Effects on Human Body: Neurosensory System
Work, vibration, & the neurosensory system

- Close effects
- Remote effects
- Stress and pressure
Temporary neurosensory effects

- Reduced sensibility due to:
  - Temporary threshold shift
- Reduced motor control due to:
  - The tonic vibration reflex
  - Impaired proprioception
  - Impaired sensibility
Permanent effects: neurosensory shift

- **Symptoms**
  - *Negative manifestations;*
    - Loss of manual dexterity
    - Loss of sensibility
  - *Positive manifestations;*
    - Symptoms of “Pain, tingling, numbness”
  - *Provocable manifestations;*
    - Symptoms elicited only in specific postures, tasks

- **Self-reported signs**
  - Shift in neurosensory function

- **Clinical findings**
Neurosensory system
Motor system
What goes wrong (1)?

Meissner corpuscle  Pacinian corpuscle  Ruffini’s corpuscle  Merkel’s disks  Free nerve endings

Diffuse neuropathy
What goes wrong (2)?

Sites of possible Entrapment

- Median nerve
- Ulnar nerve
Who is at risk for neurological effects?

- Exposed to work with vibrating machines?
- Within latency times to contract symptoms?
- Are some people more susceptible?
- What about the use of alcohol?
- What about age?
- What about body constitution or injuries?
What elicits the neurosensory symptoms?

- Demands revealing reduced function or impairment
- Exposure to local stress
- Exposure to cold
What modifies the neurosensory symptoms?

- Other neurosensory disorders or diseases
- Ambient temperature
- Time of day
- Night-time redistribution of vascular body volumes
Possible disability and handicap

- Difficulty in performing manual tasks
- Restrictions due to pain, or loss of function
- Difficulty in withstanding cold and damp due to pain
What will the physician do?

- Assess occupational and medical history
- Assess physical examination status
- Assess laboratory tests
- Care for possible treatment and management
- Inform on:
  - prognosis
  - contributory factors
  - factors affecting improvement of symptoms
  - preventive measures
  - workers compensation and litigation
Assessment of the occupational history

1. With reference to vibration exposure

2. With reference to other ergonomic load factors

3. With reference to other exposures with possible influence on the neurological system (Neurotoxic agents)
Assessment of the medical history

- Symptom description
- Times and durations
- Other diseases
- Medication
# Staging of neurosensory symptoms

<table>
<thead>
<tr>
<th>Stage</th>
<th>Symptoms and signs</th>
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</thead>
<tbody>
<tr>
<td>0SN</td>
<td>Exposed to vibration but no symptoms</td>
</tr>
<tr>
<td>1SN</td>
<td>Intermittent numbness with or without tingling</td>
</tr>
<tr>
<td>2SN</td>
<td>Intermittent or persistent numbness, reduced sensory perception</td>
</tr>
<tr>
<td>3SN</td>
<td>Intermittent or persistent numbness, reduced tactile discrimination and/or manipulative dexterity</td>
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</tbody>
</table>
Assessment of physical status

Besides from a general screening the physical examination is specifically focused on:

• The neurological system
  - The peripheral sensory system (touch, pain, thermal perception)
  - The motor system
  - The appearance of the distal parts of the hands and fingers including muscle and nerve aberrations
  - Provocation tests

• Signs of other diseases associated to mono- or polyneuropathy
Assessment with laboratory tests

- Quantitative sensory testing (QST)
  - Thermal perception
  - Vibratory perception

- Electro diagnostic methods
  - Electroneurography
  - Electromyography

- Chemical screening
  - Chemical laboratory screening
Other causes of “neuropathy”

- Focal neuropathies
  - Compression and entrapment
- Ischaemia
- Other diseases
  - Endocrine-/metabolic-disorders, infections, immune states
  - Genetically determined disorders
- Drugs, and pharmaceutical agents
- Neurotoxic agents, toxins, solvents, metals
Clinical evaluation of neurosensory effects

- Are the symptoms consistent with local or polyneuropathy?

- Are the vibration exposure characteristics consistent with the disorder?

- Are there other confounding exposures?

- What stage should the neurosensory symptoms be classified as?

- The demands for diagnostic precision depends on the aim of the neurosensorial work-up
Management & treatment of nerve effects

- Primary prevention by exposure reduction.
- Information on personal prevention actions that could modify exposure (e.g. local-stress, ergonomic work technique, posture)
- Possible surgical intervention or medical treatment
- Possible documentation for workers compensation or litigation
Prognosis of neurosensory effects

• After discontinued exposure to vibration:

• Positive manifestations such as tingling, pain could in mild cases be improved

• The chance for improvement is inconsiderable in severe cases where structural changes has appeared

• Continued exposure at work results in an unfavourable prognosis