RESEARCHREPORT

pork checkoff

PORK SAFETY

Title: Additional features to the porcine 3D model to teach the sub-primal and retail cuts of the pork carcass - **NPB#10-165** **revised-2**

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II. Industry Summary

Increasing demand for pork requires that new uses for existing underutilized muscles in the pork carcass be developed into new and novel products. Much of pork is purchased in the form of sub-primal cuts. To develop new and novel products different fabrication procedures need to be developed and then implemented by training those who fabricate the new cuts. To understand the three-dimensional (3D) muscle shapes and the muscle-to-muscle relationships in sub-primal cuts, carcass dissection is the only method available. Manual dissection can be time consuming and costly. Using computerized graphics and 3D technology it is now possible to virtually divide the 3D pork carcass into the sub-primal cuts and identify the muscles associated with each sub-primal. The user of the program can identify groups of muscles found in each sub-primal cut and well as virtually dissecting the carcass removing each muscle individually and examine their three dimensional shape. To be able to identify how sub-primal in fabricated a video has been included to assist in preparation of each sub-primal.

To gain and understanding of the chemical and physical properties of the each muscle, this information can be displayed on the individual muscles selected. This information will help the processor; chef and consumer better understand the muscles from individual meat cut. One of the major users of the Porcine Myology and Muscle Profiling Website is the culinary industry. Through the use of the Interactive Stereoscopic 3D program it is now possible to visually display chemical and physical differences in the muscles of the pork carcass. This will give those using it an interactive tool to use to be innovative with pork cuts when new uses are developed, which will increase demand for pork.

III. Keywords:

Stereoscopic 3D, myology, anatomy, IMPS, skeleton

IV. Scientific Abstract:

V.

The objective of this project was to improve the stereoscopic porcine carcass anatomy 3D tutorial by adding the following features: separate and identify pork subprimal cuts and virtually display them in 3D; add fabrication videos of the subprimal cuts; virtually display chemical differences in muscles and highlight the bones of the pork skeleton. Using the 3D pork model from earlier, each pork subprimal cut was virtually separated and added to the program so the user can select a subprimal cut of interest and it will be displayed in stereoscopic 3D. Videos of fabrication of each subprimal can be viewed. Using the data collected by Iowa State University the chemical and physical characteristics were programmed in for each muscle. By selecting a range for a specific characteristic, muscles that fit in the range will be displayed. Bones were also separated, by selecting a bone it is displayed in 3D and anatomical information can also be accessed. Some of the uses of this program would be to: 1. Provide state of the art training aids

for the Pork Industry (producers, packers, and processor) to assist in understanding carcass anatomy with out having to dissect a carcass each time 2. The program can be used to educate consumers and chefs on the anatomical location and the new uses of the pork cuts. The three dimensional view will also provide the "WOW" factor which will grab the attention of the consumers and help in selling pork.

V. Introduction:

With the increase in graphical computing capabilities, it is now possible to provide learners with a virtual three-dimensional (3D) view of a pork carcass at a reasonable cost. Through the funding of the Nebraska Pork Producer Association the University of Nebraska has developed a 3D stereoscopic model of the pork carcass and improved the interface so that the user can virtual dissect the muscles from the carcass. The software program, which is contained on a single CD, can be loaded on a compatible computer and used in both 3D stereoscopic and 2D modes. Also information about the muscle that is contained on the porcine mycology and muscle profiling website can be accessed in both English and Spanish. The interactive 3D pork carcass now provides a valuable tool for the study of the muscular anatomy that be easily distributed to various audiences. To strengthen its use in the meat industry, additional features that assist the user in understanding pork and the value and increase in demand that can be obtained when the carcass is fabricated and marketed correctly have been added to the program.

