ANTIBACTERIAL ACTIVITY OF THE NITROGEN FIXERS ISOLATED FROM THE ARABIAN SEA

ABSTRACT

The antibacterial capacity towards the terrestrial pathogenic bacteria indicates the ecological niche of these isolates from the Arabian Sea. The N_2 fixing bacteria fixes atmospheric molecular nitrogen (dissolved in seawater) to ammonia. Some portion of ammonia is assimilated and some of it is excreted in the surrounding medium. This excreted ammonia is toxic for the pathogenic bacteria tested.

Introduction

ROSENFELD AND ZOBELL (1947) described the stocks of marine bacteria capable of producing antibiotics, showed the importance of the possibility of isolating them from marine habitat too. Microorganisms were capable of synthesising substances that are active against terrestrial microflora (pathogenic and non-pathogenic both). This was primarily an ecological discovery and the use of such bacteria was only considered within the frame of endogenic microbial/antagonism in the marine world. So far, they have not been the object of any direct medical application or even *in vivo* study.

However, the study of the work carried out in this area since then shows the research has followed two quite different directions.

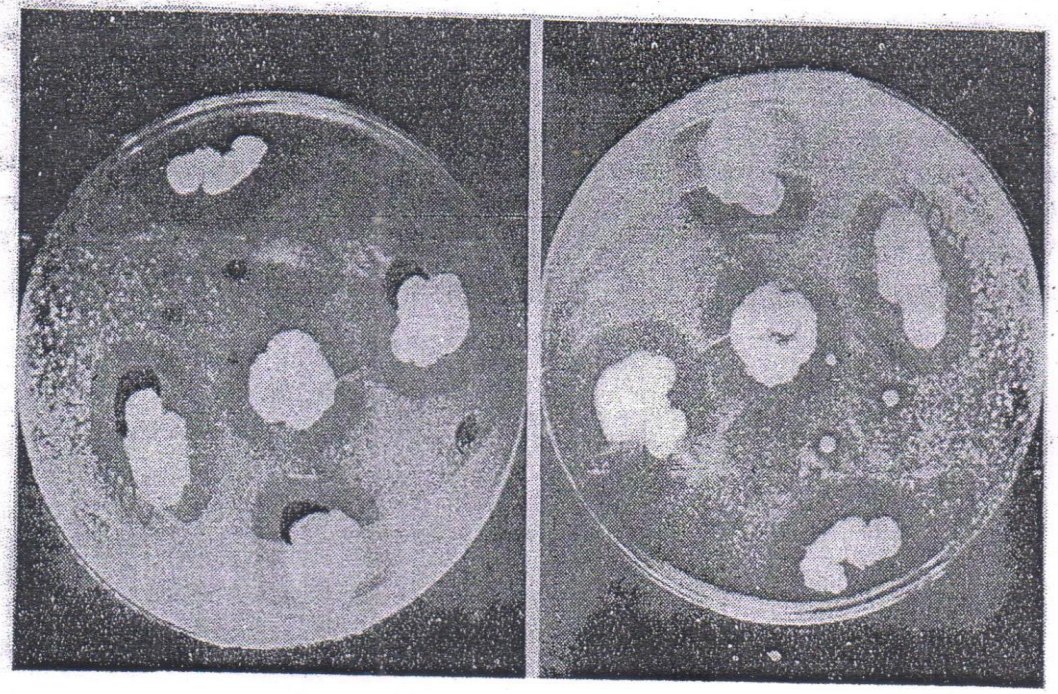

Fig. 1. Halo inhibition zones in a and b.

On one hand, many authors have attempted a global evaluation of the proportion of these microorganisms in natural marine population *e.g.* Rosenfeld and Zobell found 9 out of 56 stock cultures from marine environment to be active against bacteria of the *Genera - Proteus, Salmonella, Shigella,* Staphylococcus, etc. Krassilnikova (1961) and Baam *et al.* also isolated antibacterial cultures from seawater at different depths. On the other hand, some

research has been carried out in an attempt to define more clearly the antibacterial range of the stocks that have been isolated and the chemical nature of the inhibitory substances.

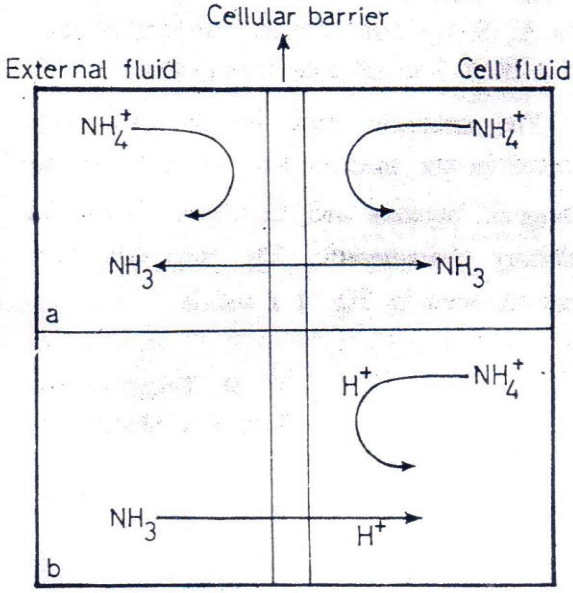

Fig. 2. Ammonia exchange across a cellular barrier : a. cell-membrane permeability is low for NH_4^+, but high for NH_3; and b. excess H^+ (side with lower pH) traps the biologically dangerous NH_3 (After Warren and Schenker, 1962).

