

**THE REPORT OF THE NATIONAL COMMISSION FOR THE INVESTIGATION
OF SCIENTIFIC MISCONDUCT**

RESEARCH INTO THE SPREAD OF SALMON VIRUS

6th April 2011

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1 Summary

The National Commission for the Investigation of Scientific Misconduct has received an enquiry from a Norwegian company in which allegations have been put forward concerning scientific misconduct in connection with an article in the periodical Archives of Virology (volume 154 (1) pp. 1-8, 2009). The article, entitled "*ISA virus in Chile: evidence of vertical transmission*", is authored by three researchers at the University of Bergen. In the article the authors claim that they have demonstrated proof that salmon virus was transmitted from Norway to Chile via salmon eggs (vertical transmission).

The Commission for the Investigation of Scientific Misconduct has on the basis of this enquiry investigated the allegations of misconduct, which relate to three areas: 1) erroneous presentation of the research material, 2) improper and distorted use of other scientific publications and research results, and 3) assertion of categorical conclusions without adequate basis.

Scientific misconduct is defined in the Code of Scientific Ethics, Item 5, second paragraph:

"By scientific misconduct is meant falsification, fabrication, plagiarism and other serious breaches of good scientific practice which are committed intentionally or as the result of gross negligence in planning, carrying out or documenting of research."

According to the preliminary draft of the Code the definition does not cover scholarly disagreement or less serious instances of breaches of good scientific practice.

The Commission employed two independent foreign experts to evaluate the article. The experts concluded that there were breaches of good scientific practice in relation to the three allegations.

The authors of the article challenged the experts' verdict and countered that the presentation of the research material was in accordance with what is normal and accepted within the field. The authors also pointed out that the citation of other scholarly literature was based upon a firm scholarly consensus. The authors further claimed that they had stated the premises upon which the conclusion was based. They claimed that the accusations, also those made by the experts, were founded in scholarly disagreement.

The Commission found unanimously that there had not been any serious breaches of good scientific practice. The Commission therefore concluded that the authors had not acted improperly.

2 The composition and mandate of the National Commission for the Investigation of Scientific Misconduct

The National Commission for the Investigation of Scientific Misconduct (hereafter referred to as 'the Commission of Investigation', or simply 'the Commission') was appointed in July 2007 by the Ministry of Education and Research. The Commission is made up of:

- Professor Johan Giertsen, University of Bergen, Leader
- Professor Rigmor Austgulen, Norwegian University of Science and Technology, Deputy Leader
- Edel Storelvmo, Managing Director Futurum AS
- Professor Monica Martinussen, University of Tromsø
- Tor Hauken, Dean/First Assistant, University of Stavanger
- Professor Ragnvald Kalleberg, University of Oslo
- Docent Sighild Westman-Naeser, Uppsala, Sweden

Temporary members:

- Cathrine Holst, Post-doc., University of Oslo
- Dag Slotfeldt-Ellingsen, Cand.real.¹
- Tone Fløtten, Institute Leader, Fafo

This report was given at the meeting at Gardermoen of 6th April 2011 with the following committee members and temporary members present:

- Johan Giertsen
- Tor Hauken
- Ragnvald Kalleberg
- Sighild Westman-Naeser
- Cathrine Holst
- Dag Slotfeldt-Ellingsen
- Tone Fløtten

The Commission is thus *a quorum*, cf. Item 3, third paragraph in the Guidelines of the Code of Scientific Ethics.

The Commission's clerical staff consist of office leader Torkild Vinther.

In addition, in the final phase of its work on this case the Commission consisted of lawyer Sigmund Simonsen, D.Phil., Rissa.

The Commission must in accordance with the Code of Scientific Ethics, Item 5, first paragraph, second sentence “give its verdict on whether research in Norway has been scientifically fraudulent”. In the Ministry of Education and Research “guide” for the Commission, dated 27th June 2007, it is stated amongst other things that:

1 Cand.real. – a 5-year university degree comparable to MSc.

- “the Commission is to evaluate and handle concrete cases in which there is a suspicion of serious instances of fraudulent research.”
- “the Commission should contribute to a researcher whose name has unjustly become associated with an contention of proper research, having their reputation restored.”
- “Where the conclusion is that the researcher in question has not acted improperly, the Commission must in its grounds exercise care in expressing criticism towards the individual who is “acquitted”.”