VI. Objectives:

Continue to improve the Stereoscopic Porcine 3D by adding the following features to the 3D Pork Carcass developed using funding from the Nebraska Pork Producer's Association:

1. Separate the 3D pork carcass into Institutional Meat Purchasers Specifications with the written information available for each sub-primal.
2. Add sub-primal fabrication video to each of the sub-primals identified.
3. Visually display the physical and chemical differences of the muscles using muscle-profiling data.
4. Highlight the bones of the pork skeleton and provide anatomical information for each.

VII. Materials & Methods:

Video of Sub-primal fabrication

Two pork carcasses were obtained and fabricated into sub-primal cuts using the USDA Institutional Meat Purchasers Specifications (IMPS). The fabrication process was captured on video and then narration was added to the video describing the each sub-primal cut. Once the all videos were collected they were edited and rendered in format that is compatible with the Pork 3D program.

Identify the Location of the Sub-primal Cuts of the Pork Carcass

The 3D digital pork carcass was digitally divided into the six basic wholesale cuts. Using the IMPS muscles and portions of muscles present in each sub-primal were selected and each sub-primal was digitally assembled. There are seventeen ham sub-primal cuts, nine shoulder sub-primal cuts, five belly sub-primal cuts, sixteen loin sub-primal cuts and ten miscellaneous sub-primal cuts. Each sub-primal was programmed in the software program using the Vizard 3D software program.

Visual Display of Physical and Chemical Differences in Muscle

From the work that has been done at Iowa State University and funded by the National Prol Board, there has been a vast amount of information that is available on the individual chemical and physical characteristics of each muscle. There are twenty six different traits that have been

measured. Using this information each muscle was color-coded based their value for each trait. This will allow the user to select a specific and range and identify the muscles, which fits best for the product and or entrée that plan to make. Using the 3D pork carcass and color-coding muscles based on such characteristics as tenderness, water-holding capacity, leanness, color and a host of other traits the best use for a muscle could be determined. This visual display will allow the learner to see visual changes in all the muscles of the carcass.

Highlight the Skeleton

Similar to what was done with each muscle of the pork carcass is the earlier version, the bones were separated and then programmed to allow the user to select each bone will move away the carcass and be highlighted. The user can then rotate the bone viewing it at all side and perspectives. Information about the bone can then be displayed.

Distribution

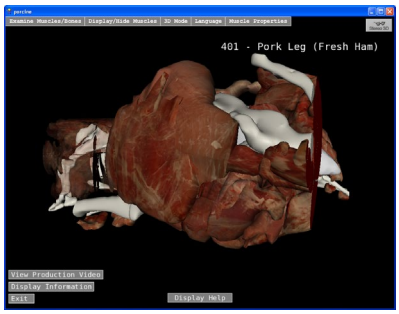
The software program will be distributed either via the Internet or on a CD to a variety of users to assist them in learning the skeletal and muscular anatomy of the pork carcass and the properties of each muscle. The program is a stand-alone file requiring no installation, which can be viewed on most personal computers. It will have the muscles on the carcass identified and when the user selects a particular muscle it can be removed from the carcass and information will appear. This will be in stereoscopic 3D for those who have the appropriate projection capabilities but also for those who do not; it will be possible to view the information in 2D. The information displayed will be similar to the information included on the porcine myology and muscle profiling web site.

VIII. Results:

The software program has been completed and will be demonstrated at the 2012 Nebraska Pork Industry convention. We are working with the NU Tech Venture group of the University of Nebraska to work out a plan to market it. This has been an arduous task.

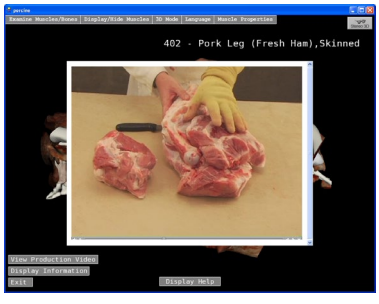
The following are screen shots of the program to give a sense of the functionality of the program.

1. Separate the 3D pork carcass into Institutional Meat Purchasers Specifications with the written information available for each sub-primal.



