke.

Eric Berg, DOSH, updated the committee on wildfire smoke. There is currently a petition before the Standards Board on Wildfire Smoke. The Division staff and Standards Board staff have each drafted a response to the petition and the petition will be heard by the Board at the public meeting in Pasadena on March 21, 2019. There was also a bill introduced to the legislature to address Wildfire Smoke, using the air quality index (AQI) and would require employers to provide respirators for voluntary use. Berg indicated that at the next meeting the Division can give another update as to what the Board decision was.

Other Business

Keating asked if there were any additional comments.

Elisa Koski, Standards Board, informed the group that she would be leading an advisory committee to look at updating 5162, the emergency eyewash and shower regulation, to update the ANSI reference from 1981 to 2014, and possibly do some other things with it. Koski asked if anyone was interested in being on that advisory committee and that she would leave some business cards. She is looking at around June of 2019 for putting the meeting together. She is particularly interested in people that have an opinion about how to define corrosive, toxic by absorption, or severely irritating, because those terms are used in 5162 but are not defined.

Keating announced that the next meeting will be June 4, 2019, and that the September 2019 HEAC meeting is cancelled so he can work with staff on preparing documents for the Standards Board. HEAC meetings will resume in December 2019. In June we hope to get closure on the P1 list so we can get started on the next group of summaries. Keating intends to come to the June meeting with more formal summaries on SO₂ and benzophenone.

Meeting adjourned.