Lessons Learned
Laboratory Oil Bath Fire

What Happened?

On a typical early spring evening, a postdoctoral associate was preparing an experiment inside a chemical hood that involved heating an oil bath to 100°C on a hot plate. About 200 ml of Thermo Fisher Synth 260 synthetic bath oil was poured on a dish, then the dish was placed on a Corning PC-420D heating stir plate with an external temperature probe. The hot plate external temperature probe is intended to sit inside the oil bath to modulate the hot plate and control the temperature.

The hot plate used in the experiment does not have the auto-shut off safety features that will shut down the device when the temperature probe is not inside the oil bath, or when the hot plate is heated above user's set temperature. The probe was accidentally left on top of the dish when the heating plate was turned on, instead of being placed in the oil bath.

The top plate temperature was heated to as high as 550C. The oil used has an auto-ignition temperature of 275°C. It was estimated that the heating plate was on for about 10-15 minutes when **the liquid bath caught fire**. When a fire extinguisher was used, the fire spread on the internal surface of the chemical hood. Finally, the lab staff used an aluminum can to smother and extinguish the fire inside the oil bath.

A typical heating stir plate with temperature probe.

Why Did This Happen?

- The temperature probe was not placed in the oil bath.
- The hydrocarbon oil used will auto-ignite when heated above 275°C.
- The hot plate used did not have auto-shutoff safety features.

Lessons Learned

- Laboratory staff must be trained and familiar with proper hot plate set-up.
- Hydrocarbon oil should be replaced with anodized heat blocks or mineral oil.
- If hydrocarbon oil is being used, then the oil-based bath fluids must have a flashpoint at least 50°C higher than the expected operating temperature.
- The laboratory should use a hot plate with auto-shut off safety features that will turn off the device when the temperature probe is not placed in the oil bath.
- Laboratory staff should wear flame-resistant lab coats, since their work involves pyrophoric materials and other high fire hazard operations.
- Due to the potential of splashing burning oil when using a fire extinguisher, alternative methods (such as sand) should be considered for extinguishing small, incipient lab fires.
- As result of this incident, the Laboratory Safety Coordinator created and initiated a safety quiz to orientate staff to the location of emergency response equipment and emergency contacts within the facility. The safety quiz was provided to the current laboratory members and will be part of the onboarding of future staff.
- EHS suggests the following tools and supplies:
  - Radleys Heat-on Block: VWR catalog #: 97002-098
  - Silicone oil: Sigma 84509
  - Heidolph® MR Hei-Tec Magnetic Hot Plate Stirrer: VWR catalog #: 89029-830

Anodized heat blocks are recommended by EHS.

Weill Cornell Medicine

Environmental Health and Safety
TEL 646-962-7233 WEB weill.cornell.edu/ehs EMAIL ehs@med.cornell.edu
Weill Cornell Medicine | 402 East 67th Street, Room LA-0020 | New York, NY 10065

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- For more information, please consult the following resources available on the EHS website:
  - Laboratorian Resources
  - Laboratory Safety FAQ
  - Fire Safety FAQ