

Study on health indicator

Links between liver diseases and blood count in *Pangasionodon hypophthalmus* in Vietnam

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Catfish in Asia : Present status and
challenges for sustainable development

December 2008

Can tho University



Objectives of the study

Improve the quality of fish

Improve incomes of farmers

- Provide “simple” indicators on health status to farmers
- THEN, identify effect of improved practices / improved feed on the performance of the farm

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2

The origin of the study

- **Private sector:** constrain of time and means
- Statement: “Production cost is high”
- Aim -> improve income of farmers
- HOW?
 - -> reduce FCR,
 - -> reduce farming time (meaning reduce feed consumption)
 - -> reduce mortality
- Statement: fish in better health will eat better (more efficiency), grow faster and die less

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3

The origin of the study

- HOW to improve health?
- We need indicators to evaluate any improvement in health status!
- We want to identify simple indicator that can reflect a certain health status of a fish
- ?? Selection of visual indicator??
- What about the liver?

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4

Liver: Functions

- Liver : one of the most important organs for maintaining the internal environment of the body.
 - Bile secretion
 - Metabolism of carbohydrates, lipids and proteins
 - Detoxification
 - Others functions
- First study by Nguyen V H, (2006)
Study on stability of rice bran and liver lesion "Pangasius catfish production, Nutritional imbalance, an open door to diseases"



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5

Bile secretion

Bile plays an essential role in emulsifying fats

- Detergent effect on the fatty particles of food. Fat globules are disintegrated into very small particles
- Absorption of fatty particles and monoglycerides from the intestine: hydrotropic function



Metabolism of carbohydrates, lipids and proteins

- Regulation of the glycemia: hepatic homeostasis
- Actively involved in the metabolism of lipids
- Protein metabolism by desamination of amino acids and formation of urea for ammonia suppression in bodily fluids

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Detoxification

Transformation of the poisonous substance into harmless metabolites by way of oxidation and conjugation

Others function

- Storage of iron
- Storage of vitamins D and B12
- Blood coagulation
- Conjugation and excretion of steroid hormones
- Maintenance of hormonal balance
- Removal of ammonia from the blood

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Liver: dysfonctionnements and consequences

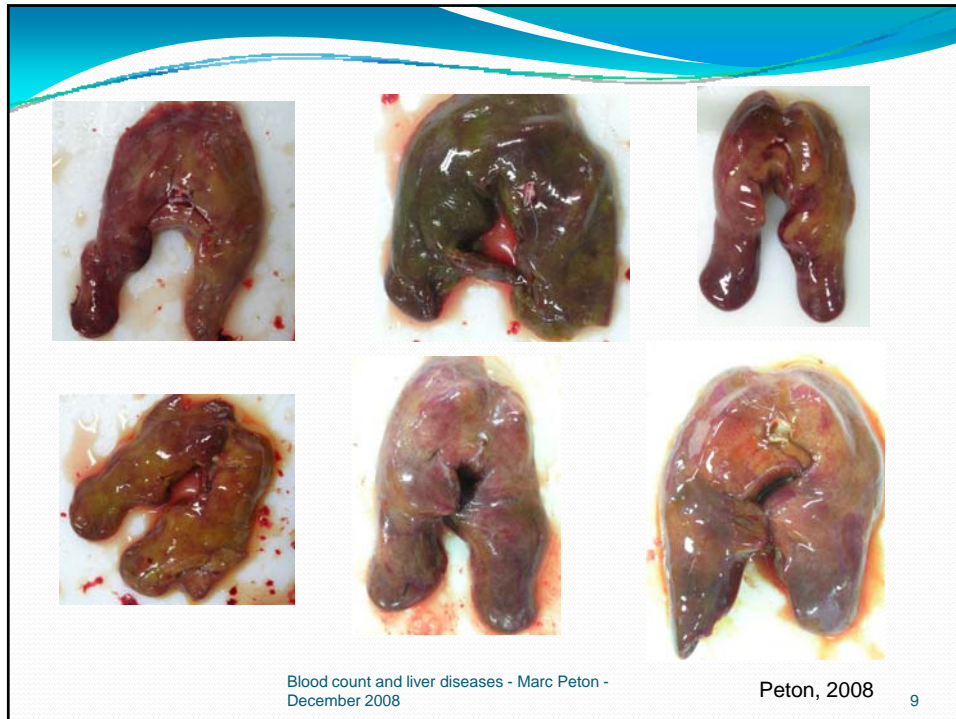
Liver lesions seem to spoil to fish health because of functions complexity of the liver

