Table 6. *Potentiation of pressure germination of spores by ribosides, products of amino acid metabolism, and related compounds*

		Germination (%)* following incubation†				
		Bacillus cereus		*Bacillus coagulans*		
Addition	Concentration	1 atm.	200 atm.	1 atm.	200 atm.	400 atm.
Control (no addition)		0	0	0	0	27
L-Alanine	1 mM	25	100	40	92·5	94
	100 μM	1	100	11·5	81	92·5
Inosine	1 mM	100	100	0	3	27
	100 μM	81	100	0	0	27
	30 μM	1	99	n.t.	n.t.	n.t. ‡
	10 μM	0	16·5	0	0	26
L-Alanine plus inosine	100 μM + 10 μM	87	100	13	82	95
Deoxyinosine	30 μM§	0	4	0	n.t.	24
Adenosine	30 μM§	0	20	0	n.t.	26
Deoxyadenosine	30 μM§	0	0	0	n.t.	26·5
Guanosine	30 μM§	0	9	0	n.t.	26
Deoxyguanosine	30 μM§	0	0	0	n.t.	25·5
Xanthosine	30 μM§	0	0	0	n.t.	26
Riboside breakdown products ¶	30 μM§	0	0	0	n.t.	24–29
Amino acid breakdown products ¶	30 μM§	0	0	0	0	n.t.

* Spores were activated before use (70°, 30 min.); germination was measured by recording the percentage of phase-dark spores.

† Spores were incubated for 30 min. at 30° (*Bacillus cereus*) or 40° (*B. coagulans*) in 0·1 M-sodium phosphate (pH 8·0) plus the indicated additions.

‡ Not tested.

§ Concentrations were 1 mM for *B. coagulans* spores.

¶ The following riboside and amino acid breakdown products and related metabolites were inactive: hypoxanthine, D-ribose, D-ribose 5-phosphate, 3-phosphoglycerate, 2-phosphoglycerate, pyruvate, ammonium (sulphate), nicotinamide adenine dinucleotide and nicotinamide adenine dinucleotide phosphate (oxidized and reduced forms), formate, acetate, acetyl phosphate, acetyl coenzyme A, coenzyme A, citrate, succinate, phosphopyruvate, adenosine diphosphate and adenosine triphosphate.

Unlike pressure on gaseous systems, hydrostatic pressure of the magnitude used here causes little compression of the liquid (water is compressed less than 4 % at 1000 atm.) and therefore results in negligible changes in concentrations of solutes. Furthermore, the effectiveness of relatively low pressures (i.e. below 1000 atm.) in causing germination of certain spores suggested that pressure was not acting by causing denaturation of proteins or other macromolecules: such changes characteristically become pronounced at pressures well in excess of 1000 atm., and particularly at elevated temperatures. In fact a high proportion of spores survived pressures as high as 8000 atm. at room temperature (Sale *et al.* 1970). Laidler (1951) showed that at high temperatures the dominant effect of pressure on biological materials was on equilibria between natural and denatured forms of enzymes, whereas at lower temperatures the principal effect was on the rates of enzyme-substrate reactions. Pressures of the order of hundreds of atmospheres, at relatively low temperatures, usually affect the rates of reactions in which reactants and products have different molecular volumes.

Such an effect on a germination reaction which normally has a negligible rate at