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Effect of Irradiation of the PEM of 1.531211SMJ29 Jeewanu with Clinical Mercury Lamp and Sunlight on the Morphological Features of the Silicon Molybdenum Jeewanu

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Abstract— Sterilized aqueous mixture of ammonium molybdate, diammonium hydrogen phosphate, mineral solution and formaldehyde on exposure to sunlight results in the formation of self-sustaining coacervates which were coined as Jeewanu, the autopoetic eukaryote by Bahadur and Ranganayaki.

Jeewanu have been analyzed to contain a number of compounds of biological interest.

The presence of various enzyme like activities viz., phosphatase, ATP-ase, esterase, nitrogenase have been also been detected in Jeewanu mixture.

Gáinti (2003) discussed that Jeewanu possesses a promising configuration similar to protocell-like model.

Keywords— Autopoetic, eukaryote, Jeewanu, PEM, sunlight, mercury lamp, morphology, 1.531211SMJ29

INTRODUCTION

Sterilized aqueous mixture of ammonium molybdate, diammonium hydrogen phosphate, mineral solution and formaldehyde on exposure to sunlight results in the formation of self-sustaining coacervates which were coined as Jeewanu, the autopoetic eukaryote by Bahadur, K and Ranganayaki, S. in 1970. **[1]**

The photochemical, formation of protocell-like microstructures "Jeewanu" in a laboratory simulated prebiotic atmosphere capable of showing multiplication by budding, growth from within by actual synthesis of material and various metabolic activities has been reported by Bahadur *et al.* **[1, 2, 3, 4, 5, 7, 8]**

Jeewanu have been analyzed to contain a number of compounds of biological interest viz. amino acids in free as well as in peptide combination (Bahadur *et al.*,; Briggs;; Maurya;), **[1,2,9,10,11,12],** sugars as ribose as well as deoxyribose by Bahadur et al. **[1,2,3,4,5]** ,nucleic acid, bases as purines as well as pyrimidines by Bahadur *et al*.,**[1,6]** phospholipids by Bahadur et al. and Singh. **[1, 13]** and ferredoxin -like material in them by Rao *et al* and Bahadur *et a*l **[8, 14]**. The presence of various enzyme like activities viz., phosphatase, ATP-ase, esterase (Briggs, 1965; Bahadur *et al*., 1970; Singh, 1973; Gupta 1980) **[1,11,13,15]**, nitrogenase (Smith *et al.*, 1965; Bahadur *et al*., 1980) **[8,16]** have been also been detected in Jeewanu mixture.

Gáinti (2003) **[17]** discussed that Jeewanu possesses a promising configuration similar to protocell-like model.

Jeewanu is capable of spitting water molecule to hydrogen and oxygen in presence of sunlight and the proton set free, is utilized to fix nitrogen and carbon dioxide. (Bahadur, K, Ranganayaki, S, Smith and Folsome, 1980). **[18]**

Jeewanu under certain conditions showed characteristic movements at different periods of exposure. A very characteristic shivering movement, of Jeewanu which were prepared by the mixing of cerous sulphate solution to a mixture of potassium ferrocyanide solution and sucrose along with other constituents, was observed by Verma in 1970. (Verma, M, L, 1970). **[19]**

The movement which is observed in protoplasm is considered to be the movement of locomotion. As this movement of protoplasm is without the aid of external factors, it is considered to be due to some internal causes. Sometimes, certain chemical substances, light and heat act as the external factors inducing the movement of protoplasm. These factors act as stimuli. Light also act as a stimulus as seen in algae which move towards the source of weak light but move away from the source of strong light. Protoplasm also responds to the stimulation of heat. When there are two different temperature areas, protoplasm moves towards the warmer area. However, if the tissue is gently warmed, the protoplasm shows more rapid rotation or circulation motion.