3 Further concerning the handling of the case

3.1 Enquiry from Aqua Gen AS

In a letter from Aqua Gen AS (hereafter Aqua Gen) dated 23rd January 2009 – with the title “An instance of breach of good research practice” – the Commission of Investigation was asked “to evaluate to what extent results and conclusions were reached in accordance with good research practice and requirements for integrity” (see further chapter 6, where Aqua Gen's allegations are set out). The letter was received by the Commission 28th January 2009. The authors of the article are Siri Vike, Stian Nylund and Are Nylund.

3.2 The University of Bergen's investigation

3.2.1 Forwarding

In the Guidelines of the Code of Scientific Ethics it is stated *inter alia* that the primary responsibility for “investigating fraudulent research lies with the institution in question”. On this basis, and because the authors were affiliated to the University of Bergen, the case was, in the Commission's letter of 3rd February 2009, forwarded for investigation by this institution.

3.2.2 Statement from the University of Bergen

The Commission of Investigation received, as an attachment forwarded with a letter of 11th November 2009, a statement from the Standing Committee on Ethics at the University of Bergen. The Standing Committee on Ethics' conclusion was

“in brief that no misconduct by any researcher at the University of Bergen has been proven in this case. In some areas aspects have been demonstrated which give cause for criticism In summary the Committee does not see any grounds for strong criticism of individual researchers or groups of researchers.”

Included in the documents were excerpts from the report given by the University of Bergen's experts. The name, academic qualifications where applicable, position and institutional affiliation etc. of the expert or experts consulted were not given.

The Commission of Investigation sent the documents from the Standing Committee on Ethics to Aqua

Gen for comments. The Commission has made clear that Aqua Gen does not have procedural rights according to the Law on Public Management, because the question of possible misconduct is neither “directed towards” or “directly concerns” this company (cf. the Law's Item 2, first paragraph, point e). In spite of this, the Commission has at several stages of the case given the company the opportunity to comment, cf. the Law on Public Management, Item 17 concerning the Commission's responsibility to “ensure that the case is as well-informed as possible prior to a decision being reached”.

3.2.3 Aqua Gen gives further details concerning its allegations

Aqua Gen gave further details concerning its allegations in a letter to the Commission of 5th January 2010.

3.2.4 The Commission's questions to the University of Bergen and the institution's response

The Commission decided in a meeting of 26th January 2010 to put some questions to the University of Bergen, cf. the Commission's letter to the institution of 2nd February 2010. The Commission requested amongst other things “to be informed of the name, title and institutional affiliation of the external expert(s) consulted”.

The University of Bergen replied in a letter of 26th February 2010. With respect to the expert's identity, the Standing Committee on Ethics referred to “agreed anonymity”.

As an attachment to the letter, the Commission was forwarded an undated document from the anonymous expert with answers to the Commission's questions. He/she stated that “I have no affiliation ... either to the research group in question at the University of Bergen, or to Aqua Gen”. The document concluded as follows – emphasis supplied by the expert:² “I am however of the opinion that one or two other experts should be appointed who should go through the case on an independent basis”.

The Commission, in a letter dated 18th March 2010, requested the University of Bergen “to prepare a revised final report in which [answers to five questions] were included”: (1) Discuss and reach an opinion on all accusations raised by the Commission and Aqua Gen. (2) State the reason why the University of Bergen's experts are anonymous. (3) Explain why the University of Bergen did not consider it necessary to employ more experts, cf. the statement from the expert that “one or two other experts ... should go through the case on an independent basis”. (4) Reach a verdict on the question of whether, in the opinion of the University of Bergen, there was misconduct according to the Code of Scientific Ethics, Item 5, second paragraph. (5) State whether the University of Bergen wishes to maintain that the documents are subject to confidentiality.

In their reply of 22th April 2010 the University of Bergen stated that it was “prepared to consider lifting the exception from the public domain”. With respect to the identity of the expert, the institution referred to an “agreement with those concerned”, and that “prospective lifting of anonymity” would require the agreement of the expert in question. The institution recommended in the letter “that this case be concluded. The alternative is ... that the Commission of Investigation handles the case to its full extent with

2 Translator's note: NB no text was emphasised (italicized or in any other way) in the source document (PDF).

new experts”.

