جمهورية العراق

وزارة التعليم العالي والبحث العلمي

كلية الحله الجامعة

قسم الفيزياء الطبية

((Skin cancer))

بحث مقدم الى :

كلية الحله الجامعة – قسم الفيزياء الطبية وهوه جزء من متطلبات نيل درجة البكالوريوس في الفيزياء الطبية

اعداد الطلبة

نرجس عدنان هادي حسين

سجاد محمد جبر

زينب محمد عبد العباس

محمد جواد كاظم حمادي

عماد فاضل فرحان

محمد عزيز حمزه

بنين هاشم علي

اشـــراف

م.م. اسامه مرتضى

١٤٤٤هـ

٢٠٢٤م

بِسْمِ اللهِ الرِحْمٰنِ الرَحِيْمْ

وَمَا قَدَرُواْ ٱللَّهَ حَقَّ قَدْرِهِۦٓ إِذْ قَالُواْ مَآ أَنزَلَ ٱللَّهُ عَلَىٰ بَشَرٍ مِّن شَيْءٍۗ قُلْ مَنْ أَنزَلَ ٱلْكِتَٰبَ ٱلَّذِي جَآءَ بِهِۦ مُوسَىٰ نُورًا وَهُدًى لِّلنَّاسِۖ تَجْعَلُونَهُۥ قَرَاطِيسَ تُبْدُونَهَا وَتُخْفُونَ كَثِيرًاۖ وَعُلِّمْتُم مَّا لَمْ تَعْلَمُوٓاْ أَنتُمْ وَلَآ ءَابَآؤُكُمْۖ قُلِ ٱللَّهُۖ ثُمَّ ذَرْهُمْ فِي خَوْضِهِمْ يَلْعَبُونَ ٩١

صَدقَ اللهِ العَلِيُ العَظِيم

إهـــداء

إلى قَسِيمَ آلَجّنِهّ وُآلنَآر آلَى آمَيَر آلمَؤمَنِيَنِ عْلَيَ بَنِ آبَيَ طَِآلَبَ (عْلَيهّ آفُضلَ آلَصّلَآهّ وُآلَسلآمَ) آلَى سيَدِهّ نِسآء آلَعْآلَمَيَنِ وُبَنِتْ رسِوُلَ آلآمَهّ فُآطِمَهّ آلَزهّرآء (عْلَيهّآ آلَسلآمَ) آلَى قُتْيَلَ آلَعْبَرآتْ آبَآ آلآحَرآر شْهّيَدِ آلَطِفُ آلَحَسيَنِ بَنِ عْلَيَ (عْلَيهّ آلَسلآمَ) آلَى آلَ بَيَتْ رسِوُلَ آللَهّ آلآصّفُيَآء آلمَتْقُيَنِ (عْلَيَهّمَ آفُضلَ آلَصّلَآهّ وُآلَتْسلَيَمَ) آلَى صّآحَبَ آلآمَر سيَدِيَ وُمَوُلَآيَ صّآحَبَ روُحَيَ وُآلَزمَآنِ آلَحَجّهّ عْلَى آلَبَريَهّ آلآمَآمَ آلَهّآدِيَ آلمَهّدِيَ آلَعْلَمَ آلمَنِصّوُبَ (عْجّلَ آللَهّ تْعْآلَى فُرجّهّ آلَشْريَفُ)

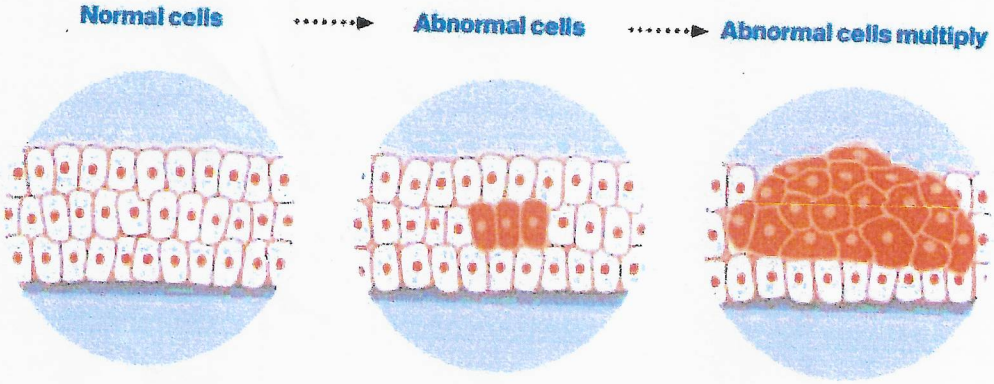
الفهرس

Introduction:

Cancer is a disease of the cells. Cells are the body's basic building blocks – they make up tissues and organs. The body constantly makes new cells to help us grow, replace worn-out tissue and heal injuries.1

Normally, cells multiply and die in an orderly way, so that each new cell replaces one lost. Sometimes, however, cells become abnormal and keep growing. These abnormal cells may turn into cancer.3

In solid cancers, such as skin cancer, the abnormal cells form a mass or lump called a tumour. In some cancers, such as leukaemia, the abnormal cells build up in the blood.2,4

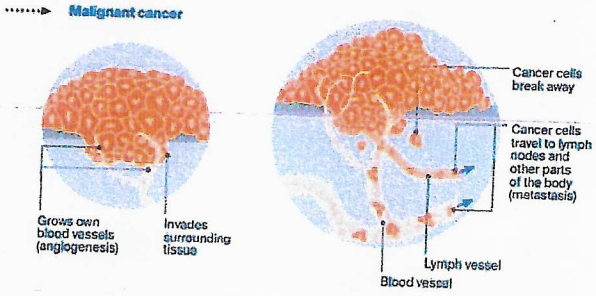


(1,1) How cancer starts?