The exocellularlylytic enzymes are produced by various seawater bacteria which affect terrestrial bacteria more than the marine bacteria itself. It is also found to have antifungal and antiviral activity.

The antibacterial capacity of the N_2 fixing bacteria was tested with some Gram positive and Gram negative strains of pathogenic bacteria. Two of the N_2 fixing bacterial cultures showed very good inhibition zone with all the tested pathogenic bacteria. This test was carried out by pourplate technique with double layer method.

Experiment

Some N_2 fixing marine bacteria were tested against few pathogenic bacteria (Gram positive and Gram negative) *Staphlococcus aureus, Staphylococcus citreus, Pseudomonas aeruginosa, Salmonella typhosa para A, Staphylococcus typhosa para B, Shigella dysentry, Escherichia coli, Proteus vulgaris, Bacillus megaterium.*

Double layered pourplate technique for observing the antibacterial activity of N_2 fixing isolates from Arabian Sea water were performed. Nine N_2 fixing isolates and nine pathogenic bacterial (standard) cultures were taken for study. The N_2 fixing isolates were grown in a nutrient broth for 48 hours. The 48 hours young culture was spotted in the sterilized Petridishes with 20 ml Nutrient agar (2%); pathogenic cultures were also inoculated for 18 hours. After 18 hours of incubation, the

TABLE 1. *Antibacterial activity of N_2 fixing bacteria*

Pathogenic bacteria	N_2 fixing bacteria inhibition zone in mm								
	1	2	3	4	5	6	7	8	9
S. aureus	T	N	T	T	T	N	N	N	N
S. citreus	T	T	7	N	T	T	N	T	T
E. coli	14	T	12	15	22	T	T	N	N
Ps. aeruginosa	T	T	N	T	T	T	N	N	T
B. megaterium	8	T	T	7	11	N	T	T	N
Pr. vulgaris	20	T	15	17	24	T	N	T	N
S. typhi para A	T	7	8	T	10	N	T	N	N
S. typhi para B	T	7	8	T	10	N	T	N	N
Sh. Dysentry	N	N	T	N	T	N	N	N	T

(N = negative; T = trace).

18 hours old pathogenic cultures were sprayed over the petridishes (previously incubated with N_2 fixing cultures) with 0.5% agar containing nutrient broth, incubated for 48 hours to observe the inhibition zones on the plates.

Results and discussion

The antibacterial activity for N_2 fixing bacteria isolated from the Arabian Sea was observed as shown in Table 1, indicating the capacity of N_2 fixing marine isolates to excrete certain extracellular products in a concentration which is toxic/inhibitory to other bacteria, of terrestrial origin and of pathogenic characteristic. Culture numbers 1, 3, 4 and 5 show inhibition zone on plates against *Escherichia coli, Bacillus megaterium, Proteus vulgaris, Staphylococcus, Styphosa para A., S. typhosa para B.* The size of zone varies from 7 to 24 mm in diameter.

The ammonia fixed by the N_2 fixers excreted in the medium may be toxic to the pathogenic bacteria and, therefore, shows the inhibitory characteristic. The halo inhibitory zones are seen in Fig. 1 a and b.

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BIOCHEMICAL COMPOSITION OF SOME COMMON SEAWEEDS FROM LAKSHADWEEP

ABSTRACT

Studies were made on protein, carbohydrate and lipid from 28 marine algae from Lakshadweep Islands. The protein content ranged from 0.1 to 18.9% in green algae, 4.6 to 12.2% brown algae and 2.7 to 13.1% in red algae. The carbohydrate content was from 0.5 to 15.8%, 1.5 to 13.0% and 2.0 to 29.4% in green, brown and red algae respectively. The lipid content varied from 2.6 to 13.8% in green algae, 2.2 to 8.3% in brown algae and 3.1 to 8.3% in red algae.

Introduction

IN INDIA much attention has been paid on commercially important seaweeds and very few studies were made on other biochemical composition such as protein, carbohydrate, lipid, etc. from seaweeds occurring at different localities along Indian Coast (Lewis, 1967; Tewari *et al.*, 1968; Murthy and Radia, 1978; Dhargalkar, 1979; Dhargalkar *et al.*, 1980; Sumitra Vijayaraghavan *et al.*, 1980; Solimabi