3.3 The Commission of Investigation's decision to investigate the case

The Commission of Investigation discussed in a meeting of 11th May 2010 whether it ought to investigate the case on its own initiative. The Commission placed particular emphasis on three circumstances:

The first circumstance concerned the identity of the expert. The Commission had to establish why the identity of the expert was unforthcoming, despite (i) the request in the Commission's letter of 2nd February 2010, and despite (ii) the request in a letter of 18th March 2010 to give reasons for why the experts were anonymous. An anonymous expert makes it impossible for the Commission, the parties, the research community and the public to be able to verify the academic competence and qualifications of the person in question. The authors who are parties in this case pointed out for example in their statement of 14th February 2011 that an anonymous expert constituted “an unacceptable risk” for both the Commission and the parties.

Secondly it was not clarified why the institution did not consider it necessary to employ more experts, cf. the statement from the expert that “one or two other experts ... should go through the case on an independent basis”.

Thirdly the University of Bergen itself pointed out the possibility that the Commission “handles the case to its full extent”.

The Commission concluded by implementing an investigation, and emphasised the importance of engaging two capable experts qualified to the level of professor.

3.4 The Commission's investigation

3.4.1 Implementation of the investigation. Appointment of experts

Following the meeting of 11th May 2010 the Commission's office worked to find national or international experts. This proved to be difficult and time-consuming.

The Commission, in a letter of 7th July 2010, gave the University of Bergen notice that the Commission had decided to investigate the matter “with the assistance of external experts”. This notification was also sent, in letter of 8th July 2010, to the authors of the article against which the case had been brought. Aqua Gen was notified in a letter from the Commission the same day.

From the middle of July until the start of September 2010 there was an extensive correspondence between the Commission and the authors concerning amongst other things questions the competence of the experts. This process was concluded with Dr. Carey Cunningham and Dr. Fred Kibenge being appointed.

[NB 2 paragraphs on credentials of the experts not translated as per request]

3.4.2 The authors' request for the scope of the investigation to be specified in more detail

The authors requested in a letter of 26th August 2010 that the Commission clarify precisely what the object of the Commission's investigation was. The Commission replied in letters of respectively 6th and 16th September: "The Commission refers to the letter of 26th August, point 3." The authors request *inter alia* that

"it is clarified and formulated in writing what concrete aspects of the research attributed to Vike et al. 2009 continue to be the object of the Commission's and the experts' evaluation of misconduct according to the Code of Scientific Ethics, Item 5".

This raises the question of whether the Commission's powers are confined to (1) reaching a verdict concerning allegations raised by Aqua Gen, or (2) whether the Commission – if the Commission finds grounds for this – also has the authority to evaluate other aspects of the article. The parties refer in their letter of 26th August to the fact that "fundamental legal requirements" in every "indictment process" dictate that alternative (1) must be the case.

The Commission firstly wishes to draw attention to the Code of Scientific Ethics, Item 5, part one, first and second points:

"There must be a national committee for investigating the integrity of academic research. The committee must reach a verdict as to whether research in Norway has been carried out in a scientifically fraudulent manner."

The regulation gives the Commission general powers to investigate (possible) misconduct, and does not distinguish between instances where a plaintiff has alleged misconduct and those where a plaintiff has not.

Secondly the Ministry of Education and Research's "guide" for the Commission, point 4.4, stipulates that the Commission must at the start of a case "indicate which publication(s) the investigation will encompass". In the present case this notification was given in a letter of 8th July 2010. In the same provision it is stated that the Commission may "at a later date" narrow or broaden the scope of the case. Where the theme of the investigation is the stated "publications", and this can be narrowed or broadened, this implies that the Commission's powers are not confined to simply reaching a verdict on allegations raised by a plaintiff, in this case Aqua Gen.

Thirdly the Commission is set up for reasons of public interest in Norwegian research being carried out in accordance with recognised ethical requirements. If the scope of the investigation were to be confined to only evaluating allegations raised by plaintiffs, one could – in conflict with the aforementioned public interest – risk potentially improper circumstances not being investigated by the Commission, because the plaintiff has not brought accusations with respect to these.

Fourthly the rule of law will be assured by the parties being given the opportunity to comment with respect to

the experts' statements. Such contradiction applies irrespective of whether the experts confine themselves to commenting on circumstances alleged by Aqua Gen AS, or if the experts also raise other questions. See the Guidelines, Item 8, especially part two, third point.: "A party must have the right to give an account of themselves to the Commission verbally or in writing and be a witness to and comment upon statements made by other parties, witnesses and experts."

The Commission's position is therefore that it has the authority to investigate the article in question in relation to the definition of misconduct in the Code of Scientific Ethics, Item 5, second paragraph, independently of accusations raised by the plaintiff. The Commission therefore sees no reason to confine the experts' jurisdiction purely to accusations raised by Aqua Gen AS".

