Medical Surveillance and Case Management of workers exposed to chloroplatinates:

Guidance on good practice

Disclaimer

This guidance document has been prepared by occupational health practitioners working in the platinum group metals (PGM) industry for the benefit of other occupational health practitioners responsible for medical surveillance of colleagues exposed to chloroplatinates in the workplace. It is not and should not be construed to be either comprehensive nor advice or recommendation of any kind. Local legal requirements and restrictions, as well as cultural and practical considerations must be accounted for when implementing a medical surveillance and case management programme. Any reader/user should consult their own local experts, scientific advisors and legal counsel or appropriate regulatory agencies to ensure compliance with applicable laws and regulations. Neither the contributors to this document nor the International Platinum Group Metals Association assumes any liability for any errors or omissions or for any personal injury, physical harm and any loss or damages of whatsoever nature that have been caused by or in connection with the use of the information contained within this document.

Contents

1 Glossary of terms and abbreviations

ATS	American Thoracic Society
BTPS	Body temperature (37°C), ambient pressure and gas saturated with water vapour
CPA	Chloroplatinic acid
ERS	European Respiratory Society
FEV1	Forced Expiratory Volume in the first one second
FVC	Forced Vital Capacity
GLI	Global Lung Initiative
IH	Industrial Hygiene
IPA	International Platinum Group Metals Association
LLN	Lower Limit of Normal
OH	Occupational Health
OHD	Occupational Health Department
OHP	Occupational Health Practitioner
EHS	Environment, Health & Safety
PEFR	Peak Expiratory Flow Rate
PGM	Platinum Group Metals
PPE	Personal Protective Equipment
PSS	Platinum Salt Sensitisation
RPE	Respiratory Protective Equipment
SM	Site Management
SPT	Skin Prick Test

2 Purpose

This document is intended to support good practice in the medical surveillance of workers with a risk of exposure to chloroplatinates. It has been prepared by occupational health practitioners in the platinum group metals (PGM) industry for others to use as a source of information. It should not be relied upon unquestioningly; readers should apply their own judgment and expertise, as well as confirming relevant existing local laws or regulatory requirements, when implementing medical surveillance and case management procedures.

3 Scope

All companies or facilities where employees are exposed to chloroplatinates or in any way come into contact with chloroplatinates as defined by the site health risk assessment.

Exposure to work processes with the potential for exposure to chloroplatinates is the key criteria for inclusion of workers in platinum medical surveillance.

4 Implementation

Note: this document is not and should not be construed to be either comprehensive nor advice or recommendation of any kind. Local legal requirements and restrictions, as well as cultural and practical considerations must be accounted for when implementing a medical surveillance and case management programme. Readers should consult their own local experts, scientific advisors and legal counsel or appropriate regulatory agencies to ensure compliance with applicable laws and regulations.

In most jurisdictions, the employer – often nominally the site manager – has ultimate responsibility for occupational health practices at a facility. Delegation of the various specific responsibilities that collectively ensure the appropriate occupational health services are provided will vary between companies and countries, and typically involve functions including Human Resources and EHS in addition to the Occupational Health Department (OHD). Occupational Health Practitioners (OHPs) should be satisfied that governance systems and policies with defined responsible persons are in place to deliver the medical surveillance programme as intended. These will need to cover various aspects covered or alluded to in this document, including *inter alia*: the identification of workers requiring medical surveillance or that may optionally undergo medical surveillance; decisions on the timing and frequency of surveillance; scheduling medical surveillance consultations; ensuring workers are aware of and attend medical surveillance consultations; and record-keeping practices.

5 Chloroplatinates and Platinum Salt Sensitisation

5.1 Platinum and chloroplatinates

Platinum is an inert grey-white precious metal. To extract and refine platinum from ores and recyclable materials, it is necessary to apply strong chlorine-based acids and oxidisers to dissolve the metal before it can be purified. This process forms substances called chloroplatinates. Chloroplatinate molecules have several – most commonly four or six – chlorine atoms directly coordinated to a central Pt atom. The chlorine ligands are labile and consequently chloroplatinate substances readily react with various other compounds, including proteins. This presents a risk of sensitisation and allergy amongst exposed industrial workers.

Chloroplatinates are typically intermediate substances which are further processed to produce refined platinum metal or commercial platinum products which do not contain chloroplatinates and, aside from platin chemotherapy drugs, typically possess no sensitisation potential.

