

CHAPTER 6 - HAEMATOLOGY

1 INTRODUCTION

Blood transports the oxygen required for, and carbon dioxide produced by the cellular metabolic processes. Any condition reducing these functions affects the individual while the reduced oxygen tension associated with altitude exacerbates any effects. Although the pressurisation of aircraft reduces such effects the airman must also be able to respond normally to the emergency loss of pressurisation.

2 ANAEMIA

Applicants with a low haemoglobin are temporarily unfit and should be investigated as clinically indicated. Final assessment is dependent on the diagnosis and response to treatment.

2.1 Iron deficiency

If the cause can be identified and is not disqualifying, treatment must lead to a haematocrit greater than 32% when re-certification can be considered.

2.2 Vitamin B12 and folic acid deficiency

After establishing the aetiology and restoring reserves of vitamin B12 or folic acid, a certificate may be issued subject to, at least, 6-monthly follow-up.

2.3 Sideroblastic anaemia

Only carriers of the familial type can be certificated and only when the haematocrit is greater than 32%.

2.4 Haemolytic anaemia

If acquired the underlying conditions must be evaluated and treated. Congenital haemolytic anaemia that is not due to a haemoglobinopathy and with haematocrit above 32%, may be considered for certification.

Applicants with hereditary spherocytic anaemia can be assessed as fit with a haematocrit above 32% or after successful splenectomy.

Applicants with chronic auto immune haemolytic anaemia are unfit. Decompensation is unpredictable and severe.

Other rare conditions, or those of obscure aetiology, should be evaluated on an individual basis. These include paroxysmal nocturnal haemoglobinuria, disorders of red cell synthesis or red cell destruction.

3 POLYCYTHAEMIA

For applicants with a haematocrit greater than 55% further investigation is needed to establish the aetiology. After successful treatment resulting in a haematocrit below 55%, certification may be considered by the AMS. Annual review is required.

Polycythaemia vera is normally disqualifying, subject to AMS discretion, due to its thromboembolic complications and rapid and unpredictable progression.

4 HAEMOGLOBINOPATHIES AND THALASSAEMIAS

4.1 Sickling disorders

Certification should be denied when sickling can be demonstrated at reduced oxygen tension.

Haemoglobin SC disease is associated with a high incidence of retinal haemorrhage and splenic infarction. Certification should be denied.

4.2 Thalassaemia

Applicants with S/B or S/Bo thalassaemia should be denied certification.

Simple, uncomplicated Beta -thalassaemia trait is acceptable.

4.3 Haemoglobin AS (sickle cell trait)

In the absence of conditions such as splenic infarction, this is acceptable.

4.4 Haemoglobin S

If the haematocrit is within the acceptable range and the candidate has no symptoms or history of vaso-occlusive disease, a certificate may be issued.

5 [BLEEDING AND THROMBOTIC DISORDERS]

5.1 Coagulation disorders

Applicants with an inherited coagulation disorder or any history of factor replacement or serious bleeding episodes are considered unfit.

a *Haemophilia*

Applicants with Factor VIII deficiency are unfit. The AMS may consider certification for Class 2 if there is no history of significant bleeding episodes.

b *Von Willebrand's disease*

Applicants with von Willebrand's disease should be denied certification. Individuals without therapy or without a history of significant bleeding episodes may be considered fit by the AMS.

c *Deep vein thrombosis*

A history of deep vein thrombosis requires full investigation for underlying conditions. The individual is considered temporarily unfit.

d *Pulmonary embolism*

Applicants with a history of pulmonary embolisation, not associated with chronic deep venous thrombosis, are considered temporarily unfit until a period of at least 6 months after anticoagulant therapy has been discontinued and not less than 1 year after the actual pulmonary embolism.

e *Recurrent pulmonary emboli*

Applicants with more than one episode of pulmonary embolisation documented by radio-isotopic or angiographic methods are unfit, even if the candidate is asymptomatic. If associated with recurrent injury or special circumstances, certification may be possible at the discretion of the AMS.

