

# Effect of heavy water (D<sub>2</sub>O) on the growth of Escherichia coli, Klebsiella aerogenes and other microorganisms

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The influence of heavy water present in nutrient broth on the growth of a number of microorganisms was investigated. In the case of certain bacteria the multiplication of cells was less in D<sub>2</sub>O medium and with K.aerogenes it was completely suppressed. The growth of K.aerogenes was also dependent on the concentration of heavy water. In the case of citrate-positive organisms, the utilization of citrate carbon in the presence of D<sub>2</sub>O was delayed and in the case of K.aerogenes it became citrate-negative.

**Key words:** D<sub>2</sub>O, growth of bacteria, microorganisms

## INTRODUCTION

Nuclear radiations are known to be lethal to microorganisms and in the present work, it was thought interesting to study the influence of heavy water on the growth of the organisms.

## MATERIALS

The nutrient broth was supplied by M/s Hi Media Laboratories, Bombay. The heavy water was obtained from B.A.R.C. Bombay and of isotopic purity 99.8%.

## RESULTS AND DISCUSSION

The data on the influence of D<sub>2</sub>O, the growth of microorganisms in nutrient broth and in citrate media are shown in Table I. The growth of the organisms is followed from the development of turbidity in the culture medium examined visually [1]. In the case of K.aerogenes, the growth in nutrient broth prepared in D<sub>2</sub>O is completely suppressed. Experiments were carried out to study the influence of D<sub>2</sub>O on citrate utilization. Accordingly, citrate media were prepared using H<sub>2</sub>O and D<sub>2</sub>O, and inoculated. In the case of K.aerogenes, although there has been the utilization of citrate in H<sub>2</sub>O medium, in D<sub>2</sub>O medium it became citrate negative. In the case of organisms which show citrate utilization in H<sub>2</sub>O medium, in D<sub>2</sub>O medium they are citrate negative after 24 hr. and show positive reactions only after 48 hr. The results show that D<sub>2</sub>O can also bring about changes in the course of metabolic reactions.

In the case of K.aerogenes, it is likely that the D<sub>2</sub>O-associated nutrients are not able to pass through the cell membrane to synthesize cellular structures and the growth is inhibited completely. With other organisms, where less

TABLE-I: Effect of D<sub>2</sub>O on the growth of bacteria in nutrient broth and citrate medium (310K)

Organism	Nutrient broth		Citrate medium			
	H <sub>2</sub> O	D <sub>2</sub> O	H <sub>2</sub> O		D <sub>2</sub> O	
	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr
Blank	-	-	-	-	-	-
1. Escherichia coli	+	<	<	-	-	-
2. Klebsiella aerogenes	+	-	-	+	+	-
3. Proteus vulgaris	+	+	+	-	-	-
4. Bacillus stearothermophilus (317K)	+	<	<	-	-	-
5. Azosprillum sp.	+	<	<	+	+	-
6. Rhizobium sp.	+	<	<	-	+	-
7. Micrococcus sp.	+	<	<	+	+	-
8. E-6*	+	+	+	-	-	-
9. E-7*	+	+	+	-	-	-
10. Aeromonas hydrophila	+	<	<	+	+	-
11. Pseudomonas sp.	+	<	<	+	+	-
12. Staphylococcus aureus	+	+	+	-	-	-
13. Aerobic spore bearers	+	<	<	-	-	-

\* Unidentified organisms isolated from tannery effluents (Microbiology Department, M.K. University, Madurai - 21)

growth is observed in  $D_2O$  medium, the enzyme systems are probably affected in view of the new environment, viz.  $D_2O$  and thus the low rate of multiplication of cell is noted. In other cases  $D_2O$  has no effect.

#### REFERENCE

1. P Gunasekaran and P Tauro, *J Biosci*, 4 (1982) 219