Effect of variation in the concentration of mineral solution in the PEM of 1.531211SMJ38 before and after exposure to sunlight, on morphology of 1.531211SMJ38 was studied by Srivastava, D. **[20]**

Effect of irradiation of 1.5312211SMJ29 Silicon Molybdenum Jeewanu PEM with clinical mercury lamp and sunlight on the blue colour intensity and the pH of the PEM of the silicon molybdenum Jeewanu was studied by Srivastava, D. **[21]**

In this paper, an attempt is made to investigate the effect of irradiation of 1.531211SMJ29 Silicon Molybdenum Jeewanu PEM with mercury lamp and sunlight on the formation and morphology of 1.531211SMJ29 Silicon Molybdenum Jeewanu has been carried out.

EXPERIMENTAL

The following solutions were prepared:

a) 4% (w/v) ammonium molybdate

b) 3 % (w/v) diammonium hydrogen phosphate

c) Mineral solution: It was prepared by mixing various minerals in appropriate proportions.
d) 36% formaldehyde
e) 3% (w/v) sodium chloride
f) 5% (w/v) water soluble sodium silicate

PROCEDURRE

Two clean, dry, sterilized corning conical flasks of 10 ml capacity were taken and labeled and B. In each flask 15 ml of 4% ammonium molybdate, 30 ml of 3% diammonium hydrogen phosphate, 10 ml of mineral solution, 20 ml of formaldehyde, 10 ml of sodium chloride and 10 ml of soluble sodium silicate were added. The total volume of each flask was 95 ml separately.

Each flask was cotton plugged and shaken well. Flask A was exposed to sunlight and flask B was exposed to mercury lamp keeping the distance of flask B from mercury lamp 32 cms and the mercury bulb used was of 125 W. Both the flasks were exposed simultaneously for same exposure time each day giving half hour exposure daily for first two days, and then 2 hours exposure daily for fourteen days giving a total exposure of 29 hours. The intensity of the blue colour and the pH were noted both before and after each exposure for each flask A and B. the microscopic observations were also done simultaneously both before and after each exposure.

After total 29 hours of exposure, particles of each flask were filtered, dried in a desiccator and weighed. The yields of both flasks were noted.

The yields of the two flasks were as follows:

		Yield of 1.531211SMJ29 in g
a)	Flask A exposed to sunlight	0.2984
b)	Flask B exposed to mercury lamp	0.2430

TABLE – 1

Effect of exposure of 1.531211SMJ29 Jeewanu to sunlight and clinical mercury lamp on the number of the particles (SA/view)

Period of exposure in hours	Irradiation to sunlight		Irradiation to mercury lamp	
	Before exposure	After exposure	Before exposure	After exposure
½	No particle seen	8.0±0.71	No particle formation	
1	6.8±0.59	128.4±2.65		
3	142.±02.60	45.0±1.94		
5	118.0±0.94	114.0±4.30		
7	255.2±1.71	164.4±2.03	227.4±2.69	145.4±1.77
9	285.0±1.84	197.0±1.78	164.6±1.93	125.0±1.84
11	605.6±1.96	165.0±1.84	205.0±1.94	154.6±1.88
13	277.8±2.13	205.0±1.72	234.8±1.79	129.6±1.86
15	339.8±3.07	255.6±1.80	305.0±1.84	204.6±1.93
17	213.8±2.76	154.8±1.77	202.4±1.63	60.6±1.91
19	37.2±1.06	28.4±1.06	93.8±2.20	56.4±2.01
21	353.8±1.41	301.2±1.25	249.0±1.81	199.4±2.10
23	602.0±1.14	367.4±1.77	367.4±1.77	303.2±1.14
25	156.1±1.88	396.8±1.98	203.2±1.39	100.8 ±1.59
27	599.8±1.39	419.4±0.67	301.2±1.15	203.2 ± 1.62
29	495.2±1.85	445.2±1.74	305.0±1.84	415.0 ±1.84

TABLE – 2

Effect of irradiation of 1.531211SMJ29 Jeewanu to sunlight and clinical mercury lamp on the size of the particles in μ (SA/view) with increasing exposure time.

