

Frequently Asked Questions

What is Viscoelastic gel with Covid Coat (Tapas Aasan)?

Viscoelastic gel with Covid Coat (Tapas Aasan) is combination of two technologies, formulated and optimized to work in sync to obtain desired outcome of inertness with cushioning and persistent anti-microbial layering.

- Viscoelastic Gel with ≥ 0.8 g/cc density rebound in less than fraction of second. It's core tensile strength is ~ 14 Kg/cm³ with elongation strain withstanding ability of ≥ 500 %. It's tear strength is ~ 3.5 kN/m with less than 4% compression set. Accordingly it is an ideal elastomeric cushion able to distribute pressure equally in all directions. It can withstand up to -40°C to $+50^{\circ}\text{C}$ with no cracks and hypoallergenic (doesn't support any fungal growth). It is latex, silicone and polyurethane free, inert/organic and reusable.
- Covid Coat is self protecting semi-conductor nano coating with 99.99% virus neutralization efficacy (instant). It is able to incapacitate microbes through multiple modes of action and possess broad spectrum of action. It's effectiveness varies in multiple variants from 90 days, 365 days ago 5 years. It can be applied on porous and non porous surfaces. It falls into the category of highly adhesive surface coating.

How this concept product is developed into reality? Whether it is indigenous?

The concept was being evolved even before pandemic hits the country. It was being evolved to have 'Hot Operation Theatre' concept that can manage contaminated and infected victims directly. The concept of Hot OTs was published by Division of CBRN Defence, INMAS. Some of the challenges found in the structural material used in such environment include foam material. The present day foams in these critical facilities used in such beds cannot be disinfected 100% leading to possible spread of infection. The most important limitation factor is 'lack of robustness, gets bottom out and once infected/contaminated, it is extremely costly procedure to get them disinfected. Thus, the exploration of development of inert material with cushioning was conducted. Large number of material compositions are available but their continuous usage is linked to toxicity. Similar composites of C3I gel powder were available. The powder was used to develop viscoelastic gel optimized to requirement of extreme inertness yet able to hold extremely adhesive coating. These two factors are contradictory thus require detailed optimization process. Covid Coat formulation was optimized to sustain on such inert layer of gel. Multiple formulations were evolved and then tested for their persistency, once achieved, tested and validated against COVID-19. Both technologies are developed indigenously with collaborative efforts in needs of hour of COVID-19 emergency. The final product withstand multiple infections as control measure as well as opt for contaminated victim management too.

Why it is referred as Tapas Aasan?

Tapas Aasan [referred as beds for tapasavi (saints) for sitting and lying] are completely safe, free from infection beds/ seats/ devices for isolated wards/ hot operation theatres/ ICUs/ General Wards of Infection Management Divisions and even seats of personnel handling such facility. Herein 'Tapasavi' literally means who is doing dedicated community work with no self expectations as 'medical and paramedical/ nursing staff' are doing during pandemic situation.

What is technology integration model and how it is applied by DRDO while developing this novel technology?

Technology Integration Model refers to combination of multiple technologies to an innovative concept / model to achieve a particular target / outcome. It reduces the cost of innovation and fasten the process of deliverables. The precise challenge is that outcome should be novel distinct from their individualistic versions. Large number of technologies are being evolved in the similar manner even your smart phones are example of such technological integration. Ultra Swachh Multi Product Disinfection Unit is combination of 'ozone disinfection'; radical dispenser; UV-C re-transformer and; Catalytic Convertors. Tapas Aasan is combination of viscoelastic gel and covid coat technologies optimized to develop beds for isolated wards and Hot Operation Theatre.

How viscoelastic gel is prepared? What are its primary constituents ? How it is different from other gel material available in the market?

Viscoelastic gel is prepared using essential oil, stabilizers in a particular ratio such that desired cushioning and inertness is achieved. As mentioned previously it has core tensile strength is $\sim 14 \text{ Kg/cm}^3$ with elongation strain withstanding ability of $\geq 500 \%$. These features make it useful in developing gel beds for such critical facilities as compared to other gel technologies.

1. Being inert, it would be advantageous for using multiple disinfection/ decontamination agents
2. Being closed cell polymer (hydrophobic) with impact resistance ability, it is extremely robust.
3. It can be easily disinfected by soap water and time for disinfection is very less and no exposure of chemicals to the person carrying out operation
4. There is no limit to reuse and time delay of re-use is less than 15 minutes.
5. Unlike foam, 100 % disinfection is possible, thus safer to use

Where are the applications of viscoelastic gel with covid coat other than it's sheets?

