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BLOOD SERUM LIPO- AND GLYCOPROTEIDS IN THE PIKE (*ESOX LUCIUS*): RESULTS OF A PAPER-ELECTROPHORETIC INVESTIGATION

It has been found that some blood serum lipoproteids play an important role in the maturing process of gonads in fishes (Ван Цзу-сюн, Ван Цзинь-бао, 1964; Куликова, 1967; Kirsipuu, 1971). The role of glycoproteids in metabolism processes of fishes is, however, rather poorly studied and only a few data on it are available (Drilhon et al., 1958; Got, 1965; Kirsipuu, 1971). Therefore, in the years 1966—1972, alongside with blood serum protein analyses, the electrophoresis of the blood serum lipo- and glycoproteids of the pike was carried out by us.

Material and methods

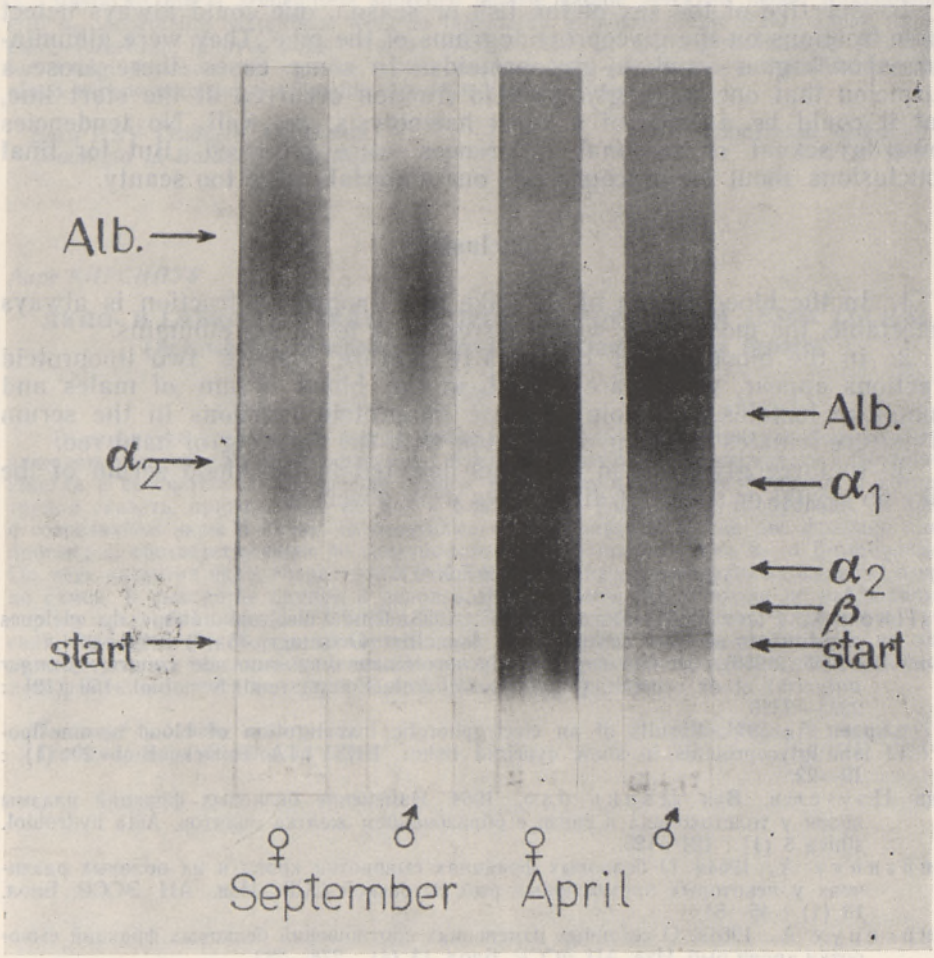
Blood serum lipoproteids were investigated in 64 and glycoproteids in 18 pikes. The fish were caught in Lake Võrtsjärv (Estonian SSR) during different seasons, most of them in the winter and spring. Electrophoresis was carried out at a temperature of 5 °C with Na-veronal buffer during 12 hours. To every strip of 2×40 cm 0.05 ml of serum was drifted. Lipoproteids were stained by Swan and glycoproteids by Kõiw and Grönwall. A detailed description of the methods used is presented by us in an earlier work (Kirsipuu, 1971).

