



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> <b>Scott L. Karney-Grobe</b>	<b>Project Number</b> <b>J1315</b>
<b>Project Title</b> <b>Meat That's Raw: How Do You Thaw?</b>	
<b>Objectives/Goals</b> Which method of defrosting meat is safest & which method of cooking kills the most bacteria?	
<b>Abstract</b> <b>Methods/Materials</b> 10ml graduated cylinder, 100 disposable 1ml pipettes, Digital scale(g), 100 disposable 20ml test tubes, 1gal distilled water, Styrofoam chest, 2 100°C thermometers, 15w bulb, blender, 40 tryptic-soy agar plates, 60 disposable inoculating loops, 6 saran cutting sheets, aluminum foil, plastic wrap, 850w microwave oven, standard oven, stereo microscope, 2lbs(each) boneless, skinless beef, chicken, pork Test 1-Thawing Meat at room temp & in fridge. A. Cut, measure, & weigh 13 pieces of each meat (avg-4.5cmX5.3cmX2.3cm)(avg-68g); B. Puree 1 piece of each meat (controls) in blender, dilute (9-11 times) & plate samples; C. Incubate samples-60 hrs at 40°C. Divide plate into 4 quadrants, count CFU in 1 quad & mult by 4 to get total CFU/ml; D. Wrap remaining meats in plastic wrap & foil, freeze for 14 days; E. Thaw ½ of samples at 22°C on counter until meats reach internal temp of 22°C; F. Thaw remaining meats in fridge until soft. Bring to internal temp of 22°C on counter (10 min); G. measure bacteria count (step C). Test 2-Cooking Meat in Microwave: A. take 2 samples of each meat thawed on counter & in fridge & cook in microwave until internal temp of 72°C-beef, 77°C-pork, 85°C-chicken; B. measure bacteria count of cooked meats (Test 1 step C). Test 3-Cooking Meat in Standard Oven: A. Repeat A & B above using oven heated to 190°C. Beef-20 min. Chicken-15 min. Pork-17 min.	
<b>Results</b> Test 1: meats thawed on counter had much more CFU than those in fridge. Order of CFU/ml for meats (all tests): beef > pork > chicken. Meat thawed in fridge had comparable bacteria counts to controls Test 2: Thawing method had no effect on CFU in cooked meats. All meats had less than 400 CFU. Test 3: Meats thawed on counter were not safe to eat after cooking. All had CFU/ml > 400. Oven cooking resulted in meat sitting in bloody juices released during baking. Meats thawed in fridge were safe to eat. Microwave cooking seemed to cook meats more uniformly in less time & no juices formed	
<b>Conclusions/Discussion</b> safest method of defrosting meat is refrigerator because meats aren't exposed to air that has bacteria & warmer temps. Method of cooking meat that kills most bacteria is microwave because it penetrates meat faster in less time. My hypothesis was half correct in that defrosting meats in refrigerator is safer than on counter. I was wrong about oven killing more bacteria than microwave.	
<b>Summary Statement</b> Determining which method of defrosting meat allows the least bacteria to grow and which method of cooking kills the most bacteria.	
<b>Help Received</b> Mom helped with some parts of testing, Dad helped with board and building incubator, Wayne Valley High School donated testing supplies	