Application of *Echinacea purpurea* in general practice – a clinical synopsis of the evidence

Participant Assessment

For each question choose one correct answer or answer True / False for each statement where indicated.

Section 1 – Introduction

1.1 Which native tribes first used Echinacea as a medicinal herb?

1. The San of Namib
2. The Incas of South America
3. Indigenous Amazonian tribes
4. Native American tribes
5. Ancient Egyptians

1.2 Echinacea was used traditionally for the following conditions:

1. Headaches & migraine
2. Septic wounds, snake bites, diphtheria & scarlet fever
3. Vertigo and motion sickness
4. Depression & anxiety
5. Eczema and allergies

Section 2 – Quality and Quantity

2.1 What farming measures are typically implemented to ensure a consistent concentration of active ingredients in Echinacea crops?

1. Crops grown in greenhouses to limit environmental influences
2. Genetically modified crops ensure each plant is identical
3. Carefully chosen farming sites and seeds
4. Biological cultivation and harvesting at the correct times
5. Combination of 1 & 2
6. Combination of 3 & 4

2.2 When producing herbal medicines, the advantage of having production facilities close to farming sites are:

1. Allows production to be performed on fresh plant material rather than dried material
2. Staff can be used for both farming and production work
3. Prevents the need for disinfestation of plant material
4. Effects of bad weather are limited
5. Combination of 1 & 3
6. Combination of 2 & 4

2.3 Batch blending refers to:

1. The process of mixing of various herbal medicines together to make a finished product
2. Mixing herbal extracts together to ensure the colour of the extract is correct
3. Mixing various batches of the same herbal extract made at different times promoting consistency of active ingredients in the finished product
4. A mixing process which allows the manufacturer to modify and improve the taste of the herbal medicine
5. Combination of 1 & 4
6. Combination of 2 & 3

2.4 Fresh plant extracts of Echinacea have higher levels of active ingredients and superior anti-viral properties compared to those made from dry plant material because:

1. Dry plant material becomes mouldy
2. The active ingredients of Echinacea are volatile and evaporate when fresh plant material is subjected to heat and drying process.
3. Dry plant extracts have been stored in warehouses for too long.
4. The active ingredients are dry and can't be absorbed
5. Viruses do not grow in a dry environment.

2.5 Fresh plant extracts of Echinacea have been proven to have X times more active ingredients than dry plant extracts.

1. Two times more
2. Ten times more
3. Three times more
4. Twenty times more
5. Hundred times more

Section 3 – Active ingredients and mechanism of action

3.1 The active ingredients in *Echinacea purpurea* have been identified in studies as being:

1. Polysacharides

2. Cannabinoids
3. Alkylamides
4. Lipidic compounds
5. Combination of 3 & 4

3.2 Depending on dose format the maximum concentration (C_{max}) of active ingredient of *Echinacea purpurea* is reached within a time (T_{max}) of:

1. 20 seconds
2. 2-5 minutes
3. 28-45 minutes
4. 120 minutes
5. 6 hours

3.3 The active ingredient of *Echinacea purpurea* is first detectible within the blood:

1. Within 30 seconds of taking an oral dose and remains in measurable amounts for up to 30 minutes
2. Within 15 minutes of taking an oral dose and remains in measurable amounts for up to 180 minutes
3. Within 120 minutes of taking an oral dose and remains in measurable amounts for up to 360 minutes
4. Within 240 minutes of taking an oral dose and remains in measurable amounts for up to 480 minutes
5. Within 12 hours of taking an oral dose and remains in measurable amounts for up to 48 hours

3.4 The active ingredient of *Echinacea purpurea*:

1. Activates Type 1 Cannabinoid receptors (CB_1) found in the central nervous system, lungs liver and kidneys
2. Inhibits Type 1 Cannabinoid receptors (CB_1) found in the central nervous system, lungs liver and kidneys
3. Activates Type 2 Cannabinoid receptors (CB_2) found within the immune system
4. Activates Dopamine receptors within the central nervous system
5. Activates B Cell and T Cell receptors within the immune system

3.5 *Echinacea purpurea* is considered to have anti-inflammatory effects due to:

1. Its anti-cytokine activity
2. Its ability to inhibit pro-inflammatory IL-6 and IL-8
3. Its ability to modulate tumour necrosis factor alpha (TNF-α)
4. Its ability to stimulate IL-10
5. All the above