- Metabolism dysfunctions of carbohydrates, proteins and lipids
- Lack of vitamins deposits
- Poor feed digestion and utilization
- Decreasing of detoxification activity
- Many others consequences which have direct impact on organism functioning

→ **Bring to light the importance of the liver lesions
impact on the fish global health**

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8



Blood count: indicators of fish health status

- In Human, white blood cell (WBC) count is a common clinical measurement used to determine evidence of acute inflammation or infection
- Sum of several cell types:
 - neutrophils and lymphocytes: most common types
 - eosinophils, basophils, and monocytes
- WBC blood concentration variation associated with tissue infection and inflammation
 - **Reflects the fish health status**

Assessment of the liver status

- Screened for a variety of histopathological features (Greenfield, 2008):
 - Granular cytoplasmic inclusion bodies (CIB)
 - Lipidosis or hepatocellular vacuolation (LIP)
 - Macrophage aggregates (LMA)
- Lesions scored on an ordinal ranking system of:

0 = none/minimal	2 = moderate
1 = mild	3 = severe
- Aim: linked lesions level and blood analysis

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11

RESULTS

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12

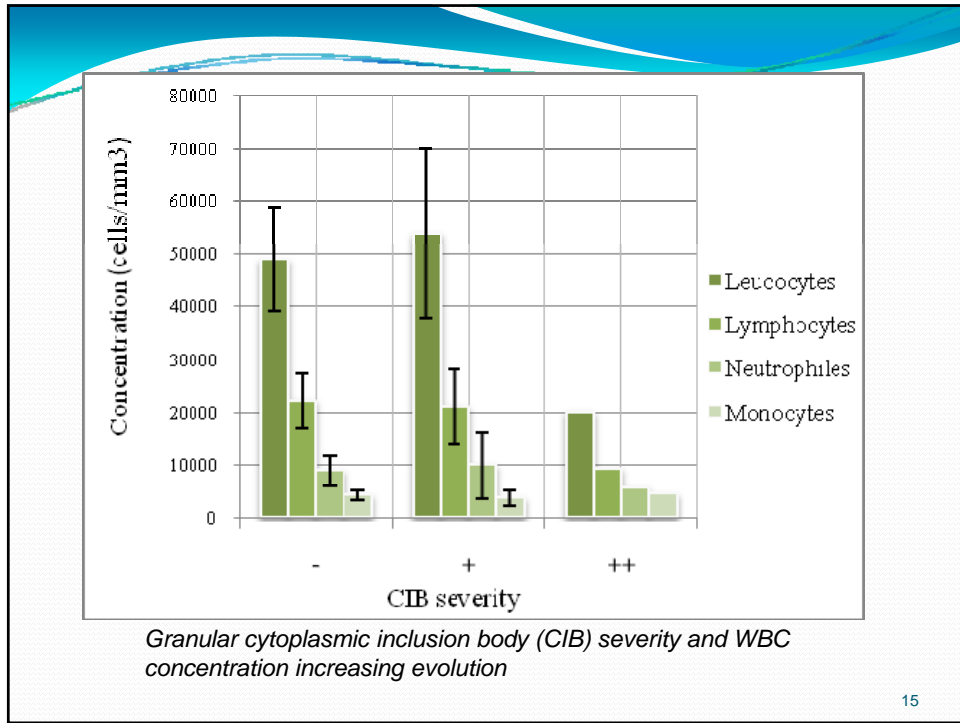
*Granular cytoplasmic inclusion bodies
microscopic observation (x40)*

