
DA (Daunorubicin) and Ara-C (Cytarabine) for Acute Myeloid Leukaemia

**A Guide for
Patients**

Introduction

In this booklet, we focus on DA treatment, a combination of the two drugs Daunorubicin and Cytarabine (Ara-C), used primarily as induction chemotherapy in patients with newly diagnosed Acute Myeloid Leukaemia.

Acute Myeloid Leukaemia (AML) is one type of rare cancer considered as a very challenging disease by physicians. People who just have been diagnosed with AML should generally start treatment as soon as possible. To know more about the symptoms and diagnosis of AML, please view our booklet titled Acute Myeloid Leukaemia.

Booklet compiled by Saloua Najjam, PhD. (Haematology). Thank you to Nurse Shirley Aston as well as Nicola Clack, CNS at Guy's Hospital, for further input and insight to this document and to Dr Steve Knapper of University Hospital of Wales, Cardiff for peer reviewing this booklet. We are also grateful to Julie Quigley, AML patient reviewer, for her valuable contribution.

If you would like any information on the sources used for this booklet, please email communications@leukaemiacare.org.uk for a list of references.

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About Leukaemia Care

Leukaemia Care is a national charity dedicated to ensuring that people affected by blood cancer have access to the right information, advice and support.

Our services

Helpline

Our helpline is available 9.00am - 10.00pm on weekdays and 9.00am - 12.30pm on Saturdays. If you need someone to talk to, call **08088 010 444**

Nurse service

We have two trained nurses on hand to answer your questions and offer advice and support, whether it be through emailing **nurse@leukaemicare.org.uk**, over the phone on **08088 010 444** or via LiveChat.

Patient Information Booklets

We have a number of patient information booklets like this available to anyone who has been affected by a blood cancer. A full list of titles – both disease specific and general information titles – can be found

on our website at <https://www.leukaemicare.org.uk/support-and-information/help-and-resources/information-booklets/>

Support Groups

Our nationwide support groups are a chance to meet and talk to other people who are going through a similar experience. For more information about a support group local to your area, go to <https://www.leukaemicare.org.uk/support-and-information/support-for-you/find-a-support-group/>

Buddy Support

We offer one-to-one phone support with volunteers who have had blood cancer themselves or been affected by it in some way. You can speak to someone who knows what you are going through. For more information on how to get a buddy call

08088 010 444 or email
support@leukaemicare.org.uk

Online Forum

Our online forum, **www.healthunlocked.com/leukaemia-care**, is a place for people to ask questions anonymously or to join in the discussion with other people in a similar situation.

Patient and carer conferences

Our nationwide conferences provide an opportunity to ask questions and listen to patient speakers and medical professionals who can provide valuable information and support.

Website

You can access up-to-date information on our website, **www.leukaemicare.org.uk**, as well as speak to one of our care advisers on our online support

service, LiveChat (9am-5pm weekdays).

Campaigning and Advocacy

Leukaemia Care is involved in campaigning for patient well-being, NHS funding and drug and treatment availability. If you would like an update on any of the work we are currently doing or want to know how to get involved, email **advocacy@leukaemicare.org.uk**

Patient magazine

Our free quarterly magazine includes inspirational patient and carer stories as well as informative articles by medical professionals. To subscribe go to **https://www.leukaemicare.org.uk/communication-preferences/**

What is DA?

DA (Daunorubicin) and Ara-C (Cytarabine) is a combination of two chemotherapy drugs, Daunorubicin and Cytarabine. Each works in a slightly different way and in the DA regimen they are used at the optimum doses to allow the maximum number of cancer cells to be killed.

Daunorubicin, and Idarubicin are both examples of anthracycline chemotherapy agents. This means they are both made using extracts of a bacterium species. They are used in remission induction therapy for AML, with Daunorubicin being the first and most widely used drug.

Daunorubicin Hydrochloride

Daunorubicin, or more specifically Daunorubicin hydrochloride, is an anthracycline cytotoxic antibiotic produced by a bacterium species.

Daunorubicin Hydrochloride has antimitotic (it stops cell division) and cytotoxic (it kills cancer cells) activity.

Ara-C (Cytarabine)

Cytarabine (Ara-C) is used to treat certain types of leukaemia such as AML and Acute Lymphoblastic Leukaemia (ALL).

It is a nucleoside analogue, which interferes with the growth and spread of cancer cells in the body (an antineoplastic). Like Daunorubicin, Cytarabine is one of a group of drugs known as cytotoxics.

Anthracycline – Made from extracts of a bacterium species.

Antimitotic – A mitotic inhibitor is a drug that inhibits mitosis, or cell division.