Not all tumours are cancer. Benign tumours tend to grow slowly and usually don't move into other parts of the body or turn into cancer. Cancerous tumours, also known as malignant tumours, have the potential to spread. They may invade nearby tissue, destroying normal cells. The cancer cells can break away and travel through the bloodstream or lymph vessels to other parts of the body.

The cancer that first develops is called the primary cancer. It is considered localised cancer if it has not spread to other parts of the body. If the primary cancer cells grow and form another tumour at a new site, it is called a secondary cancer or metastasis. A metastasis keeps the name of the original cancer. For example, squamous cell carcinoma that has spread from the skin to the lymph nodes is called metastatic squamous cell carcinoma.1,5,6

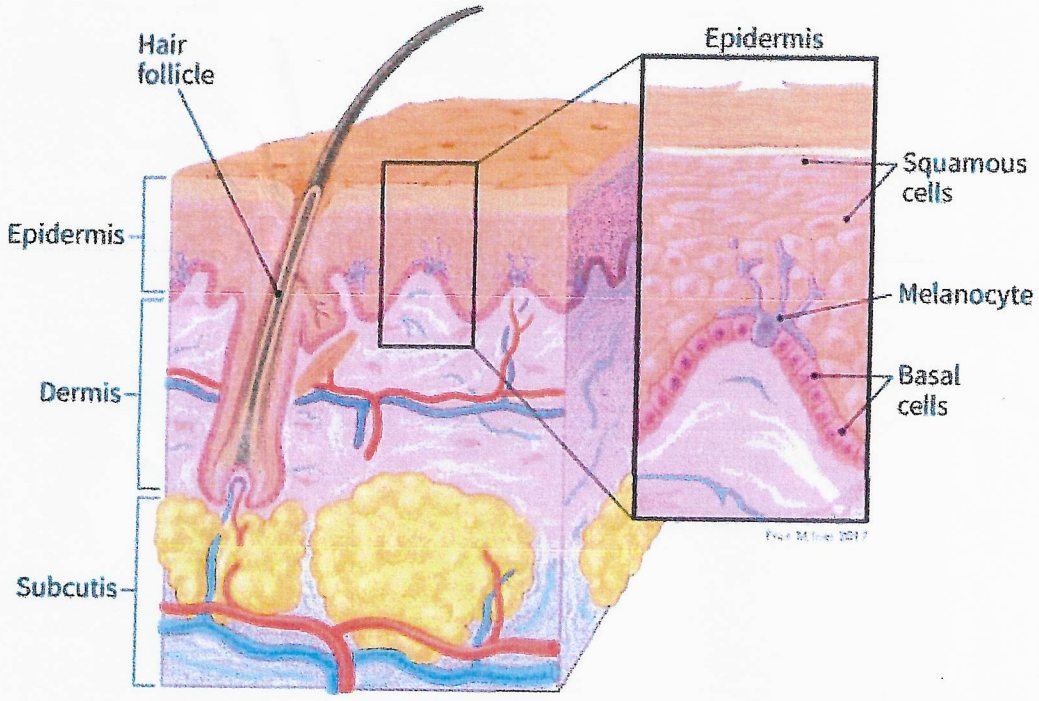
(1,2)How cancer spreads.



Types of Skin Cancer:

There are three main types of skin cancer: 3,4

1. Melanoma – begins in the melanocytes and is the deadliest form of skin cancer.
2. Squamous cell cancers – starts in the squamous cells of the skin and typically appear on sun exposed areas.
3. Basal cell cancers – begins in the basal cell layer of the skin and grow slowly and rarely spread to other parts of the body.