The most common chloroplatinate compounds encountered in industrial settings that are associated with platinum salt sensitisation (PSS) include:

- Hexachloroplatinic acid
- Ammonium hexachloroplatinate
- Potassium hexachloroplatinate
- Potassium tetrachloroplatinate
- Sodium tetrachloroplatinate

Platinum substances containing chlorine atoms that are not directly coordinated to the platinum atom do not possess respiratory sensitisation potential.

5.2 Platinum salt sensitisation

Susceptible individuals who are exposed to chloroplatinates may develop platinum salt sensitisation (PSS). PSS is an IgE-mediated Type I hypersensitivity reaction, typically diagnosed via a positive skin prick test (SPT) to a chloroplatinate solution (see Section 7.3.1).

PSS develops over time and may take several years to develop, depending upon exposure frequency and intensity. Factors such as smoking also increase the risk of sensitisation.

A proportion of those workers that become sensitised may, with continued exposure, go on to develop symptomatic allergy.

A high standard of occupational hygiene is needed for prevention of chloroplatinates sensitisation and allergy. If adequate exposure control cannot be ensured through engineered containment (e.g. closed production processes) it is required that workers wear suitable personal protective equipment (PPE) including respiratory protective equipment (RPE), as recommended by company EHS specialists.

5.3 Platinum salt-related diseases

Amongst workers who become sensitised to chloroplatinates, further exposure may result in an allergy-like reaction. Depending on the severity of the disease and the personal predisposition of the worker, one or more of the following signs and symptoms usually can occur within a few minutes of exposure, but in some cases the allergic reaction may be delayed and cause nocturnal symptoms:

a) Conjunctivitis with itching and lacrimation

b) Rhinitis with nasal obstruction, rhinorrhea, and sneezing attacks (3 or more consecutive sneezes)

c) Bronchial effects include coughs, tightness of the chest, shortness of breath and wheezing

d) Urticaria after direct contact with chloroplatinates

e) Other dermal symptoms may include erythema of exposed surfaces and pruritus

f) Contact dermatitis may occur but it is not common

Evidence from occupational epidemiology studies of PSS suggests that sensitisation to chloroplatinates and symptomatic allergy are most likely to occur within the first two-three years of exposure.

6 Workplace exposure to chloroplatinates

Exposure to chloroplatinate occurs by inhalation and/or dermal contact in the work environment.

Current analytical chemistry techniques preclude the routine measurement of chloroplatinates in workplace air or skin wipe samples. In the absence of specific speciation capabilities, total soluble platinum is measured as a surrogate. In doing so, it is typical to assume that all measured soluble platinum is chloroplatinate unless the chemical knowledge of the manufacturing process and work area would indicate otherwise.

Both the approach used for sampling and the analytical technique used to quantify the soluble Pt content can affect the results obtained. The International Platinum Group Metals Association (IPA) has developed a harmonized method for sampling and analysis of soluble Pt in workplace air, based on research conducted by the University of Wisconsin.

6.1 Exposure bands for chloroplatinate exposure

In defining medical surveillance requirements for workers exposed to chloroplatinates, and for the case management of workers that become sensitised, it is helpful to differentiate levels of exposure that may be experienced in the workplace based on the anticipated associated risk. In this guidance document, the following exposure bands are used:

Very high exposure:	> 2000 ng/m³
Moderate/high exposure:	100-2000 ng/ m³
Low exposure:	20-100 ng/m³
Very low exposure:	< 20 ng/m³

6.1.1 Moderate/High and Very High Exposure areas

Typically, this will include all areas where chloroplatinates occur on a regular basis and in significant quantities. Or where historical data from the facility or from experience at another site indicates a significant risk from the same process. Highest levels of personal protection, scrupulous housekeeping standards and strict adherence to procedures are required.

Moderate/High and Very High exposure areas may include:

a) Refining of Platinum Group Metals (PGM) including dissolution of recovered secondary materials in a chloride system

b) Platinum salt production involving halogenated platinum compounds

c) Production of catalysts using chloroplatinic acid (CPA) or other chlorinated platinum salts

d) Purification of platinum metal using chlorine or chloride systems

e) Dispensing and packing of chloroplatinates in a fume hood

f) Maintenance work in areas where chloroplatinates are found

g) Other areas identified by the EHS or IH experts

6.1.2 Low Exposure area

Low exposure areas will typically include areas and processes where there are only small amounts of platinum salts that are handled with proven and sustained good containment. There is likely to be no or only very limited history of primary sensitisation attributable to that process or work area.

