



The Food and Environment
Research Agency

What species of animal is in my food or drug?

New research by Fera and the University of York
on gelatine has the answer.

Helen Grundy

Fera

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on gelatine has the answer.

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Issue of product labelling

Overview

Specifically considering gelatine:

- What is gelatine?
- Where do we find it?
- How gelatine is made?
- Species issues.
- How food scientists met archaeologists.
- Method developed

What is gelatine?

- Offal
- Bi-product from the meat / fish industry
- Skin and bones

Properties of gelatine

- Thickening agent/binder
- Stabiliser
- Texture enhancer
- Increase mass of foods
- Precipitation
- Sponge properties
- Production of stem cells
-

What is gelatine used in?

- Cosmetics
- Paté, salami
- Wine/fruit juice
- Sauce thickeners
- Drugs and capsules
- Movie and photographic film
- Confectionery
- Ice cream
- Sand paper/matches
- Paper
- Detergents
- Fertilisers
- ...and much, much more...

Gelatine

Gelatine is a protein

Used extensively in the food industry

Gelatin is one of the few foods that cause a net loss of protein if eaten exclusively. In the 1960s, several people died of malnutrition while on popular liquid protein diets.

How is gelatine made?

- 275-350kt produced annually worldwide
- Value of gelatine as a raw material ~£500M
- 117kt in Europe - 70% to food, 20% to pharma
- Confectionery industry is largest consumer in domestic market (~50% sales)

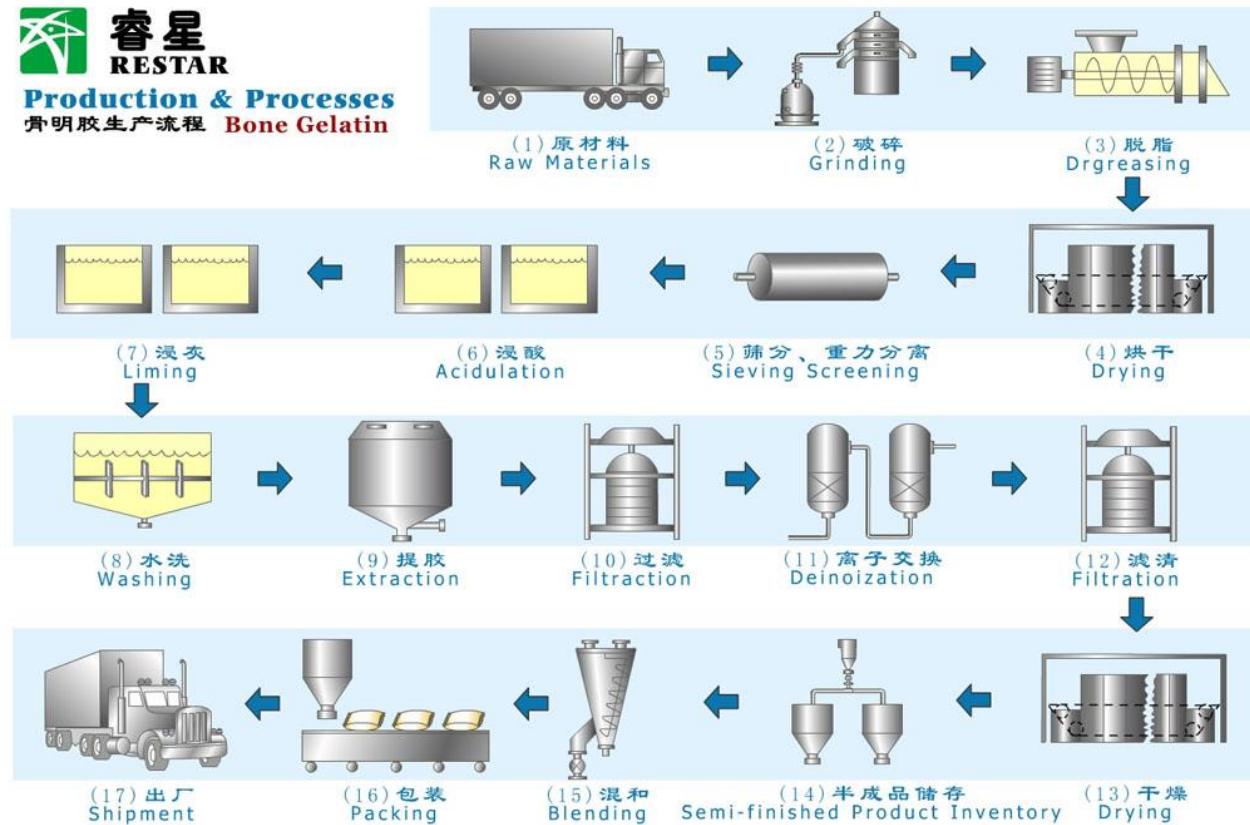
How is gelatine made?