Results and discussion

In the lipoproteidograms of the pike one could establish up to four fractions (Figure), the electrophoretic mobility of which corresponded to albumins, α_1-, α_2-, and β-globulins of serum proteins. As the mobility of the albumin-like lipoproteid fraction (henceforth A-lipoproteid) was a little slower than that of albumins, in some cases it was very difficult to differentiate between A_1- and A_2- lipoproteids on the one hand, and between A- and α_1-lipoproteids on the other.

In 13 investigated males we could usually observe a single A-lipoproteid fraction, only. In two cases another lipoproteid fraction was found in males, but it was difficult to decide if the latter was an α_{1}- or α_2-lipoproteid. In immature females (two individuals) only A-lipoproteid was detected, as well.

In sexually mature females (49 individuals investigated) only albumin-corresponding and a feeble α_2-lipoproteid fraction was detectable at the beginning of October, 1966, while at the end of the month one could already clearly differentiate between A-, α_1-, and α_2-fractions on the lipoproteidograms of the females. In December (the data from 1972) one more



Lipoproteidograms of the blood serum of the pike in spring and autumn.

fraction was added to them, being of the mobility of β-globulins. In winter (in January and February, in 1967, 1968, and 1971) the α_2-lipoproteid fraction strengthens to such an extent that at first it covers the fraction of α-lipoproteids, while in April-May it blends with β-lipoproteids, as well.

It is evident that such an increase in the amount of α_2-lipoproteids in the blood of sexually mature females is called forth by the ripening of hard roe which, according to our data (Кирсипуу, Пиху, 1965), lasts until March in the case of pike, and calls forth a remarkable augmentation of the amount of α_2-globulins in the serum (Кирсипуу, 1964а; Кирсипуу, 1964б; Кирсипуу, Пиху, 1965). An increase in the amount of β-lipoproteids is not excluded, either.

In any case one must take into account that in comparison with the α_2-lipoproteids of man or those of cyprinid fishes, α_2-lipoproteids of the pike are considerably less mobile and, therefore, possibly belong to the β-globulin complex. We must also remind here of the fact that in some fishes the lipoproteid connected with the ripening of hard roe is of the mobility of β- or evenly γ-globulins (Куликова, 1967).

Irrespective of the sex of the fish or season, one could always detect three fractions on the glycoproteidograms of the pike. They were albumin-corresponding, α_1- and α_2-glycoproteids. In some cases there arose a suspicion that one more glycoproteid fraction occurred at the start line, but it could be a trace of a weak haemolysis, as well. No tendencies towards sexual or seasonal differences were observed. But for final conclusions about the glycoproteids our materials were too scanty.

Conclusions

1. In the blood serum of the pike one lipoproteid fraction is always detectable, the mobility of which corresponds to serum albumins.
2. In the blood serum of sexually mature females two lipoproteid fractions appear, which are absent in the blood serum of males and immature females. The role of these lipoproteid fractions in the serum of mature females arises in connection with the ripening of hard roe.
3. In three glycoproteid fractions detected in the blood serum of the pike no sexual or seasonal differences were observed.

REFERENCES

Drilhon A., Fine J. M., Daoulas F., 1958. Étude électrophorétique de quelques constituants sériques des poissons. Ann. Inst. Océanogr. **35** (2) : 141—158.

Got R., 1965 (1966). Études sur les glycoprotéines du sérum de congre (*Conger vulgaris*) et de rousette (*Scyllium stellare*). Compt. rend. Soc. biol. **159** (12) : 2323—2326.

