and flavoprotein is included in the electron transport system suggested by Falcone *et al.* (7) as functioning in the bacterium during the oxidation of hydroxylamine to nitrite. The nature of the donor molecule is not known, but many possibilities exist. Peroxidase may perform a peripheral rather than vital role, but, depending on the identity of the physiological donor, the enzyme in *N. europaea* may catalyze an oxidation step in some metabolic sequence, or, possibly, act on a substrate such as cytochrome c to form part of an alternate respiratory chain.

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Occurrence of Polyamines in the Germs of Cereals

The presence of aliphatic polyamines in the animal world has been known for some time (1, 2). Of those present, spermine and spermidine seem the most interesting; in spite of a great variability among species and an irregular distribution, they are largely diffuse and preferentially localized in seminal fluids and in organs such as the prostate, pancreas, and liver (3, 4).

The polyamines are also present in elevated concentrations in many microorganisms (5–7); for some of them, such as *Hemophilus parainfluenzae* (8), *Neisseria perflava* (9), and a mutant strain of *Aspergillus nidulans* (10), polyamines are essential growth factors, while for others, although not essential they have a stimulating growth effect (11).

Less is known about polyamines in the vegetable kingdom, except for some observations on the presence of spermine in some alkaloids (12, 13).

We looked for aliphatic polyamines in cereals; in particular our attention was directed toward the germ tissue. Having found the presence of cadaverine, putrescine, spermidine, and spermine in the germ of wheat, our research was extended to other cereals.

The polyamine determinations were carried out on fresh germ after homogenization in a glass Potter homogenizer with 10% perchloric acid. The combined supernatant solutions were neutralized with 5 *N* KOH and then adsorbed on a column of Amberlite resin CG 50 K^+. After washing the column with water, the polyamines were eluted according to the method of Tabor *et al.* (6), with a 1.5 *M* sodium sulfate solution in 0.1 *M* phosphate buffer at pH 7.2; the mixing vessel contained 200 ml. of water at the start. The polyamine contents of the single fraction were evaluated with a spectrophotometer at 420 mμ after reaction with 2,4-dinitrofluorobenzene (DNFB).

Identification of the eluted polyamines was carried out with paper chromatography with ethylene glycol monomethyl ether-propionic acid-water (70:15:15) saturated with NaCl as the solvent; the R_f values were compared with the authentic compounds. Besides these, electrophoretic separations with sulfosalicylic acid (0.065 *M*) at pH 3.5 were used (14). The values obtained are shown in Table I.

It can readily be seen from our data that polyamines occur in appreciable quantities in germs of cereals. With respect to their distribution, spermidine is the major component while cadaverine and putrescine are present in lower concentrations except for barley germ. It is interesting to point out that in the endosperm polyamines are also present but in small amounts; for example, in the endosperm of wheat seed the polyamine complex does not exceed 20 γ/g. of seed.

TABLE I

Polyamine Content in the Germ of Cereals (γ/g. of fresh germ)

Germs	Cadaverine	Putrescine	Spermidine	Spermine	Total
Barley	234[a]	136	291	128	789
Rice	133	69	153	141	496
Oats	71	53	307	109	540
Corn	17	12	124	90	243
Wheat	56	43	254	41	394
Sorghum	18	14	83	21	136

[a] γ/g. fresh germ. The data represent the average of two determinations.

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Although the biologic role of these substances is not as yet known, their presence in germs of cereals is suggestive if one recalls the observation of Herskho *et al.* (15) and Martin and Ames (16) on the effects of spermine and spermidine on amino acid incorporation *in vitro* and its consequences in protein synthesis.

On the other hand, while the strong affinity of the polyamines for the nucleic acids with formation of stable complexes (17) permits an understanding of the stabilizing action of spermine on the ribosomes (18), it still leaves open the precise role of polyamines in the life of embryo.

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