Appendix 8 – Sputum induction protocol

Indication for Paediatric CF Sputum Induction:
Children with CF (who are generally non-productive of sputum) with:

- Recurrent pulmonary exacerbations or declining lung function but no recent significant bacterial growth on cough swab sampling.
- Previous isolation of bacterial or fungal infection (including Non-Tuberculous Mycobacterium) - looking for additional growths to decide about treatment initiation or eradication success.
- Previous growth of *Pseudomonas aeruginosa* to confirm eradication following treatment. (SI should be completed 2 weeks after stopping initial eradication treatment and 4 weeks after stopping long term antipseudomonal treatment).

Exclusion Criteria:

- Children with a history of bronchoconstriction to inhaled therapies.
- Children with a history of recent haemoptysis or pneumothorax.
- Children unwell on the day of the SI *e.g*. diarrhoea, vomiting, temperature, increased work of breathing.
- Children with history of procedural distress around nebulised therapy (test to be carried out by physiotherapist with play and psychology involvement).
- Patient referred to assess for *Pseudomonas aeruginosa* eradication but still taking eradication/suppression treatment.

Prior to the Procedure:

- The Referrer (doctor, nurse, physiotherapist) refers the patient via ICE stating the reason for referral and preferred timeframe of sputum induction.
- Phone the patient to arrange the appointment.
- Ask a medical or non-medical prescriber to complete **Paediatric Induced Sputum Testing Patient Specific Direction** (Prescription) – See below. To include 36mls hypertonic saline (3 or 7%) and a pre- and post-inhaled bronchodilator (Salbutamol 100 micrograms MDI preferred unless previous allergy).

During the Procedure:

- Collect and set up equipment for SI (see SI protocol data collection sheet below).
- Complete the SI and record results on the SI protocol data collection sheet below.
- Ensure all medication is double checked and signed for by a registered healthcare practitioner (nurse/physiotherapist).

Post Procedure:

- Upload completed SI form including prescription (Patient Specific Direction) to Electronic Patient Record/notes and email a copy to n.collins4@nhs.net to put on RBH EPR.
- Chase result to inform referrer and patient of result.
- Inform RBH CF team of result and plan of action.

Sputum Induction Equipment Required

Nebuliser:

- Ultrasonic Nebulizer (DeVillbiss ultraneb nebuliser) & nebulising chamber with white transducer
- Disposable cup and lid for the nebuliser
- Elephant tubing (2 lengths: 1 and 4 sections)
- Bacterial Filter
- Mouthpiece/mask

Medication:

- Hypertonic saline 7% (36mls or x9 vials)
- Salbutamol MDI 100mcg & Spacer
- 0.9% saline for flushing suction catheter

Spirometry and Assessment:

- Spirometer
- Calibration syringe
- Stethoscope
- Saturation monitor (with age appropriate probe)
- Timer / Calculator (can use phone)

Suction:

- Suction tubing and
- 10 suction catheter
- Yellow sputum trap x2

Microbiology:

- Sputum collection pot
- Cough swab x1
- Viral swab

For the patient:

- Drink of water
- Tissues
- Vomit bowl
- Own Airway Clearance device if relevant

Overview of the Procedure

- Assemble the ultrasonic nebulizer according to the manufacturer's instructions

- Take a brief current history and note any oral antibiotics. Check the patient doesn't have any drug allergies or previous reactions to hypertonic saline or bronchodilator (in most cases this will be salbutamol).

- If you don't need to know the patient's Bronchodilator Reversibility give patient a bronchodilator (usually 2 puffs Salbutamol or whatever dose they normally take pre-physio – refer to PSD) via MDI & spacer. Wait 15mins.

- Record the patient's height and weight for spirometry if appropriate.

- If age appropriate perform spirometry. From the best result of this spirometry calculate 10% and 20% drop in FEV_1 **use as safety value** for monitoring of the procedure. Fill in table on results page.

- Draw up 20 ml of 7 % hypertonic saline and place in the ultrasonic nebuliser chamber.

- Perform a cough swab.

- Perform baseline auscultation.

- Perform baseline oxygen saturation monitoring.

