Transmission Electron Microscopy
Laboratory Portfolio

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Submitted for
MCR 683 Transmission Electron Microscopy
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N.C. Brown Center for Ultrastructure Studies
These images were prepared as part of the class MCR 485/683 Transmission Electron Microscopy at SUNY College of Environmental Science and Forestry, Spring 2019

All images were acquired on the JEOL JEM 2100F Transmission Electron Microscope in the N. C. Brown Center for Ultrastructure Studies
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Major: Wood Science

Minor:

Career Goals: Researcher, Educator, Inspirational Leader

This portfolio includes a set of micrographs from lab sessions demonstrating proper specimen preparation and imaging.

14 total number of images were acquired:
  7 Images were acquired from an animal tissue (mouse liver)
  7 from a plant source (maple cellulose)
Preparation of Mouse Liver tissues

1. Live mouse was euthanized; liver was harvested and diced.
2. Fixed with 1.5% glutaraldehyde and 1% osmium tetroxide
3. Washed thrice with water and series of dehydration in ethanol
4. Tissues were infiltrated with propylene oxide, embedded in epoxy 812 resin
5. Tissues were thin sectioned (60-90nm) on microtome
6. Mounted on a 400 mesh TEM copper grid
7. Thin sections stained with uranyl acetate and lead citrate

Imaging

7 images were acquired in TEM mode using different magnifications and accelerating voltages.
Figure 1. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a MAG of 10kX. The image shows numerous mitochondria (M) and Rough Endoplasmic Reticulum (Arrowed). Bar =1µm. SS 1. Alpha 3.
Figure 2. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a MAG of 15kX. The image shows numerous mitochondria (M) and Rough Endoplasmic Reticulum (Arrowed). Bar =500nm. SS 1. Alpha 3.
Figure 3. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a MAG of 25kX. The image shows numerous mitochondria (M) and Rough Endoplasmic Reticulum (Arrowed). Bar = 500nm. SS 1. Alpha 3.
Figure 4. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a MAG of 15kX. The image shows part of an erythrocyte (red blood cell: E). Bar =1000nm. SS 1. Alpha 3.
Figure 5. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a MAG of 25kX. The image shows part of an erythrocyte (red blood cell: E). Bar = 500nm. SS 1. Alpha 3.
Figure 6. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a lower MAG of 10kX. The image shows mitochondria (M) and hepatocyte (liver cell) nucleus (N) with double membrane (Arrowed). Bar =1um. SS 1. Alpha 3.
Figure 7. TEM image of mouse liver. The sample was stained with uranyl acetate and lead citrate. Image was acquired with 200kV at a higher MAG of 20kX. The image shows mitochondria (M) and hepatocyte (liver cell) nucleus (N) with double membrane (Arrowed). Bar =1μm. SS 1. Alpha 3.
Preparation of Plant Samples (Cellulose)

**Preparation of maple cellulose fibers/particles**
1. Maple wood was acquired and chopped into wood chips (match sizes)
2. Maple wood chips were macerated using Hydrogen Peroxide+ acetic acid at 25°C and 100°C
3. White macerated cellulose fibers were pulped using magnetic stirrers
4. 1% pulped macerated cellulose fibers were prepared using DI water
5. Solution was dispersed using a sonicator for a minute
6. A drop of solution was dropped onto a 400 mesh formvar coated copper TEM grid using a pipette
7. Specimen was stained using uranyl acetate

**Imaging**
7 images were acquired in TEM mode using different magnifications and accelerating voltages.
Figure 8. TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a MAG of 30kX. The image shows agglomerated microfibrils with strands of microfibrils (~23nm) which is less than 35nm as expected for microfibril diameter. Bar =200m. SS 1. Alpha 3.
Figure 9. TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a MAG of 100kX. The image shows agglomerated microfibrils with strands of microfibrils (~12nm) which is less than 35nm as expected for microfibril diameter. Bar =100nm. SS 1. Alpha 3.
Figure 10. TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a MAG of 200kX. The image shows nanocellulose particles Bar =50nm. SS 5. Alpha 1.
**Figure 11.** TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a MAG of 200kX. The image shows nanocellulose particles Bar =50nm. SS 3. Alpha 2.
Figure 12. TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a high MAG of 800kX. The image shows numerous nanocellulose particles (arrowed) Bar = 50nm. SS 5. Alpha 1.
Figure 13. TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a MAG of 800kX. The image shows a number of molecular cellulose crystals (arrowed) Bar =10nm. SS 5. Alpha 1.
**Figure 14.** TEM image of cellulose microfibrils. The sample was macerated using Acetic acid and hydrogen peroxide and stained with uranyl acetate. Image was acquired with 200kV at a MAG of 800kX. The image shows molecular cellulose crystals (arrowed) Bar = 10nm. SS 5. Alpha 1.
Reference links

- [https://www.researchgate.net/publication/312427503_Sirtuin_1_Downregulation_Exacerbates_Fibrosis_and_Inflammation_in_Obesemice_Liver](https://www.researchgate.net/publication/312427503_Sirtuin_1_Downregulation_Exacerbates_Fibrosis_and_Inflammation_in_Obesemice_Liver)

- [https://www.bcm.edu/research/advanced-technology-core-labs/lab-listing/integrated-microscopy/](https://www.bcm.edu/research/advanced-technology-core-labs/lab-listing/integrated-microscopy/)


- [http://www.drjastrow.de/WAI/EM/EMEry.html](http://www.drjastrow.de/WAI/EM/EMEry.html)