- Pig, cow, poultry + fish offal (skin and bones)
- Boil bones at home
- High temperatures, acid/alkali treat in industry
- Can take several weeks
- 6kg raw material = 1kg gelatine

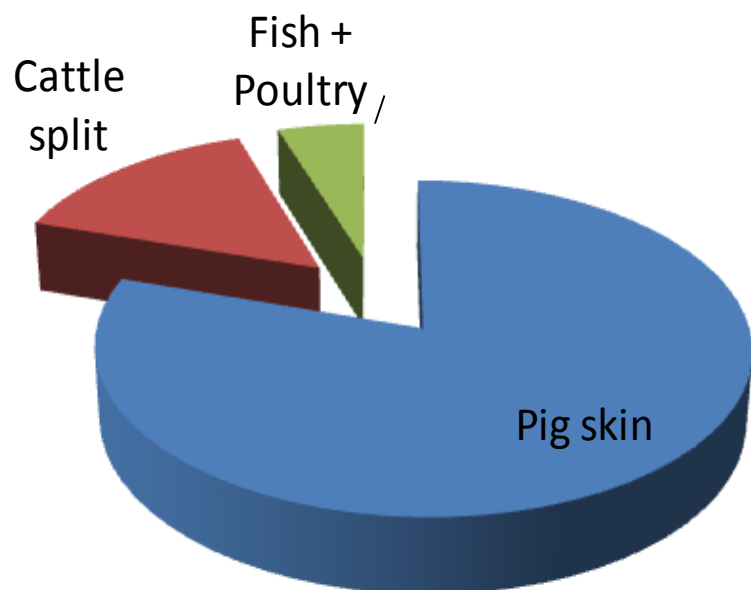
How is gelatine made?

- Skin and bone composed of collagen
- Collagen insoluble
- Pre-treat to remove impurities
- Hot water or acid(10-48h)/alkali (weeks)
/enzyme to break cross-linkages
- Refining

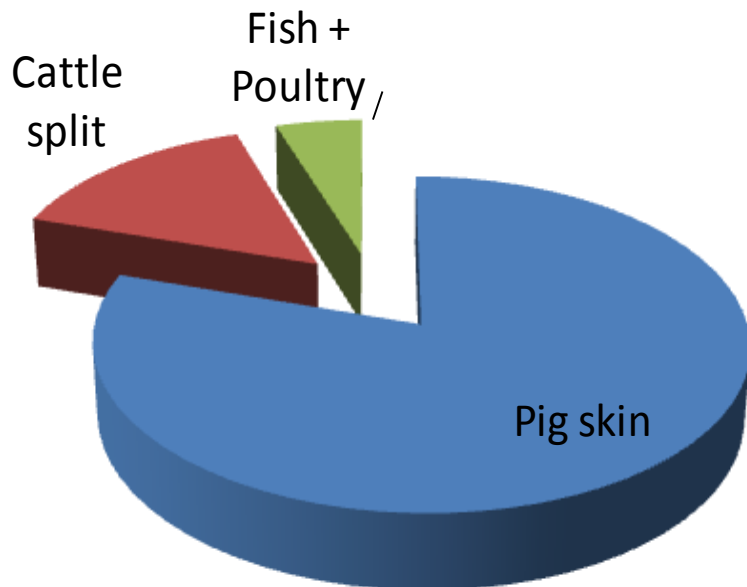
Industrial production



Gelatine production in Europe:



Gelatine production in Europe:



Ethical and religious preferences:

=4.98M people in UK

Source: Wikipedia and BBC

- ~5M people have cultural preferences concerning consumption of certain species
- Need for accurate product labelling
- Need to be able to scientifically verify species of gelatine
- Paper trail is not enough

- We sourced commercial gelatines from food chain producers/suppliers across Europe.
- 15% of samples did not contain the species of gelatine stated on the packaging – suppliers misinformed



The Food and Environment Research Agency

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Chicken fill it



Studied ... chicken

By CLODAGH HARTLEY
Consumer Affairs Editor
Published: 05 Jun 2009
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THOUSANDS of Brits are being served chicken bulked up with beef and pork when they go out for a meal, a report revealed yesterday.