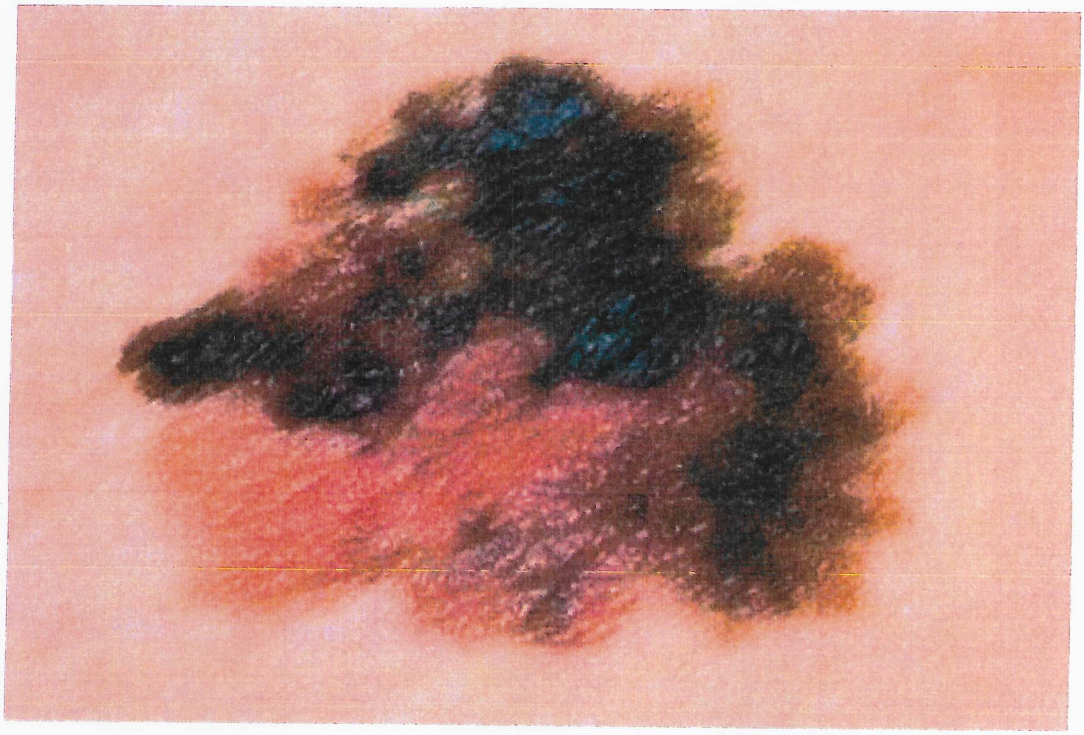


(1,3)Skin.

Melanoma skin cancer:

Melanoma is a type of skin cancer that develops when melanocytes (the cells that give the skin its tan or brown color) start to grow out of control. Cancer starts when cells in the body begin to grow out of control. Cells in nearly any part of the body can become cancer, and can then spread to other areas of the body. Melanoma is much less common than some other types of skin cancers. But melanoma is more dangerous because it's much more likely to spread to other parts of the body if not caught and treated early.4,5 Melanoma is a cancer that begins in the melanocytes. Other names for this cancer include malignant melanoma and cutaneous melanoma. Most melanoma cells still make melanin, so melanoma tumors are usually brown or black. But some melanomas do not make melanin and can appear pink,

tan, or even white. Melanomas can develop anywhere on the skin, but they are more likely to start on the trunk (chest and back) in men and on the legs in women.



(1,4) Melanoma.

The neck and face are other common sites. Having darkly pigmented skin lowers your risk of melanoma at these more common sites, but anyone can get melanoma on the palms of the hands, soles of the feet, or under the nails. Melanomas in these areas make up a much larger portion of melanomas in African Americans than in whites. Melanomas can also form in other parts of your body, such as the eyes2, mouth, genitals, and anal area, but these are much less common than melanoma of the skin. Melanoma is much less common than some other types of skin cancer. But melanoma is more dangerous because it's much more likely to spread to other parts of the body if not caught and treated early.2,5,7

Benign tumors that start in melanocytes:

A **mole** (nevus) is a benign skin tumor that develops from melanocytes. Almost everyone has some moles. Nearly all moles (nevi) are harmless, but having some types can raise your risk of melanoma. See Risk Factors for Melanoma Skin Cancer8 for more information about moles. A **Spitz nevus** is a kind of mole that sometimes looks like melanoma. It's more common in children and teens, but it can also be seen in adults. These tumors are typically benign and don't spread. But sometimes doctors have trouble telling Spitz nevi from true melanomas, even when looking at them under a microscope. Therefore, they are often removed, just to be safe. 3,6

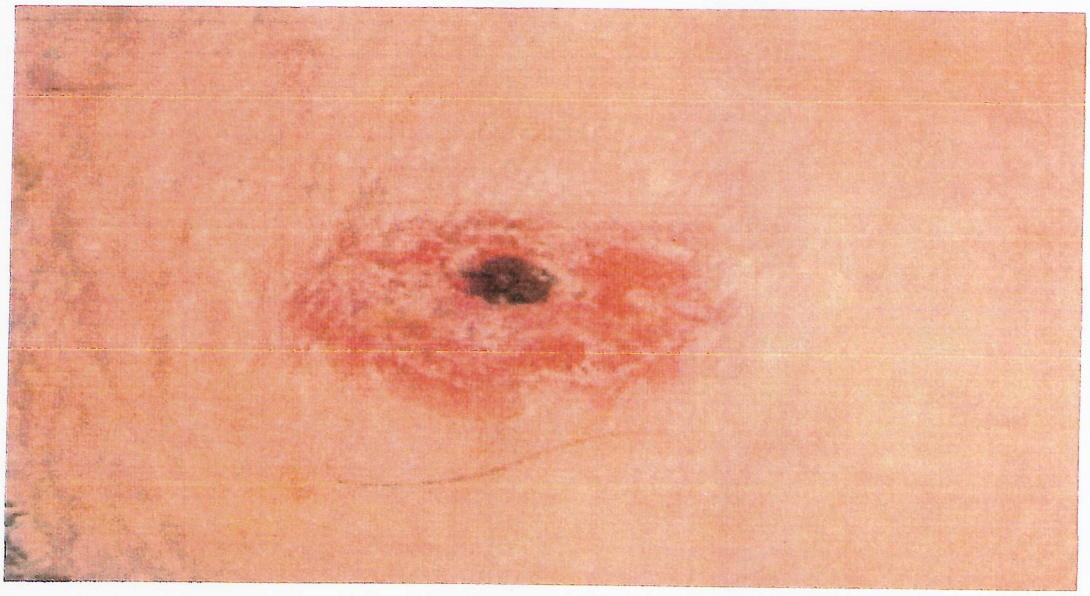
Melanoma genetic research:

