National Qualifications 2017

X707/77/11

Biology
Supplementary Sheet

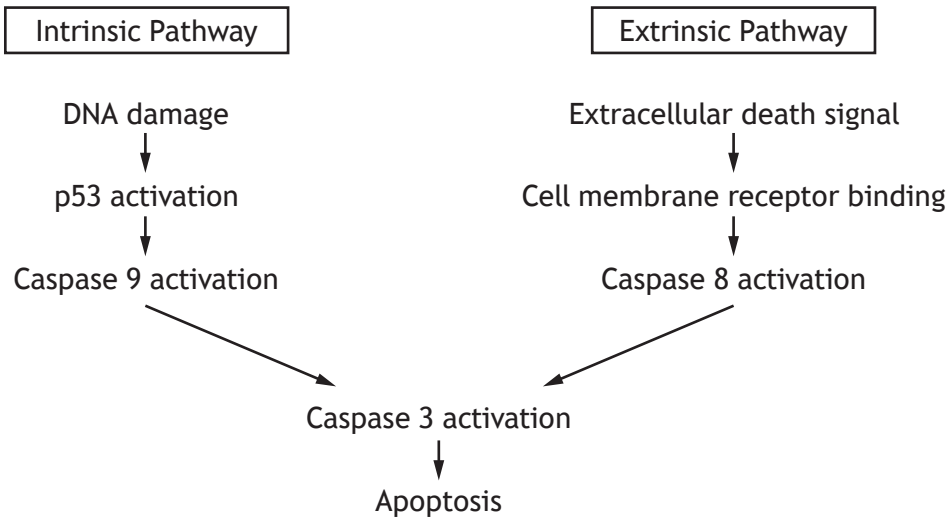
TUESDAY, 23 MAY
9:00 AM – 11:30 AM

Supplementary Sheet for Question 1

1. There are two main pathways of programmed cell death (apoptosis): *intrinsic* (from within the cell) and *extrinsic* (from outside the cell).

Figure 1 summarises some of the main features of the two pathways.

Figure 1

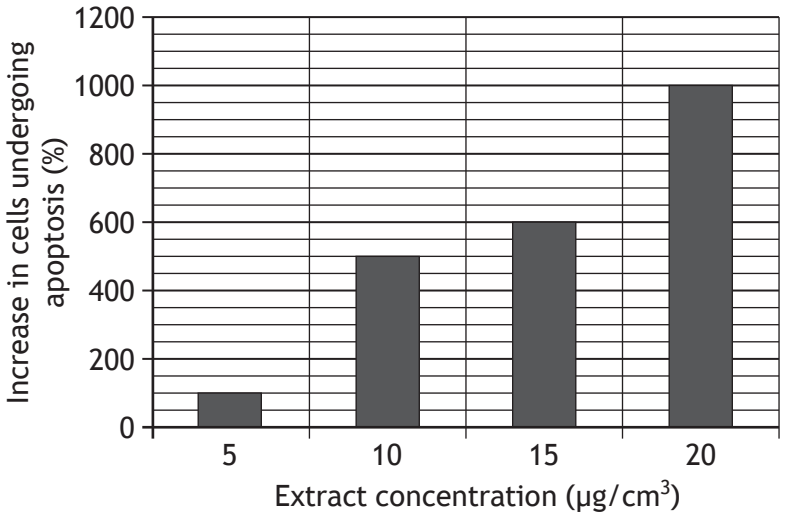


Apoptosis is deregulated in many tumours, resulting in uncontrolled cell division despite the presence of significant DNA damage. One strategy for the discovery of new anti-cancer drugs has been to examine traditional medicinal herbs.

A study was carried out to investigate the effect of an extract of the wild ginger plant, *Asiasari radix*, on the initiation of apoptosis in colon cancer cells.

Colon cancer cells were treated with this extract and then assessed for the presence of apoptotic cells. The percentage increase in cells undergoing apoptosis was calculated by comparing the level of apoptosis in treated cells with that in untreated controls as shown in Figure 2.