f *Arterial emboli*

A single episode is disqualifying because of the high risk of emboli in the brain.

g *Anticoagulant medication*

The use of anticoagulant drugs, such as heparin, coumarin and warfarin, is disqualifying. Following therapy, certification may be considered by the AMS. The use of low dose of low molecular weight heparine may be considered acceptable by the AMS. The use of antiplatelet agents such as acetylsalicylic acid, dipyridole or sulphinpyrazone alone for their prophylactic anti-platelet effect is not disqualifying. Ongoing treatment with anticoagulants in an otherwise fit individual, may be acceptable for Class 2 safety pilot ('OSL') certification after consideration by the AMS. Cardiovascular requirements also refer (see JAR–FCL 3.150(c), JAR–FCL 3.270(c), paragraph 11 Appendix 1 to Subparts B and C and Manual Chapter Aviation Cardiology paragraph 9).

h *Haemorrhagic platelet abnormalities*

A decreased circulating platelet count due to any cause may result in debilitating haemorrhagic episodes. Haemorrhage can also occur when platelet counts are normal but platelet function is abnormal.

5.2 Thrombotic disorders

Applicants with idiopathic thrombocytopenic purpura (ITP) previously treated by splenectomy and with stable platelet counts for six months after therapy has been discontinued, may be considered. Platelet counts should be repeated at six monthly intervals. Applicants who have had thrombocytopenia due to abnormal destruction or consumption, as with disseminated intravascular coagulation (DIC), vasculitis or thrombotic thrombocytopenic purpura (TTP), should be denied certification permanently.

Persons with thrombocytopenia below $75\,000/\text{mm}^3$ should be disqualified. Some temporary episodes of thrombocytosis can occur in persons with underlying iron deficiency anaemia or other temporary disorders such as recovery from alcoholic bone marrow suppression.

If there is a temporary, secondary thrombocytosis that has been resolved and platelet counts have been consistently normal, the AMS may consider certification. Applicants with "essential" thrombocytosis without apparent explanation, who continue to have platelet counts above $750\,000/\text{mm}^3$, should be assessed by the AMS.

6 HAEMATOLOGIC NEOPLASIA

Applicants with a haematologic neoplasia should be denied certification. Individuals with histories of haematologic neoplasia not requiring continuous therapy may be assessed as fit. Adequate follow-up and re-assessment is necessary because of risk of relapse or progression.

Individuals receiving chemotherapy or glucocorticoids should be assessed as unfit.

6.1 Leukaemia

a *Acute lymphocytic leukaemia*

Applicants with the diagnosis of acute lymphocytic leukaemia as an adult shall not be certificated. Applicants with a medical history of acute lymphocytic leukaemia in childhood may be certificated if they are in complete remission and without treatment for at least ten years.

If the individual has had cranial radiation, particular attention should be paid to examination of the neurologic system and mental status.

b *Acute myelogenous leukaemia*

Acute myelogenous leukaemia (AML) or acute nonlymphocytic leukaemia is a very serious disorder and long-term survival is uncommon. Treatment is effective, yet the relapse rate is high and remission lasts only about 15 months on average. An applicant with a history of AML may be considered for certification by the AMS.

c *Pre leukaemia or myelodysplastic syndromes*

The preleukaemic or myelodysplastic syndromes are a group of haematopoietic disorders that frequently evolve to acute myelogenous leukaemia. They are characterised by hypercellular bone marrow and various degrees of peripheral blood cytopenias. Persons with these conditions are prone to infection and bleeding. Because of the relatively poor prognosis and high risk of sudden incapacitation, individuals with these disorders should not be certificated.

d *Chronic myelogenous leukaemia and myeloproliferative syndromes*

Applicants with a confirmed diagnosis of either Ph chromosome-positive or negative chronic myelogenous leukaemia (CML) should be denied certification permanently.

