PROTOTYPE DRUG | Propylthiouracil (PTU) | Antithyroid Agent

**ACTIONS AND USES**
Propylthiouracil is administered to clients with hyperthyroidism. It acts by interfering with the synthesis of T3 and T4 in the thyroid gland. It also prevents the conversion of T4 to T3 in the target tissues. Its action may be delayed from several days to as long as 6 to 12 weeks. Effects include a return to normal thyroid function: weight gain, reduction in anxiety, less insomnia, and slower pulse rate. Owing to its short half-life, PTU is usually administered several times a day.

**ADVERSE EFFECTS**
Overtreatment with propylthiouracil produces symptoms of hypothyroidism. Rash and transient leucopenia are the most common side effects. A small percentage of clients experience agranulocytosis, which is its most serious adverse effect. Periodic laboratory blood counts and TSH values are necessary to establish proper dosage.

**INTERACTIONS**
Drug–Drug: Propylthiouracil can reverse the effects of drugs such as amino-phylline, heparin, and digoxin. Drugs containing iodine may diminish the antithyroid effects of propylthiouracil.

Lab Tests: May increase prothrombin time and increase serum levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP).

**PHARMACOKINETICS**
- **Onset:** 30–40 min
- **Peak:** 1–1.5 h
- **Half-life:** 1–2 h
- **Duration:** 2–4 h

**ADMINISTRATION ALERTS**
- Administer with meals to reduce GI distress.
- Pregnancy category D.

**NURSING PROCESS FOCUS** Clients Receiving Antithyroid Therapy

**Assessment**
- Prior to administration:
  - Obtain a complete health history including allergies, drug history, and possible drug interactions.
  - Obtain a complete physical examination.
  - Assess for the presence of hyperthyroidism.
  - Obtain laboratory studies including T3, T4, and TSH levels, level, ECG, and complete blood count (CBC).

**Potential Nursing Diagnoses**
- Infection, Risk for, related to drug-induced agranulocytosis
- Injury, Risk for, related to side effects of drug therapy
- Health Maintenance, Ineffective, related to adverse GI effects
- Knowledge, Deficient, related to drug therapy

**Planning: Client Goals and Expected Outcomes**
The client will:
- Exhibit a decrease in the symptoms of hyperthyroidism.
- Exhibit normal thyroid hormone levels.
- Exhibit no drug adverse effects such as agranulocytosis or GI distress.
- Demonstrate an understanding of the drug’s action by accurately describing drug side effects and precautions.

**Implementation**
- **Interventions and (Rationales)**
  - Monitor vital signs. (Changes in metabolic rate is manifested as changes in blood pressure, pulse, and body temperature.)
  - Monitor thyroid function tests. (Test results determine the effectiveness of the drug therapy.)
  - Monitor for signs of infection, including CBC and white blood cell (WBC) count. (Antithyroid drug may cause agranulocytosis.)

- **Client Education/Discharge Planning**
  - Instruct client:
    - To count pulse for a full minute, record pulse with every dose, and report rates as ordered by the healthcare provider.
    - To report dizziness, palpitations, and intolerance to temperature changes.
  - Instruct client in the importance of follow-up care and to keep all laboratory appointments.
  - That antithyroid medication may affect the body’s ability to defend against bacteria and viruses.

(Continued)
I-131 are used in nuclear medicine to determine the degree of iodide uptake in the various parts of the thyroid gland.

Nonradioactive iodine is also available to treat other thyroid conditions. Lugol’s solution is a mixture of 5% elemental iodine and 10% potassium iodide that is used to suppress thyroid function 10 to 15 days prior to thyroidectomy.

Sodium iodide is administered IV (along with propylthiouracil) to manage an acute, life-threatening form of hyperthyroidism known as thyroid crisis, or thyroid storm.

Potassium iodide (Thyro-Block, ThyroSafe) is administered to protect the thyroid from radiation damage following a nuclear bioterrorist act, as discussed in Chapter 3.