Scientists have made a great deal of progress in understanding how some of the DNA (gene) changes inside normal skin cells can lead them to become melanoma cells. In some cases, these gene changes can now be targeted with newer treatments8 for melanoma. Some people inherit mutated (damaged) genes9 from their parents that raise their risk of melanoma. For example, changes in the CDKN2A (p16) gene cause some melanomas that run in certain families. People who have a strong family history of melanoma might want to speak with a cancer genetic counselor or a doctor experienced in cancer genetics to discuss the possible benefits, limits, and downsides of testing for changes in this gene10.

Basal and squamous cell skin cancers:

Are the most common types of skin cancer. They start in the top layer of skin (the epidermis), and are often related to sun exposure. Cancer starts when cells in the body begin to grow out of control. Cells in nearly any part of the body can become cancer cells.7

(1,5) Basal cell skin cancers.



(1,6) squamous cell skin cancers.

Basal cell carcinoma (also called basal cell skin cancer) is most common type of skin cancer. About 8 out of 10 skin cancers are basal cell carcinomas (also called basal cell cancers). These cancers start in the basal cell layer, which is the lower part of the epidermis. These cancers usually develop on sun-exposed areas, especially the face, head, and neck. They tend to grow slowly. It's very rare for a basal cell cancer to spread to other parts of the body. But if it's left untreated, basal cell cancer can grow into nearby areas and invade the bone or other tissues beneath the skin. If not removed completely, basal cell carcinoma can come back (recur) in the

same place on the skin. People who have had basal cell skin cancers are also more likely to get new ones in other places. 5,8,9

About 2 out of 10 skin cancers are squamous cell carcinomas (also called squamous cell cancers). These cancers start in the flat cells in the upper (outer) part of the pidermis. These cancers commonly appear on sun-exposed areas of the body such as the face, ears, neck, lips, and backs of the hands. They can also develop in scars or chronic skin sores elsewhere. They sometimes start in actinic keratoses (described below). Less often, they form in the skin of the genital area. Squamous cell cancers can usually be removed completely (or treated in other ways), although they are more likely than basal cell cancers to grow into deeper layers of skin and spread to other parts of the body. 2,6

Pre-cancerous and other skin conditions related to squamous cell carcinoma:

1- Actinic keratosis (AK), also known as solar keratosis, is a pre-cancerous skin condition caused by too much exposure to the sun. AKs are usually small (less than 1/4 inch across), rough or scaly spots that may be pink-red or flesh-colored. Usually they start on the face, ears, backs of the hands, and arms of middle-aged or older people with fair skin, although they can occur on other sun-exposed areas. People who have them usually develop more than one. AKs tend to grow slowly and usually do not cause any symptoms (although some might be itchy or sore). They sometimes go away on their own, but they may come back. A small percentage of AKs may turn into squamous cell skin cancers. Most AKs do not become cancer, but it can be hard sometimes to tell them apart from true skin cancers, so doctors often recommend treating2 them. If they are not treated, you and your doctor should check them regularly for changes that might be signs of skin cancer. 9,1

2- Squamous cell carcinoma in situ, also called Bowen disease, is the earliest form of squamous cell skin cancer. "In situ" means that the cells of these cancers are still only in the epidermis (the upper layer of the skin) and have not invaded into deeper layers. Bowen disease appears as reddish patches. Compared with AKs, Bowen disease patches tend to be larger, redder, scalier, and sometimes crusted. Like AK, Bowen disease usually doesn't cause symptoms, although it might be itchy or sore. Like most other skin cancers (and AKs),

these patches most often appear in sunexposed areas. Bowen disease can also occur in the skin of the anal and genital areas (where it is known as erythroplasia of Queyrat or Bowenoid papulosis). This is often related to sexually transmitted infection with human papillomaviruses (HPVs), the viruses that can also cause genital warts. Bowen disease can sometimes progress to an invasive squamous cell skin cancer, so doctors usually recommend treating3 it. People who have these are also at higher risk for other skin cancers, so close follow-up with a doctor is important. 10,13

3- Keratoacanthomas are dome-shaped tumors that are found on sun-exposed skin. They may start out growing quickly, but their growth usually slows down. Many keratoacanthomas shrink or even go away on their own over time without any treatment. But some continue to grow, and a few may even spread to other parts of the body. They can be hard to tell apart from squamous cell skin cancer, and their growth is often hard to predict, so many skin cancer experts recommend treating them (typicallywith surgery).12

Benign tumors that develop from other types of skin cells:

- **Seborrheic keratoses:** tan, brown, or black raised spots with a "waxy" texture
- **Hemangiomas:** benign blood vessel growths, often called *strawberry spots*
- **Lipomas:** soft growths made up of fat cells.
- **Warts:** rough-surfaced growths caused by some types of human papilloma virus (HPV).8

Malignant melanoma:

Stage		Explanation
0	Melanoma in situ	This means that the melanoma cells have not invaded into the deeper tissues of the skin (the dermis) and is confined in the outer most layer of the skin (the epidermis)
1A	Melanoma is less than 1mm thick, not ulcerated (the surface of the skin is intact) and no signs of actively dividing (mitoses)	The uppermost layer of the skin has been replaced with melanoma cells and no signs of further spread, such as to the lymph nodes or other parts of the body
1B	Melanoma is less than 1mm thick but has ulceration (the surface of the skin is broken) or mitoses; Melanoma is 1-2 mm thick without ulceration or mitoses	The uppermost layer of the skin has been replaced with melanoma cells and no signs of further spread, such as to the lymph nodes or other parts of the body
2A	Melanoma is 1-2 mm thick and has ulceration; Melanoma is 2-4 mm thick without ulceration	The melanoma is only into the skin and no signs of further spread, such as to the lymph nodes or other parts of the body
2B	Melanoma is 2-4 mm thick without ulceration; Melanoma is 4mm thick or more but without ulceration	The melanoma is only into the skin and no signs of further spread, such as to the lymph nodes or other parts of the body
2C	Melanoma is 4mm thick or more, with ulceration	The melanoma is only into the skin and no signs of further spread, such as to the lymph nodes or other parts of the body
3A	Melanoma is not ulcerated but has spread to the local lymph nodes (up to three nodes)	Melanoma cells are seen in a lymph node using a microscope (microscopic deposit), but they have not increased sufficiently in number for the lymph node to be felt through the skin (macroscopic deposit). There is no evidence it has spread to other parts of the body

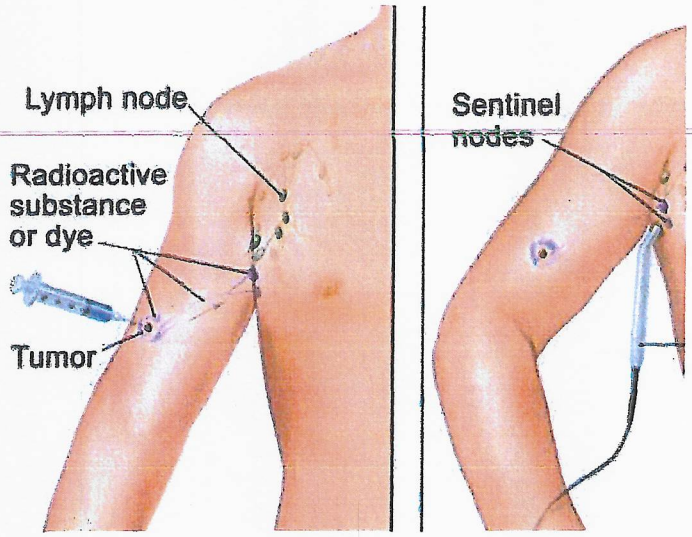
Stage		Explanation
3B	Melanoma is ulcerated and microscopic deposits of melanoma have been found in no more than three lymph nodes; or	Cells have spread from the primary site of the melanoma to the local lymph nodes but only microscopically, as would only be determined by SLNB as the nodes would not be palpable to touch. There is no evidence it has spread to other parts of the body.
	Melanoma is not ulcerated and macroscopic deposits of melanoma have been found in no more than three lymph nodes; or	Cells have spread from the primary site of the melanoma to the local lymph nodes and are now palpable. There is no evidence it has spread to other parts of the body.
	Melanoma is not ulcerated and has not been found in the lymph nodes. Melanoma deposits have been found within the tissues in transit to the lymph nodes.	Cells have spread from the primary site of the melanoma along the lymphatic channels but have not reached the local lymph nodes. There is no evidence it has spread to other parts of the body.
3C	Melanoma is ulcerated and macroscopic deposits of melanoma have been found in the lymph nodes; or	Cells have spread to the local lymph nodes and are also in the lymphatics (in transits). There is no evidence it has spread to other parts of the body.
	Melanoma is not ulcerated and macroscopic deposits have been found in at least four lymph nodes; or	In addition to being ulcerated at the primary site, cells have spread to the local lymph nodes and are now palpable. There is no evidence it has spread to other parts of the body.
	Melanoma has been found as in transit disease and in the lymph nodes.	Cells have spread to the local lymph nodes which are now palpable and matted together. There is no evidence it has spread to other parts of the body.
4	Melanoma has spread to other parts of the body	There is evidence that the melanoma has spread from the primary site and gone beyond the local lymph node; these sites can occur in the skin well away from the primary melanoma, the liver, the lungs, and the brain. These latter sites can be picked up by radiological investigations such as CT scans, MRI and PET scans.