The user can select the sub-primal cut of interest and click on the name. The selected sub-primal will be highlighted and will move toward the user. The user can mouse over the picture rotate the picture to see all the sides of the image. Using the up/down keys the sub-primal will get larger and smaller. In the lower left-hand corner the user can click on “view production video” and view a video of fabrication of the sub-primal. If the user click on the “Display Information Button”, muscle profiling information is displayed

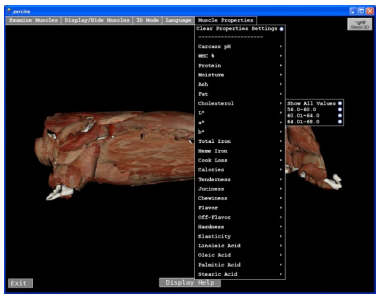
2. Add sub-primal fabrication video to each of the sub-primals identified.



This a screen shot of the video that is displayed demonstrating the fabrication of the pork sup-primal cut. Narration describes the sub-primal being fabricated

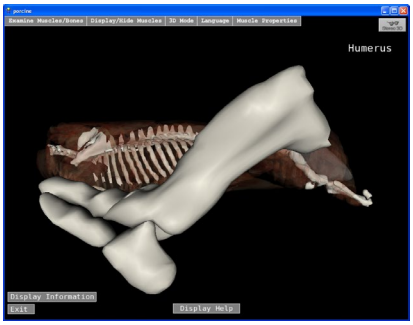
3. Visually display the physical and chemical differences of the muscles using muscle-profiling data.

To identify muscles with like characteristics the user can select on of twenty six different chemical or physical measures and the select on of three ranges. Muscles that fit in that range will be displayed so the user can view muscle with like characteristics. For example if someone is interested in muscles with similar tenderness rating they can view them by selecting the desired range.



4. Highlight the bones of the pork skeleton and provide anatomical information for each.

It is now possible to study the skeleton of the pork carcass. The user can select a bone or a group of similar bones and the bone will be highlighted and
move to the forefront of the screen. Like the individual muscles and sub-primals, the user can rotate the bone and view all side of the bone. By clicking on the "Display Information" in the lower left-hand corner, information about the bone will be displayed



IX Discussion:

Increase demand for pork requires that new uses for existing muscles in the pork carcass be utilized in new and novel ways. To do this different fabrication procedures need to be developed and then implemented by training those who fabricate the new cuts. Information on the location, and action of muscles needs to be shared with those involved in meal preparation. One of the major users of the Porcine Myology and Muscle Profiling Website are those involved in the culinary industry. They frequently request a 3-D model be developed to assist culinary arts students in understanding the muscles of a pork carcass. This will give them the tools to use to be innovative with pork cuts when new uses are developed, which will increase demand for pork.

A second use of this technology will be in the instruction of animal and veterinary science students in understanding a pork animal, this will reduce the cost of anatomy instruction providing anatomy lessons in an anytime, anywhere situation and will help in strengthening the two year veterinary science program being instituted at the University of Nebraska.

The use of this technology will benefit several segments of the pork supply chain. They are:

a. Provide state of the art training aids that can be used in a classroom setting. Students in the Pork Industry (producers, packers, and processor) and assist them in understanding carcass anatomy so they will be able to develop new uses for pork can use the tutorial. Thereby increasing demand.

b. Provide a rapid method of instruction for the meat processor industry so they can rapidly alter and disseminate new methods of carcass fabrication to take advantage of new uses for pork that more effective utilize and increased the value of the carcass .

c. Be used in training of culinary arts people in the new uses of pork cuts on the menu. A group of chefs or other food personnel can be instructed on pork anatomy and the value of specific cuts. They will be able to view a three dimensional view of the cut and possible methods of preparation..

d. The program can be used to educate consumers on the anatomical location and the new uses of the pork cuts. The three dimensional view will also provide the "WOW" factor which will grab the attention of the consumers help in selling pork.