3.4.3 The Ministry of Education and Research's interpretation statement

The authors, in a letter of 26th August 2010, also raised questions concerning whether the Commission had the authority to handle the case on its own initiative or whether such authority was precluded because the University of Bergen had already dealt with the case. The Commission put this question to the Ministry of Education and Research. The Ministry replied in a letter of 1st October 2010, and concluded that "the Commission's right to handle cases on its own initiative is not confined by whether the case has previously been dealt with by institutions concerned".

3.4.4 Statement from the experts, contradiction

The experts delivered their report 8th December 2010. The report was forwarded to the authors and Aqua Gen in a letter from the Commission of 14th December 2010 with a deadline for response of 10th January 2011.

The authors requested an extension to the deadline. The deadline was extended until 15th February 2011. The authors' statement in response to the experts' report is dated 14th February 2011.

3.5 Period of investigation – the Commission's comments

This case was instigated by a letter from Aqua Gen to the Commission dated 23rd January 2009. The case was concluded by the Commission with today's statement, dated 6th April 2011. The Commission's reflections in the light of the period of investigation are these:

(1) A period of investigation of 27 months is generally speaking unacceptable, because (i) the burden upon the parties may thereby become too great, and (ii) use of time and resources can, in the case of such a process, be relatively large in proportion to the severity of the case. (2) The present case illustrates that the period of investigation may be long if (i) the institution is required to investigate the case, and (ii) if the Commission is subsequently required to investigate the case.

4 General remarks concerning the evaluation of misconduct

4.1 General remarks

The Commission must as stated assess whether scientific misconduct has taken place. It is *not* the Commission's task to give a general qualitative assessment of scientific publications and their content.

It follows from the Guidelines of the Code of Scientific Ethics, Item 10, fourth paragraph, that the Commission's decisions must include a statement of claims, a short summary of the parties statements, the Commission's argument and conclusion. In addition it is stated that the conclusion must be either that the accused has behaved improperly, or has not.

4.2 Conditions for establishing a verdict of misconduct

Improper research can affect amongst others persons and businesses which have acted on the basis of the research results. Improper research also weakens the confidence society has and has a right to expect to be able to have in researchers and research results. On the other hand consideration for the researchers' legal rights dictates that the criteria for establishing misconduct must be high. The legislature has in the definition of misconduct in the Code of Scientific Ethics, Item 5 stipulated such high criteria.

Two conditions must be fulfilled for the Commission to ascertain whether researchers have committed scientific misconduct.

Firstly there must be *serious* breaches of good scientific practice. This requires that there exist standards for practice which the researchers are supposed to follow, but which have been breached. Standards for good scientific practice derive in the first instance from established practice and habits within the academic milieu, together with written or unwritten guidelines and regulations.

It is only "serious" breaches – such as for example falsification, fabrication and plagiarism – which are defined as misconduct. The Code of Ethics' interpretive notes emphasise that the legal definition of misconduct does not encompass "scholarly disagreement or less serious instances of breaches of good scientific practice", cf. Proposition no. 58 to the Odelsting (2005-2006), p. 62.

Other examples of breaches of good scientific practice which may constitute misconduct are, according to the Code of Ethics' interpretive notes: consciously withholding undesirable results; consciously misleading use of statistical methods; consciously misleading information concerning who has contributed to the research (omissions and inclusions) and how much they have contributed; intentionally or through gross negligence withholding details of methodology; consciously supplying false information concerning scientific qualifications in applications; consciously destroying research material so as to obstruct investigations misconduct in research. See further Proposition no. 58 to the Odelsting (2005-2006), pp. 53-54.

Secondly, subjective culpability is required. A serious breach of good scientific practice must be committed intentionally or through gross negligence. For negligence to be considered gross, there must be behaviour qualified as reprehensible which results in severe reprimand for a lack of due circumspection.

4.3 Tightening of the criteria for evidence: Requirement for clear preponderance of probability

Consideration for legal rights has also necessitated a strict standard of proof. In order for a fact in the disfavour of a researcher against whom accusations have been brought to be adduced, clear preponderance of probability is required. See the Guidelines, Item 10, fourth paragraph, second sentence.

These guidelines from the Ministry of Education and Research set out the scope of what factual circumstances the Commission can adduce. The law of evidence entails that where the Commission accepts that a researcher against whom accusations have been brought has in all likelihood been guilty of misconduct, the Commission cannot state this, because the usual preponderance of probability is not sufficient.