Period of exposure in hours	Irradiation to sunlight		Irradiation to mercury lamp	
	Before exposure	After exposure	Before exposure	After exposure
½	No particle seen	0.80±0.120		
1	0.80±0.121	0.80±0.121		

3	1.00±0.001	0.50±0.006	No particle formation	
5	0.50±0.004	0.25±0.140		
7	0.50±0.020	0.50 ±0.201	0.50±0.008	0.50±0.006
9	0.75±0.006	0.50±0.008	0.50±0.014	0.25±0.001
11	0.50±0.018	0.50±0.043	0.25±0.006	0.25±0.015
13	0.50±0.013	0.25±0.001	0.25±0.218	0.25±0.026
15	0.25±0.104	0.25±0.006	0.12±0.143	0.25±0.018
17	0.25±0.001	0.25±0.044	0.12±0.014	0.12±0.006
19	0.25±0.005	0.12±0.068	0.25±0.061	0.25±0.004
21	0.25±0.063	0.12±0.014	0.25±0.043	0.25±0.048
23	0.25±0.041	0.25±0.005	0.25±0.140	0.12±0.064
25	0.25±0.002	0.25±0.084	0.12±0.008	0.12±0.001
27	0.12±0.043	0.25±0.134	0.12±0.002	0.25±0.084
29	0.25±0.061	0.25±0.206	0.25±0.006	0.25±0.091

CONCLUSION

The microscopic observations indicate that in the PEM exposed to sunlight, the particle formation was observed after half hour exposure but in the PEM exposed to clinical mercury lamp light, no particle formation took place up to 5 hours of exposure. Maximum particle formation was observed in the PEM exposed to sunlight and subsequently kept in shade. It was further observed that in both the cases, the number of particles was more when the PEM was kept in shade for overnight before exposure, and on exposure, in both the cases, the number of particles decreased. In PEM irradiated with sunlight, maximum particle size was observed before exposure after the night phase and after exposure the size decreased. In the PEM exposed to clinical mercury lamp radiation, smaller particles were formed and the maximum average size observed was 0.5µ. in later hours of exposure, in the PEM irradiated with sunlight, along with the spherical particles, oval particles were also observed. At certain stages of exposure, some crystals like structures were also recorded. It was further observed that the particles formed in the PEM which was exposed to sunlight were blue coloured whereas the particles which were formed in the PEM irradiated with clinical mercury lamp light were transparent.

Another salient feature observed was the oscillating motion of the particles which was observed after the night gap before 11 hours exposure in the PEM irradiation with sunlight. Similar motion was observed in the particles of the PEM exposed to clinical mercury lamp light after the night gap before 25 hours exposure. It was further observed that in both the PEM, the motion of the particle was more pronounced before exposure and after exposure it either became slow or vanished.

It has been observed that the motion of the Jeewanu was not due to the flow of the medium; it was not affected by the tapping of the stage of the microscope and was present even after 30 minutes. The motion of the particles was not zigzag but oscillatory and thus was not Brownian motion. Brownian motion is found only at certain temperatures and is not observed in electrolytes. But the PEM in which Jeewanu are formed contains many electrolytes viz. ammonium molybdate, diammonium hydrogen phosphate, biological minerals and 7% formaldehyde, so the motion observed in Jeewanu is one of the metabolic activity and not the Brownian motion. (Mathur, V, 1989). **[22]** According to Matsuno, k, 1986), **[23]** at an early stage of evolution, it might have been possible that the abiogenic microstructures or the model of protocell made of phospholipids like material shoed photo biological motility due to oxidative phosphorylation. He suggested that the origin of photo biological and biological motility is an evolutionary event that could have raised force equilibration proceeding at a definite velocity thus, the motion which was observed in Jeewanu, which has a number of phospholipids in them. (Singh, 1973), **[13]** materials with phosphate like activity (Briggs, 1964), **[24]** ATP-ase like activity (Bahadur, 1970) **[1]** and acid phosphatase like activity (Gupta, 1984), **[25]** could be considered to be a step forward in the process of evolution.

Comparing the yield of the particles produced it was observed that sunlight favoured greater formation of the particles.

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