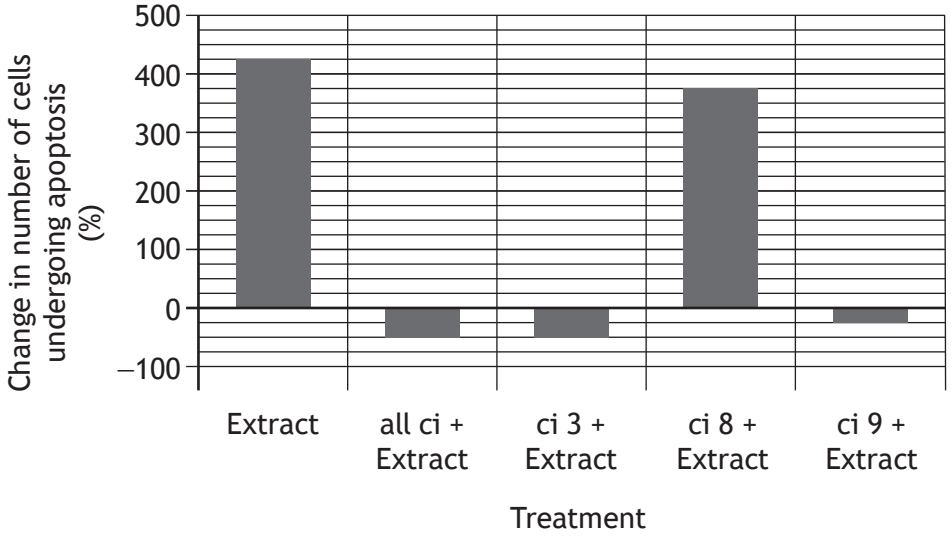
Figure 2



1. (continued)

To investigate the involvement of caspases in this process of apoptosis, the experiment was repeated using a single dose of extract (10 µg/cm^3) but with the addition of a variety of caspase inhibitors (drugs known to prevent the activation of one or more caspases). Inhibitors used included an inhibitor known to prevent activation of all caspases (all ci) and individual inhibitors of caspase 3 (ci 3), caspase 8 (ci 8) and caspase 9 (ci 9). Percentage changes in the number of cells undergoing apoptosis compared to untreated cancer cells are shown in Figure 3.

Figure 3



The distribution of the cancer cells across the different phases of the cell cycle was then investigated by measuring the DNA content of the cells. Cultures of cells were treated with 10 µg/cm^3 extract or left untreated for 24 hours as a control and then the DNA content of 10,000 cells was analysed for each cell culture. Results for treated cells are shown in Figure 4A and for control cells in Figure 4B. DNA content is displayed with arbitrary units where 200 units represents the DNA content of a non-dividing diploid cell.

Figure 4A

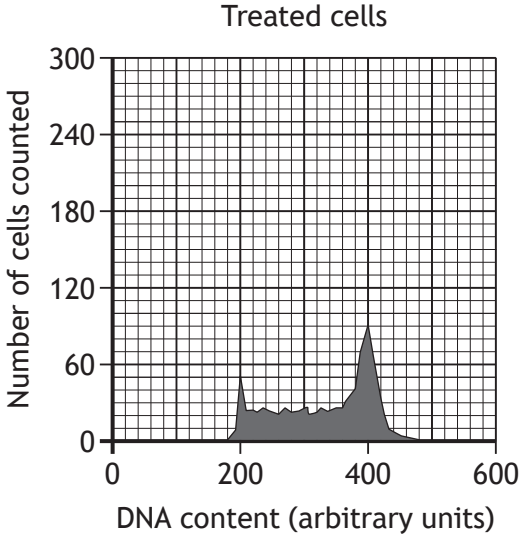
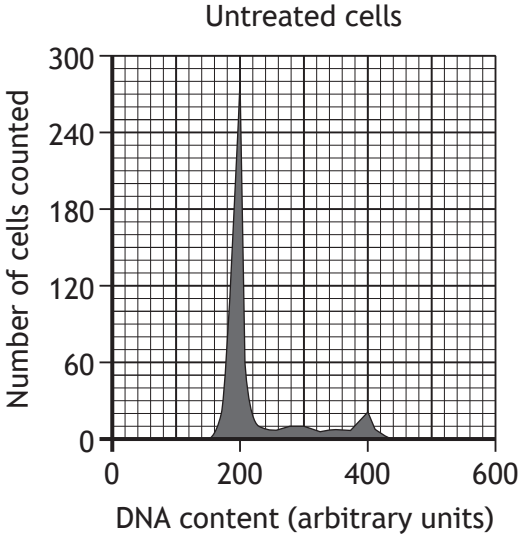


Figure 4B



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