- Explain/demonstrate to the patient what they need to do and **Start first 5 min** period of nebulisation with hypertonic saline. Remember to set time to 5 mins and to record time started.

- **End of first 5 mins.** Ask the patient to rinse their mouth with water (if they can) and then to try and expectorate. For many patients' it is helpful to lean forward and perform 3 phases of sputum expectoration *i.e.*
  a) Huffing and coughing
  b) Clearing the throat, often noisily: "hawking";
  c) Spitting into the pot.

- Next - Take patient's spirometry prior to starting the next 5 min cycle of nebulisation. If <10% different to the baseline result continue with next 5-minute cycle of nebulisation (if >10% see below). Perform auscultation and monitor oxygen saturations. Record all observations on the data collection sheet.

- Top up the nebulising chamber with 8mls of hypertonic saline. Repeat the nebulisation for 2 more cycles of 5 minutes (15 minutes in total) – topping up with 8mls of hypertonic saline each time. Check SPO_2, auscultation and spirometry (if age appropriate) at the end of each cycle. The FEV_1 must be within 10% of the initial baseline before proceeding and then leaving the department.

- At the end of the 15 minutes of nebulisation the patient should perform a few cycles of their normal ACT if appropriate or you may try graded huffs and or AD and or exercise to achieve a good expectorated sample.

- If the patient is unable to expectorate an adequate sputum sample oral suction should be performed with a size 10 catheter and sputum trap. We call this a "magic cough swab". The depth of suction is similar to a cough swab and is similar to the distance between child's nostril and ear. The sample can be flushed into the trap using 0.9%

saline. If possible, try and remove suction while withdrawing the catheter back out the mouth (in practice this isn't always possible). A firm cuddle (by parent/carer) whilst supporting the child's forehead helps make this procedure quicker and more effective.

- Prior to the patient leaving the department you should let them know of any possible latent adverse reactions and what to do if they experience these.

- If indicated split sputum sample in two and send one for virology (respiratory PCR) or you may just do a viral swab. This won't be necessary for all patients as it depends on reason for referral (*e.g.* post eradication and well won't need a viral sample sent). All specimen pot(s) should be labelled with patient's name, date of birth, hospital number, date and time collected. Complete sample request (yellow form – bacteria, orange form virology). All sputa to be sent for mc&s, AFB and fungal culture. Cough Swab sent for mc&s.

STOP the sputum induction if:

The patient becomes wheezy
Develops chest discomfort
Oxygen saturations drop below 92%,
Has signs of increased work of breathing
$FEV_1 \geq$ 10% drop from baseline at any stage

- They should be treated with bronchodilator as prescribed via large volume spacer.
- Lung function should be repeated after 10-15 minutes.
- If FEV_1 remains $\geq$ 10% drop from baseline, then discuss with medical team before continuing.
- If Spirometry has returned to <10% difference to baseline and no other symptoms, then continue with next nebulisation.

Should **FEV_1 fall $\geq$ 20%,** the **induced sputum procedure must be stopped immediately**, emergency bronchodilator to be given as prescribed and doctor called to review situation. Repeat FEV_1 after 15 mins and medical team to review before discharged.

Please note if you need medical attention during this trial: ***INSERT YOUR TRUSTS OWN INFORMATION AND CONTACT DETAILS HERE***

Cleaning

- Disposable equipment should be thrown away.
- Reusable equipment nebuliser chamber (not white transducer) should be cleaned by soaking in Tristel for 5 – 10 minutes (in lung function), rinsing in sterile water and left to air dry.
- All other equipment including chairs and trolley should be wiped down using medical wipes *e.g.* (Clinell wipes). Please let reception know if the room needs a deep clean.
- **Make sure to keep the transducer (base part of the ultrasonic nebuliser) – it is very expensive!!**