Viscoelastic gel will be used to develop Operation Theatre Positioning Devices as its specific variants for hot operation theatre. It includes Head positioner, prone positioner, universal positioning devices. arm, knee, leg, back, spine, sacral, shoulder, nerve fibers are major aspects of various positioning devices. Specific positions with respect to specific operations like delivery of child, cancer operations, eye care etc. Any positioning prolonged enough to cause any discomfort or bed sores will be managed through such variants. Comatose patients, wheel chair bound or any other morbidity involving bony structures require such positioner. All these are unique structural designs developed through special dyes keeping the technology same.

What is Covid Coat Solution? How it is applied on any surface?

The composition contains highly potent biocide agents covered in polymers (of cationic nature) for controlled and sustained release. these structures have antimicrobial semi - conductor nano-particles with multiple modes of neutralization. Such nanoparticles are covalently bonded acts as repellent and neutralizing moieties for microbes as contact inhibitors. Significant Log Reduction in count ensures long term operations.

What is difference in Covid Coat solution coated on Viscoelastic gel from general surface Covid Coat Solution available?

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How long does Corona Virus live on different surfaces? How Covid Coat is useful against such surfaces?

Multiple research teams showed that COVID-19 remained viable on surface and air up to 2-3 days. On copper surface, it sustains up to 4 hours, plastic and stainless steel - 72 hours, air-nearly 3 hours while cardboard- 24 hours. It remained viable on clothes up to 1 day while upto 7 days on outer layer of medical masks. It can survive in wide range of ambient temperature condition and ph values. It is susceptible to heat and standard disinfection procedures under enhanced cleaning process. Covid Coat- 90 days solution once applied, it sustain on the surface and doesn't allow microbial flora and COVID-19 to grow on the surface. This long term disinfection solution is an ideal and cost effective surface disinfectant. It can be used on (a) Touch Surfaces like Walls, Glass Panels, Common Areas, Lobby, Meeting Areas, Work Stations, Storage, etc; (b) Interaction surfaces like Door Handles, Elevators, Work Surfaces, Rest Rooms, Hand Rails, Social Areas, Dining Surfaces, etc and; (c) Air Conditioning based contamination - HVACs, Air Conditioners, Air Purifiers, Air Curtains, Air Blowers, etc. These are rapid contaminant zones and responsible for majority of spread of cases. However, it can be useful on any surface either in high, moderate or low risk areas. The principle is to coat the surface to prevent 'surface linked spreading of virus'.

How it reduces the requirement in number of enhanced cleaning processes? What would be final ecosystem solution to manage present and future pandemics?

The supplies goes into the cleaning and amount used (or should say over-utilized with extraneous cost pressure) is explained by an example to understand the usage of Covid Coat. In an office of 530 Employees; 3500 hand sanitization dispensing; 4000 pounds of waste removed per day; large number of cleaning staff on rotation; 3000 gallons of disinfectant used per day; 8-10 disinfectant wipes are used per cleaning (with respect to enhanced cleaning process); disposable mops used per day: 2500; Enhanced Contact Precaution Cleaning: 65-90 minutes; INR 700-800 per room cleaning with patient and 12,000 per room cleaning after discharge. All these factors exhibit a cost value to all these processes accounting for material and man power. The evolution of man power to enhance their skills through training is an additional cost. **The addition of Covid Coat / Viscoelastic Gel with Covid** impact complete ecosystem with substantial reduction in each cost. The proposed ecosystem uses multiple CBRN Ultra Devices in conjunction with this technology as mentioned below:

Items	Utility in Disinfection Ecosystem		Impact
Protecton- PPEs (multi-use)	30 days (times) cyclic usage in combination with Ultra Swachh in Isolated Wards / Hot OTs	100 days cyclic usage in combination with Ultra Swachh in low and moderate risk areas for all non-medical personnel	Multi-Fold decrease in cost of PPE per day utility and environmental safety in terms of reduced waste burden