X-rays, CT scans and blood tests:

Once melanoma has been diagnosed, your specialist will guide you about whether any scans or blood tests are needed. Historically, chest x-rays have been used to assess whether disease has spread but we now use CT scans as they are more detailed. A CT scan is usually requested if there is a risk that melanoma may have spread to other parts of the body. An additional test that may be requested is a blood test to examine the function of the liver. Patients needing a general an aesthetic for surgery may have blood tests and x-rays as part of checking their overall health and fitness.

Sentinel lymph node biopsy (SLNB):

Your doctor may offer this additional procedure to see if melanoma cells have travelled to the lymph nodes in the armpits, neck or groin region. Sentinel lymph node biopsy allows your doctor to locate the nearest lymph node to your melanoma and 'map' this with radioactive dye (in the x-ray department) before you come to the operating theatre. When your plastic surgeon completes the wider excision of the melanoma scar, this lymph node or nodes are also removed through a small scar and sent away for careful examination to look for tumour cells. It takes three or four weeks to complete this work whilst you recover from surgery. Around 20% of patients will have a few melanoma cells in the sentinel node that has been removed. Currently it is recommended for these patients that the remaining lymph nodes at the same site are removed in case they too have microscopic deposits. We are not yet certain whether this test and subsequent surgery to remove the remaining lymph nodes, if the SLNB is positive, extends a person's overall life expectancy. However, it gives the best information about the risks of your melanoma causing further problems.



(1,7) SLNB.

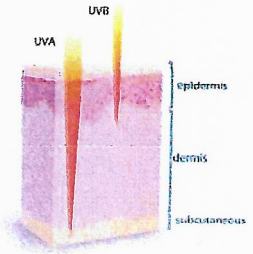
Risk Factors for Skin Cancer:

Exposure to ultraviolet (UV) radiation, in any form, can lead to DNA damage to skin, resulting in short-term adverse effects such as sunburn, eye damage, fainting, and suppression of the immune system.1,5,6 The damage of UV radiation is cumulative over an individual's lifetime.1 Repeated exposure can result in long-term effects such as premature aging of the skin, wrinkles, solar keratosis (scaly growth on the skin), permanent eye damage, and skin and ocular cancers.1,3 The two types of UV radiation that cause the most damage to skin are: 7,8

• UVA – The most common kind of UV light which penetrates below the top layer of skin. Wavelength ranges from 315 to 400 nanometers (nm).
• UVB – UV light which does not penetrate as deeply as UVA rays, but still damages the skin. Wavelength ranges from 280 to 315 nm.

Other risk factors include: 9

- Use of indoor tanning devices
- Fair skin, freckling, and/or light hair
- Presence of atypical, larger, or numerous (more than 50) moles
- Personal or family history of skin cancer, especialy melanoma
- Older age
- Weakened immune system
- Smoking



(1,8)Risk factor.

- Long-term skin conditions, rare inherited conditions , and certain treatments for some medical conditions.

Causes skin cancer:

Over 95% of skin cancers are caused by exposure to UV radiation. When unprotected skin is exposed to UV radiation, how the cells look and behave can change. UV radiation most often comes from the sun, but it can also come from artificial sources, such as arc welders, glue curing lights (e.g. for artificial nails) and solariums (also known as tanning beds or sun lamps). Solariums are now banned for commercial use in Australia because research shows that people who use solariums have a much greater risk of developing skin cancer. Most parts of Australia have high levels of UV radiation from the sun all year round. UV radiation cannot be seen or felt and it is not related to temperature. It can cause sunburn; premature skin ageing; and damage to skin cells, which can lead to skin cancer. You can't always see sun damage to the skin – it can start long before you get sunburnt or develop a tan, and the damage adds up over time. To better understand how to protect your skin from the sun and prevent skin cancer, see pages 32–33. 5,7,8

Diagnosis:

1- **Physical examination:** If you notice any changes to your skin, your doctor will look carefully at your skin and examine any spots you think are unusual. The doctor may use a handheld magnifying instrument called a dermoscope to examine the spots more closely.9
2- **Skin biopsy:** it's not always possible to tell the difference between a skin cancer and a non-cancerous skin spot just by looking at it. If there is any doubt, the doctor may need to take a tissue sample (biopsy) to confirm the diagnosis. A biopsy is a quick and simple procedure that is usually done in the octor's office. You will be given a local anaesthetic to numb the area, then the doctor will either: 1- completely cut out the spot and a small amount of healthy tissue around it (excision biopsy) 2- take a small piece of tissue from the spot (punch or incision biopsy). Stitches may be used to close a larger wound and help it heal. All tissue that is removed is sent to a laboratory, where a pathologist will examine it under a microscope. The results will be available in about a week. If all the cancer and a

margin of healthy tissue are removed during the biopsy, this may be the only treatment you need.6,10

3- **Staging:** The stage of a cancer describes its size and whether it has spread. BCCs rarely need staging because they don't often spread or have other highrisk features. Only a very small number of SCCs require staging. This may be because of where the SCC is, its size or because it has spread. Usually a biopsy is the only information a doctor needs to stage skin cancer. The doctor may also feel the lymph nodes near the skin cancer to check for swelling. This may be a sign that the cancer has spread to the lymph nodes. Rarely, some people will have imaging scans to help with staging.8,9,11

4- **Prognosis:** means the expected outcome of a disease. Your treating doctor is the best person to talk to about your prognosis. Most BCCs and SCCs are successfully treated, especially when found early. Being told you have cancer can come as a shock and you may feel many different emotions.10,12

(1,9)

Diagnosis.