PAEDIATRIC INDUCED SPUTUM TESTING PATIENT SPECFIC DIRECTION

*******THE TEST WILL NOT BE UNDERTAKEN WITHOUT ALL SHADED AREAS COMPLETED******

HOSPITAL NUMBER **Wt kg** **SURNAME** **FIRST NAME** **D o B**	**Inpatient/ Outpatient**
DATE OF REFERRAL: **REASON FOR REFERRAL:** **PRESCRIBER: *PRINT*: ……** ***SIGN*……..** **PRESCRIBER BLEEP/ EXT no. #** **CONSULTANT:**	**ALLERGIES**

	Medicine	**DOSE**	**Administered?**	**Initials for check**
MEDICATION DOSE (36mls 7% or 3% hypertonic saline)			**YES NO**	
PRE TEST BRONCHODILATOR (salbutamol 100micrograms MDI preferred unless previous allergy)			**YES NO**	
POST TEST OR DURING TEST BRONCHODILATOR *(please circle/indicate dose)*	**Salbutamol NEB** **Salbutamol 100micrograms MDI** (preferred unless previous allergy)	**……mg** **……puffs**	**YES NO**	

Terminal clean required post-test? *(i.e. MRSA/ M. abscessus/B. cepacia)*:
YES / NO

SI Protocol Data Collection Sheet

Referral Information

Name of patient	
Date of Birth	
Hospital Number	

Sputum Induction requested by

Date of Referral		By when should Sputum Induction be done?	
Reason for referral			
Have they had SI before?	**No / Yes** If Yes when? _____		
Any other Relevant Clinical Information?			

Assessment

Date of procedure			
Height:	**cm**	**Weight:**	**kg**
Pre SI cough swab taken	**Tick to confirm completed:** ☐		
Clinical presentation today			

Current Antibiotics	**Oral:** **Nebulised:**
Check for Allergies	**<u>Allergies?</u>** **Yes/No** **If yes what?.....**
Inform Patient	**<u>Possible Side Effects/Adverse Reactions:</u> Increased heart rate, tremor, flushing, rash, swollen lips, tight chest, wheeze, difficulty breathing, drop in lung function, cough, sore throat, nausea** **<u>Safety Net:</u> Inform patient that any side effects/adverse reactions experienced should go before leaving the department but they must inform you if they experience any delayed effects and if concerned go to their local hospital** **Tick to confirm completed:** ☐ **<u>Verbal Consent for SI Obtained from Parent/Carer?</u>** **Tick to confirm completed:** ☐

SI Protocol Data Collection Sheet

Spirometry

Pre Bronchodilator **FEV_1 -** N/A unless want to check BDR (absolute and % pred)	FEV_1: FVC:
Post Bronchodilator **FEV_1** (absolute and % pred)	FEV_1: FVC:
Calculated FEV_1 10% drop : 0.9 x FEV_1 baseline (absolute)	FEV_1:
Calculated FEV_1 20 % drop 0.8 x FEV_1 baseline (absolute)	FEV_1:

Time started	Duration	Completed (Y/ N)	FEV_1/FVC/SpO2/ Auscultation	Sample produced (Y / N)	Comments
	Pre		SPO2 Ausc:		
	5 minutes		FEV_1 FVC SpO2 Ausc:		
	5 minutes		FEV_1 FVC SpO2 Ausc:		
	5 minutes		FEV_1 FVC SpO2 Ausc:		

	10 minutes post induction	If indicated The FEV_1 must be within 10% of the initial baseline before leaving the department.	FEV_1 FVC SpO2 Ausc:		
	Physio performed?		N/A		
	Oraopharyngeal Suction performed?		N/A		

Post Test or During Test Bronchodilator Administered: **Date given:**	Time given:	Dose given:	Initials for Check:
Post Test or During Test Bronchodilator Administered: **Date given:**	Time given:	Dose given:	Initials for Check:

Comments:

Signature: **Print Name:**

Job Title and Band: **Date:**

Sputum induction sample processing

Sample:	Send for:	Form:	Completed Y / N
INDUCED SPUTUM SAMPLE (expectorated or oropharyngeal suction)	MC&S, AFB FUNGAL	Yellow microbiology form	
OROPHARYNGEAL SUCTION SAMPLE OR VIRAL SWAB (if symptomatic)	VIROLOGY	Orange virology form	
COUGH SWAB (pre)	MC&S	Yellow microbiology form	