Items	Utility in Disinfection Ecosystem		Impact
India 365 Masks (Protecton Category)	-do- (no requirement of Ultra Swachh)	-do- (no requirement of Ultra Swachh)	-do-
Tapas Aasan (Viscoelastic Gel with Covid Coat)	directly used as replacement of foam based beds with Gel based sheets in Isolated Wards and in Operation Theatre- also replace OT Positioning Devices	Continuous usage as easily disinfect able and decontaminated using standard non-corrosive agents/ washable with water (as hydrophobic and inert)	Extreme decrease in contact precaution enhanced cleaning cost, decontamination cost and lowest burden of biological waste due to extreme high shelf life and closed cell structure
Covid Coat (as part of Tapas Aasan)	Directly use in all types of risk areas and prevent spread of infection by deployment of ideal contact precaution measure	-do-	-do-
Trinetra Hand Sanitizer and Triyogani Hand Sanitizer Concentrate	Directly use as replacement of alcohol based hand disinfectant medium at multiple places	Directly use as replacement of alcohol based hand disinfectant medium at multiple places especially in residential colonies too.	Reduces cases of chronic toxicity caused by alcohol and children becomes safer too. Ozonated Water with Triyogani is an extremely cost effective solution thereby reducing existing recurring cost nearly to 50%.
Ozonated Radical Confined Space Disinfection Unit (Poorn Swachh) with Triyogani (Fumigant)	Directly use as replacement of toxic disinfectant medium like HoCl, NaoCl and others at multiple places	Directly use as replacement in residential colonies too.	Reduces cases of chronic toxicity caused by HoCl, NaoCl and other quarts based disinfectants. Aqueous ozonated fog is an ideal and cost effective solution thereby reducing cost of disinfectant of room to nearly 50-70%.
Taaran (Safe Passage) Patient Transfer system	Ideal for triage and hospital areas dedicated for infectious case management and CBRN emergencies	Ideal for transferring of patient from residential colonies to dedicated ambulances or evacuation of CBRN victims during dirty bomb attacks	No such item exists but it provides an additional advantage of significantly limiting general spread of infection within hospitals
Ati Swachh Heat Sensitive Medical Device Disinfection Unit	Designed for hospitals to cater sterilization of devices that cannot be autoclaved.	Designed to cater luggage sterilization at airports, seaports and metros etc.	Ideal item for provides an additional advantage of significantly limiting general spread of infection within hospitals and crowded places.

What are the key touch points for disinfection in which COVID-COAT helps?



How it affects cleaning frequency at work place?

It can reduce surface cleaning by period of months due to its continue sustenance and reduces dally cleaning time by 40% in high risk area, 70% time in low to moderate risk areas. It reduces use of staff and chemicals by 20% in enhanced contact precautions cleaning process. This all eventually is linked to reduction is frequency by 20% on per day basis.

In which places Covid Coat can be used other than on viscoelastic gel?

Covid Coat is ideal for both porous and non-porous surfaces thus useful in almost all types of surfaces. However viscoelastic gel is a unique form of gel with absolute inertness requires specialized formulation of Covid Coat developed exclusively for viscoelastic gel in sync with DRDO.

What do you understand by 90 day anti-microbial coating?

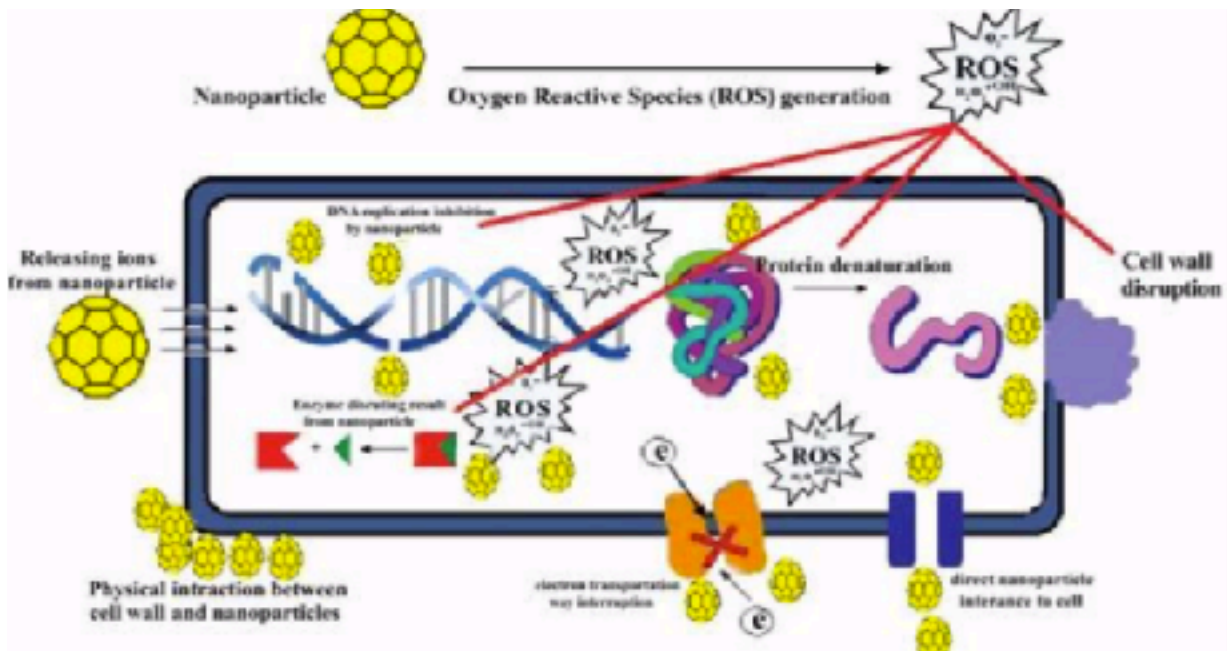
90- day anti-microbial coating means once coated with Covid Coat, the layer sustains there up to 90 days preventing any growth. The high zeta potential of the nanoparticles (>80mV) along with the steric hindrance of the long chain silane bonded polymers generates highly stable dispersion which ensures *very strong adhesive and uniform coating* on surfaces. This also leads to charge repulsion with the microbes leading to their prolonged antimicrobial activities

