Who (or what) is killing the birds?

In this hands-on investigation, students explore the role of genetic mutations in inherited diseases. Using a DNA Model Kit and coloured objects to represent nucleotide bases, like Poppit Beads, they build and decode DNA sequences to uncover which genetic condition is affecting a population of birds. The “culprit” isn’t a person, it’s in the genes.

Curriculum Links

Australian Curriculum v9:
Year 9 – Biological Sciences:

AC9S9U03
Genetic information is passed down through generations and determines the characteristics of living things.

AC9S9H01
Use scientific knowledge to evaluate claims and propose evidence-based arguments

Activity Idea:

DNA Forensics - Genetic Disease Investigation

Theme link: Decoding life’s blueprint

You’ll need:

- [ ] DNA Model Kit
- [ ] Poppit Beads – Blue
- [ ] Poppit Beads – Green
- [ ] Poppit Beads – Yellow
- [ ] Poppit Beads – Red
- [ ] “Case files” with genetic sequences and condition clues (below)

1. Students receive a mystery case involving a population decline in a bird species.
2. Using colour-coded Poppit Beads, they construct DNA sequences found in different samples.
3. They compare their strand to reference sequences and identify the genetic mutation responsible (e.g. a disease causing metabolic or structural issues).
4. Once identified, students research how this mutation could impact survival or reproduction.

Extend

Link to biodiversity and conservation through the concept of environmental DNA (eDNA).

DNA Forensics Case File & Student Worksheet

A local population of native birds is declining and scientists suspect a genetic disease is impacting the health and survival of the species. As a geneticist, your job is to decode the DNA samples and identify the disease-causing mutation.

Materials

- [ ] DNA Model Kit
- [ ] Poppit Beads (Red, Blue, Green, Yellow)
- [ ] Printed DNA Sequences (this worksheet)
- [ ] Scissors and tape (if assembling sequences)
- [ ] Reference guide to genetic diseases

Reference: Genetic Conditions

Use the colour-coded beads or paper strips to build the following sequences.

Mutation: CAA → CGA
Linked to reduced oxygen transport (model: sickle-cell-like disorder).

Mutation: TTT → TTA
May disrupt protein synthesis, leading to energy metabolism issues. .

Mutation: CTA → CTT
Causes a shift in amino acid placement, resulting in structural protein malfunction.

Step-by-step

Use the colour-coded beads or paper strips to build the following sequences.

Sample A:

ATG GTC CAA TTT GGA CTA

Sample B:

ATG GTC CAA TTT GGA CTT

Sample C:

ATG GTC CGA TTT GGA CTA

Sample D:

ATG GTC CAA TTA GGA CTA

Student analysis questions

Which sample(s) contain a mutation compared to the original reference sequence?

Match each mutation to a possible condition using the reference guide.

How might the identified mutation impact the bird's survival or reproduction?

Why is it important to understand how mutations affect populations?

What are some other ways DNA is used in environmental science?