

# BC Cancer Protocol Summary for First-Line Induction and Consolidation Therapy of Acute Promyelocytic Leukemia using Arsenic Trioxide and Tretinoin (All-Trans Retinoic Acid)

**Protocol Code**

LKATOATRA

**Tumour Group**

Leukemia/BMT

**Contact Physician**

Dr. Sujaatha Narayanan

## ELIGIBILITY:

- Newly diagnosed acute promyelocytic leukemia (APL) with low to intermediate risk (WBC less than  $10 \times 10^9/L$ )

## EXCLUSIONS:

- Total bilirubin greater than 51 micromol/L
- Baseline QTc greater than 500 msec

## TESTS:

- **Baseline:**
  - CBC & Diff, platelets, sodium, potassium, calcium, magnesium, phosphate, urea, creatinine, alkaline phosphatase, ALT, total and direct bilirubin, LDH, albumin, uric acid, INR, PTT, fibrinogen, HSV, VZV, HBsAg, HBsAb, HBcAb, ECG, serum HCG (in women of child bearing potential)
  - Send peripheral blood to Cancer Genetics Laboratory for baseline MRD assessment for PML/RARA prior to commencement of arsenic
- **Induction:**
  - Daily: CBC & Diff, platelets, sodium, potassium, magnesium, urea, creatinine
  - Twice weekly: Alkaline phosphatase, ALT, AST, GGT, total and direct bilirubin, albumin, LDH, calcium, phosphate, random glucose
  - Weekly: Fibrinogen, INR, PTT
- **Consolidation:**
  - Three times a week while receiving arsenic, and weekly while off arsenic: CBC & Diff, platelets, sodium, potassium, magnesium, urea, creatinine, alkaline phosphatase, ALT, GGT, total and direct bilirubin, LDH, calcium, phosphate, albumin
  - Weekly during arsenic weeks and as clinically indicated: ECG
  - Weekly during consolidation and as clinically indicated: INR, PTT, random glucose
  - Day 1 of each arsenic consolidation cycle for women of child bearing potential (Day 1 of Weeks 1, 9, 17, and 25): Serum HCG

### DISEASE MONITORING:

- Post Induction: Bone marrow to confirm morphological remission (karyotype, FISH, MRD are not indicated)
- Post consolidation: Peripheral blood MRD assessment for PML/RARA on completion of all planned consolidation cycles to confirm a molecular remission. Following confirmation of molecular remission please perform peripheral blood MRD assessments 3 monthly for 3 years
- CBC & Diff, platelets monthly for 5 years is recommended

### PREMEDICATIONS:

- Optional during consolidation:
  - metoclopramide 20 mg PO x 1 dose 30 to 60 minutes prior to arsenic trioxide or
  - prochlorperazine 10 mg PO x 1 dose 30 to 60 minutes prior to arsenic trioxide

### SUPPORTIVE MEDICATIONS:

- predniSONE 0.5 mg/kg (round to nearest 5 mg) once daily on Days 1 to 28 or until end of induction therapy, then taper over 7 to 10 days.
- If HSV and/or VZV seropositive: valACYClovir 500 mg PO BID  
Continue valACYClovir until at least 1 month after completion of all cycles of arsenic OR at the discretion of the physician

### TREATMENT:

Drug	Induction Dose	BC Cancer Administration Guideline
tretinoin	22.5 mg/m <sup>2</sup> * BID on Days 1 to 60** (Total daily dose = 45 mg/m <sup>2</sup> /day)	PO
arsenic trioxide	0.15 mg/kg once daily on Days 1 to 28**	IV in 100 mL NS over 2 h

