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Melting and Using Agar in the Lab

What is agar?

Agar is used in many biological labs as a growth medium for various different microorganisms. It is often used in tandem with other growth conditions (i.e. antibiotics) to influence the growth (typically on a petri dish). The microorganisms that are put on the plate create colonies which are genetic clones of the parents. These can then be applied further to various applications in the lab for activities like genetic studies, protein growth, and so forth. Agar is very instrumental in these studies as the medium for growth, but can pose a hazard due to the heating of the solution, as well as the potential for needing to melt solidified media.

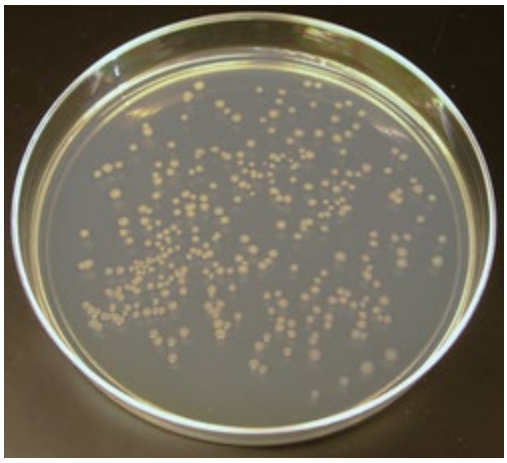

Figure 1. Agar plate with colony growth.

What are the hazards?

Agar poses low innate hazard from exposure. It can cause irritation in the respiratory tract if inhaled, but there are not special precautions to take when handling agar (aside from the proper PPE that should be worn in lab at all times). The main hazard of agar arises after the solution is autoclaved. After autoclaving, the media bottle will be hot, so proper gloves should be worn. Before pouring the media into the petri dishes (i.e. making plates), the agar/media solution should be cooled to a temperature such that the glassware can be handled with nitrile gloves. However, if too much time passes between the autoclave step and pouring, the solution will solidify in the media bottle. The reheating of this solution to melt the agar typically poses the highest risk in this process. Also, many times plates are poured by the Bunsen burner, so special precautions should be taken around the open flame.

How can you minimize the hazard?

There are various ways that you can minimize the hazard when reheating the solidified agar solution. The following are the recommended options for getting this solid back to liquid, in order of preference when it comes to safety:

1. Put the media bottle back in the autoclave, or use immediately after autoclaving. This process will get you back to where you had started before the solution solidified or circumvent the solidification process. If there isn't a rush on making your plates, and the autoclave is available,

this would be the safest option to use. Be sure to keep an eye out so the media doesn't solidify again!

2. Use a water bath. This process allows for you to control the heating of the solution. An even, slow melt will occur over time, and will allow you to pour your plates with a minimal cooling period afterwards. This is a great alternative if the autoclave is occupied, or you do not want to wait for a full cycle to complete again.
3. Use a microwave. This is the least desirable method for heating your solidified agar, and EH&S discourages this. There have been multiple reported accidents of this solution boiling over after being removed from the microwave and burning the researcher. This can happen because localized regions of the media can superheat and flash boil when they are disturbed by being moved or even slightly agitated. Heating in short burst of 30 s or less, with swirling in between, can help to prevent superheating. If this method is being used, EH&S also recommends a site of nucleation be added to your media, such as a few Teflon boiling chips. Adding a nucleation site will prevent super heating by providing a surface for bubbles to form on.

The process of heating a material will always pose some sort of risk to the user, but following this guide can help minimize the hazard of having to reheat agar to pour plates. VWR has a guide on how to pour plates and melt agar, that echoes the tips found here.

Figure 2. Pouring plates should occur when the glass is cool enough to touch, but not too cool where the agar has solidified.

References

SDS for agar: https://www.sigmaaldrich.com/US/en/sds/sial/05040

VWR plate pouring: https://media.vwr.com/emdocs/docs/scied/Pouring_Plates.pdf