


**Welcome To
The University of Maryland**


**Department of Cell Biology and
Molecular Genetics**

**College of Computer, Mathematical
and Natural Sciences**




**Science and Our Food
Supply**


**Investigating Food Safety from
Farm to Table**



Your Maryland Team

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Our schedule

- Today
 - This morning
 - Safety in the microbiology laboratory
 - Pouring your own media
 - Professional development
 - simple stains
 - microscopy
 - This afternoon
 - All of the experiments!!
- Thursday
 - Look at results



Basic Lab Safety



Basic Lab Safety

- Always wash hands when you leave the room
- Wash down bench at the beginning AND end of the exercise
- Use gloves when handling hamburger
- Use goggles when heating anything
- Put parafilm on the plates after inoculation



Basic Lab Safety

- Please - Follow ALL safety instructions given to you by all of us
 - we are NOT being mean or rude even if it seems that way – please remember that for today and Thursday – YOU ARE STUDENTS – NOT TEACHERS.
- Labs we are using are used for
 - pathogenic Microbiology
 - Immunology
 - microbial genetics
 - recombinant DNA laboratory



What about all the good bacteria?

- 10X More Bacterial Cells than Human Cells in Your Body!
- Promote Health & Prevent Disease
 - Normal Flora
 - Stimulate Immune System Development
 - Compete w/ Pathogens
 - Metabolize Toxins
 - Produce Beneficial Metabolites



Coliforms

- group of Gram-negative bacilli put together because they share similar morphological and biochemical characteristics.
 - lactose fermentation w/ 48 hours
 - usually with acid and gas productions
 - 35-37°C
 - rods
 - non-spore forming
 - facultative anaerobes



<http://www.cehs.slu.edu/flx/medmicro/colif.htm>

Coliforms

- test for presence of fecal coliforms
 - > one of 9 tests done for water safety
 - > considered a more accurate indication of animal or human waste than the total coliforms.
 - > The EPA states that no more than 5.0% of samples can test positive for total coliform in a month. (NO Fecal coliforms are allowed)
 - > domestic water supply - 2000 fecal coliforms per 100 ml allowed





Probiotics



- Live microorganisms that when consumed in food or supplements have a beneficial effect upon the host.
- Types of Food
 - > Dairy Products
 - > Fermented Foods & Beverages
- *Lactobacillus* & *Bifidobacterium*



<http://nccam.nih.gov/health/probiotics/>

Lactobacillus


- Born without it but it soon gets established in our intestine and vagina
- Over 50 species of lactobacilli and it is most common one found in probiotics
 - > yogurt & fermented foods
 - > thought to help with diarrhea and lactose intolerance




If you buy/use them – be careful

- Be sure there are live cultures!
- Some types of bacteria are better suited for certain types of treatments
- Chronic conditions should get OK from physician first

Don't believe the internet!




General Info about this workshop!!



Can you really do all this??

YES, you can!!!!

And – there are lots of ways to save money along the way



Some money saving tips

1. Make new friends with the following people who can donate expired media to you (they can't use it!!! – but you can)

Hospitals

Diagnostic companies

Large Medical practices



Some money saving tips

2. Make the media yourself. community colleges/local universities have access to autoclaves



Some money saving tips

3. Learn to deal. Bigger scientific supply houses (Fisher Scientific, VWR) are likely to give bigger discounts – check with school district. Check out local big medical and dental practices – they may be able to help get supplies at a discount for you.



Some money saving tips

- 4. Check out Universities and Big companies undergoing renovations.
So much stuff is there for free – just because they want to space, all someone has to do is ask.



Some money saving tips

- 5. For most experiments – split the plates.





bacteria everywhere
1 plate instead of 4



Some money saving tips

- 6. Use smaller Petri dishes
Standard plates (ones we use, 100 x15 mm) take about 20 ml of media to fill – use 35 x 10 mm plates instead (save 60%) NOTE: more difficult to split in quadrants but can be halved.



Some money saving tips

- 7. Use smaller test tubes
You will need to decrease volumes accordingly. For example, in "Blue's the Clue", use 13mm test tube and only 3 – 3.5 ml of milk. This will allow you to buy the milk in pint sizes and there is less waste.



Some money saving tips

- 8. Buy big and save.
If you are making your own media, think long term. 100 g of TSA will give less than 2 liters of media and costs > \$40. 500 g will make almost 10 liters and costs < \$80. Which is a better deal? As long as it stays capped – it will last forever – and you can use it past the expiration date – don't worry.



Some money saving tips

9. Meat know-how

★ Cook one hamburger per team and take samples going from uncooked to 160°

★ Use the cheapest meat possible (*note- we've always had the best results using really cheap stuff!*)



Some money saving tips

9. Meat know-how

★ Talk to the manager of your store (discounts and sometimes freebies)

★ Ask the butcher to give you the smallest package available for "chilling investigation" (be sure to smile pretty but this will not work if your name is Ken).



Some money saving tips

10. Use cheap substitutes!
- measuring cups (cylinders)
 - plastic spoons (spatulas)
 - heating coils (hot plates)
 - wax paper (weight boats)



This morning

- Simple stain using crystal violet
- Directions are in your folder
- John and Sabrina will demo everything – *please* follow their instructions!!!
- ALL of you did your homework, right?

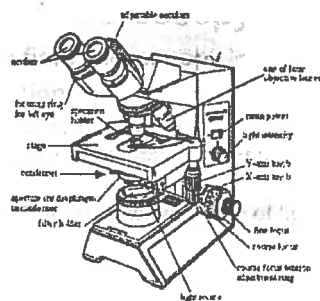


Microscopy

- bright field microscopy
- resolution
 - the ability to separate or distinguish between small objects that are close together
 - determined by wavelength of light

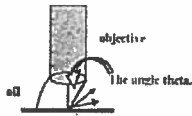


The Microscope



How oil immersion works

- page 7 of handout you read last night!!

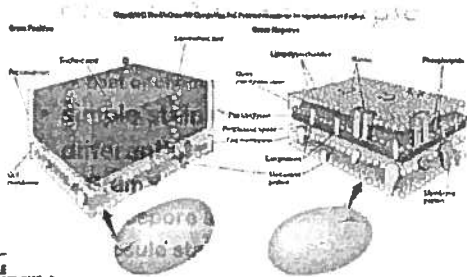


Preparation of sample

- fixation
 - > heat or chemical
- simple staining
- differential staining
 - > Gram Stain
 - > endospore stain
 - > capsule stain



Gram Stain

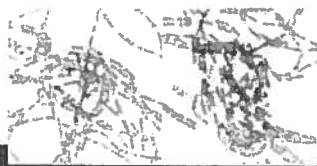


Gram Stain



Endospore

- formed by some Gm positives
- very resistant
 - heat, UV & other radiations, chemicals
 - survive 1 hr of boiling water!



Capsule Stain

- organized layer outside the cell wall
- usually polysaccharides
- help in resisting phagocytosis
 - increase pathogenesis