Low exposure areas would typically include:

a) Research and Development using small volumes of platinum salts with high levels of containment

b) Analytical laboratories where all platinum salts are handled in fume hoods

c) Production areas with contained production processes and only minimal release of chloroplatinates

6.1.3 Very Low Exposure

Areas classed as very low exposure areas will normally be those where there is an absence of exposure to chlorinated platinum salts, normally with no work with platinum compounds carried out in these areas.

There should be no history of sensitisation attributable to the area and processes occurring there.

Other hazardous substances may be handled in these areas and requiring appropriate control techniques according to the risk assessment.

Very low exposure areas typically include:

a) offices, break rooms, hallways and warehouses in facilities engaged in the production or analysis of platinum salts

7 Health surveillance

It is important that all workers at risk of exposure to chloroplatinates are identified and included in the platinum medical surveillance programme. Records of the workers, their fitness to work certificate and the due dates for their next medical consultation should be kept by the site Human Resource Department and the OHD.

7.1 Determination of exposed workers

All workers identified (by the company-specific health risk assessment process) to be at risk of chloroplatinate exposure should be included in the medical surveillance programme and undergo regular surveillance by a qualified medical professional. This should include workers from Very High, Moderate/High, and Low exposure areas, and may include workers from some areas classified as Very Low exposure areas, especially if there has been a previous case of Pt sensitisation there. For other Very Low exposure areas where exposure to chloroplatinates can essentially be excluded, inclusion in regular platinum medical surveillance is not necessary.

7.2 Medical examination schedule

Workers identified to be at risk of chloroplatinate exposure should undergo medical surveillance:

a) before job placement

b) periodically at the defined routine medical surveillance examination interval

c) if there are any changes in the health condition of the worker

d) if there is a change of the job role or workplace of a worker

e) following spill incidents judged by EHS to present an increased risk of sensitisation to chloroplatinates

f) prior to returning to work following an extended period of illness

g) before exiting the company

The periodic routine health surveillance of workers exposed to chloroplatinates should be performed regularly to identify and assess cases of sensitisation to complex platinum salts at an early stage, so that appropriate action can be taken to prevent the development of adverse health effects.

7.2.1 Pre-placement assessment

A pre-placement assessment should be completed before the assignment of a worker to a role with risk of exposure to chloroplatinates in order to:

a) Identify pre-existing disease which may be aggravated by occupational risks, or may mask early

signs of allergy to complex platinum salts (e.g. chronic sinusitis, chronic lung or heart disorders)

b) Identify pre-existing conditions which may prevent the necessary high standard of occupational hygiene (e.g. skin diseases like severe neurodermatitis)
c) Identify factors which may increase the risk of allergy to complex platinum salts (e.g. asthma, personal and family history, smoking history, prior workplace exposure).

Skin Prick Testing may be conducted to confirm an absence of sensitisation and exclude possible previous exposure.

7.2.2 Periodic evaluation during employment

An initial medical follow-up examination should be scheduled within 6-12 months or less after placement at the workplace with chloroplatinate exposure. The specific timing will depend on the risk level determined by EHS and the decision of the OH physician.

Thereafter, periodic medical surveillance assessments should be conducted. These should take place at least every 12 months, or more frequently (e.g. every six months or every three months) depending on the exposure level and EHS risk assessment, and view of the OH physician.

As part of the assessment, updated information should be obtained regarding factors that may increase the risk of allergy to complex platinum salts, including smoking, peak exposures in the workplace (e.g. from spill incidents) and disease diagnosis.

7.2.3 Changes in health condition

Workers with occupational risk for chloroplatinates exposure should be aware of the symptoms of the potential allergic reaction to complex platinum salts and the adverse health effects risked if not reported and evaluated promptly. Workers should be informed that they should seek medical attention and receive further medical assessment if symptoms occur between the routine periodic evaluations. Workers should avoid concealing possible symptoms and should inform the medical department if any medication is taken.

If a worker demonstrates asthma-like symptoms, they should be removed from the exposure and sent to the OHD for a medical assessment. Likewise, the worker should report any significant changes in their health which could affect their fitness to work in areas with chloroplatinate exposure. If the OHD confirms that the symptoms are work/chloroplatinate-related or the medical condition conflicts with the medical fitness for duty, the worker shall be removed from their workplace. For further details, see Section 9 and Appendix 3 on Case Management.