What is skin cancer?	• Australia has one of the highest rates of skin cancer in the world. Over 95% of all skin cancers are caused by UV exposure from the sun. • Common signs include a spot that looks and feels different from others on the skin; a spot that has changed size, shape, colour or texture; a sore that doesn't heal within a few weeks; or a sore that is itchy or bleeds. • Your GP can treat most skin cancers. If necessary, they can refer you to a specialist, such as a dermatologist, surgical oncologist, plastic surgeon or radiation oncologist.
Health professionals	• A dermatologist is a specialist doctor trained in preventing, diagnosing and treating skin conditions, including skin cancer. • A surgical oncologist is trained to perform surgery to treat skin cancer. In some cases, a plastic surgeon may be the treating specialist. • A radiation oncologist is a specialist doctor trained to use radiation to treat cancer, including skin cancer. • Some people visit a skin cancer clinic. When choosing a clinic, consider the staff's qualifications and experience, the costs, and the services offered.
Main tests	• Your doctor will examine your skin and any unusual spots. They may use a magnifying instrument called a dermoscope to look at the spots more closely. • Sometimes a biopsy is used to work out if the spot is cancerous. Tissue is removed and examined under a microscope. You may have stitches to close up the wound. • An excision biopsy may be the only procedure needed to remove skin cancer.

Treatment:

- ✓ Skin cancers may be treated by GPs, dermatologists, surgeons and radiation oncologists. By prescribing the appropriate treatment for the condition and type of skin cancer.11
- ✓ Non-melanoma skin cancer is treated in different ways. The treatment recommended by your doctors will depend on:
  - the type, size and location of the cancer
  - your general health
  - any medicines you are taking (these may increase the risk of bleeding after surgery or delay healing)
  - whether the cancer has spread to other parts of your body. If the excision biopsy removed all the cancer, you may not need any further treatment.12,13,14,15
- ✓ Surgery to remove the cancer (surgical excision) is the most common treatment for invasive BCC and SCC. Most small skin cancers are removed by a GP or a dermatologist in their consulting rooms. A surgeon may treat more complex cases.12
- ✓ Mohs micrographic surgery (usually done under local anaesthetic by a dermatologist or a Mohs specialist. It is used to treat skin cancers that have begun to spread deep into the skin. It can also be used for cancers in areas that are hard to treat, such as near the eye or on the nose, lips and ears).13,14
- ✓ Some sunspots may need treatment if they are causing symptoms or to prevent them becoming cancers. 12
- ✓ Skin cancer that affects cells only on the surface of the top layer of the skin is called superficial. 13
- ✓ Treatment options for superficial BCC and SCC in situ (Bowen's disease) include curettage and electrodesiccation, freezing, topical creams and photodynamic therapy. 13
- ✓ Surgery is not always used for superficial BCC and SCC in situ. It may be used if the diagnosis is uncertain or if the area of abnormal tissue does not respond to non-surgical treatments.15
- ✓ Curettage and electrodessication (also known as cautery) is used to treat some BCCs, small SCCs, and areas of SCC in situ (Bowen's disease). This may be done by a GP or dermatologist.12
- ✓ Cryotherapy, or cryosurgery, is a procedure that uses extreme cold (liquid nitrogen) to remove sunspots, some small BCCs and SCC in situ (Bowen's disease).15

- ✓ Topical treatments (Some skin spots and superficial skin cancers can be treated with creams or gels that you apply to the skin).14
- ✓ Immunotherapy and Chemotherapy cream.15
- ✓ Photodynamic therapy.14
- ✓ Radiation therapy (radiotherapy).14

Main treatment	• Surgery is the most common treatment for skin cancer.
How surgery is done	• The doctor will cut out the cancer and close the wound with stitches. • During Mohs surgery the surgeon removes layers of cells and checks them under a microscope immediately. • For larger wounds, the doctor may use skin from another part of the body (flap or graft) to cover the wound. • Curettage and electrodesiccation (cautery) is when the doctor removes the cancer with a small, sharp tool called a curette. Heat is then applied to stop the bleeding and destroy any remaining cancer cells.
Other treatments	• Cryotherapy is used to treat sunspots and some early skin cancers. The doctor will spray liquid nitrogen onto the skin to freeze and destroy the cancer cells. • Creams, lotions and gels are used to treat some sunspots and cancers. This is known as topical treatment. They may contain immunotherapy or chemotherapy drugs. • Photodynamic therapy uses a cream and a light source to treat sunspots and some skin cancers. • Radiation therapy can be used in areas that are difficult to treat, for large areas and as an alternative to surgery in some cases. It can also be used to reduce the chance of the cancer coming back.

(1,10) Treatments of skin cancer.