Antineoplastic – Interferes with the growth and spread of cancer cells in the body.

Cytotoxic – A group of medicines that contain chemicals which are toxic to cells, preventing their replication or growth, and so are used to treat cancer.



What receives DA?

The 'DA' combination chemotherapy regimen is generally given to newly-diagnosed AML patients who are considered to be medically fit enough to be treated with intensive chemotherapy.

This is generally patients aged below 60 years and fitter patients aged 60 - 70 years.

If you wish to have further information on AML please view our collection of patient information booklets that are available on our website at www.leukaemiacare.org.uk

How is DA administered?

Before starting treatment

Prior starting day one of your treatment with DA, your doctor will run a Full Blood Count (FBC), Liver Function Tests (LFTs) and a measure of kidney function (U&Es). You may also have an echocardiogram (ultrasound scan of the heart) to assess your heart function prior to starting treatment.

These tests will be performed to ensure that you are medically fit to start your treatment. Some chemotherapy drugs can have an effect on your heart.

Usually a central line (PICC line, Hickman line or temporary central line) will need to be inserted, through which the chemotherapy will be administered. Alternatively, a small cannula can be used in your arm or hand.

Induction therapy with the DA

drug combination given in the UK generally consists of two cycles: Cycle 1 DA 3+10 and Cycle 2 DA 3+8, which are summarised on page 9 and 10. Sometimes older patients (generally aged over 60yrs) may also receive a third 'consolidation' cycle of DA(2+5) which is given over five days (younger patients will usually be given different consolidation chemotherapy regimens beyond cycle 2).

If you are well, you will be discharged following your first treatment of DA if your blood counts are improving. The Doctors will review the white cell count (WCC) and let you home when the neutrophils are greater than $1 \times 10^9/L$.

Ask your medical team if you would like more information.

How is DA administered? (cont.)

	Days									
Cycle 1 (DA 3+10)	1	2	3	4	5	6	7	8	9	10
Daunorubicin	x		x		x					
Cytarabine	x	x	x	x	x	x	x	x	x	x

Cycle 1

Ara-C (Cytarabine) given via a drip, or via your central line over 30 minutes twice a day for 10 days.

Daunorubicin is given via a drip once a day on days one, three and five.

The first cycle (Cycle 1 DA 3+10) is given in the hospital, where you will usually remain for about 4-5 weeks until your blood counts recover. The length of this first period of treatment changes from one person to another.

About 18-21 days from the end of the first cycle of DA treatment, you will be advised by your doctor to have a further bone marrow

aspiration to assess the initial response of the AML to treatment. Usually, this procedure does not cause any complications but in a small number of cases:

- It may cause bleeding from the biopsy site, which stops just after. If the bleeding is more severe, a blood transfusion may be necessary.
- The wound may become infected after the biopsy. If you sense any worsening pain or the site becomes sore or inflamed, you should contact a member of the medical team who will advise you.
- The biopsy needle may damage other nearby structures, which is very unlikely to happen.

	Days									
Cycle 1 (DA 3 + 10)	1	2	3	4	5	6	7	8	9	10
Daunorubicin	x		x		x					
Cytarabine	x	x	x	x	x	x	x	x		

Cycle 2

After a short stay at home, you will come back to the hospital to receive the second cycle (Cycle 2 DA 3+8) of treatment. Prior to this, blood tests will again be performed to assess your blood count, kidney and liver function.

Your treatment during this cycle will consist of receiving Ara-C (Cytarabine) via a drip over 30 minutes twice a day for eight days Daunorubicin via a drip over one hour once a day on days one, three and five.

The administration of Daunorubicin and Cytarabine through a thin tube by your nurse could be done in one of the

following ways:

- Into a vein in your arm or hand
- Through a Hickman line which is tunnelled under the skin of your chest into a vein in your arm that goes up into a vein in your chest (PICC line)

Your chemotherapy nurse will take all the precautions while administering DA drug to avoid any extravasation. This is when chemotherapy leaks out of the vein into the tissues under the skin. If unluckily this should happen, your nurse will contact a senior member of the medical team such as your cancer doctor and follow local protocol for dealing with cytotoxic

How is DA administered? (cont.)

extravasation.