The Commission is expected to base its report on an independent evaluation of the material which is presented in the documents relating to the case, considered against the definition of misconduct. The Commission is not bound by whistleblowers' or the researchers' statements with respect to facts or legal considerations. The experts' report is an important element of the Commission's basis for reaching a decision, but in common with information and assessments presented in other documents is not binding for the Commission.

4.4 The precautionary principle

It is further stated in the Ministry of Education and Research's guide, point 4.8, third paragraph, that:

“Where the conclusion is that the accused party is not guilty of misconduct, the Commission must exercise caution in its grounds by expressing criticism towards the “acquitted” party. This must not prevent the Commission from, in its summing up of the respective parties' allegations and/or in the Commission's explanatory statement, commenting upon alleged circumstances deserving of criticism which are the basis for the case. Nor should it prevent the Commission from remarking upon possible systemic failures, where the investigation provides a basis for this.”

The Code's high criteria for misconduct, the tightened standard of proof and not least the requirement for “caution” is a manifestation of a general and overriding precautionary principle which applies in this kind of case, and which has its basis in key consideration for legal rights.

It follows from this principle that the Commission should refrain from suggestions that “acquitted” researchers are nonetheless “guilty”. This may also be considered in the light of the presumption of innocence which is a fundamental principle in the administration of criminal law and in The European Convention on Human Rights.

The precautionary principle may also be considered in connection with the strain which results from suspicions of misconduct and the need for clearing one's name in instances where misconduct is not proven, see point 4.5 below.

4.5 Clearing of researchers' names

In the Guidelines to the Code of Scientific Ethics, Item 6, second paragraph it is stated that the Commission “should contribute to a researcher who has unjustly had his or her name linked to an accusation of improper research, having his or her reputation restored, on the condition that the the party in question presents all relevant information which he or she is in the possession of.”

This means that where the Commission concludes that misconduct has not occurred, the researcher must be regarded as having acted with integrity. Such a conclusion can thereby contribute to a researcher against whom accusations have been brought having his or her reputation restored.

[NB section 5 – summary of the article in question - not translated as per request]

6 Aqua Gen's claims

On the 23rd of January 2009 Aqua Gen sent, via administrative director Odd Magne Rødseth, a report with an attachment dated January of the same year to the Commission. The title of the report is “*Vike et al. (2009): ISA virus in Chile: evidence of vertical transmission – a documented case of serious violation of good scientific practice*”. The authors are Nina Santi, Arne Storset and Odd Magne Rødseth, all affiliated to Aqua Gen.

The authors assert that Vike et al. are guilty of scientific misconduct. This assertion is made with reference to amongst other things the guidelines for research ethics in the natural sciences prepared in 2007 by the National Committee for Research Ethics in Science and Technology (NENT). The claims centre on three main points of criticism and an additional point (see the aforementioned report, page 3):

- I. “Lack of quality assurance in collecting research material and data and manipulation/falsification of history and characterization of such material (Guidelines Item No. 6).
- II. Selective citation of data from their own and others' research publications. Lack of respect for relevant findings by other researchers (Guidelines Item No. 6).
- III. Critical evaluation of certainty and precision that characterizes the research results and conclusions are lacking (Guidelines Item No. 10).

In addition we would also like to mention that the first author was made aware that the manuscript contained numerous factual errors. This information conveyed by us on our own initiative in due time prior to publication was ignored, which is also in conflict with the ethical *Guidelines* (Item No. 7d).”

In connection with point I., Aqua Gen broadly assert that the authors claim that smolt are represented as sexually mature broodfish, that two different ILA viruses are presented as if they were one and the same virus isolate from a single broodfish, and that sequence isolates are presented as if they were virus isolates.

In connection with point II. it is asserted that it is reprehensible that no reference is made to two publications which present conflicting research results, including a Norwegian publication from 2008 (Lyngstad et al.).

In connection with point III. it is asserted that the conclusion is too categorical, and that the authors ought to have formulated their arguments in a more circumspect and nuanced manner, since the research material and results of the analysis do not constitute a basis for drawing the conclusions the authors draw.

From the report's concluding remarks may be cited the following (p. 18):

“Aqua Gen wants to emphasise that we are not opposing the general conclusion of the paper by Vike et al., 2009, acknowledging that there is a chance that the ISA virus may have arrived in Chile with infected salmonid eggs. However, the scientific data and the presentation of the data as they appear in this paper is far from adequate to claim evidence of vertical transmission, as the title of the paper suggests.