**NURSING CONSIDERATIONS**

The role of the nurse in hyperthyroidism therapy involves careful monitoring of a client’s condition and providing education as it relates to the prescribed drug treatment. Assess for signs and symptoms of hypothyroidism such as weight gain, hypotension, bradycardia, fatigue, depression, sensitivity to cold environments, hair loss, and dry skin in those clients receiving antithyroid therapy. Assess for complications and adverse effects specific to the antithyroid medication prescribed for the client. For clients receiving propylthiouracil (PTU), monitor white blood cell (WBC) levels periodically, because PTU may cause agranulocytosis, which places the client at risk for infection. Assess for signs of jaundice and monitor liver enzymes, because PTU is metabolized by the liver. The administration of anticoagulants should be monitored carefully, because PTU causes an increase in bleeding. Methimazole (Tapazole) is similar to PTU but is more toxic. Assess for blood dyscrasias such as agranulocytosis and jaundice. These adverse effects usually disappear when the drug is discontinued.

Radioactive iodine (I-131) is used to permanently decrease thyroid function. Assess thyroid function tests, because this medication must be carefully calibrated to

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**NURSING PROCESS FOCUS Clients Receiving Antithyroid Therapy (Continued)**

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Client Education/Discharge Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor weight at least weekly. (As a result of slower metabolism, weight gain is expected.)</td>
<td>To report sore throat, fever, chills, malaise, and weakness.</td>
</tr>
<tr>
<td>Monitor for drowsiness. (Antithyroid medications may cause drowsiness.)</td>
<td>Of the importance of proper hand-washing techniques to decrease the risk of developing an infection.</td>
</tr>
<tr>
<td>Monitor for gastrointestinal distress. (Antithyroid medications may cause nausea and vomiting.)</td>
<td>Instruct client to weigh weekly and to report significant changes.</td>
</tr>
<tr>
<td>Monitor for a decrease in symptoms related to hyperthyroidism such as nervousness, insomnia, tachycardia, dysrhythmias, heat intolerance, chest pain, and diarrhea. (These parameters help determine whether the drug is at a therapeutic level.)</td>
<td>Instruct client about the signs of hyperthyroidism and to avoid hazardous activities until the effects of the drug are known.</td>
</tr>
<tr>
<td>Monitor for symptoms related to hypothyroidism such as fatigue, constipation, cold intolerance, lethargy, depression, and menstrual irregularities. (These symptoms indicate drug toxicity.)</td>
<td>Instruct client to take antithyroid medication with food.</td>
</tr>
<tr>
<td>Monitor for activity intolerance. (Hyperthyroidism results in protein catabolism, overactivity, and increased metabolism leading to exhaustion.)</td>
<td>Instruct client about the signs of hypothyroidism and to report any to the healthcare provider.</td>
</tr>
<tr>
<td>Monitor dietary intake. (Iodine increases the production of thyroid hormones, which is not desirable in these clients.)</td>
<td>Instruct client to schedule rest periods while performing activities of daily living until medication has achieved therapeutic effect.</td>
</tr>
<tr>
<td>Monitor client’s response to drug therapy. (Response determines effectiveness of drug therapy.)</td>
<td>Instruct client to avoid foods with high iodine content such as soy, tofu, turnips, iodized salt, and some breads as directed.</td>
</tr>
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**Evaluation of Outcome Criteria**

Evaluate the effectiveness of drug therapy by confirming that client goals and expected outcomes have been met (see “Planning”).

- The client demonstrates decreased symptoms of hyperthyroidism.
- The client demonstrates normal serum thyroid levels.
- The client is free of adverse effects such as agranulocytosis or GI distress.
- The client demonstrates an understanding of the drug’s action by accurately describing drug side effects and precautions.

See Table 43.3, under the heading “Antithyroid Agents,” for a list of drugs to which these nursing actions apply.