No medication is required prior your treatment; however your doctor may advise you to take some supportive medication during the treatment such as:

- Rasburicase or allopurinol for prevention of tumour lysis syndrome; this will usually only apply to cycle 1.
- Antimicrobial mouth care to prevent infections. These are specially designed to kill micro-organisms and stop their growth.
- Anti-infection treatment whilst your neutrophil count is under $0.5 \times 10^9/L$ including antibiotics and anti-fungal drugs.
- Daily administered doses of Daunorubicin are generally $50\text{mg}/\text{m}^2$, but it can be given at higher doses of up to around $90\text{mg}/\text{m}^2$, and Cytarabine is

given twice-daily at $100\text{mg}/\text{m}^2$. Your doctor may decide to lower the dose of DA drug if abnormalities of either kidney or liver function are picked up from your blood tests. In the case of detection of kidney deterioration, your doctor will usually adjust the level of dose of given Daunorubicin, but not Cytarabine.

In the case of detection of liver damage, both Daunorubicin and Cytarabine doses may be adjusted. A raised Bilirubin level may indicate liver damage, while a raised blood creatinine level may indicate kidney damage.

You will have daily routine blood tests while you are in hospital to monitor the effects of the chemotherapy, but please tell your nurse if you experience any symptoms that you are worried about.



What are the side effects of DA?

This treatment can have serious or possibly life-threatening side effects. Therefore, it is very important that you report side effects straight away.

Chemotherapy is the most commonly prescribed anti-cancer treatment but while you are having it, you will become more vulnerable to infection. Symptoms of infection like fever, shivering, discomfort when you pass urine, sweats, sore throat, diarrhoea, cough or breathlessness should be reported to your doctor or nurse to prevent them from becoming life threatening if they are untreated.

You can try the following methods to try and minimise the risk of infection:

- Hand washing.
- Avoidance of ill persons.
- Perform regular temperature checks using a thermometer. If you temperature exceeds 37.5c please contact your Doctor and/ or hospital team immediately.

If you cannot contact them for any reason, go to the hospital directly.

- Stay extra clean.
- If you have a central line (also known as Hickman line), keep the area around it clean and dry. This advice should also be followed if you have a PICC line.
- Clean your teeth every day and check for sores in the mouth or other signs of infection.
- If you get injured and have a scrape or cut, make sure you clean it well.
- Let your doctor or hospital team know if you have a sore bottom, or whether it bleeds. If this happens, this could increase your risk of infections.

Everyone will experience different side effects from DA induction chemotherapy. It is very important that you report any new symptoms to the medical team (doctors and nurses) so that they can be properly assessed and, if necessary, treated. You will have routine blood tests on most days while you are in hospital to monitor the effects of the chemotherapy.

There are four types of side effects: possible, common, uncommon and rare side effects this treatment may cause.

Possible side effects

Common (probable) side effects

- **Discoloured urine** - The red coloured solution of the DA drug may discolour your urine red or pink for the first few days following your treatment. This should not worry you as it is perfectly normal.
- **Anaemia (low number of red blood cells)** - DA chemotherapy

will cause you to become more anaemic (reduces the number of red blood cells being made in the bone marrow). This is often associated with tiredness and breathlessness. Red blood cell transfusions will need to be given until your bone marrow recovers from the chemotherapy (after 4-5 weeks).

Tell your Doctor or inform your hospital immediately if you develop the following signs and symptoms of low blood counts while you are at home:

- Fever (a temperature over 37.5c)
 - Infection
 - Nosebleeds on a regular basis
 - Easy bruising
- **Bruising or bleeding** - This treatment will reduce the

What are the side effects of DA? (cont.)

production of platelets which help the blood clot. Let your doctor know if you have any unexplained bruising or bleeding, such as nosebleeds, bloodspots or rashes on the skin, or bleeding gums. You are likely to need platelet transfusions at least twice per week until your bone marrow recovers from the chemotherapy (usually after four to five weeks).

Top tips if you experience bleeding:

- Apply direct pressure on the bleeding site (this will apply if it is an open area of bleeding skin).
- If you have a nosebleed, apply pressure below the bridge of your nose.
- After applying pressure (where possible), contact your Doctor or hospital immediately.
- If you are unable to control the bleeding, go to your hospital immediately.

- **Blood clots** - Cancer can also increase the chance of a blood clot (thrombosis) and chemotherapy can contribute to this. Symptoms of a blood clot include pain, swelling and redness. If you think you may be suffering from a blood clot, it is important that you speak to your nurse straight away.
- **Skin changes** - Cytarabine can affect the skin due to its toxicity, but it is normally only temporary and will ease off when your treatment ends. Cytarabine rash can leave the skin red and dry and it might be itchy. If this develops, avoid using perfumed moisturising creams and speak to your nurse for more information.
- **Nausea and vomiting (sickness)** - Daunorubicin is highly emetogenic (having the capability to induce sickness) compared to Cytarabine, which means that it induces vomiting and this side effect varies from person to person. Your doctor will provide you with anti-sickness medication along with your

chemotherapy to prevent this. If you continue to feel or be sick, tell your nurse and your doctor may increase the dose of anti-sickness medication or change it completely.

