

## CHAPTER VIII

### EFFECT OF SURFACE ACTIVE AGENT ON BIOSORPTION OF $Hg^{++}$ BY *Saccharomyces cerevisiae*A100

Surface active agents have a wide range of utility as manifested by their applications in detergency, solubilization, emulsification, capillary penetration, wetting and spreading. Because of their growing industrial utilization these compounds have been commercially available on an increasing scale with consequent opportunities for application to systems of biological interest (362). These compounds have exhibited marked effectiveness in low concentration in interaction with biological system with phenomena such as precipitation, complex formation and denaturation of proteins, cytolysis of cells, destruction of microorganisms and inactivation of viruses as examples (363). Surface active agents are the substances, which alter the energy relationships at interfaces(364). Alteration of surface tension may produce marked effects on the growth of microorganisms. Charge bearing ligands present on the cell surface also majorly affected by the alteration of the surface tension(365). Alteration in cell surface composition of *S.cerevisiae* with addition of surface active agent was reported by Pringle & Rose(366). Thus surface active agents play a significant role on biosorption of metal. Concentration below the effective one causes an inhibition of bacterial metabolism. The stimulatory effect has been found more frequently with anionic than with cationic surface active compounds. However growth inhibition and retardation may occur at concentrations of surface active agents, which have little or no effect on cellular energy production(366).

Detergents are known to lower the surface tension of the microbial cell and causes cell death. As the major part of the biosorption takes place on the surface of the microorganism, presence of detergents play a significant role on biosorption process.

Considering the above aspect, a detail study on detergents were conducted. In our experiments Tween – 20, Tween – 80 and sodium lauryl sulphate are used to observe their effect on biosorption of  $Hg^{++}$ .

#### **Material & Methods:**

For the determination of the effect of different surface active agents on biosorption of  $Hg^{++}$  by *Saccharomyces cerevisiae*A100, the biosorption experiments were carried out with biosorption medium consisting of glucose : : 5%, urea : 0.15%,  $K_2HPO_4$  : 0.15%,  $MgSO_4 \cdot 7H_2O$  : 0.06%, KCl : 0.06%,  $Fe^{++}$ : 1 $\mu$ g/ml,  $Mn^{++}$ : 5 $\mu$ g/ml,  $Mo^{6+}$  : 10 $\mu$ g/ml. The pH of the biosorption medium was adjusted to 5.0. The solution of each surface

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active agent was prepared separately in double distilled water. The sterile solution of surface active agents was added aseptically to the sterile basal medium at different concentrations. The cultural conditions and the methods of determination of dry cell weight, biosorption of  $Hg^{++}$  were same as mentioned in chapter 1.

## Result & Discussion:

TABLE 15: EFFECT OF SURFACE ACTIVE AGENTS ON BIOSORPTION OF  $Hg^{++}$

Surface active agent	Time of addition(Hour)	Concentration (%)	Cell Growth (mg/L)	Biosorption (%)
Control	-	00	27.04	85.40 ± 0.25
Sodium lauryl sulphate	0	0.1	20.64	68.10 ± 0.66
		0.2	18.75	60.25 ± 0.75
		0.3	17.60	53.70 ± 0.65
	19	0.1	23.50	71.26 ± 0.58
		0.2	20.64	66.10 ± 0.66
		0.3	18.36	62.44 ± 0.59
	24	0.1	25.33	75.66 ± 0.63
		0.2	22.66	68.75 ± 0.64
		0.3	20.56	65.00 ± 0.79
	30	0.1	25.75	76.82 ± 0.55
		0.2	24.76	72.66 ± 0.45
		0.3	22.75	70.14 ± 0.56
Tween-20	0	0.1	22.45	68.17 ± 0.33
		0.2	20.36	65.18 ± 0.40
		0.3	18.50	60.00 ± 0.30
	19	0.1	23.60	71.66 ± 0.44
		0.2	22.82	67.33 ± 0.53
		0.3	20.96	66.12 ± 0.26
	24	0.1	24.82	72.00 ± 0.58
		0.2	23.02	70.69 ± 0.64
		0.3	21.66	68.05 ± 0.46
	30	0.1	25.27	75.89 ± 0.57
		0.2	24.32	72.44 ± 0.60
		0.3	22.80	69.56 ± 0.64

Surface active agent	Time of addition(Hour)	Concentration (%)	Cell Growth (mg/L)	Biosorption (%)
Control	-	00	27.04	85.40 ± 0.25
Tween-80	0	0.1	21.33	67.08 ± 0.63
		0.2	19.30	64.11 ± 0.50
		0.3	17.75	54.55 ± 0.75
	19	0.1	22.86	69.06 ± 0.45
		0.2	21.15	66.80 ± 0.70
		0.3	19.93	62.02 ± 0.64
	24	0.1	24.76	72.52 ± 0.56
		0.2	22.39	68.70 ± 0.43
		0.3	20.86	66.74 ± 0.42
	30	0.1	25.50	76.48 ± 0.54
		0.2	24.26	71.57 ± 0.62
		0.3	22.35	70.00 ± 0.53

Biosorption Values are expressed as mean ± Standard Deviation

All values of cell growth and biosorption are biologically significant ( $p < 0.001$ ).

In the present study it is observed from Table.15 that tween 80 and sodium lauryl sulphate declines the biosorption process significantly. Tween-20 also inhibits the growth and biosorption capacity of *S.cerevisiae*A100. But compare to Tween-80 and sodium lauryl sulphate tween-20 has minor effect on biosorption and cell growth of the organism. It is also evident that the effect of the surface active agent increases with the increase of concentration. The effect is also dependent with the time of addition of the agent to the biosorption medium.