\* Round to nearest 10 mg

\*\* Continue onto Day 60 if not in morphological complete remission at Day 28

Drug	Consolidation Dose*	BC Cancer Administration Guideline
tretinoin	22.5 mg/m <sup>2</sup> ** BID on: <ul style="list-style-type: none"><li>▪ Weeks 1 to 2</li><li>▪ Weeks 5 to 6</li><li>▪ Weeks 9 to 10</li><li>▪ Weeks 13 to 14</li><li>▪ Weeks 17 to 18</li><li>▪ Weeks 21 to 22</li><li>▪ Weeks 25 to 26</li></ul> (Total daily dose = 45 mg/m <sup>2</sup> /day)	PO
arsenic trioxide	0.15 mg/kg once daily for 5 consecutive days per week on: <ul style="list-style-type: none"><li>▪ Weeks 1 to 4</li><li>▪ Weeks 17 to 20</li><li>▪ Weeks 9 to 12</li><li>▪ Weeks 25 to 28</li></ul>	IV in 100 mL NS over 2 h

\* Usually starts one week after end of induction

\*\* Round to nearest 10 mg

**Note:** Dosing of arsenic trioxide based on total body weight in obese patients may result in higher than expected plasma and tissue concentrations in obese patients. Monitor all obese patients closely for signs of acute arsenic toxicity.

**Consolidation dosing schema:**

	<b>Wk 1</b>	<b>Wk 2</b>	<b>Wk 3</b>	<b>Wk 4</b>	<b>Wk 5</b>	<b>Wk 6</b>	<b>Wk 7</b>	<b>Wk 8</b>
tretinoin	Days 1-14		rest	rest	✓	✓	rest	rest
arsenic trioxide	Days 1-5	Days 1-5	Days 1-5	Days 1-5	rest	rest	rest	rest
	<b>Wk 9</b>	<b>Wk 10</b>	<b>Wk 11</b>	<b>Wk 12</b>	<b>Wk 13</b>	<b>Wk 14</b>	<b>Wk 15</b>	<b>Wk 16</b>
tretinoin	Days 1-14		rest	rest	✓	✓	rest	rest
arsenic trioxide	Days 1-5	Days 1-5	Days 1-5	Days 1-5	rest	rest	rest	rest
	<b>Wk 17</b>	<b>Wk 18</b>	<b>Wk 19</b>	<b>Wk 20</b>	<b>Wk 21</b>	<b>Wk 22</b>	<b>Wk 23</b>	<b>Wk 24</b>
tretinoin	Days 1-14		rest	rest	✓	✓	rest	rest
arsenic trioxide	Days 1-5	Days 1-5	Days 1-5	Days 1-5	rest	rest	rest	rest
	<b>Wk 25</b>	<b>Wk 26</b>	<b>Wk 27</b>	<b>Wk 28</b>				
tretinoin	Days 1-14		rest	rest				
arsenic trioxide	Days 1-5	Days 1-5	Days 1-5	Days 1-5				

**DOSE MODIFICATIONS:**

**1. Non-hematological**

Dose levels for toxicities (except hepatotoxicity and QTc prolongation)

<b>Dose Level</b>	<b>arsenic trioxide (mg/kg) once daily</b>	<b>tretinoin (mg/m<sup>2</sup>) BID*</b>
Start level 0	0.15	22.5
-1	0.11	18.75
-2	0.10	12.5
-3	0.075	10

\* Round to nearest 10 mg

## 2. Hematological: NO dose reduction during induction

ANC (x 10 <sup>9</sup> /L)		Platelets (x 10 <sup>9</sup> /L)	Duration	Dose (both drugs)
Less than 1.0	or	Less than 50	More than 5 weeks	Reduce by one dose level
Less than 1.0	or	Less than 50	More than 50 days or occurs on 2 consecutive courses	Send bone marrow aspirate for RT-PCR analysis of PML/RARA. If persisting molecular complete remission, resume at one dose level lower than the previous dose.