Kirsipuu A., 1971. Results of an electrophoretic investigation of blood serum lipo- and glycoproteids in some cyprinid fishes. ENSV TA Toimet., Biol. 20 (1) : 19—22.

Ван Цзу-сюн, Ван Цзинь-бао, 1964. Изменение белковых фракций плазмы крови у толстолобика в связи с образованием желтка ооцитов. Acta hydrobiol. sinica 5 (1) : 121—125.

Кирсипуу А., 1964а. О белковых фракциях сыворотки крови и их половых различиях у некоторых промысловых рыб Эстонской ССР. Изв. АН ЭССР. Биол. **13** (1) : 45—54.

Кирсипуу А., 1964в. О сезонных изменениях соотношений белковых фракций сыворотки крови рыб. Изв. АН ЭССР. Биол. **13** (4) : 278—283.

Кирсипуу А. Й., Пиху Э. Р., 1965. О связи между половым циклом и белковой системой сыворотки крови некоторых пресноводных рыб. В кн.: Теоретические основы рыбоводства. М. : 49—52.

Куликова Н. И., 1967. О сывороточных липопротеидах крови рыб. В кн.: Обмен веществ и биохимия рыб. М. : 292—296.

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HAUGI (*ESOX LUCIUS*) VERESEERUMI LIPO- JA GLÜKOPROTEIIDID
(Paberelektroforeetilise uurimistöö tulemused)

Resümee

Haugi vereseerumis esineb alati üks lipoproteiidne fraktsioon, mille elektroforeetiline liikuvus paberil vastab albumiinide liikuvusele. Suguküpsete isaste vereseerumis võib leiduda veel teine fraktsioon, mille kohta on raske otsustada, kas see kuulub albumiinide (A_2) või α_1-globuliinide hulka. Suguküpsete emaste verre ilmub marja küpsedes tavaliselt veel kaks lipoproteiidset fraktsiooni, milledest üks vastab oma elektroforeetilise liikuvuse poolest α_2-, teine β-globuliinidele.

Need fraktsioonid puuduvad isaste ja mittesuguküpsete kalade vereseerumis.

Vastavalt marja arenemisele suureneb emaste kalade veres ka nende fraktsioonide, eriti α_2-lipoproteiidi osatähtsus. Kolmest täheldatud glükoproteiidide fraktsioonist, millede elektroforeetiline liikuvus paberil vastas albumiinidele, α_1- ja α_2-globuliinidele, ei avastatud ühelgi ei sesoonseid ega ka soolisi muutusi, kuid käesolevas uurimistöös kasutada olnud vähene materjal ei võimalda siin teha lõplikku otsust.

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ЛИПО- И ГЛИКОПРОТЕИДЫ СЫВОРОТКИ КРОВИ ЩУКИ (*ESOX LUCIUS*)

(Результаты исследования методом электрофореза на бумаге)

Резюме

В сыворотке крови щуки всегда наблюдается одна липопротеидная фракция, подвижность которой при электрофорезе на бумаге соответствует подвижности альбуминов. Иногда в сыворотке половозрелых самцов наблюдается и вторая фракция, о которой трудно сказать, принадлежит ли она к альбуминам (A_2) или α_1-глобулинам. В связи с созреванием икры в крови половозрелых самок появляются еще две фракции липопротеидов, соответствующих по электрофоретической подвижности α_2- и β-глобулинам. По мере развития икры возрастает и относительное значение названных фракций в крови самок. В сыворотке самцов и неполовозрелых самок эти фракции не наблюдались.

Из трех обнаруженных в крови леща фракций гликопротеидов, электрофоретическая подвижность которых соответствовала альбуминам, α_1- и α_2-глобулинам, ни одна не подвергалась сезонным изменениям или половым различиям, однако для окончательного решения вопроса материал данной работы недостаточен.

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