3.6 With respect to the parts of the *Echinacea purpurea* plant used to manufacture extracts:

1. Fresh extracts of the aerial parts (herba) have the most anti-viral effects and fresh extracts of the roots provide the anti-inflammatory effects
2. Extracts of the flowers provide the most potent anti-inflammatory effects
3. Extracts from the dried leaves have the most active ingredients and are anti-viral
4. A combination of fresh root and aerial parts provide a combination of anti-viral and anti-inflammatory properties
5. Combination of 2 & 3
6. Combination of 1 & 4

Section 4 – Biological activity of *Echinacea purpurea*

4.1 *Echinacea purpurea* is considered to be antiviral:

1. As it has been shown to inhibit inflammatory cytokines specifically produced by viral pathogens (IL-6, IL-8 and TNF-α) which are attributed to most of the symptoms in viral infections
2. As it has been shown to directly kill viruses with membranes such as human influenza, herpes simplex, RSV
3. As it directly inhibits growth of influenza virus including human, avian and swine variants by preventing viral entry into cells
4. By supressing haemagglutination viruses are not able to bind to and enter host cells
5. All of the above

4.2 The anti-bacterial properties of *Echinacea purpurea* are attributed to:

1. Its ability to inhibit the production of pro-inflammatory cytokines produced by *Streptococcus pyogenes* and *Staphylococcus aureus (MRSA)*, *Haemophilus influenzae and Legionella pneumophilia*
2. Bactericidal against *Clostridium difficile*
3. Directly bactericidal against *Streptococcus pyogenes, Haemophilus influenzae, and Legionella pneumophila*
4. Combination of 2 & 3
5. Combination of 1 & 3

Section 5 – Clinical application

5.1 The literature supports the use of *Echinacea purpurea* for the treatment of the 'common cold' because:

1. The inflammatory effects of the Rhinovirus which cause common cold symptoms are inhibited by *Echinacea purpurea*

2. Mucin secretion and muco-polysaccharides in goblet cells were reduced by *Echinacea purpurea* in Rhinovirus infected human airway epithelial cells
3. *Echinacea purpurea* has been proven to reduce the duration of colds
4. This is confirmed in a meta-analysis and Cochrane review
5. All of the above

5.2 Research into the anti-influenza virus effects of *Echinacea purpurea* have confirmed the following:

1. Influenza viral resistance does not occur in response to *Echinacea purpura* in cell culture assay studies whereas it does develop against Oseltamivir.
2. *Echinacea purpurea* directly inhibits propagation of various types of influenza virus including human H3N2, H1N1, avian H5 & H7 and swine H1N1 – by preventing viral entry into cells
3. An Echinacea hot drink was shown to be as effective as Osteltamivir in early treatment of influenza virus with less complications and fewer adverse events
4. Ostelamivir resistant influenza virus was as sensitive *in vitro* to *Echinacea purpurea* as wild untreated virus.
5. All of the above
6. Combination of 1 & 3

5.3 Literature suggests that the use of *Echinacea* in treatment of respiratory tract infections:

1. Reduces the risk of common complications by 50%
2. Should be avoided at all cost
3. Results in a decrease in the need for antibiotic therapy
4. Significantly reduces the risk of pneumonia, otitis and tonsillitis/pharyngitis
5. Combination of 1,3 & 4
6. Is effective due to high vitamin C content

5.4 Research into the prophylactic use of Echinacea confirms the following:

1. Cold episodes are significantly reduced in athletes who take Echincaea
2. There was a 55% higher chance of developing rhinovirus cold symptoms in those who took placebo compared to those who took Echinacea
3. It is only useful for treatment not prevention
4. It should not be taken preventatively for long periods
5. Combination of 3 & 4
6. Combination of 1 & 2

5.5 Regarding recurrent respiratory tract infections:

1. Complications such as pneumonia, otitis, tonsillitis and pharyngitis are reduced by use of Echinacea
2. Echinacea is not indicated
3. Risk is significantly reduced by prophylactic use of Echinacea as confirmed by meta-analysis

4. The higher the risk of recurrent RTI the greater the prophylactic benefit of Echinacea
5. Echinacea is only indicated for acute RTI
6. Combination of 1,3 & 4