Preventing genital skin cancers:

Squamous cell cancers that start in the genital region account for a large proportion of the deaths from this type of skin cancer. Many of these cancers are related to infection with certain types of human papillomavirus (HPV)7, which can be spread through sexual contact. Limiting sexual partners and using safer sex practices such as wearing condoms may therefore help lower the risk of some of these cancers. Vaccines8 are available to help protect against infection from some types of HPV that can cause certain cancers. The main intent of the vaccines has been to reduce the risk of cervical cancer, but they may also lower the risk of 5 other cancers related to HPV, including some squamous cell skin cancers.

Prevention of Skin Cancer:

Avoiding exposure to UV light is the best way to prevent skin cancer.9 This can be done by: 4,9

- Avoiding indoor tanning devices.
- Seeking shade when outdoors in the sun, especially between 10 a.m. and p.m.
- Wearing sun-protective clothing, such as long sleeves, pants, hats, and UV protective sunglasses.
- Using broad spectrum sunscreen with a SPF of 30 or greater to exposed skin.

Cancer trials:

Your doctors and cancer scientists continue to find ways to better treat people with skin cancer. Whenever a new discovery is made, it needs to be carefully tested to understand if it is better than the current treatments. There are trials of new medicine opening all the time and your doctors and nurses will advise you if there is a trial that may be suitable for you. You will be guided through what the trial is about, whether you need any extra tests and how much time you will need to commit. It is entirely up to you if you want to take part, and importantly, saying 'no thank you' does not change your treatment in any way.

Support for patients:

A diagnosis of skin cancer can be very worrying for you and your family but there is lots of support out there for patients and their families. There can be anxiety around visits to the doctor, looking different following surgery, managing financial pressures and talking about how you feel. Talk to your doctors, nurses or GP and they can guide you. Specialist nurses, counselors and clinical psychologists are affiliated to our skin cancer multi-disciplinary teams and many patients find support from these groups very helpful in dealing with new diagnoses, treatment and future plans and support of dependent family.

References:

1. Cancer Council Australia Keratinocyte Cancers Guideline Working Party, *Clinical Practice Guidelines for Keratinocyte Cancer*, Cancer Council Australia, Sydney, viewed 13 July 2021, available from wiki.cancer.org.au/australia/Guidelines:Keratinocyte_carcinoma.

2. Cancer Council Victoria and Department of Health Victoria, *Optimal Care Pathway for People with Keratinocyte Cancer (basal cell carcinoma or squamous cell carcinoma)*, second edition, Cancer Council Victoria, Melbourne, 2021.

3. Australian Institute of Health and Welfare (AIHW), *Skin Cancer in Australia*, AIHW, Canberra, 2016.

4. Services Australia, *Medicare Item Reports*, Services Australia, Canberra, 2020, viewed 3 November 2021, available from medicarestatistics.humanservices.gov.au/statistics/mbs_item.jsp.

5. American Cancer Society. *Cancer Facts & Figures 2020*. Atlanta, GA: American Cancer Society; 2020.

6. Guy GP Jr, Machlin SR, Ekwueme DU, Yabroff R. Prevalence and costs of skin cancer treatment in the U.S., 2002-2006 and 2007-2011. *Am J Prev Med*. 2015; 48(2): 183–187. doi:10.1016/j.amepre.2014.08.036.

7. American Cancer Society. What are Basal and Squamous cell *skin cancers*? Accessed January 2020. https://www.cancer.org/cancer/skin-cancer/prevention-and-early-detection/what-is-skin-cancer.html.

8. National Cancer Institute. Skin cancer prevention – Patient version. Updated April 10, 2019. Accessed January 2020. https://www.cancer.gov/types/skin/patient/skin-prevention-dq#section/_4.

9. Eller MS, Maeda T, Magnoni C, Atwal D, Gilchrest BA. Enhancement of DNA repair in human skin cells by thymidine dinucleotides: evidence for a p53-mediated mammalian SOS response. *Proc Natl Acad Sci U S A*. 1997;94(23):12627-12632.

10. Guy GP, Watson M, Haileyesus T, Annest JL. Indoor tanning-related injuries treated in a national sample of US hospital emergency departments. *JAMA Internal Medicine*. 2015; 175(2): 309-311.

11. Centers for Disease Control and Prevention. What is skin cancer? Updated June 24, 2019. Accessed January 2020. http://www.cdc.gov/cancer/skin/basic_info/what-is-skin-cancer.htm#uv.

12. National Toxicology Program U.S. Department of Health and Human Services. Scientific review of ultraviolet (UV) radiation, broad spectrum

and UVA, UVB, and UVC. Accessed January 2020. https://ntp.niehs.nih.gov/ntp/roc/content/profiles/ultravioletradiationrelatedexposures.pdf.

13. American Cancer Society. *Cancer prevention and early detection facts & figures 2019-2020.* Atlanta: American Cancer Society; 2019.

14. Cancer Council Australia Keratinocyte Cancers Guideline Working Party, *Clinical Practice Guidelines for Keratinocyte Cancer,* Cancer Council Australia, Sydney, viewed 13 July 2021, available from wiki.cancer.org.au/australia/Guidelines:Keratinocyte_carcinoma.

15. Cancer Council Victoria and Department of Health Victoria, *Optimal Care Pathway for People with Keratinocyte Cancer (basal cell carcinoma or squamous cell carcinoma),* second edition, Cancer Council Victoria, Melbourne, 2021.