Preliminary Screening Information on Possible Classes of Chemicals used in UV Applications

Laurel Plummer, PhD
Office of Environmental Health Hazard Assessment

Presentation to the Scientific Guidance Panel
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Purpose of agenda item

- Discuss two possible classes of chemicals used in UV applications*
  - Benzophenones
  - Phenolic benzotriazoles
- Obtain Panel and public input on next steps

**"UV applications" includes uses as UV stabilizers, UV absorbers, or photoinitiators, for example.*

Why classes?

Evaluating chemical classes or groups, rather than individual chemicals:

- Is resource-efficient for SGP chemical selection
- Allows the Program to quickly respond to shifts in chemical use and target emerging chemicals of concern
- Facilitates development of broad lab panels for related chemicals
- Allows for non-targeted screening within a class of chemicals

Background: Criteria for recommending designated chemicals

- ***Exposure or potential exposure*** to the public or specific subgroups
- The ***known or suspected health effects*** resulting from some level of exposure based on peer reviewed scientific studies
- The ***need to assess the efficacy of public health actions*** to reduce exposure to a chemical
- The ***availability of a biomonitoring analytical method*** with adequate accuracy, precision, sensitivity, specificity, and speed
- The ***availability of adequate biospecimen samples***
- The ***incremental analytical cost*** to perform the biomonitoring analysis for the chemical

Preliminary screen of compounds used in UV applications

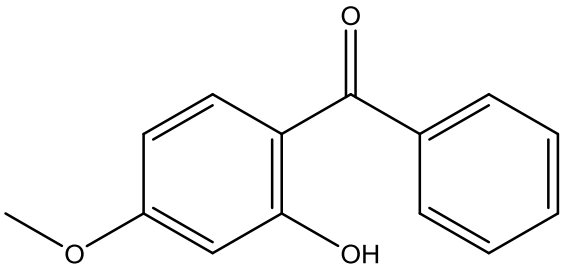
Broad research on a variety of topics, including:

- Chemical identity and structure
- Use and production
- Detections in humans, biota, and the environment
- Bioaccumulation and persistence
- Toxicity information

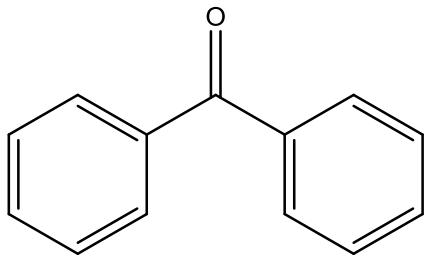
Some other compounds used in UV applications

- *p*-Aminobenzoates
- Avobenzone
- Cinnamates
- Salicylates

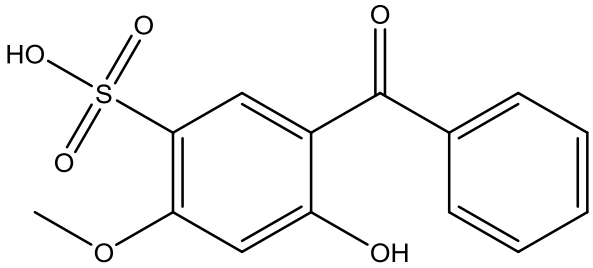
Benzophenones: Example chemicals



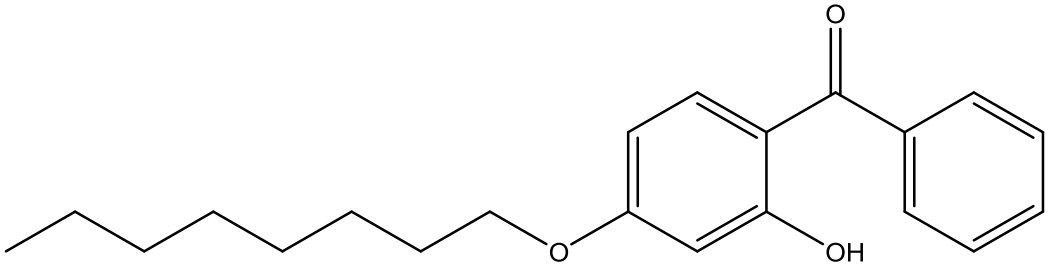
Benzophenone-3 (BP-3)



Benzophenone (BP)



Benzophenone-4 (BP-4)



Benzophenone-12 (BP-12)

US production/import volume

Chemical	2012 volume (lbs)
Benzophenone-3 (BP-3)	100K – 500K
Benzophenone	3.9M
4-Methylbenzophenone	Withheld
Benzophenone-1 (BP-1)	32K
Benzophenone-4 (BP-4)	Withheld
Benzophenone-12 (BP-12)	2M

Biomonitoring studies

- Detections of parent compounds and/or biomarkers in urine:
  - BP-3, BP, BP-1, BP-2, BP-4, BP-8

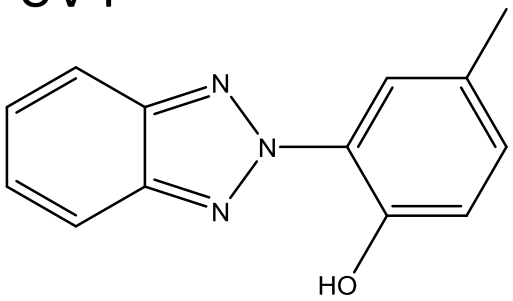
- Detections in other biospecimens:
  - Placental tissue: BP-4
  - Serum, breast milk, adipose tissue: BP-3