7.2.4 Change of job role or workplace of a worker

If the worker changes their job role or workplace resulting in a change in the risk of exposure, a medical examination should be conducted.

7.2.5 Exposure to spill incidents

If the worker is exposed to a spill incident judged by the EHS group to present an increased risk of sensitisation to chloroplatinates, the worker should attend the OHD for an assessment.

7.2.6 Return to work

If the worker is absent from work due to illness for an extended period (> 6 weeks) or due to a more severe illness which could affect their capability to work with chloroplatinates, a chloroplatinate medical examination should be conducted as part of a return-to-work examination. Skin prick testing upon return to work should be considered if symptoms and findings consistent with platinum salt allergy are found.

7.2.7 Exit medical

All workers included in the Pt medical surveillance programme should undergo a medical examination before leaving the employment of the company.

7.3 Medical examination content

The worker should be informed and consent obtained that a fitness to work certificate regarding medical clearance to work with chloroplatinates will be issued to the employer after the medical examination. The worker should be informed of the examination results, including the results of the Skin Prick Testing.

The medical surveillance assessment should include:

Preplacement medical examination

The preplacement examination includes all aspects of the periodic medical examination (incl. SPT) and in addition a general medical history (incl. preexisting diseases, accidents, family history, etc) (see Appendix 1).

Focus on past medical history of symptoms of an allergic reaction to complex platinum salts, respiratory and skin health status, review of past medical history and review of occupational history. Specific attention should be put upon previous exposure to chloroplatinates and respiratory sensitisers or irritants, smoking history, and changes in symptoms from a prior surveillance evaluation.

Periodic medical examination

Changes in medical history in general with specific focus on symptoms of an allergic reaction to complex platinum salts, in terms of general, respiratory and skin health status since last examination. For further routine medical surveillance basic pulmonary / allergic symptoms, risk factor development as well as work-related symptoms should be reviewed and documented (see Appendix 2).

Further examination content:

a) Measurement of vital signs, including blood pressure, heart rate, height, weight

b) Physical examination with special emphasis given to heart, lung and skin findings

c) Spirometry / pulmonary function testing (see Section 8 and also Section 11 for links to ERS/ATS spirometry guidance)

d) Skin Prick Testing (SPT)

7.3.1 Skin Prick Testing

SPT may be conducted pre-employment to confirm an absence of sensitisation and exclude possible previous exposure. SPT is typically performed using a 1 mg/ml solution of sodium hexachloroplatinate in 0.9% saline. If desired, lower concentrations may be used to examine the sensitivity threshold. Appendix 4 briefly describes preparation of the Pt-SPT test solution dilutions.

Note: The invasiveness, safety, sensitivity, and accuracy of testing procedures in compliance with the legal requirements in the respective jurisdictions must be carefully verified by readers in each individual case in advance. Any usage of the testing procedure remains under the sole responsibility of the reader.

The use of additional control solutions is necessary for appropriate interpretation of results. Physiological saline, 0.9% NaCl, should be used as the negative control. A histamine positive control, such as histamine phosphate 0.1% or 1%, should also be used. If no response to histamine is observed, causes such as antihistamine or topical corticosteroid use should be considered. Where there is an identified medical purpose for routine antihistamine or topical corticosteroid use, the OHP must employ professional judgement in deciding whether it is safe and appropriate to recommend the medication is withheld for a period prior to SPT. A number of other types of medication (including tricyclic antidepressants, atypical antidepressants and sedatives, benzodiazepines, beta-blockers, H2 antagonists, neuroleptics, immunomodulators such as omalizumab, and some anti-emetic and antimigraine medication) can also variously affect the immune response – decreasing the likelihood of a positive response or increasing the risk of a more serious reaction – and can continue to be effective for differing amounts of time after administration (for example, see ASCIA, 2020 and Heinzerling et al 2013 in Section 11). The OHP should be aware of all medications being taken by workers under medical surveillance for PSS and consider how the medication and SPT may affect each other.

SPT should be performed by a medical professional with training and experience in the technique. It is performed by first cleansing the forearm or back of the worker with alcohol and labelling the test areas. A drop of each solution (negative control, positive control, test solution) should be placed in the corresponding labelled test area of skin. A 25G needle or lancet specifically designed for skin prick testing should be used to ‘prick’ the skin through the solution. A fresh needle/lancet should be used for each solution/test area. 25G needles should be inserted through the solution at 45 degrees and puncture only the outer layer of skin. Lancets are used vertically. Avoid penetrating the skin far enough to cause bleeding.