5.6 Echinacea prevents complications of viral respiratory tract infection by:

1. Inhibiting bacterial attachment to bronchial epithelial cells – preventing secondary bacterial infection
2. Enhancing expectoration of respiratory secretions
3. Prevents expression of bacterial ligands such as ICAM-1, PAFr & fibronectin
4. Facilitates detoxification of airway cells
5. Prevents viral induced cytokine production and thus inhibits inflammation
6. Combination of 1,3 & 5
7. Combination of 2 & 4

Section 6 – Safety & Tolerability

6.1 Echinacea is considered to have a good safety and tolerability record due to:

1. Confirmation of this in more than four clinical studies, one meta-analysis and one Cochrane review.
2. Few people report bad reactions and it has been used for hundreds of years
3. Consumption of Echinacea for four months in a prevention study confirmed that safety was non-inferior to placebo and there was no change in haematological and metabolic parameters
4. Historical literature and extensive traditional use of Echinacea confirms that it is safe
5. Combination of 1 & 3
6. Combination of 2 & 4

6.2 Echinacea use during pregnancy:

1. Is considered to be safe and poses no increase of malformation, adverse pregnancy outcome based on 363 women who used Echinacea during their pregnancies.
2. Is contraindicated due to risk of birth defects
3. May aggravate morning sickness
4. May result in low birth weight
5. All herbal medicines are contraindicated in pregnancy

6.3 Reports from clinical trials using Echinacea:

1. Confirm that that adverse events were infrequent, and if they did occur they were mild and transient
2. Document vomiting, diarrhoea and skin rash and insomnia as side effects
3. Tolerability by participants was rated as ‘good’ or ‘very good’ in more than four studies

4. Combination of 1 & 3
5. Combination of 2 & 3

6.4 Echinacea is known to be possibly contraindicated with concomitant use of:

1. Paracetamol – due to risk of liver failure
2. Anti-malarial medication – due to inactivation thereof
3. Immuno-suppressant drugs – due to potential inactivation thereof
4. Oral contraceptives – due to inactivation thereof
5. NSAID drugs – due to potentiation of anti-inflammatory effect

6.5 Regarding concurrent use of *Echinacea purpurea* and anti-retroviral drugs the literature reports the following: (answer true or false for each statement)

6.5.1 Echinacea should never be used with ARV drugs – because it inactivates ARV drugs

6.5.2 Echinacea can be used but with adequate monitoring

6.5.3 Echinacea with boosted protease inhibitor drugs (boosted with ritonavir) appear to be safe and without the need to dose adjustment

6.5.4 Etravirin (nonnucleoside reverse transcriptase inhibitor) alone with co-administration of Echinacea is reported to safe and well tolerated without need for dose adjustment

6.5.5 Patients on ARV therapy should disclose Echinacea use to their doctors and be monitored

6.5.6 Combining *Echinacea purpurea* and ARV therapy causes raised liver enzymes

6.5.7 Echinacea use is totally contraindicated with ARV therapy

Section 7 – Conclusion

7.1 The general mode of action of *Echinacea purpurea* is:

1. A highly nutritious herb providing all essential nutrients for general health and functioning of the immune system
2. Potent analgesic and antipyretic thus useful in influenza and other infections characterised by pain and fever
3. Anti-viral, anti-bacterial and anti-inflammatory thus useful in infections and infection related inflammation
4. A detoxification agent resulting healthier immune system
5. Due to very high levels of Vitamin C, Echinacea boosts the immune system.

7.2 Answer true of false for each of the following statements about the clinical effects of *Echinacea purpurea:*

7.2.1 Reduces the risk of common complications of RTI by 50%

7.2.2 Prevents recurrent migraine due to its anti-inflammatory effect

7.2.3 Prevents secondary bacterial infections of viral RTI by inhibiting bacterial receptor expression

7.2.4 Useful for arthritis as it is anti-inflammatory

7.2.5 Efficacy in treatment of viral infections and symptoms thereof is partially due to the ability to inhibit inflammatory cytokine production

7.2.6 Has direct antimicrobial effect against rhinovirus, influenza virus, *S pyogenes, H influenzae*

7.2.7 Relieves menstrual cramps due to it being an anti-inflammatory

7.2.8 Clinically proven to treat RTI

7.2.9 Acts as a free radical scavenger

7.2.10 Promotes platelet aggregation thus useful for epistaxis (nose bleeds) and bleeding conditions