## 3. Liver dysfunction:

Hepatotoxicity	Dose (both drugs)
Grade 3-4	<ul style="list-style-type: none"> <li>▪ Hold until <b>total and direct</b> bilirubin and/or AST and/or alkaline phosphatase below 4 x ULN</li> <li>▪ Resume at 50% of previous dose during the first week.</li> <li>▪ Increase to full dose if no further worsening.</li> <li>▪ If hepatotoxicity reappears, discontinue both drugs.</li> </ul>

## 4. QT prolongation

QTc interval	Dose of arsenic trioxide
Greater than 500 msec*	<ul style="list-style-type: none"> <li>• Hold dose until QTc less than 500 msec*</li> <li>• Resume as below if no prolongation after each escalation:               <ul style="list-style-type: none"> <li>• Week 1: 0.075 mg/kg</li> <li>• Week 2: 0.11 mg/kg</li> <li>• Week 3 and thereafter: 0.15 mg/kg</li> </ul> </li> </ul>

\*Calculate corrected QT interval (in msec) using Framingham formula [QTc = QT + 0.154 (1 – 60/HR)]

## 5. Other non-hematological toxicities:

Toxicity	Dose (both drugs)
Grade 2	Reduce by one dose level
Grade 3-4	Hold until less than grade 2, then resume at two dose level reduction

### PRECAUTIONS:

1. **Neutropenia:** Fever or other evidence of infection must be assessed promptly and treated aggressively. Refer to [BMT/Leukemia Febrile Neutropenia Guidelines](#).
2. **Renal dysfunction:** patients with creatinine clearance less than 30 mL/min may require dose reduction [of arsenic trioxide and tretinoin](#).
3. **Acute arsenic toxicity** presents with convulsions, muscle weakness, confusion, and ECG abnormalities.
4. **APL differentiation syndrome (DS)** is defined as unexplained fever, dyspnea, pleural and/or pericardial effusion, pulmonary infiltrates, renal failure, hypotension, and unexplained weight gain greater than 5 kg. Severe DS is defined as 4 or more of these signs or symptoms and moderate DS is defined as 2 or more signs and symptoms. Dexamethasone 10 mg IV BID should be initiated.
5. **Leucocytosis** may develop after treatment initiation. Patients can be treated with hydroxyUREA 500 mg QID for WBC 10-50 x 10<sup>9</sup>/L or 1000 mg QID for WBC greater than 50 x 10<sup>9</sup>/L. Discontinue hydroxyUREA when WBC less than 10 x 10<sup>9</sup>/L.
6. **QTc prolongation:** Arsenic trioxide is associated with QTc prolongation. Monitor ECG at baseline, weekly during arsenic trioxide therapy, and as clinically indicated. Treatment interruption and subsequent dose reduction is required for development of QTc prolongation (QTc > 500 msec). Correct electrolyte abnormalities prior to treatment, and maintain serum potassium above 4 mmol/L and serum magnesium within normal limits during arsenic trioxide therapy. Use caution in combination with other medications also associated with QTc prolongation.
7. **Transient, mild headache** may occur several hours after tretinoin ingestion.
8. **Hypervitaminosis A syndrome** have been observed with tretinoin, including xeroderma, lip and mouth dryness, cheilitis, rash, edema, nausea, vomiting and bone pain.
9. **Benign or idiopathic intracranial hypertension** (pseudotumour cerebri) may occur with an onset of about 3-17 days of tretinoin therapy.
10. **Venous and arterial thrombosis** is a risk during the first month of tretinoin treatment.
11. **Hepatitis B Reactivation:** All patients should be tested for both HBsAg and HBcAb. If either test is positive, such patients should be treated with hepatitis B prophylaxis according to current guidelines. Such patients should also be monitored with frequent liver function tests and hepatitis B virus DNA at least every three months. If the hepatitis B virus DNA level rises during this monitoring, management should be reviewed with an appropriate specialist with experience managing hepatitis and consideration given to halting chemotherapy.

**Call Dr. Sujaatha Narayanan or tumour group delegate at (604) 877-6000 or 1-800-663-3333 with any problems or questions regarding this treatment program.**

**References:**

1. Lo-Coco F, Avvisati G, Vignetti M, et al. Retinoic acid and arsenic trioxide for acute promyelocytic leukemia. *N Engl J Med* 1998;339(19):1341-48.
2. Estey E, Garcia-Manero G, Ferrajoli A, et al. Use of all-trans retinoic acid plus arsenic trioxide as an alternative to chemotherapy in untreated acute promyelocytic leukemia. *Blood* 2006;107(9):3469-73.