Read skin reaction results after 15 minutes. Compare the response to the test solution with the responses to the positive and negative control solutions.

An itchy weal should develop at the histamine prick site within 10 minutes. The maximum or mean diameter of each weal should be read at 15 minutes. A weal of 3 mm or more in diameter at the chloroplatinate test solution site is generally considered to represent a positive response indicating sensitisation. The negative control is important because it excludes the presence of dermographism, which if present makes the tests difficult to interpret. Thus, a test solution weal 3 mm or more larger in diameter than that of the negative control weal is also used to identify a positive response. The test results should be documented in a standard format.

8 Fitness to Work criteria

Pre-existing diseases or conditions that may increase risk of sensitisation or the severity of disease should the worker become sensitised shall be identified by the medical examination.

Notwithstanding the need to comply with employment law and antidiscrimination legislation, medical conditions that require restriction from placement into work involving chloroplatinates include (after review on a case-by case by a medical professional):

a) Allergy to complex salts of platinum. If identified at the preplacement examination from prior work, this is an absolute contraindication. If identified during periodic examination, the worker should be managed following the case management process (see Section 9 and Appendix 3.).

b) Chronic pulmonary disorders

c) Bronchial asthma

d) Repeated diagnosis of symptomatic bronchial hypersensitivity or hyperreactivity

e) Significant impairment of lung function:

- The normal range of values of FEV1 and FVC for healthy individuals is a wide one, and the level at which a result should be considered to be abnormal varies. Allowance, typically 10-13%, should be made for the non-Caucasian decrease from Caucasian values
- The observed results of lung function testing should normally be compared with the predicted values of FEV1, FVC, and the FEV1/FVC ratio obtained from normograms or tables of normal values (such as Knudson or Hankinson, Global Lung Initiative/GLI in Europe) calculated at body temperature, and the results adjusted from ambient to BTPS. The GLI based the predicted value and Lower Limit of Normal (LLN) defined as the 5th percentile (i.e. 5% of the healthy population are below the LLN) on the reference values of multiple quality-controlled lung function measurements from various countries. These values normally can be obtained via a specific lung function test software (www.lungfunction.org, often integrated in spirometry devices).
- When the observed reading of FEV1 and/or FVC is greater than or equal to LLN or 80% of the predicted value, work with platinum salts should in general not be restricted, unless a medical condition is present that contradicts work with platinum salts.
- However, if the observed value, of FEV1 and/or FVC is less than LLN or 80% of the predicted value then medical clearance should in general not be considered without further assessment on a case-by case basis.

f) The presence of cardiac disorders resulting in significant pulmonary function impairment.

g) Disruption of the skin barrier e.g. chronic ulceration that increase permeability of skin contaminants and severe skin diseases such as dermatitis, neurodermatitis, or psoriasis.

Other conditions that may require restriction from placement into work involving chloroplatinates include:

h) Symptoms of allergic rhinitis and hay fever should be explored for association with asthma symptoms – as well as the possibility such symptoms will make maintaining the necessary standards of workplace hygiene difficult.

i) Other health conditions which require frequent medication, food or fluid that may be incompatible with maintenance of hygiene standards should be reviewed and advice provided.

j) Smoking and atopy as contraindications may be considered in terms of risk relative to the risk of sensitisation in the absence of these factors.

8.1 Positive Skin Prick Test without Symptoms

When a confirmed positive SPT response to chloroplatinates occurs:

a) If preplacement, work with platinum salts is contraindicated.

b) If identified during the periodic examination, follow the case management process (see Section 9 and Appendix 3).

9 Case Management

A worker should be subject to case management when, according to the judgement of the OHP, they have become sensitised to Pt salts. A worker with a confirmed positive SPT to complex platinum salts (i.e. where an initial positive SPT is confirmed with a second positive SPT approximately two weeks later) should be considered sensitised whether or not they present with allergy (i.e. symptoms). A diagnosis of Pt sensitisation may also be concluded by the OHP in the absence of a positive SPT (and even when SPT is negative, though this is rare) when indicated by the weight of evidence, including symptoms and lung function testing during and after time away from work.

In those cases, the worker should be managed according to the case management process (see Appendix 3).