Top tips for managing nausea:

- Eat little and often rather than large meals.
- Eat foods that appeal to you rather than forcing yourself to eat things you do not fancy.
- Eat dry food throughout the day such as toast or crackers.
- Try to avoid skipping meals as much as you can.
- Sip liquids slowly.
- Avoid foods that have a strong smell, are overly sweet, fried or fatty.
- If you experience vomiting, take sips of clear liquids such as water to replace any fluids you have lost.

- **Hair loss** - This is called alopecia, caused by the toxicity of chemotherapy, can be partial or total, but it is completely reversible as your hair will grow back when your treatment is completed. Hair does not always return to its pre-chemo state and can grow back a different colour or curly when previously straight. This hair loss happens gradually usually starting 10 to 14 days into your first course of treatment. If you would like an appointment with the wig service, this can be arranged for you. Please ask a member of staff.

- **Lethargy/Fatigue** - This is when you feel tired and lacking in energy. First, talk to your nurse or doctor about it, then try to manage it by giving yourself more rest when needed, learning how to relax and maybe adopting some simple changes to your diet and exercise routine.

Uncommon side effects

- **Effects on the lung** - You may develop wheezing, a cough, or a fever, or you may feel breathless because of Cytarabine and this

What are the side effects of DA? (cont.)

is more common when given at higher doses. If this is the case, your doctor can arrange tests to check your lungs.

- **Extravasation** - This is when chemotherapy leaks outside the vein. If you develop redness, soreness or pain at the injection site at any time please let your doctor or nurse know straightaway.
- **Diarrhoea** - As this may be a sign of infection, you should let know your nurse when this becomes a problem during or after your treatment.
- **Mouth problems** - Your mouth may become sore or dry, or you may notice small mouth ulcers during this treatment. Drinking at least two litres of fluids a day and keeping a high oral hygiene can help to reduce the risk of this happening. Your doctor can prescribe a mouthwash for you to use during treatment. Occasionally during treatment, you may experience strange taste, sometimes described as metallic or bitter that can be

disguised by strongly flavoured sweets or mints.

Rare side effects

- **Irregular heartbeats** - Daunorubicin may cause heart toxicity. This may cause an irregular heartbeat, breathlessness or swelling of the legs. This is quite rare, especially if your heart is healthy prior to starting treatment, and may be reversible. You should inform your nurse or doctor of any pain in the chest, palpitations or breathlessness that you experience during the treatment.
- **Skin changes** - Sometimes, your skin may appear darker in colour, especially around the joints. This is known as hyperpigmentation. The skin will return to normal when treatment is finished.

Serious and potentially life threatening side effects

- In a small proportion of patients' chemotherapy can result in very severe side effects which may rarely result in death. The medical team caring for you will discuss the risk of these side effects with you in more details.
- **Sex, contraception & fertility**
- It is recommended that you protect yourself and your partner from the toxicity of chemotherapy drugs. It is therefore recommended that you or your partner use a condom during sexual intercourse while you are having the course of chemotherapy. Chemotherapy is dangerous to unborn babies and this will also protect you and your partner from any chemotherapy drugs that may be present in semen and in the vagina. You should inform your doctor immediately if you suspect that you may be pregnant.
- **Fertility** - This chemotherapy

may affect your ability to have children and this will be discussed with you before the start of the treatment.

Late side effects

- Some side effects may become obvious only after a number of years. Accordingly, you should discuss with your doctor before starting the treatment and measure the potential benefit you receive from treatment against the risks of serious long term side effects. With some drugs there is also a small but definite risk of developing another cancer. If any of these problems apply to you, the doctor will discuss these with you and note this on your consent form.

You can find out more about possible late effects in our booklet, which is available on the website or by ringing **08088 010 444**.

What happens if DA doesn't work for me?

The majority of patients with newly-diagnosed AML will achieve complete remission following one to two cycles of DA chemotherapy. Some patients have disease that is more resistant to treatment. In these circumstances, your haematologist will be able to discuss alternative treatments: this may involve further intensive

chemotherapy, discussion of clinical trial options or a switch to less intensive/palliative treatments.

Leukaemia Care offers nationwide support groups for people affected by a diagnosis of a blood or lymphatic cancer. Visit www.leukaemiacare.org.uk, or call **08088 010 444**, to find out more and to find a group near you.

