




Components

| | NAME | DESCRIPTION | AUDIENCE |
|---|--|---|----------|
|  | <i>Melanoma risk factors</i> teacher guide | This guide describes activities to introduce students to melanoma risk factors. | teachers |
|  | <i>Melanoma: rate your risk</i> learning object | This learning object introduces melanoma. Interactive activities explore six major risk factors related to melanoma developing. Students build their own personal risk profile. | students |
|  | <i>All about melanoma</i> background sheet | This background sheet provides detailed information about genetics of melanoma, its detection, how it develops and current treatments. | teachers |

Purpose

To **Engage** student interest in gene expression by investigating melanoma and risk factors associated with its development.

Outcomes

Students:

- understand melanoma is a genetic disease, resulting in different gene expression patterns;
- recognise risk factors that are implicated in development of melanoma may be environmental, phenotypic and genetic, and that there's interaction between them;
- understand that the specific risk factors for melanoma development are: overexposure to UV radiation, age, geography, skin type, number of moles, familial and personal history;
- rate an individual's risk of melanoma development based on specific risk factors; and
- build a personal risk profile assessing potential impact of risk factors on their own chance of developing melanoma.

Activity summary

| ACTIVITY | POSSIBLE STRATEGY |
|--|-----------------------|
| Students work through the learning object, <i>Melanoma: rate your risk</i> , and build their personal risk profile for melanoma development. | pairs or individually |
| Class discussion after completion of the learning object, <i>Melanoma: rate your risk</i> . | whole class |

Technical requirements

The teacher guide and background sheet requires Adobe Reader (version 5 or later), which is a free download from www.adobe.com.

The learning object requires a modern browser (eg Internet Explorer 9 or later, Google Chrome, Safari 4.0+, Opera or Firefox) on computer or mobile device. It can be placed on a web or file-server and run either locally or remotely in a web browser. Javascript should be enabled for best results.

Teacher notes

Key discussion points in the learning object, *Melanoma: rate your risk*, include:

| SCREEN | KEY POINTS AND DISCUSSION TOPICS |
|--------------------------------|--|
| (introduction) | <p>Melanoma is predominantly associated with acquired genetic mutations. Only a small percentage of cases are inherited. Genetic mutations change gene expression patterns of affected cells.</p> <p>Melanoma often begins as a localised tumour on the skin, but melanoma cells can travel through the body via the circulatory and lymphatic systems. This is known as metastatic melanoma.</p> <p>Advanced stage metastatic melanoma is difficult to treat.</p> |
| Melanoma personal risk profile | <p>Everyone is at risk of melanoma, but certain risk factors (variables) increase your chances of melanoma developing. Risk factors are characteristics, conditions or behaviours that affect your chance of developing a disease. There are particular risk factors associated with increased risk of genetic mutations that may result in melanoma.</p> <p>Exposure to risk factors doesn't mean a person will develop melanoma, but it increases chances of it developing.</p> |
| geography | <p>Australia has one of the highest incidences of melanoma in the world, surpassed only by New Zealand.</p> <p>This high rate is associated with latitude, high UV levels, and large numbers of Caucasians or fair skin types.</p> <p>Students should understand that phenotype (skin type) interacts with environment (geography).</p> |
| skin type | <p>Skin type is a phenotypic characteristic. Skin type is determined by the amount of melanin in the skin. This pigment offers some protection against UV radiation. Darker skinned people have more melanin than fair skinned people so they have a lower risk of melanoma developing.</p> <p>Skin type interacts with environmental risk factors, such as geography and sun exposure.</p> |
| number of moles | <p>Moles are present from birth and/or develop throughout a person's lifetime. People with many moles on their body (> 50) have an increased risk of melanoma developing. People with large numbers of moles often have fair skin types and higher sun exposure levels.</p> <p>Atypical or dysplastic moles are benign moles that have an unusual appearance: they may be oddly coloured or shaped. People with these types of moles have a higher risk of melanoma developing.</p> |
| age | <p>Incidence of almost all cancers increases with age.</p> <p>Acquired mutations cause most cancers, and as we age more mutations accumulate, increasing the likelihood of cancer developing.</p> <p>Melanoma is one of the most common cancers in younger age groups, 15-39 years, accounting for 20% of all cancer cases.</p> |
| personal or family history | <p>Inherited melanoma is rare. In Australia inheritance accounts for around 1 – 2% of all melanoma cases.</p> <p>However, a family history of melanoma does increase a person's risk because family members often have similar phenotypes, skin type and moles. They also share similar environments and behaviours, such as high levels of sun exposure.</p> |
| sun exposure | <p>Sun exposure and melanoma development is complex. There's some indication that intermittent or infrequent sun exposure has a greater risk for melanoma development. Serious sunburn during childhood (under age 15 years) is also linked with an increased risk.</p> <p>Other skin cancer types, such as basal cell carcinoma and squamous cell carcinoma, are more often associated with chronic or frequent sun exposure.</p> <p>Infrequent, intense bursts of sun seem to be significant in the development of melanoma.</p> |

| SCREEN | KEY POINTS AND DISCUSSION TOPICS |
|-----------------------------|--|
| interaction of risk factors | Exploration of the interaction between phenotypic, genetic and environmental factors in melanoma development is encouraged. Melanoma involves multiple genetic mutations that are predominantly acquired, and may be associated with environmental/behavioural factors such as sun exposure, and with phenotypic characteristics, such as skin type. |
| What's your risk? | To help students interpret their profile outcomes, explain that exposure to risk factors doesn't mean a person will develop melanoma. Advise students to practise SunSmart behaviours to reduce their risk, particularly if they have fair skin type. For more information about SunSmart please visit: https://www.cancerwa.asn.au/prevention/sunsmart/ For more information about melanoma, including melanoma support please visit: http://www.melanomawa.org.au/ |

Image credits

Melanoma: rate your risk (learning object)

All about melanoma (background sheet)

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Associated SPICE resources

Gene expression 1: Melanoma risk factors may be used in conjunction with related SPICE resources to address the broader topic of gene expression and regulation.

| DESCRIPTION | LEARNING PURPOSE |
|---|------------------|
| <p><i>Gene expression (overview)</i></p> <p>This learning pathway shows how a number of SPICE resources can be combined to teach the topic: gene expression and regulation.</p> <p>All resources use a human disease context, melanoma, which helps students relate to advances in biotechnology and our understanding of molecular genetics.</p> | |
| <p><i>Gene expression 1: Melanoma risk factors</i></p> <p>Students use an interactive learning object to investigate risk factors associated with melanoma developing.</p> | Engage |
| <p><i>Gene expression 2: Polymerase chain reaction</i></p> <p>Students simulate polymerase chain reaction in the classroom.</p> | Explore |
| <p><i>BioDiscovery activity (optional)</i></p> <p>Students attend the LotteryWest Biodiscovery Centre at the Harry Perkins Institute of Medical Research to participate in a SPICE-developed PCR laboratory activity. See <i>Gene expression (overview)</i> for details.</p> | Explore |
| <p><i>Gene expression 3: Measuring gene expression</i></p> <p>Students measure gene expression via a microarray simulation conducted in the school laboratory.</p> | Explore |
| <p><i>Gene expression 4: Regulating gene expression</i></p> <p>An animation explains how gene expression is regulated by complex molecular interactions. These processes are important in increasing organism adaptability, flexibility and complexity.</p> | Explain |
| <p><i>Gene expression 5: Personalised medicine</i></p> <p>Students explore an interactive story to discover how increased understanding of molecular biology and advances in biotechnology have led to development of personalised medical treatments for melanoma patients.</p> | Elaborate |