Restaurants and cafes unwittingly buy chicken containing other animals from wholesalers and dish it up for customers.

The meat is bulked up by producers in Germany and Spain.

The Food Standards Agency traced the beef and pork proteins only after using new scientific techniques.

The proteins are in a powder mix that is injected with water into birds to make them look "meatier".

The FSA tested four supposedly chicken-only powder mixes from three meat production firms.

All contained protein from either cows or pigs. It is illegal to add the pork and beef bulking agents, but the FSA said many Brits were unaware of their presence.

They are on the ingredients list as "hydrolysed animal protein".

The FSA said it is safe to eat the chicken, but most EU countries do not approve of the practice.

It urged Brits to ask restaurant owners whether their chicken was bulked up with beef or pork before they purchased meals.

A spokesman for British Hindus, who do not eat beef, expressed "shock" at the findings.

The London Board for Shechita, which supplies kosher meat to the Jewish community, insisted none of its chicken was bulked up in this way.

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Chicken injected with beef waste sold in UK

Muslims and Jews conned into eating meat bulked out with cow and pig products

Martin Hickman, Consumer Affairs Correspondent

Friday, 4 June 2009

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Restaurants and cafes across Britain have been selling chicken bulked up with beef and pork waste, *The Independent* can reveal today.

A hi-tech fraud run by firms in three EU states, food manufacturers out of porcine and bovine gristle and bones that help it fetch a higher price.

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PANORAMA

The Chicken Run



Panorama: The Chicken Run was broadcast on Thursday, 22 May 2003 at 21:00 BST on BBC One.

Transcript: [Click to view or save to disk](#)

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Wednesdays 16 September 2009

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New study highlights undeclared ingredients in chicken products
Thursday 4 June 2009

The Food Standards Agency (FSA) has carried out an exploratory study into injection powders used to retain water in chicken breast products supplied mainly to the catering trade.

Water can be added to chicken products by manufacturers for a number of reasons, for example to improve the succulence of the meat. Adding water to chicken is permitted, but where the water content is greater than 5%, water must be declared in the name of the food and listed as an ingredient. Fresh chicken meat that you buy from supermarkets or butchers cannot have any ingredients, including water, deliberately added to it.

The agents used to hold added water in chicken can include salt, phosphates and hydrolysed animal proteins; these are supplied to manufacturers in mixtures as injection powders. When water retaining agents are used, they must be described accurately on the label.

The FSA's snapshot study looked at a small number of injection powders that claimed to contain only chicken protein. Analysis using a new approach developed under the Agency's authenticity programme indicated that proteins from beef or pork were also present in some of the samples. Hydrolysed pork and beef proteins can be used as water retaining agents in chicken as long as they are properly labelled. Use of these proteins does not make chicken products unsafe, but it is important that people are given accurate information about their food.

There is no evidence to suggest that there is a widespread problem with undeclared proteins in chicken products but the Agency is carrying out further studies and gathering more information in partnership with other European Member States.

Chicken secretly injected with beef and pork products served in UK restaurants

By SEAN POULTER
Last updated at 8:24 AM on 05th June 2009

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Chicken sold in Indian and Chinese restaurants and some cafes is being secretly pumped up with a water and chemical mix containing pork or beef.

The tactic fools customers into thinking they are getting more for their money.

It means consumers are eating beef and pork - generally waste skin harvested from carcasses - without being told.



© Alamy

Scam: Chicken breasts are secretly being injected with pork and beef materials to bulk them up, before being sold on to wholesalers in Britain

The news will alarm the county's two million Muslims, Jews and Hindus, who are forbidden from eating either pork or beef for religious and cultural reasons.

This Panorama special investigates a major food scandal.

