Brian Magee, Ph.D. Comments on IRIS Benzo(a)pyrene Profile, April 15, 2015

Good morning. My name is Dr. Brian Magee, and I am speaking today on behalf of the American Petroleum Institute and the Pavement Coatings Technology Council. Thank you for the opportunity to address the Panel. I'd like to focus today on the proposal Dermal Slope Factor (DSF), which does not pass the most simple of validation tests. In March, I spoke about the fact that the DSF predicts that PAH levels in typical urban soils cause more than 100% of skin cancer in Americans at certain anatomical locations and in certain sub -populations.

Today, I'd like to extend those comments to show how many skin cancers the DSF predicts when people touch char-broiled food, such as hamburgers. To perform this risk assessment calculation, one needs to know the benzo(a)pyrene- toxic equivalent (BaP-TE) concentration on the surfaces of charbroiled foods. All data in the published literature give PAH concentration data for meat homogenates, not the surfaces. To fill this data gap, ARCADIS cooked hamburgers, chicken and salmon on a café gas grille and then scraped the meat surface to obtain surface samples. These samples were analyzed by Alpha Analytical for an extended PAH list that included several of the new PAHs for which EPA proposed Relative Potency Factors (RPFs) in 2010.

Table 1

Average BaP-TE (µg/kg) in Meat Cooked on a Gas Grill[a]

Sample	EPA RPF (2010)[b]		EPA RPF (1993)[c]
	$BaP\text{-}TE_{Extended}$	$BaP\text{-}TE_{16}$	$BaP\text{-}TE_{16}$
Salmon, Skin (*n* = 3)	45.5	11.5	6.65
Chicken, Shavings (*n* = 3)	211	59.2	38.5
Hamburger, Shavings (*n* = 4)	318	75.8	42.5
Hamburger, Whole (*n* = 3)	40.3	9.53	5.19

[a] BaP-TE calculated using ½ MDL for non-detects and half concentrations for PAHs that co-eluted.

[b] Relative potency factors are from USEPA. 2010.

[C] Relative potency factors are from USEPA. 1993.

ARCADIS found that cooked meat surfaces contain roughly ten-times higher levels of PAHs than homogenate samples (hamburger) and that many of the extended list PAHs proposed by EPA in 2010 are present in grilled meat. The BaP-TE concentration of the surface of meat was found to be 20.5 ng/cm2. Estimated lifetime cancer risk was estimated using the EPA equation in *Appendix G Summary of External Peer Review and Public Comments and USEPA's Disposition* (EPA, 2014) with the following assumptions:

- Children 1-2 years old did not touch char-broiled hamburgers (or other charbroiled meat)
- Older children and adults touched hamburgers (or other charbroiled meat) 20 times a year
- The area of skin contacting the hamburger was one palm (65 cm for the child and 245 cm for the adult)
- EPA's transfer factor from soil was not applied because the DSF is in *administered dose* units, and the PAHs in greasy meat would be absorbed in a similar manner as PAHs applied to the mouse skin

The estimated lifetime cancer risk for the hand is 1.8E-03. The lifetime risk of contracting nonmelanoma skin cancer at all sites in the US population is 2E-01 (Robinson, 2005; Stern, 2010). Only 2.8% of these skin cancers are present on the hands (Scotto, et al., 1983), so the lifetime cancer risk for hand cancer is 5.6E-03. No information could be found in the literature on the rates of non-melanoma skin cancers on the palms or fingers, so the observed hand cancers in the population are likely on the backs of the hands, which get greater exposure to sunlight.

The lifetime risk value of 5.6E-03 for nonmelanoma skin cancer of the hands refers to the white population of the United States. Almost all nonmelanoma skin cancer surveys have been performed on white Americans, because their skin cancer risk is much higher than the risk for black Americans. Specifically, the nonmelanoma skin cancer rate in black Americans is 68-fold lower than for white Americans (Scotto, et al., 1983), at 8.2E-05 for hands.

Table 2

Nonmelanoma Skin Cancer Predicted by Proposed DSF

Assuming 30 Contacts per Year with Charbroiled Meat

Population	Predicted Hand Cancer Risk	Actual Hand Cancer Risk	Predicted/Actual
White Americans	1.8E-03	5.6E-03	33%
Black Americans	1.8E-03	8.2E-05	2,200%

In the following table the estimated skin cancer risk from dermal contact with char-broiled meat is added to that from dermal contact with urban background soil.

Table 3

Nonmelanoma Skin Cancer Predicted by Proposed DSF

Dermal Exposures to Charbroiled Meat & Urban Soil

Population	Predicted Hand Cancer Risk, Meat	Predicted Hand Cancer Risk, Soil	Total Predicted Hand Cancer Risk	Actual Hand Cancer Risk	Predicted/Actual
White Americans	1.8E-03	3.8E-03	5.6E-03	5.6E-03	100%
Black Americans	1.8E-03	3.8E-03	5.6E-03	8.2E-05	6,800%

These calculations demonstrate that the DSF is fundamentally flawed because it predicts that 100% of the observed hand cancer rate in the white population is due to touching BaP-TE in char-broiled meats and urban soils and 6,800% of the observed hand cancer rate in the black population is caused by touching BaP-TE in charbroiled meats and urban soils. These results contradict the known role of ultraviolet radiation from the sun in the etiology of nonmelanoma skin cancer.

References

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