How this anti-microbial coating works ?

The prime mechanism of anti-microbial coating is given below:

Anti- adhesion: It preventions adhesion by microflora due to repulsion and also disruption of membranes. It is attributed towards unlike charges between surface and microbes contributed by silane based and nitrogen moiety.

Slow Release induced Disruption: The system release biocide components at slow rate eventually causing disrupting osmotic balance and photocatalysis.



Contact neutralization: Biocidal agents creates high surface tension and oxidize biomolecules of microbes leading to their complete neutralization.

What is ATP Meter Test ? How it works with respect to Covid Coat?

ATP is the energy currency which is emitted by all microbial cells (bacteria/virus/fungi)

- 1 Remove swab from collection tube**
- 2 Swab area**
10 cm x 10 cm (4" x 4")
- 3 Put swab back into collection tube**
Snap together tightly
- 4 Activate**
Hold upright and press plunger down firmly
- 5 Insert activated swab in ICCN**
Keep collection tube on
Ensure flat sides face left / right
Do NOT force swab down into chamber
- 6 Select desired test point and run test**
- 7 View result**

The single application of Covid Coat exhibit following results:



What is biofouling? How Covid Coat prevents it?

Covid Coat is ideal for both porous and non-porous surfaces and it prevents biofouling. Biofouling refers to initial attachment of microflora on a surface that eventually becomes irreversible followed by initial and exponential growth. The first phase of attachment itself is prevented by Covid Coat by its + charge induced repulsion and contact neutralization potential.

What are other benefits of Covid Coat in addition to disinfection?

It is non-sacrificial (stays for longer period); anti-microbial efficacy as per global standards of JIS and AATCC; anti-corrosive (protects metal); eliminates VOC (pollutants and odors); protects against UV (sun damage) and its Minimum Inhibitory Concentration is < 17 microgram/ml. Now it is smart textile coating; viscoelastic gel coating; daily surface coating and prolonged surface coating variants are available. Viscoelastic gel coating (universal coat) is developed in sync with DRDO.

Enlist all the bactericidal (both opportunistic and antibiotic resistant) and virucidal activity of Covid Coat?

- **Antibiotic-Resistant Bactericidal Activity:**

Community Associated Methicillin Resistant Staphylococcus aureus (CA-MRSA) (NRS 123) Genotype USA 400 (NRS384) Genotype USA 300, Methicillin resistant staphylococcus aureus (MRSA), (ATCC 33593), Vancomycin resistant Enterococcus faecalis (VRE), (ATCC 51575), Vancomycin intermediate resistant Staphylococcus aureus (VISA), (CDC Isolate 99287), Methicillin resistant Staphylococcus epidermis's (MRSE), (ATCC 51625)

- **Bactericidal Activity:**

Staphylococcus aureus, (ATCC 6538), Pseudomonas aeruginosa, (ATCC 15442), Salmonella choleraesuis, (ATCC 10708), Escherichia coli, (ATCC 11229), Escherichia coli O157:H7, (ATCC 43895), Listeria monocytogenes, (ATCC 35152), Salmonella typhi, (ATCC 6539), Streptococcus pyogenes (Necrotizing Fasciitis-Group A) (VA. Medical Center Isolate 04001), Yersinia enterocolitica, (ATCC 23715), Enterococcus faecium, (ATCC 6569), Corynebacterium ammonia genes, (ATCC 6871)

- **Virucidal Activity:**

Avian Influenza A Virus (H3N2), (Avian Reassortant) (ATCC VR-2072), Avian Influenza Virus Type A (Turkey/WIS/66), (H9N2), SARS Associated Coronavirus (ZeptoMetrix), Paramyxovirus (Mumps) (ATCC VR-1438), Hepatitis A Virus (HAV), Rhinovirus Type 39 (ATCC VR-340), Rotavirus, CoronaVirus