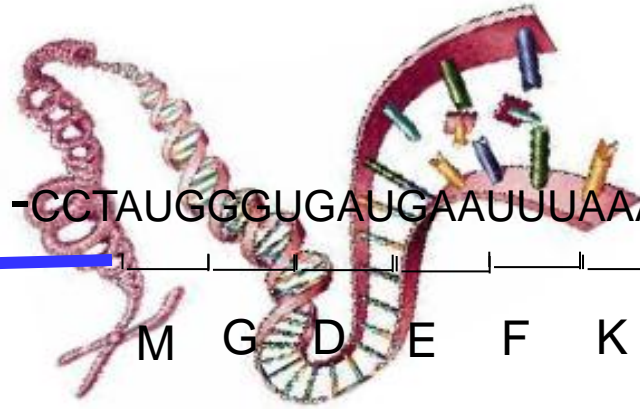
-low the frozen chicken industry in Holland which ships over a thousand tonnes of chicken into the UK each week routinely pumps the meat full of water to make it weigh more thus swelling profits.

But to keep the water in, there is a magic ingredient - protein additives.

Shockingly some are made from the remains of pigs and cows. Since this was discovered, alarmed food regulators have been trying to clamp down.

But Panorama can reveal the breathtaking lengths to which some protein manufacturers are now going to keep adding cow and pig to your chicken - without you, or the regulators, even knowing it.

Theory



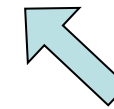
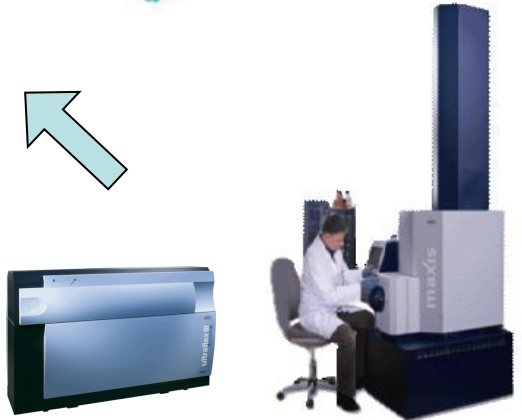
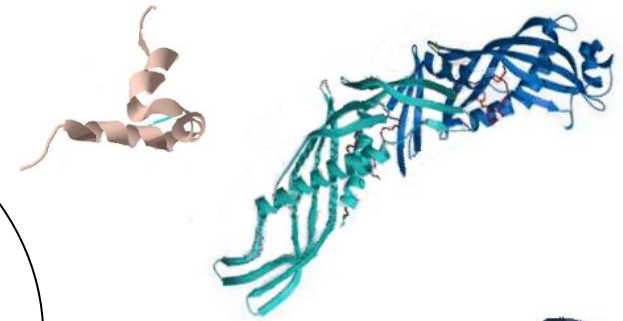
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M G D E F K R N L A I T V S P Q H Y C



Protein sequence
database
(www.uniprot.org)

A = Alanine	M=Methionine
C = Cysteine	N=Asparagine
D= Aspartic acid	P=Proline
E=glutamic acid	Q=glutamine
F= Phenylalanine	R =Arginine
G=glycine	S=Serine
H=Histidine	T=Threonine
I=Isoleucine	V= Valine
K = Lysine	W = Tryptophan
L=Leucine	Y=Tyrosine



Method to verify the species of gelatine

DNA – damaged/destroyed by processing
- open to fraud

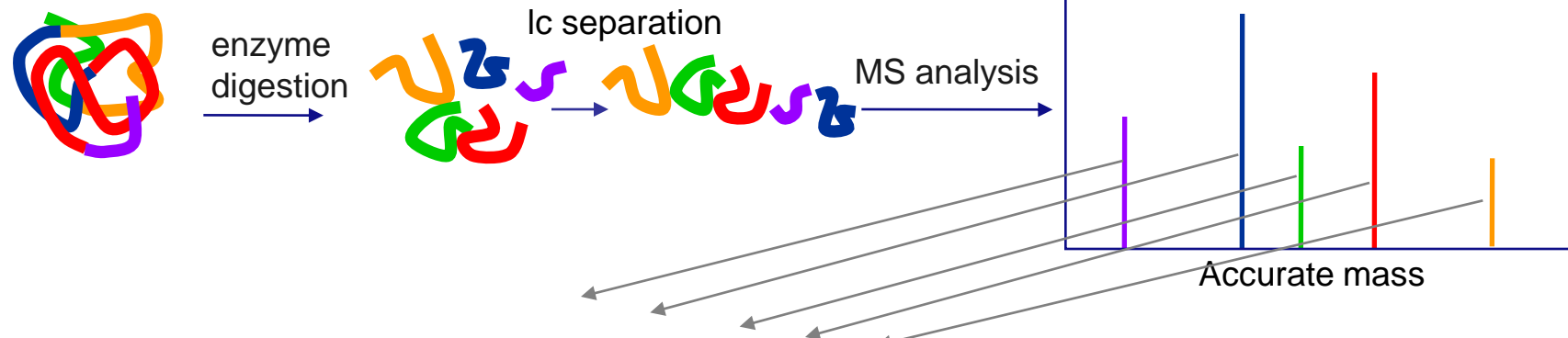
Protein – gelatine and collagen are proteins