*Macrophage aggregates microscopic
observation (x40)*

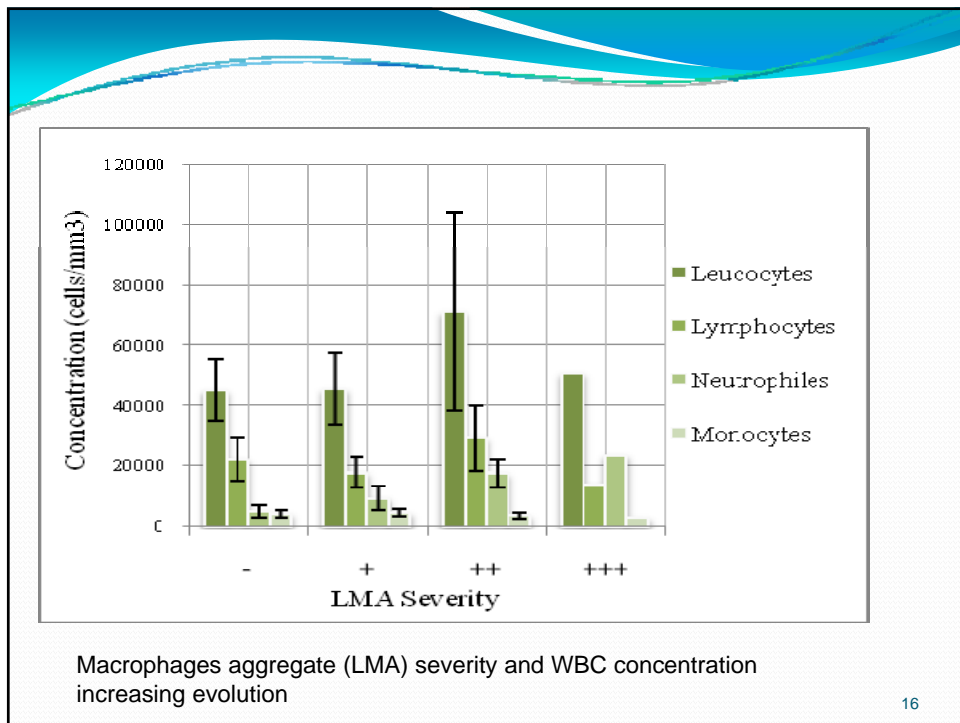
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13

