

## **Porcine RESuscitation and its Effect on the Nature of Taste (PResENT) Trial**

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### **Introduction**

The choice of fluid medium in the setting of resuscitation was once a contentious issue between hospital specialties. With the introduction of the 2013 NICE guidelines on fluid resuscitation however variable practices have now been standardised. Despite this progress a seemingly untouched liquid related controversy remains as the optimal preparation for a festive Christmas ham continues to be the subject of much scrutiny and debate. In recent years culinary giants have pioneered the judicious use of glucose laden cooking mediums, such as Coca-Cola, in preference to more traditional water and stock based solutions<sup>1-3</sup>. To date no studies within the literature have objectively examined the impact of fluid choice, used in cooking a christmas ham, on its final taste.

### **Methods**

The ham selected for the study was a locally sourced gammon joint supplied by McGees butchers in ASDA. The joint in question was readily available for purchase by the public and no additional pigs were harmed specifically for the purposes of this study. The ham was sectioned into three equal portions, by the supplier, so that each measured exactly 1000g on industrial scales. Each portion was then added to a fluid medium and cooked for exactly 90 minutes at gas mark one in a Prestige Deluxe stainless steel pressure pot by the first author's mother. Exactly 1500mls of each of three chosen fluids (water for injection, 0.9% saline and 5% glucose) was blinded prior to cooking.

Pre and post cooking weights of the ham and the post cooking volume of remaining fluid were recorded. Finally a double blinded taste test was conducted to include a cross section of the multidisciplinary team within a district general hospital in Northern Ireland. All those who tasted the samples were informed of the cooking methods used and gave oral consent prior to tasting. Formal ethical approval was not sought and none of the investigators had a valid food hygiene certificate (although one of the lead investigators was 2nd in a third year Home Economics exam at secondary school). Members of the multidisciplinary team were selected at random to taste all three samples and asked to record their satisfaction using a standardised five point Lickert scale. They were finally asked to rank their favourite in terms of overall flavour. Once all of the tastings had been completed an envelope, sealed by first authors mother, was opened, revealing the nature of each cooking medium used, to the investigators.

### **Results**

The post cooking weight of each ham showed a reduction with 0.9% NaCl having greatest impact on mass with a reduction of 345g (compared with 276g in water and 260g in 5% glucose). The remaining volume of fluid also varied with type of solution used with 1500ml, 1550ml and 1600ml measured post cooking with water, 5%

glucose and 0.9% NaCl respectively (refer to Table 1). Sixty Four members of staff sampled were asked to taste then rate Ham's A, B and C. 45 females and 19 males with an age range of 21 - 82 were sampled. The breakdown of each individual per specialty included: 6 admin staff, 2 anaesthetic trainees, 1 dietitian, 3 domestics, 4 healthcare assistants, 11 medical students, 3 medical practitioners, 18 nurses, 1 physiotherapist, 1 porter, 12 surgical trainees and 2 urologists. Each respondent completed a questionnaire in which taste, flavour and texture were individually assessed using a standard five point Likert scale (refer to Table 2). Finally each participant was asked to rate their overall favourite ham sample. 51.6% (n=33) respondents favoured the ham cooked in 0.9% NaCl, 32.8% (n=21) favoured water and 15.6% (n=10) favoured 5% glucose.

**Table 1: Measured effect of cooking on volume of remaining solution used and change in overall ham mass.**

	Solution A (Water)	Solution B (5% Glucose)	Solution C (0.9% NaCl)
Pre-cooking solution volume	1500ml	1500ml	1500ml
Post-cooking solution volume	1500ml	1550ml	1600ml
Pre-cooking ham weight	1000g	1000g	1000g
Post-cooking ham weight	724g	740g	645g
Change in ham mass	-276g	-260g	-345g

**Table 2: Breakdown of participant questionnaire**

Age	
Sex	
Job Title	
Ham A	
Taste (1 worst taste ever / 5 best taste ever)	
Flavour (1 very salty / 5 very sweet)	
Texture (1 very dry / 5 very succulent)	
Ham B	
Taste (1 worst taste ever / 5 best taste ever)	
Flavour (1 very salty / 5 very sweet)	
Texture (1 very dry / 5 very succulent)	
Ham C	
Taste (1 worst taste ever / 5 best taste ever)	
Flavour (1 very salty / 5 very sweet)	
Texture (1 Very dry / 5 very succulent)	
Overall Favorite ham	

## **Discussion**

The use of water, stock or sugar rich solutions during the cooking process used in producing a Christmas ham has become a contentious topic with variable practices championed by celebrity chefs. In particular the use of coca-cola and apple cider has gained increasing prominence, compared with vegetable based stock solutions, as the ideal method for enhancing the flavour of the meat. With over half of the individuals sampled favouring ham cooked in 0.9% NaCl, more than three times more than those who preferred 5% glucose, our results contradict this growing trend and add weight to traditional ham cooking methodology.

The use of cooking solutions as either the main method of preparing a boiled ham or as a preparatory step in cooking a roast ham is to enhance the natural flavour of the meat. We found that in using 0.9% NaCl that the post cooking meat weight was reduced and the post cooking volume of solution that remained increased. We

purpose that this was due to the osmotic effect of the saline that drew water out of the meat thereby concentrating the flavour within and increasing the volume of fluid surrounding. This observation would explain not only why 0.9% NaCl scored so favourably with tasters but also why 5% glucose performed so poorly. In contrast to saline, 5% glucose had a smaller volume of remaining solution following the cooking process (1550mls vs 1600mls) and a heavier end weight of the ham (740g vs 645g). We conclude that the difference in weight, between the solutions used, is due to fluid volume retained by the meat and propose that such additional fluid gain, to the meat, dilutes the natural flavour and taste of the ham thereby degrading its overall taste quality.

The authors accept that a variable practice in preparing and cooking a Christmas ham exists and that some families may opt to boil or roast their ham rather than use a pressure cooker. We recognise that such methods may produce different results. Additionally we accept our results in terms of taste are open to selection bias and therefore an audience outside of working diversity of Craigavon Area Hospital, i.e. mainly indigenous Northern Ireland residents may enjoy other tastes more than others e.g. prefer dry or salty hams rather than succulent and sweet. This study did not investigate additional marinades such as honey, mustard or marmalade nor did it investigate the taste impact of cloves traditionally used in a Christmas ham preparation and we recognise the need for further study in these areas.

Our results show that the fluid producing the best rehydration in terms of remaining mass, following the cooking process, was 5% dextrose. Despite this however 5% dextrose poorly performed in a taste test when compared to 0.9% NaCl and water. We propose that this additional fluid gain dilutes the natural flavour and taste of the ham thereby degrading its overall taste quality. Conversely the fluid having the greatest dehydrating effect was 0.9% NaCl which we propose acted to concentrate and therefore enhance the flavour of the ham resulting in the most favoured taste from those sampled. Contrary to recent popular trends we recommend the use of a salt based resuscitative fluid solution in order to achieve superior taste quality outcomes when preparing a Christmas ham. Further research into mustard, honey, marmalade and cloves is required.

### **Declaration of Conflicts of Interest:**

The authors confirm they have no conflict of interest to declare nor do they advocate frequently consuming high amounts of boiled Christmas ham as part of a healthy diet.

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