Note: Due to constantly evolving legal conditions and requirements readers must verify compliance with applicable local regulations to case management in the respective jurisdiction.

10 Record-keeping

Accurate and timely record-keeping is an essential part of a medical surveillance and case management programme. Records of all medical questionnaires and examinations should be maintained by and only accessible to the OHD. The OHP must satisfy themselves that robust systems and procedures are in place to ensure data protection and medical privacy needs are maintained.

Reliable information about each worker's job role and any changes in job role or participation in non-routine activities such as stock take or presence during an incident such as a spill where an acute high exposure to chloroplatinates may have occurred can also be valuable not only for optimizing the early identification of cases of PSS and their subsequent management, but also for gaining important insights into the possible factors contributing to workers becoming sensitised at a facility. Information about operational or industrial process changes is beneficial for the same reasons. Typically, such information will be stored outside the OHD, either in employment records, or industrial hygiene or engineering records. OHPs should understand the policies and procedures on such record-keeping at their company and, when appropriate, advocate for practicable improvements where they would benefit the objectives of occupational health surveillance.

11 Reference Documents

- Guidance Document "**Safe Use of Platinum Group Metals in the Workplace**" , International Platinum Group Metals Association (2017).

- ERS/ATS technical standard on interpretive strategies for routine lung function tests (Stanojevic S et al., Eur Resp J 2022; 60:2101499). (https://erj.ersjournals.com/content/erj/60/1/2101499.full.pdf)

- ASCIA (2020) Skin Prick Testing Guide for Diagnosis of Allergic Disease. Australasian Society of Clinical Immunology and Allergy. https://www.allergy.org.au/images/ASCIA_HP_SPT_Guide_2020.pdf

- Heinzerling L, Mari A, Bergmann K-C, Bresciani M, Burbach G, Darsow U, Durham S, Fokkens W, Gjomarkaf M, Haahtela T, Bom AT, Wohrl S, Maibach H, Lockey R (2013) The skin prick test – European Standards. *Clinical and Translational Allergy*, **3**,3.

Appendix 1 – Preplacement questionnaire

Chloroplatinate exposure Preplacement Questionnaire

_____ _____
Date of examination *Location*

_____ _____
Name (Print) *Social Security or Employee ID*

Please check the single best answer to each question

	Yes	No
1. Have you ever worked with platinum or platinum salts?	☐	☐
If yes, was this work prior to working at "*company name*"?	☐	☐
2. Do you have a history of allergy?	☐	☐
If yes, describe symptoms and any treatment:		
_____		
3. Do you have a history of lung diseases, especially:		
asthma?	☐	☐
COPD?	☐	☐
other chronic lung diseases?	☐	☐
If yes, please provide details (e.g. when diagnosed, respiratory allergens)		
_____		
4. Have you had past eczema or skin rashes?	☐	☐
5. If you answered "Yes" to any of questions 2 - 4, did you experience allergic reaction or any kind of lung/bronchial or skin disease related to work?	☐	☐
If yes, please provide details (including if related to specific work tasks/processes):		
_____		
6. Do you smoke?	☐	☐

If 'Yes':

Since when? _____

How many cigarettes per day? <10 ☐ ≤ 20 ☐ >20 ☐

7. Check the symptoms you now currently have (check each one that applies)

☐ Nasal stuffiness	☐ Sniffling	☐ Hives
☐ Frequent sneezing	☐ Skin rash	☐ Coughing
☐ Loss smell/taste	☐ Nose itching	☐ Cough at night
☐ Frequent throat clearing	☐ Clear nasal discharge	☐ Shortness of breath
☐ Itching/burning eyes	☐ Mucus production	

8. Where are the above symptoms worse? ☐ Home ☐ Work

9. List all medications you are taking at the present time.

_____

_____

10. List ALL medications you may be allergic to and the symptoms they caused you to have.

_____

_____

11. Does anyone in your family have a history of allergies? ☐ Yes ☐ No
If yes, describe:

_____

12. Do you have any immediate family members with the following conditions (check each one that applies)? If checked, please describe age and relationship of family members affected.

