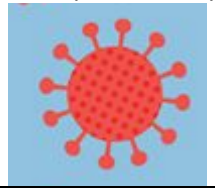
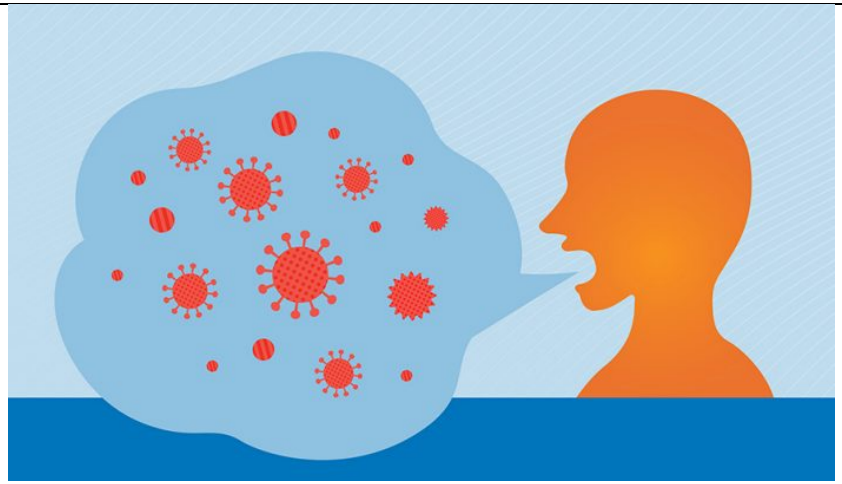
Animation Script

Article Title: Characterization of aerosol generation during various intensities of exercise

Scene Number	Text	Scene Description	Client comments/queries
1	Chest journal intro scene		
2	Screenshot of paper		
3	Concern over potential aerosol transmission of SARS-CoV-2 resulted in curtailment of activity in testing laboratories and many indoor exercise facilities were closed.	Split screen image: **Left**: single adult male on bicycle doing cardiopulmonary exercise testing. Aerosols are dispersing and being inhaled by the technician seating near him at the computer.  **Right:** Multiple people exercising in a gym. Perhaps a spin studio type scene with covid particles dispersing and being inhaled by everybody.	

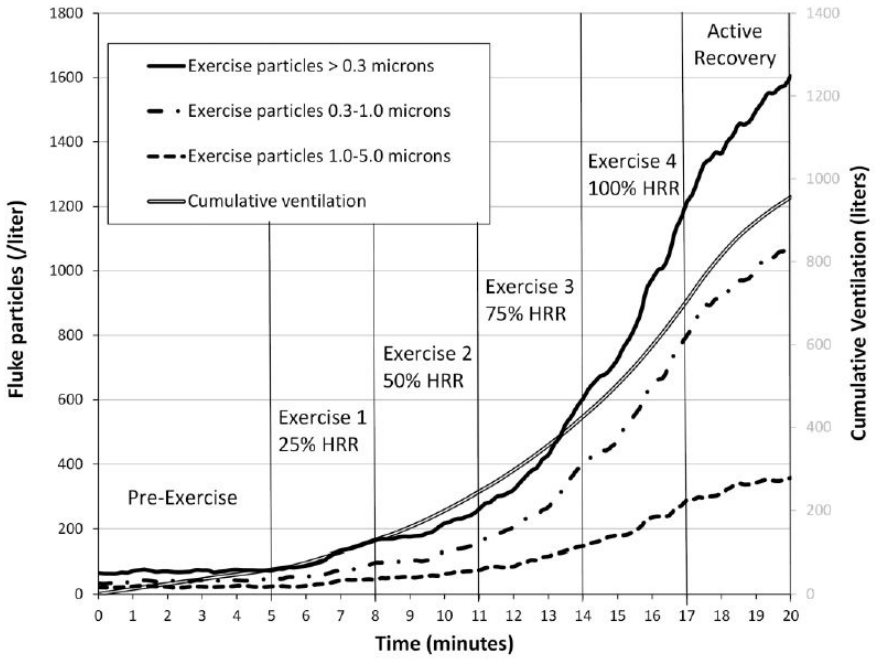
		 Example: COVID particle: 	

4	Aerosols are fine solid particles or liquid droplets suspended in air.	 Aerosol cloud should be smaller and the image should show several clouds – some close to the person and some farther away. Each cloud should have different sized particles.	
5	Particles < 1.0µm in diameter remain in suspension, while particles > 10µm likely fall out as droplets at short distances from the mouth during normal breathing.	Scene 4 clouds are focused on. The small particles are labeled < 1.0µm and continue to float in the cloud in the air. The larger particles are labeled > 10µm and fall out of the cloud a short distance from the patients mouth.	
6	Allison and colleagues hypothesized that sustained deep and rapid breathing during heavy exercise will generate measurable volumes of aerosols with potential for carrying infective agents like COVID-19 to both near and distant spaces in an	Show a single person on an exercise bicycle breathing deeply and rapidly. Show a cloud of particles being dispersed throughout the room.	

	exercise laboratory or center.		
7	Eight healthy volunteers performed cycle exercise activities inside a specialized altitude training tent while four particle counters within the tent measured aerosol generation.	Show this tent structure (don't include the black HEPA filter) and then have the camera move into the tent to show a person on a bicycle riding. Camera then flies up for an almost top down view that portrays the particle counters (labeled fluke and p-trak). Label should just be "particle counter." There are 4 of them.  	

			
8	Oxygen consumption, ventilation, oximetry, and heart rate were measured throughout the study.	Same scene. Focus on person riding the bike and display a monitor with pulse oximeter (98%), heart rate – 135bpm, and respiratory rate 37 bpm. The ECG (green tracings) and pulse oximeter (blue tracing) should be twice as fast – i.e. waveforms should appear closer together. The green respiratory tracing should be fast as well (below pulse ox tracing). Blood pressure can be left off.	

			
9	Measurements were taken during 5 minutes of resting and during four 3 minute stages of exercise at 25%, 50%, 75%, and 100% of age-predicted heart rate reserve.	Show participant at rest on bike. As voiceover continues person is biking harder and the patient's heart rate and respiratory rate are increasing. Can use 160bpm as the heart rate reserve for this subject so animation should show the heart rate increase from 60 to 160.	

10	The authors found that significant concentrations of aerosols are generated during exercise in all measured sizes of particles and exponentially related to exercise intensity and volume of ventilation.	 - Color each plotted line to make it easier to discern and rather than having a legend box, simply label each line (can have arrow pointing it) - Simplify Y-axis (left): 500 increments rather than 200 depicted. - Simplify Y-axis (right): 400 increments - Simplify X-axis: 5 minute increments rather than 1 minute	
11	The authors conclude that aerosol generation increases substantially at 50% of heart rate reserve with exponential rise at 75-100% of heart rate reserve, indicating that exercise testing produces aerosols with COVID-19 virus carrying capacity potential	Back to opening scene split screen. Show particle generation increasing as the various people start working harder.	

	far greater than other known aerosol generating procedures.		
12	In another study published in this issue by Allison and colleagues, they demonstrate that a portable HEPA filter in the tent can mitigate 96% of aerosols generated during exercise.	 Show this tent again, with a person on the bicycle exercising. This this time include the black HEPA filter. Show it sucking the particles out of the room effectively. Overlay the following figure, but simplify it. Just show the > 0.3 micro data (don't label the size, just label "no filter" and "HEPA filter" with the goal of showing the difference between the two overall.	

		X-axis 5 minute increments