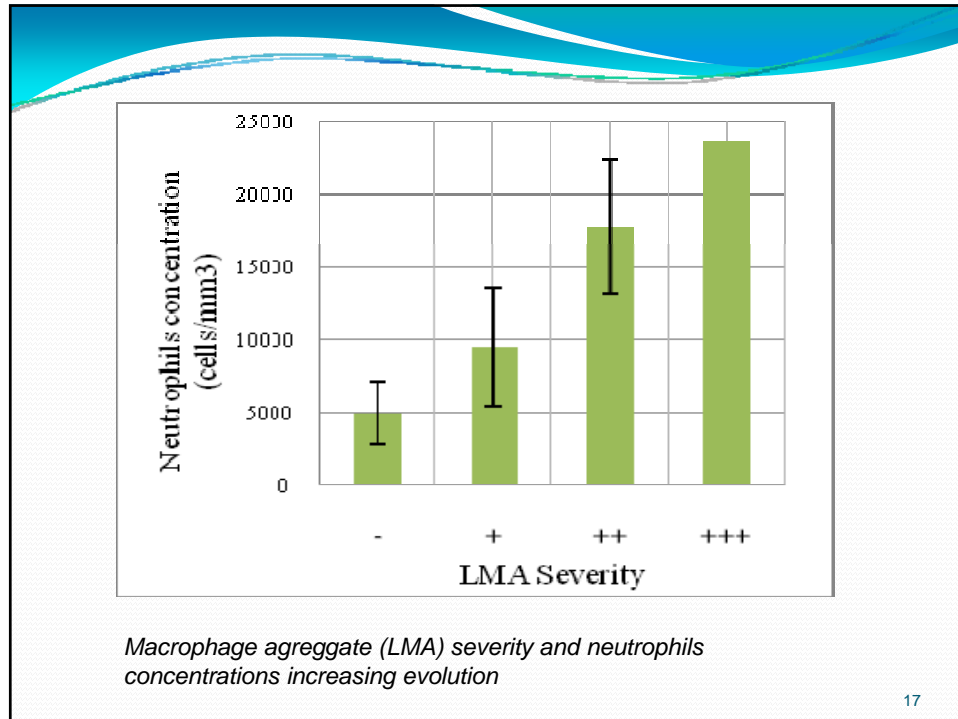
Sample	LMA	LIP	CIB	Red blood cell (cell/mm ³)	White blood cell (cell/mm ³)	Lymphocytes (cell/mm ³)	Neutrophils (cell/mm ³)	Monocytes (cell/mm ³)	Thrombocytes (cell/mm ³)	Eosinophils (cell/mm ³)	Basophils (cell/mm ³)
1	++	-	-	2100000	50066	21028	24783	2754	14019	0	0
2	-	-	-	1195000	26979	15108	10522	2158	5935	270	0
3	++	-	-	1685000	50061	17521	13767	5507	25781	0	0
4	+	-	++	1245000	20081	9237	5723	4518	5623	0	0
5	-	-	-	740000	15189	7519	6076	1671	3721	0	0
6	+	-	-	2120000	43294	23595	14287	4113	12122	0	0
7	++	-	+	2445000	50767	14215	23607	2792	22845	0	0
8	+	-	-	1730000	42989	15046	23429	8598	6663	0	0
9	+	-	+	1995000	41302	11978	14249	5163	20238	0	0
10	-	-	-	2635000	48603	8020	13609	9235	29891	0	0
11	-	-	-	2195000	46702	8406	11442	3970	34326	234	0
12	++	-	-	2605000	57006	34204	13966	3135	19952	0	0
13	++	-	-							Nothing on the lames	
14	+	-	-	1910000	35621	23866	11399	6590	2315	178	178
15	++	-	-	2135000	127330	44566	18463	3183	92951	0	0
16	+	-	+	3320000	78995	34363	9479	1185	53717	0	0
17	+	-	+	2795000	78182	15636	3909	5473	72709	0	0
18	-	-	-	3905000	83978	42829	2939	5459	53746	0	0
19	-	-	-	3130000	26388	25860	1979	4090	1056	0	0
20	-	-	-	3030000	51222	18440	2049	7683	35856	0	0
21	-	-	-	2255000	58194	32006	6110	6110	28515	0	0
22	+	-	+	1655000	30729	23969	6760	4917	2766	0	0
23	-	-	-	2285000	27408	6852	2741	1919	22749	0	0
24	-	-	-	2725000	77961	48336	1559	7406	40150	0	0
25	-	-	-	1690000	27962	23488	4474	4334	2656	0	0
26	-	-	+	2630000	43805	26721	1752	3066	23217	0	0
27	-	-	-	2810000	53331	33332	1867	533	30932	0	0
28	+	-	-	2440000	32254	10644	2096	1451	26126	0	0
29	-	-	-	2025000	42791	16046	3209	1498	32735	0	0
30	+	-	-	2695000	51268	12561	4101	3076	44091	0	0



15



16



Interpretations

- CIB and LIP : not appropriated to fish health status assessment with the carried out study conditions
- No correlations between CIB and LIP severity with the overall WBC, lymphocytes, and monocytes concentrations
- Significant correlation between liver lesions increasing (LMA) and neutrophils concentration increasing.
- (LMA seems to be correlated to coloration of the liver)

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18

LMA and neutrophils concentration

- Neutrophils concentration increase is the consequence of many factors:
 - Parasitosis
 - Bacterial infection
 - Inflammation diseases
 - Tissue necrosis
 - Cancers
 - Metabolic dysfunctions
 - Myeloproliferation syndrome
 - Haemolysis and Haemorrhage
 - Intoxication: benzene, radiation, meds

19

Conclusion

- A first study...
- With first result: correlation between neutrophils and macrophage aggregates
- Next step: confirmation of the correlation with a second lot of fish.

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20