☐ Hayfever _____

☐ Asthma _____

☐ Hives _____

☐ Eczema _____

☐ Sinusitis _____

Appendix 2 – Periodic questionnaire

Respiratory Surveillance Questionnaire

_____ _____

Date of examination *Location*

_____ _____

Name (Print) *Social Security or Employee ID*

Please check the single best answer to each question

	Yes	No
1. Did you change job/tasks or did your workplace/environment change since your last examination?	☐	☐
If yes, please describe:		
_____		
General:		
2. Do you (still) smoke	☐	☐
3. Do you take any kind of medication?	☐	☐
If yes, please list:		
_____		
Since your last examination:		
4. Has your chest felt tight or your breathing become difficult?	☐	☐
5. Has your chest sounded wheezing or whistling?	☐	☐
6. Have you had a persistent or regular cough?	☐	☐
7. Have you experienced a skin rash?	☐	☐
8. If you answered 'yes' to any of questions 4 - 7, have you experienced any of the symptoms above in the last 4 weeks?	☐	☐
9. If you answered 'yes' to question 8, please answer the following questions:		
9.1 If you run, or climb stairs fast do you		
9.1.1. cough?	☐	☐
9.1.2. wheeze?	☐	☐
2.1.3. get tight in the chest?	☐	☐

9.2. Is your sleep broken by

9.2.1.	wheeze?	☐	☐
9.2.2.	difficulty with breathing?	☐	☐

9.3. Do you wake up in the morning (or from sleep, if a shift worker) with

9.3.1.	wheeze?	☐	☐
9.3.2.	difficulty with breathing?	☐	☐

9.4. Do you wheeze

9.4.1.	if you are in a smoky room?	☐	☐
9.4.2.	if you are in a very dusty place?	☐	☐