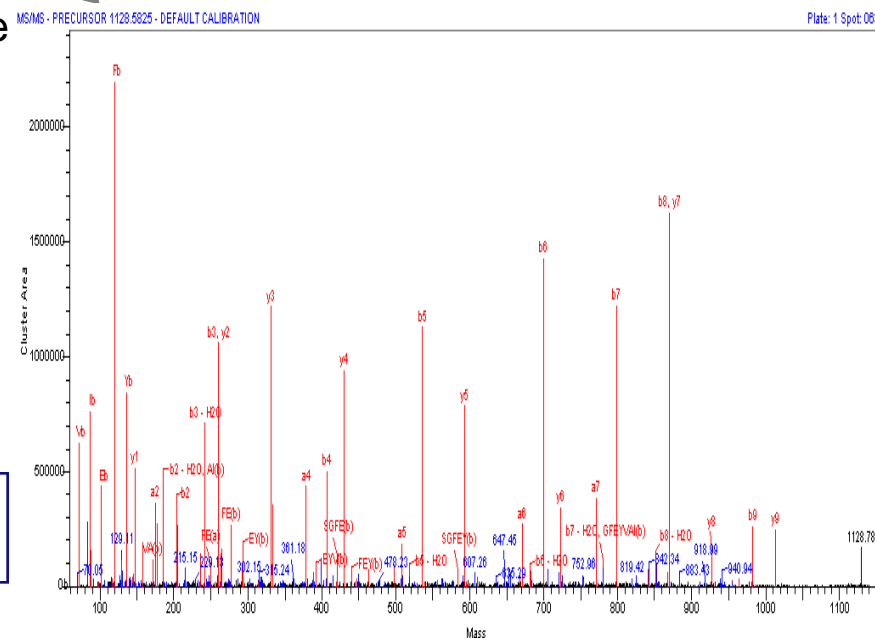
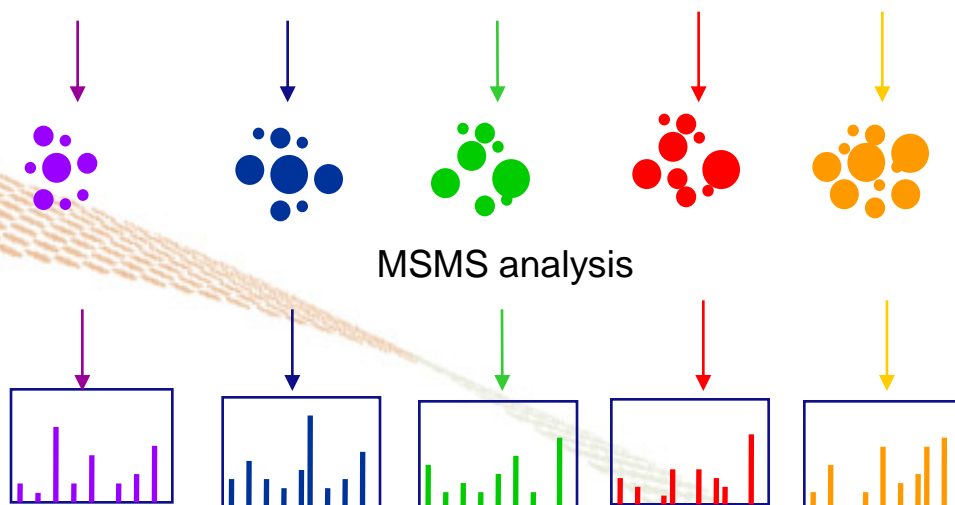
Interested in gelatine?

