of the liver, remove glucose from the blood and the liver adds glucose there seems to be a carbohydrate cycle between muscle and liver, muscles sending lactic acid through the blood to the liver and the liver returning glucose to the muscles.

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Difference in Calcium Level of the Blood Between the Male and Female Cod.

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As far as we are aware, no reports have been made of calcium in the blood of fish. In the course of a study of various physiologic phenomena in the cod, a marked difference was found in the level of calcium in the blood of the male and the female. The percentage in the former was found to be approximately 9 to 12.5 mg., the cause of the variability not being ascertained. In the female a percentage as high as 29 was not uncommon, the lowest figure being 12.7 mg. These variations were due clearly to the generative state of the fish. When the roe was large and mature, the serum calcium percentage was high, whereas when the roe was hard, or after the fish was spent, the percentages were markedly lower. A similar relationship between spawning season and calcium level of the serum was found to exist in the puffer fish. Calcium in the female was found as high as 26 mg. %, whereas in the male it was about 12 mg. %. This phenomenon is not, however, common to all fish. For example, in the dog fish, a viviparous species, the calcium level was high in both male and female.

The inorganic phosphate was far more constant than the calcium. Generally it ranged between 9 and 12 mg. %, the former amount having been obtained in a female cod which had 17.8 mg. % of calcium in the blood. The highest figure was 14.7 in a female with 13.3 mg. % of calcium. From these figures, it is evident that the inorganic phosphorus does not bear a definite ratio to the percentage of calcium. Nor does it vary with the spawning season, a fact which is emphasized by an instance in which a female with a calcium percentage of 29 mg. in the blood had a percentage of inorganic phosphorus of only 10.9 mg.

The total cholesterol content of the blood varied within wide

limits. Figures as high as 319 and 330 mg. % were found in 2 females which were spent. The blood sugar also showed no distinctive relationship.

The function of the high blood calcium in fish cannot be the formation of exceptionally strong bone. On the other hand, the eggs were found especially rich in calcium, which suggests that the calcium may be required for their elaboration. In connection with this study, attention should be called to the observation of Riddle[1] and others to the effect that the blood calcium increases markedly in birds at the period of ovulation. This has been attributed to the requirement incidental to the formation of the shell.

[1] Riddle, O., and Reinhart, W. H., *Am. J. Physiol.*, 1926, lxxvi, 660.

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Synthesis of Racemic 2, 5-Dihydroxy Phenyl Alanine (Gentisic Alanine)

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In 1922, in cooperation with Dr. Casimir Funk, we attempted the synthesis of the gentisic alanine by the Sasaki[1] and Hirai[2, 3] methods, namely condensation of dimethoxy gentisic aldehyde with glycine anhydride in presence of anhydrous sodium acetate and acetic anhydride, and subsequent splitting of the diketo piperazine compound by means of prolonged heating with strong hydriodic acid and red phosphorus.

We failed to obtain the desired compound at that time and, due to pressure of other work, temporarily dropped the problem. Early in 1927, we again resumed this work and succeeded in preparing a crystalline substance which gave all the reactions of the desired compound. A Kjeldahl nitrogen determination gave the correct analysis for nitrogen, but due to the small amount of material available, we were unable to do a complete combustion at that time and were therefore loathe to publish our results.

As K. Hirai[4] has lately reported the synthesis of this amino acid, and as our compound appears to be identical with Hirai's in all respects, we feel justified in reporting our work.

Splitting of the 2.5-dimethoxy benzal glycine anhydride to racemic 2, 5-dihydroxy phenyl alanine.