e *Chronic lymphocytic leukaemia*

A common staging system for chronic lymphocytic leukaemia (CLL) is as follows:

Stage 0	– bone marrow and blood lymphocytosis only
Stage I	– lymphocytosis with enlarged nodes
Stage II	– lymphocytosis with enlarged spleen or liver, or both
Stage III	– lymphocytosis with anaemia
Stage IV	– lymphocytosis with thrombocytopenia

Individuals with disease in Stage II through IV should not be certificated. In these stages of the disease cytotoxic therapy is often necessary and the cytopenias present a serious risk of sudden incapacitation. Persons with Stage 0 or Stage I disease may be certificated by the AMS, provided there is no haemolytic anaemia and no requirement for chemotherapy or corticosteroids. Re-examination at intervals of three months should be required with documentation by the treating physician.

f *Hairy cell leukaemia*

Individuals who are stable after splenectomy, or without treatment could be assessed as fit by the AMS.

6.2 Lymphomas

a *Hodgkin's disease*

Applicants with active Hodgkin's disease or individuals undergoing therapy should not be certificated. Persons with Stage I and II-A who have had no evidence of disease for two years after completion of treatment may be certificated.

Persons with Stage II-B through IV-B should be free of disease and therapy for at least five years before consideration for certification and they should be re-evaluated every six months for ten years. After ten years there should be annual appraisals.

b *Non Hodgkin's lymphoma*

Well differentiated and poorly differentiated lymphocytic lymphoma, mixed lymphocytic lymphoma and histiocytic lymphoma of either the nodular or diffuse type, are usually disqualifying. Persons with Bcell, diffuse histiocytic lymphoma, particularly in the early stages, may be cured by radiation therapy and/or chemotherapy. If they are free of disease without therapy for at least three years they may be certificated with re-evaluation every three months for three years and then every six months. Persons with T-cell, diffuse histiocytic lymphoma, including immunoblastic lymphoma and T-cell lymphoblastic sarcoma, should not be certificated because of the high degree of malignancy of these disorders and their unpredictability. Cases of Burkitt's lymphoma are usually disqualifying, but may be certificated at the discretion of the AMS.

c *Plasma cell dyscrasia*

Applicants with multiple myeloma, Waldenstrom's macroglobulinaemia or multiple plasmocytomas should not be certificated. These disorders are not curable, require frequent therapy that is toxic, and are associated with side effects such as neurologic impairment that may lead to sudden incapacitation.

Applicants with a single plasmocytoma may be cured and, if they are free of disease more than three years after therapy has been discontinued, they may be considered for certification with frequent follow-up.

Applicants with benign monoclonal spike gammopathy with a monoclonal spike comprising less than 2 gram/dl of protein, with less than 5% plasma cells in the bone marrow and with no haematopaietic compromise of osteolytic lesions, may be certificated by the AMS. The major risk of monoclonal gammopathy is progression to multiple myeloma and an increase in serum viscosity leading to neurologic impairment.

Applicants with amyloidosis associated with plasma cell dyscrasia should not be certificated because of the high incidence of organ infiltration and the risk of sudden impairment.

Applicants with gamma or alpha heavy chain disease should not be certificated. The median survival is approximately 12 months for gamma heavy chain disease and the alpha chain disease is often associated with abdominal lymphoma.

Applicants with cold agglutinin disease should not be certificated because of the risk of sudden haemolysis.

Applicants with cryoglobulinaemia associated with myeloma and persons with the mixed cryoglobulinaemia syndrome should not be certificated because of the risk of sudden vascular incidents and neurologic dysfunction.

7 SPLENOMEGALY

Significant enlargement of the spleen is disqualifying due to the increased risk of sudden rupture. The AMS may consider certification where the enlargement is minimal, stable and no associated pathology is demonstrable. In all cases splenomegaly requires investigation of the cause of the enlargement.

8 BONE MARROW TRANSPLANTATION

Cases of bone marrow transplantation may be certificated at the discretion of the AMS.

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