

Introduction

Flesh Eaters is a new piece of science software, developed specially for Science Year. Its aim is to make learning about enzymes more exciting, by harnessing pupils' enthusiasm for TV series like the X Files. There, the investigators solve cases using the same process as pupils do in a school science investigation i.e. they think up hypotheses, test them, and analyse results. We hope Flesh Eaters will show pupils that science is also about solving fascinating mysteries.

Pupils take the role of MI5 Special Projects agents. They will:

- Watch video sequences to set the plot, and develop it later, in dramatic ways
- Do multimedia activities: collect/analyse clues, and solve puzzles (built in assessment)
- Do a hands-on experiment in the laboratory to test for 'flesh eating properties'

Here is a summary of the whole plot. Two tunnel workers are found with their flesh eaten away. Pupils are put on the case. They eliminate most clues found at the crime scene. Their experiment proves the flesh eating chemical was in the cave water. Pupils find that the chemical is an enzyme – which breaks large molecules (in flesh) into smaller ones. Finally, they discover an 'antidote' - changing temperature and pH to slow down its activity.

The case consists, of three parts:

- Level 1 (30-40 mins). It is done at the computer, with the CD-ROM.
- Experiment: (Set up 20-30 mins. Results/analysis 15 mins). Done at the laboratory bench.
- Level 2 (30 mins) Back to the computer, to finish solving the case.

Running the activity*Lesson organisation*

Flesh Eaters requires 2-4 lessons, depending on the length of a lesson and how you choose to organise it. The 'flesh eating' experiment requires two separate lessons, as it takes 24 hours to work. One way to schedule the activities is: first lesson - do level 1 in computer room. Return to lab and set up experiment. Second lesson: Results/analysis in lab. Move to computer room and do level 2.

Alternatively, you could organise the lessons so there is no moving between lab and computer room: First lesson: level 1 in computer room. Second lesson: Set up experiment in the lab. Third lesson: Results/analysis in lab. Fourth lesson: level 2 in computer room.

IT issues

- Flesh Eaters could be run on a network. However the quality of the video will be much better if the CD ROM runs on individual computers. You can purchase a class set of CD's at minimal cost from ASE.
- Sound is an important element. Pupils may need individual pairs of headphones.

Safety

- Pupils should wear eye protection for the flesh eating experiments, particularly when heating.
- They should be told not to eat any of the flesh (jelly)
- They should ensure that hands are washed after the experiment

Learning outcomes

- food is digested by enzymes
- enzymes break down large molecules into smaller molecules
- the effect of temperature and pH changes on enzyme activity
- (Sc1: investigations) use observations, measurements and other data to draw conclusions
- (Sc1: ideas and evidence) the interplay between empirical questions and scientific explanations

Prior learning

A simple understanding of acids, alkalis and pH.

Where the activity fits in

QCA Unit 8A Food and digestion.

Skills

Thinking skills: information-processing, reasoning, creative-thinking. Investigative skills.

Careers

All the major activities on the CDROM have a Careers document with them. Printed out these could be used as a growing wall display during Science Year.

Level 1 – at the computer**Level 1A:**

- It begins with a video clip showing the death of two railway tunnel workers, whose flesh is eaten away.
- Pupils are asked to write down, in the case notes ideas for possible causes of death ('Case notes' sheet supplied).
- They then return to a 'cartoon cave', where they have to collect all the hidden clues.
- Answers: the clues are water, air, gun, rock, electric cable, rat, severed hand, sandwich, torch, metal bar, slime (hardest – in top right of screen).

Level 1B:

- In the office, there is a whiteboard showing possible causes of death. Pupils have to match the correct clues to the causes, by dragging and dropping.
- Answers: Self evident except: 'rock', which goes with 'Head hit by falling object'.

Level 1C:

- In the 'cartoon laboratory', pupils 'carry out' tests on the clues, using a microscope, a mass spectrometer (to find its chemical contents), an autopsy bench, plus a 'cartoon scientist' who can do further tests. They have to do all the possible tests to continue.
- Pupils should write in their case notes when they get test results which eliminate clues

Level 1D:

- In the office, the whiteboard shows all the clues. Pupils look at the results from the tests they have just done, and decide which clues they can now eliminate, and why.
- Answers: Pupils can now eliminate Elec. Cable – by Human autopsy, Rat – by animal autopsy, Rock – by microscope, Air – by mass spectrometer, Gun – by scientist.
- Level 1 finishes with another video sequence: the scientist who was 'in the middle of' carrying out a 'flesh eating' tests on the water and the slime is murdered.
- So, the pupils are asked to repeat her experiment themselves – in the school laboratory.

Flesh eating experiment

- Pupils do an investigation to find out whether the cave water or slime - collected from the crime scene - can eat flesh
- The experiment uses jelly (or gelatin) in a petri dish, as a substitute for real flesh. Gelatin is a protein. The cave water contains an enzyme (a protease) which breaks down the gelatin (in the same way as enzymes in the stomach and small intestines digest food). The enzyme works at room temperature, but is inactivated at high temperature.
- To set up the experiment, pupils make small 'wells' in the jelly, with straws. Toothpicks help extract the 'plug' of jelly by cutting round the inside of the straw. Pupils fill the wells with liquid, as follows:
 - 1) cave water at room temperature
 - 2) heated cave water
 - 3) slime at room temperature
 - 4) heated slime
- Since the enzyme takes several hours to break down the protein, the experiment should be left overnight. Pupils will see that the hole with the (room temperature) cave water has dramatically increased in size, but the slime has no effect.
- We suggest you test out the protease enzyme solution you will be using yourself first, as its effectiveness can vary. You want it to increase the size of the well, but not eat away everything. Also, if you leave the dishes for more than 24 hours, keep them in the fridge. This stops the enzyme eating away all the jelly.
- Instructions for doing the experiment are on the 'Scientist note book' sheet. The sheet also provides space for pupils to enter their results and write their conclusions.
- To save pupils time setting up the experiment, you can prepare the heated cave water and slime solutions before the lesson.
- Pupils prepare two identical dishes - to repeat their results. To spice up the plot, you can contaminate one set from each group, as though the killer did it! This will show the value of making sure you have a second set of results.

Level 2 – at the computer

Level 2A

- Give pupils the password to re-enter Flesh Eaters on the computer. It is: **wzbknt**.
- In the office, the whiteboard has three yes/no statements relating to the experiment.
- Answers (in order): yes, no, no

Level 2B

- In the 'cartoon laboratory', pupils collect objects, each of which has a clue. They are only allowed to collect 5 out of 8. They must collect the right ones to solve the puzzle.
- Pupils should write in their case notes which objects they intend to collect. The sheet gives clues to help them choose the right ones.

Level 2C/D

- In a video clip, the pupils themselves are 'attacked' and left in the tunnel, to be eaten by the enzyme. They are challenged to find an 'antidote' before they run out of time.
- Answer: First find the cold water (which buys time, by slowing down the enzyme). Then use the flare to light up the darkest cave. In it, find the 'ammonium cleaner'. It changes the pH and virtually stops the enzyme – saving you.
- When pupils have succeeded, they can choose their virtual reward. The game ends.
- During the game, ensure that pupils appreciate that the tunnel they view on the video clips is the cave, and that they equate flesh with muscle which is meat (food).