Glossary

A bone marrow aspiration

It removes some of the bone marrow fluid which is then usually looked at under the microscope or tested in other ways. This is almost always taken from the back of the hip bone (iliac crest), but is occasionally taken from the breast bone (sternum). Bone marrow aspiration will be done at the time of original diagnosis and also at points in your treatment where the response of the bone marrow to treatment is assessed (usually following recovery from courses of chemotherapy).

Anthracycline

It is a type of antibiotic that comes from certain types of *Streptomyces* bacteria. It has antitumour antibiotic properties.

Antimitotic

A mitotic inhibitor is a drug that inhibits mitosis, or cell division.

Antineoplastic

Interferes with the growth and spread of cancer cells in the body.

A trephine bone marrow biopsy

It removes a small sample of bone marrow tissue. This is always taken from the back of the hip bone (iliac crest). The sample of tissue is then examined under the microscope to look for abnormal cells and may also be tested in other ways. Bone marrow trephines are done much less often than bone marrow aspirates in AML, most frequently as part of the initial diagnostic tests.

Bilirubin

It is an orange-yellow substance made during the normal breakdown of red blood cells. A raised blood bilirubin level may be an indication of problems with the liver.

Creatinine

A chemical waste molecule that is generated from muscle metabolism. The level of creatinine in the blood gives an indication of kidney function.

Glossary (cont.)

Cytotoxic

A group of medicines that contain chemicals which are toxic to cells, preventing their replication or growth, and so are used to treat cancer.

Emetogenic

Having the capacity to induce emesis (vomiting), a common property of anticancer agents.

Extravasation

Extravasation is when chemotherapy leaks outside the vein. If you develop redness, soreness or pain at the injection site at any time please let your doctor or nurse know straightaway.

Induction Therapy

Remission induction, often just called induction, is the use of chemotherapy to induce remission, ideally complete remission (CR) which means that no leukaemia cells can be found in the bone marrow when this is examined under the microscope. It is important to understand that remission, even CR, does not mean cure; if treatment stops at

this point, almost all patients will relapse – their AML will return.

Leukaemia

A cancer of the blood with many different subtypes. Some forms are acute (develop quickly) and others are chronic (develop slowly). Leukaemia is an excess number of abnormal cells in the blood, usually white blood cells, which stop the bone marrow working properly.

Tumour lysis syndrome

A group of laboratory (e.g.: high level of uric acid in the blood) and clinical (e.g.: kidney failure, seizures) metabolic abnormalities that occur within 3 days before or up to 7 days after the initiation of cancer therapy.

Prophylaxis

Describes measures taken by members of the medical team to maintain health during chemotherapy treatment. For example, the use of antibiotic prophylaxis to reduce the likelihood of infections.

Useful contacts and further support

There are a number of helpful sources to support you during your diagnosis, treatment and beyond, including:

- Your haematologist and healthcare team
- Your family and friends
- Your psychologist (ask your haematologist or CNS for a referral)
- Reliable online sources, such as Leukaemia Care
- Charitable organisations

There are a number of organisations, including ourselves, who provide expert advice and information.

Leukaemia Care

We are a charity dedicated to supporting anyone affected by the diagnosis of any blood cancer.

We provide emotional support through a range of support services including a helpline, patient and carer conferences, support group, informative website, one-to-one buddy service and high-quality patient information. We also have a nurse on our help line for any medical queries relating to your diagnosis.

Helpline: **08088 010 444**
www.leukaemiacare.org.uk
care@leukaemiacare.org.uk

Bloodwise

Bloodwise is the leading charity into the research of blood cancers. They offer support to patients, their family and friends through patient services.

020 7504 2200
www.bloodwise.org.uk

Cancer Research UK

Cancer Research UK is a leading charity dedicated to cancer research.

0808 800 4040
www.cancerresearchuk.org

Macmillan

Macmillan provides free practical, medical and financial support for people facing cancer.

0808 808 0000
www.macmillan.org.uk

Maggie's Centres

Maggie's offers free practical, emotional and social support to people with cancer and their families and friends.

0300 123 1801
www.maggiescentres.org

Citizens Advice Bureau (CAB)

Offers advice on benefits and financial assistance.

08444 111 444
www.adviceguide.org.uk

Leukaemia Care is a national charity dedicated to providing information, advice and support to anyone affected by a blood cancer.

Around 34,000 new cases of blood cancer are diagnosed in the UK each year. We are here to support you, whether you're a patient, carer or family member.

Want to talk?

Helpline: **08088 010 444**

(free from landlines and all major mobile networks)

Office Line: **01905 755977**

www.leukaemicare.org.uk

care@leukaemicare.org.uk

Leukaemia Care,
One Birch Court,
Blackpole East,
Worcester,
WR3 8SG

Registered charity
259483 and SC039207

Leukaemia Care
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