- BioArCh, University of York
- Interested in ancient bones – dinosaurs
- Food processing versus centuries of burial
- DNA different = proteins different in all species
- Look for species-specific parts of proteins

LC QTOF MSMS Mass Spectrometry

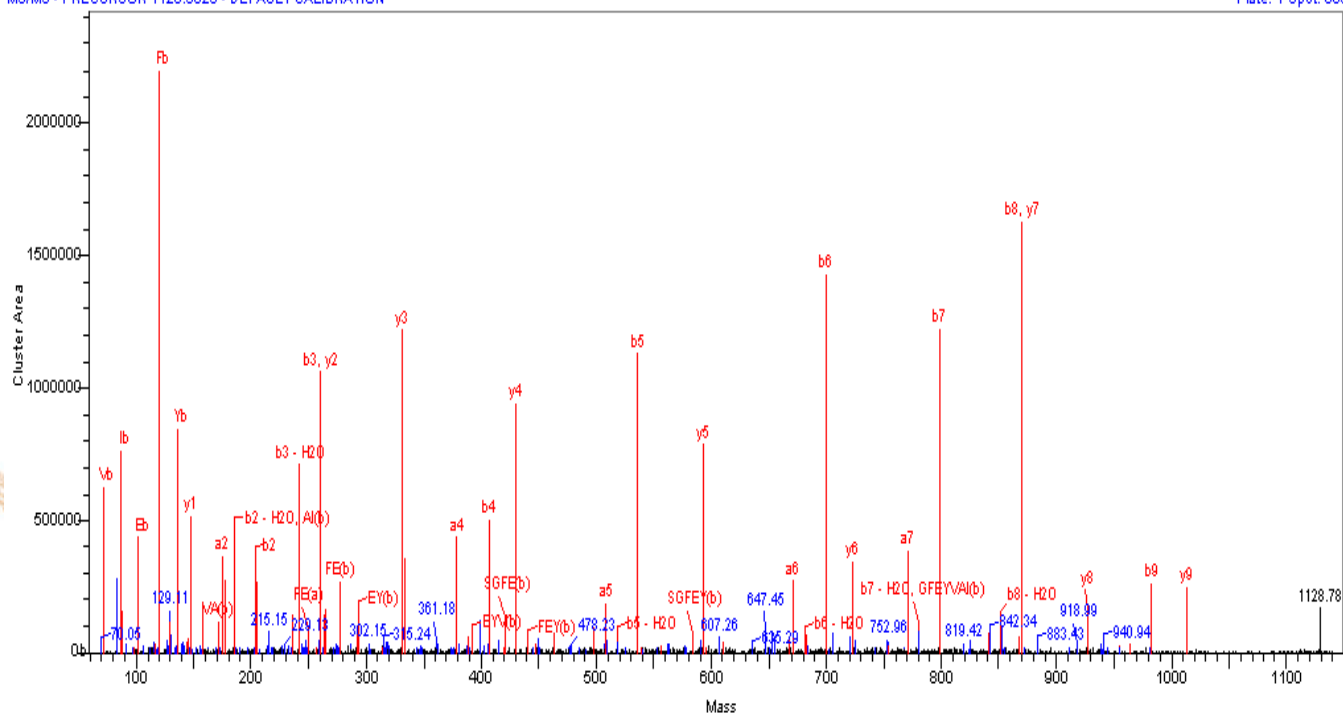


Fragmentation of tryptic peptides in MSMS mode



MS/MS - PRECURSOR 1128.5825 - DEFAULT CALIBRATION

Plate: 1 Spot: 063



Interested in gelatine?

- Public databases of peptides exist
- Database of all of the masses of the proteins/peptides that are unique to the collagen of each species
- The changes we see to our peptides of interest are not predicted by the public databases

Bovine peptide	Peptide mass	Peptide modification
GYPGNPGPAGAAGAP	1235.58	Non-tryptic cleavage product
GYPGNPGPAGAAGAPGPQGAVGPAGK	2173.08	Unmodified peptide
GYPGNPGPAGAAGAPGPQGAVGPAGK	2189.07	Hydroxyl of single proline
GYPGNPGPAGAAGAPGPQGAVGPAGK	2205.07	Hydroxylation of prolines 3 and 15
GYPGNPGPAGAAGAPGPQGAVGPAGK	2221.06	Three hydroxyprolines
GYPGNPGPAGAAGAPGPQGAVGPAGKHGMR	2653.3	Missed tryptic cleavage hydroxylation of proline 29
GYPGNPGPAGAAGAPGPQGAVGPAGKHGMR	2669.29	Missed cleavage plus two proline hydroxylations
Porcine peptide		
IGQPGAVGPAGIR	1192.68	
IGQPGAVGPAGIR	1193.66	Deamidation + Q3
IGQPGAVGPAGIR	1208.67	Hydroxyl + DKNP 4
IGQPGAVGPAGIR	1209.66	Deamidation +Q3; Hydroxyl+DKNP9

It's not easy !!