10.1. What happens to this on weekends? ☐ better ☐ same ☐ worse

10.2. What happens to this on holidays of 4 days or more? ☐ better ☐ same ☐ worse

10.3. Does this occur with exposure to a particular substance or process? Please describe.

_____

_____

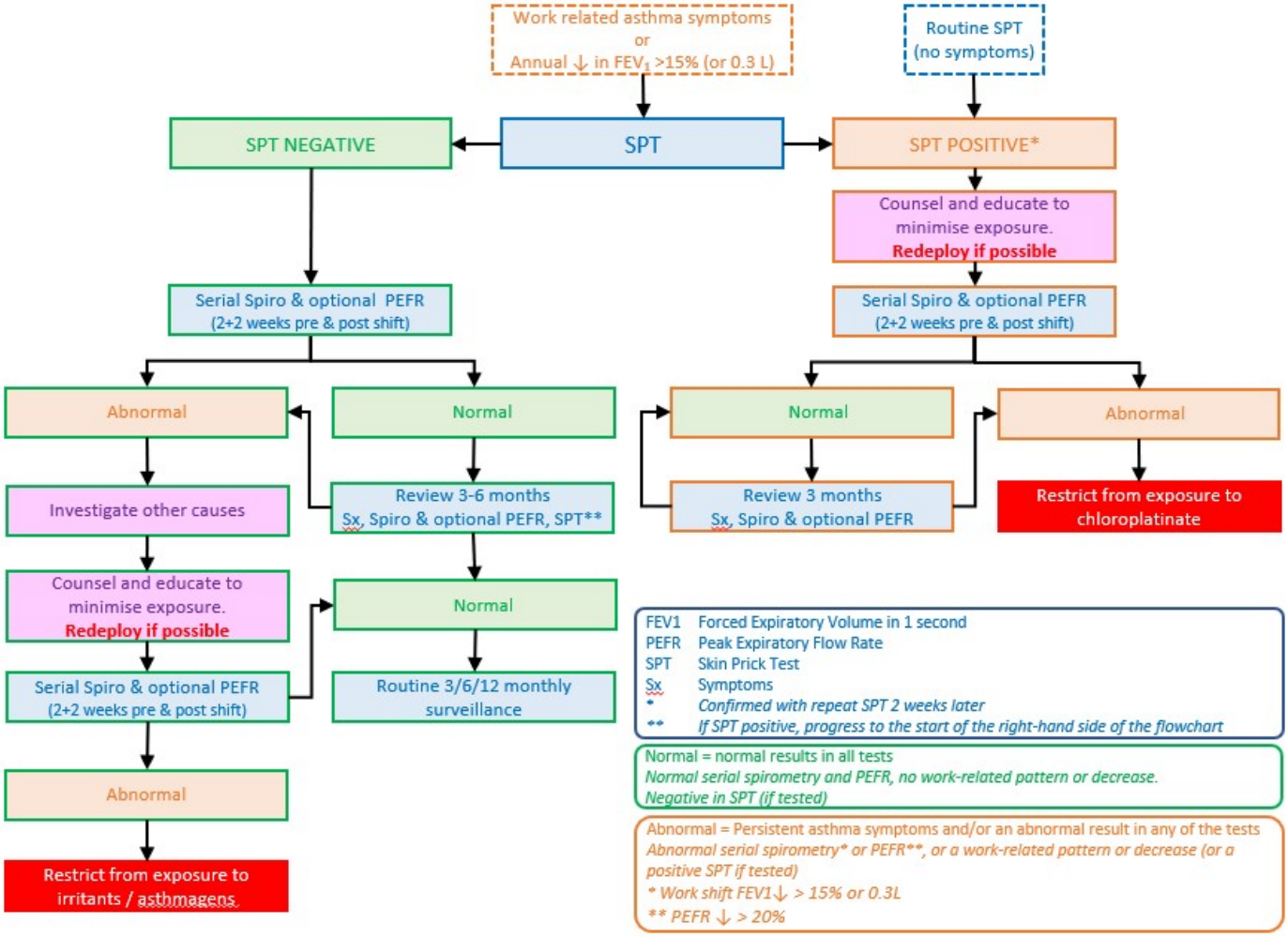
_____

Appendix 3 – Case Management flow chart

The flowchart below provides a summary representation of good practice for the case management of workers that become or may have become sensitised to platinum, accepting that in practice decisions may be affected by the particular circumstances of the individual, the company and its policies on removal from exposure and the possibilities for redeployment, local legal requirements, and the judgments of the OHP and EHS colleagues tasked with protecting the affected individual's health and welfare.

Note: Due to constantly evolving legal conditions and requirements readers must verify compliance with applicable local regulations to case management in the respective jurisdiction.

Once a worker has been restricted from exposure to chloroplatinates and removed from their present job role due to platinum sensitisation, they should not be allowed to return to working with chloroplatinates even if in the future their SPT status reverts to negative and/or any symptoms have resolved.



Appendix 4 – SPT solution preparation protocol

Sodium hexachloroplatinate is the chloroplatinate salt most commonly used for skin prick testing (SPT) to test for sensitisation to chloroplatinates. Solutions of sodium hexachloroplatinate in saline are not commercially available.

Note: The invasiveness, safety, sensitivity, and accuracy of testing procedures in compliance with the legal requirements in the respective jurisdictions must be carefully verified by readers in each individual case in advance. Any usage of the testing procedure remains under the sole responsibility of the reader.

Preparation protocol:

- **Preparation of stock solution (Na_2PtCl_6 at 10^{-2} g/ml solution, i.e. 10 mg/ml):**
  Weigh 1g of Na_2PtCl_6, dissolve in 0.9% NaCl and make up to 100 ml; neutralize by NaOH to pH 7.0.
- **Preparation of standard test solution (1 mg/ml)**
  The standard test solution is sodium hexachloroplatinate at a concentration of 10^{-3} g/ml (1 mg/ml).
  Set up a small bottle labeled 10^{-3}. Deliver 9.0 ml of 0.9% NaCl solution into the bottle. Then pipette 1.0 ml of stock solution (10^{-2} g/ml) into the bottle. Stopper the bottle and shake well.
- **Preparation of lower test concentrations:**
  If desired, lower concentrations of test solution, down to 10^{-9} g/ml, may be used to examine the sensitivity threshold.
  Set up small bottles labeled 10^{-3}, 10^{-4}, 10^{-5}, etc. Deliver 9.0 ml of 0.9% NaCl solution into each bottle. Pipette 1.0 ml of stock solution (10^{-2} g/ml) into the bottle labeled 10^{-3} g/ml. Stopper and shake well. Pipette 1.0 ml of the 10^{-3} g/ml solution and add to the bottle labeled 10^{-4} g/ml. Stopper and shake well. For further dilutions, continue in the same way.

Sodium hexachloroplatinate is stable for up to 6 months in saline, but it is recommended that sodium hexachloroplatinate solutions are discarded and refreshed after 3 months. The solutions must be kept in the dark, in a refrigerator, to reduce microbial proliferation.

Disposal of surplus and waste solution
Excess and redundant test solutions should be treated to reduce the chloroplatinates to non-allergenic compounds before disposal. Solutions and contaminated surfaces may be treated with sodium borohydride solution for this purpose.