CORN AS AN ETIOLOGICAL FACTOR IN THE PRODUCTION OF A NICOTINIC ACID DEFICIENCY IN THE RAT[1,2]

THE consumption of corn has been associated with pellagra since the time of Casal in 1735. Handler,[3] working with dogs, has indicated that corn may be a causative agent in pellagra, and we[4] have found the nicotinic requirement of dogs to be markedly increased when corn grits are added to synthetic rations. With rats on rations containing corn, Frost and Elvehjem[5] found a very slight growth increase when nicotinic acid was fed, but they recognized that the rations used were deficient in other factors, thus complicating their results.

By using a synthetic ration containing sucrose 78, casein 15, corn oil 3, salts IV 4 and cystine 0.15 parts so prepared as to be essentially free of nicotinic acid (< 0.01 mgs per 100 gm) but adequate with respect to all other known fat and water-soluble vitamins except "folic acid" and p-aminobenzoic acid, we have produced a pronounced growth retardation in the rat by adding 40 per cent. yellow corn, white corn or corn grits at the expense of the entire ration. The addition of nicotinic acid at levels of from 0.5 to 1 mg per 100 gm of the corn-supplemented ration completely counteracts the growth-depressing action of corn. A specially prepared nicotinic acid-low norite eluate from solubilized liver extract fed at a level equivalent to 11.5γ of B_c (*S. lactis* assay) per 100 gm of ration failed to counteract the deleterious effect of corn. These data are summarized in Table 1.

In addition we have found that the kind of carbohydrate and the level of casein modify the extent of the untoward effect of corn. With glucose as the carbohydrate or when the level of casein (nicotinic acid content < 0.005 mgs per 100 gm) was raised to 20 per cent. the growth depression caused by corn was diminished. In all cases, however, the addition of nicotinic acid resulted in growth stimulation.

TABLE 1

GROWTH-RETARDING EFFECT OF YELLOW CORN AND CORN GRITS AND THE COUNTERACTION WITH NICOTINIC ACID

Rations used			Average weight gain in 4 weeks; 3 animals per group
Experiment A			grams/week
Sucrose basal			30 (22–38)
"	"	+ 1 mg per cent. nicotinic acid	28 (21–33)
"	"	+ 40 per cent. yellow corn	13 (9–16)
"	"	+ 40 per cent. yellow corn + 1 mg per cent. nicotinic acid	33 (30–36)
Experiment B			
Sucrose basal		(same as in experiment A)	25 (20–29)
"	"	+ 40 per cent. unenriched corn grits	4 (2– 5)
"	"	+ 40 per cent. unenriched corn grits + 1 mg per cent. nicotinic acid	27 (21–29)
"	"	+ 40 per cent. unenriched corn grits + "folic acid" prep.* ≡ to 1 per cent. solubilized liver extract or 11.5γ B_c (*S. lactis*) per 100 gm	5 (4– 6)

* The "folic acid" preparation was so prepared as to retain most of the B_{10} and B_{11} activity.

Unenriched corn grits which contain 0.7 to 1.0 mg of nicotinic acid per 100 gm produce more profound growth depression than does yellow corn meal, which contains about 2.0 mgs per 100 gm. It is interesting to note that polished rice or rolled oats, both of which contain significantly less nicotinic acid than whole yellow corn, produce no growth depression when fed under identical conditions. One sample of white corn has been tested and was more effective in retarding growth than was yellow corn.

Evidence at hand indicates that milk, although very low in nicotinic acid (*ca.* 0.8 mg per cc), is active in counteracting the growth depression caused by corn.

Complete details of this work and the additional investigations which are in progress will be reported at an early date.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

METHODS FOR DETERMINING REFRACTIVE INDICES IN POLARIZED LIGHT MICROSCOPY

A SIMPLE but effective method for determining refractive indices in polarized light microscopy has been used successfully by students in these laboratories for the past three years. The main advantages of the method are that it is rapid and requires no extensive knowledge of geometrical or optical crystallography. It is of particular interest, therefore, to the chemist who has occasional need for microscopical observations under polarized light, but can not afford the time necessary to master the crystallography and physical optics required by the more extensive microscopical procedures.

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