Some toxicity information

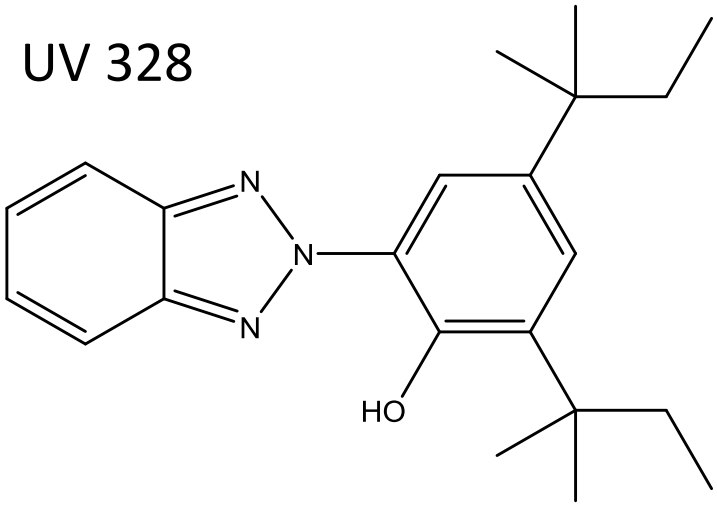
- BP listed under Proposition 65 as known to the state to cause cancer
- Several benzophenones, including BP-3, show indications of endocrine activity (estrogenic, anti-estrogenic, anti-androgenic)
- Selected ToxCast™ bioactivity for benzophenones tested included effects on:
  - Endocrine activity
  - Cell viability
  - Cellular metabolism
  - Immune- and inflammation-related endpoints

Phenolic benzotriazoles: Example chemicals

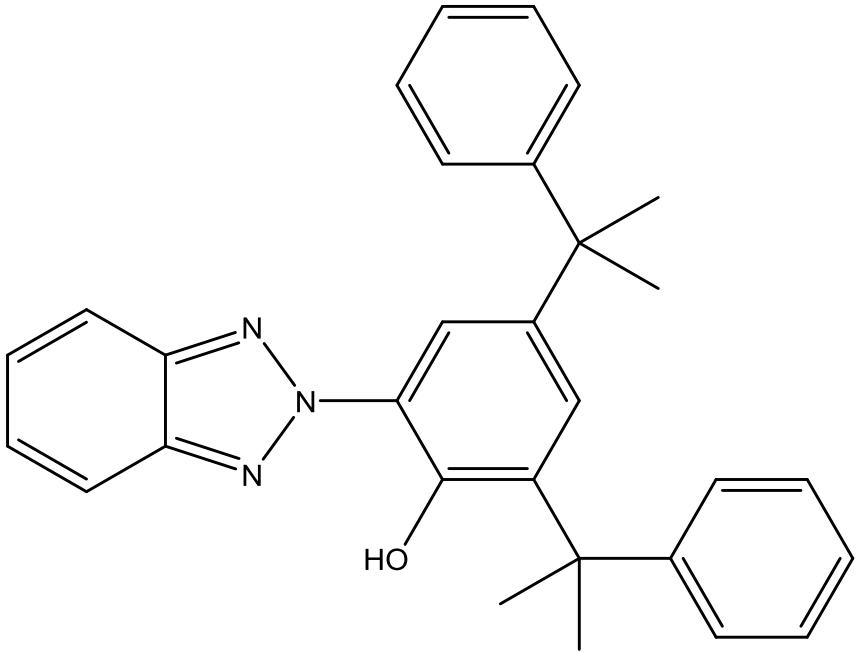
UV P



UV 328



UV 234



US production/import volume

Chemical	2012 volume (lbs)
UV P	605K
UV 234	1M - 10M
UV 326	394K
UV 327	Withheld
UV 328	2.2M
UV 329	500K - 1M

LogKow and bioconcentration factor (BCF)

Chemical	LogKow	BCF (L/kg)
UV P	4.31 *(exp)*	324.1
UV 234	7.67	3,741
UV 326	5.55	1,283
UV 327	6.91	10,160
UV 328	7.25	6,006
UV 329	6.21	5,843

Evidence for persistence: LogKow ≥ 4
Evidence for bioaccumulation: BCF > 1,000

Biomonitoring study: Breast milk

Chemical	Detection Frequency (%)	Average ± SD (ng/g)	Maximum (ng/g)
UV P	13	19.2 ± 60.1	374
UV 326	9.1	1.77 ± 7.09	53.1
UV 327	29	10.0 ± 19.0	95.5
UV 328	98	64.3 ± 66.4	334
UV 329	8.7	4.54 ± 19.5	178
For comparison: Tonalide (synthetic musk)	*54*	*65.1 ± 84.9*	*350*

Lee et al. 2015

Detections in biota

- Dolphin plasma
- Porpoise blubber
- Aquatic organisms (fish, mussels, and other)

Some toxicity information

- NTP studies underway on several chemicals in this class
- A few phenolic benzotriazoles show indications of:
  - Anti-androgenic activity
  - Aryl hydrocarbon receptor (AhR) pathway activation
- Selected ToxCast results for phenolic benzotriazoles tested included effects on:
  - Endocrine activity
  - AhR pathway activation
  - Xenobiotic metabolism
  - Cell proliferation
  - Immune- and inflammation-related endpoints

Options for the Panel

The SGP could:

- Request that OEHHA prepare a potential designated chemical document on one or both of these classes
- Propose further screening or continued tracking of the classes
- Advise no further action on either classes
- Suggest other classes for possible consideration