- State of the art
- Others have tried and been less successful

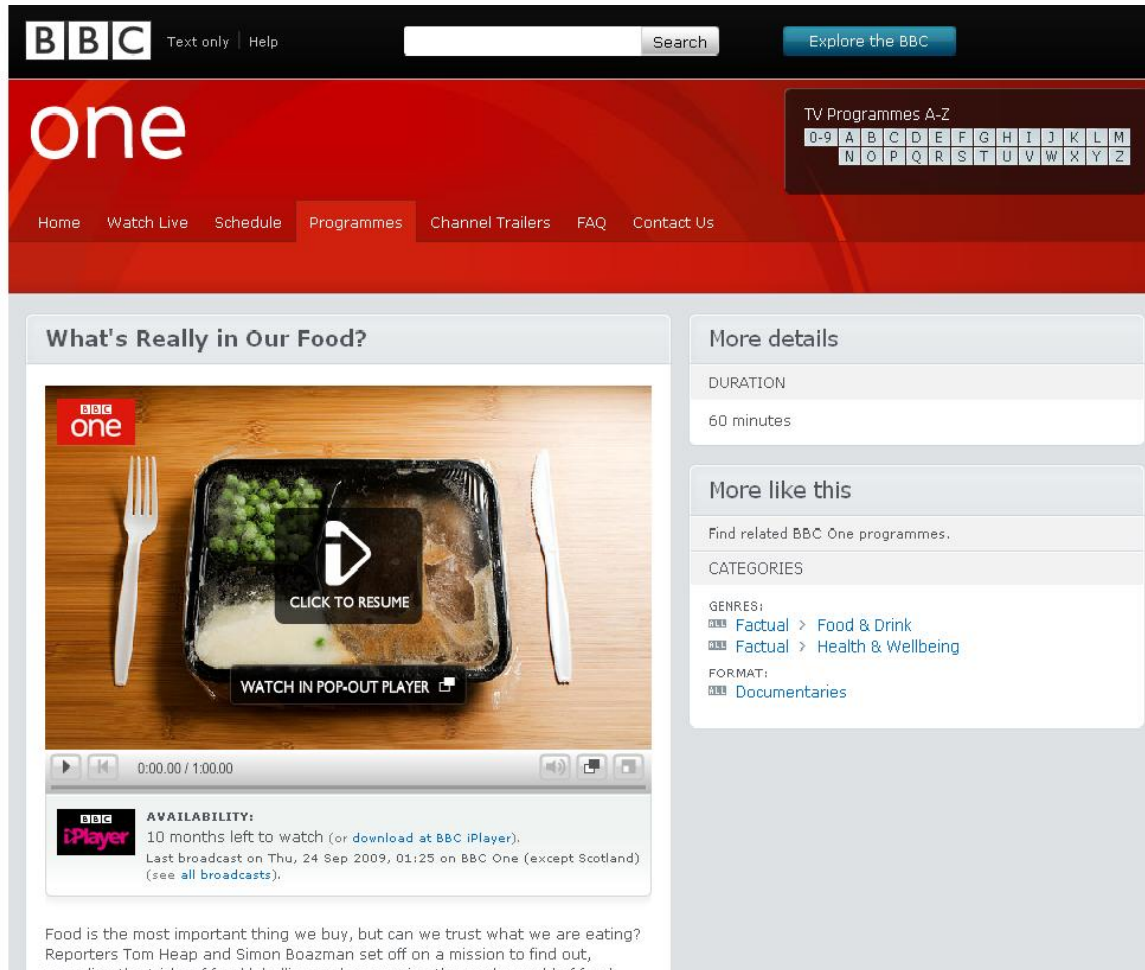
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BBC one

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 10 months left to watch (or [download at BBC iPlayer](#)).
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Food is the most important thing we buy, but can we trust what we are eating? Reporters Tom Heap and Simon Boazman set off on a mission to find out, revealing the tricks of food labelling and uncovering the murky world of food



More details


DURATION
60 minutes

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Thank you