Are Nylund has for several years claimed that vertical transmission is the most important mode of spreading the ISA virus, and even maintained that horizontal transmission of ISAV lacks scientific support. In the paper by Vike et al., 2009, it is stated that:

'However, there are no studies documenting transmission between farming sites.'

In a letter to the Commission dated 5th January 2010 Aqua Gen maintained and expanded upon the claims of misconduct.

7 The verdict of the experts

The Commission appointed two experts, Dr. Cunningham and Dr. Kibenge, who independently of one another went through material forwarded to them. The experts were requested to comment upon whether or not serious breaches of good scientific practice had taken place, this being the principle condition for a charge of misconduct. The experts were to give their verdict upon possible subjective culpability, this being the second condition for a charge of misconduct, see point 4.2 above.

The two experts prepared a joint report as a declaration that they agree upon the premises and the conclusions.

The experts took as their point of departure the three principle claims which were put forward in the enquiry from Aqua Gen, cf. point 6 above.

The presentation of the research material

The experts state that that which is in fact smolt is incorrectly designated as broodfish. The experts found that the sample from the fish referred to as "broodfish" was taken when the fish weighed approx. 100 grams, and 2-3 months before it was due to be moved from the hatching facility to the breeding facility in the sea. The fish from which the samples were taken cannot therefore be characterised as broodfish, and neither as smolt. The experts state that one cannot assume that the same result would have been reached, either from the broodfish which was its parent or from fish from the same population which have grown up and become broodfish. The experts characterise this as a serious falsification of the history and the characteristics of the material which was analysed.

Two different, genetically related virus isolates from smolt in Nylund et al. (2007) are presented in Vike et al. (2009) as one and the same isolate from broodfish. The experts state that it is incorrect to declare the two sequences in question to be identical and that the material came from "isolates". Although a degree of explanation for how this error occurred may be found in what is indicated in the report to GenBank, the article ought not to have stated that the source material came from "isolates" when it came from fish tissue.

The virus sequences do not come from the same source, even though they are stated as doing so in the publication. According to the experts this indicates a critical error in quality assurance when the research

material was collected. The presentation of the two sequences as coming from the same source, and the designation of the source as broodfish, are manipulations of data which were presumably done in order to support a particular hypothesis or conclusion. The use of only a minority of the existing sequences suggests use of data which only supports their conclusions.

As requested by the Commission, the experts explicitly address the claims presented in a letter from Aqua Gen dated 5th January 2010. The experts point to a number of errors and shortcomings, including that the use of the term “isolate” is erroneous and misleading, but not serious. It is also pointed out that smolt are erroneously designated as broodfish. The experts in addition contend that results from analyses of smolt cannot necessarily be compared with results from analyses of broodfish. In relation to the authors' contention that their findings “give solid evidence” for vertical transmission the experts assert that: “The results presented in the paper do not support this hypothesis”. The experts stress that another method ought to be used to test such a hypothesis.

The use of other scientific publications

The experts state that the authors have demonstrated a lack of respect for relevant findings from other researchers. At the time the paper was written, there already existed several publications which discussed vertical transmission. These publications ought therefore to have been cited, even if the authors disagreed with the findings presented. The experts therefore concluded that the use of other scholarly publications (research results) was selective.

The presentation of the research results

This is according to the experts the most critical point, and they state that:

“There is considerable lack of critical evaluation of certainty in the central conclusion of Vike et al. (2009), i.e. that phylogenetic analysis of ISAV sequences indicates a link between ISAV in Chile and Norwegian brood fish. In addition to the problem of denoting sequences from smolt as from brood fish, there is a great deal of uncertainty around the use of molecular phylogenies in the epidemiology of ISAV.

Epidemiological investigations into ISAV in Chile should involve examination of many factors in addition to the potential for vertical transmission. The results presented by Vike et al. (2009) do not support the conclusion that “these isolates must have a Norwegian origin”.

Vertical transmission is one hypothesis to explain transmission of ISAV. In scientific analyses, all possible evidence should be considered and evaluated before reaching a conclusion. The paper by Vike et al. (2009) demonstrates a serious lack of critical evaluation in relation to their own results and conclusions. It appears that the conclusions of Vike et al. are a result of over-ambitious extrapolation from incomplete datasets and potentially problematic analyses. At worst, it could be inferred that the authors have a preferred explanation for transmission of ISAV and have only considered evidence and publications that support this hypothesis, ignoring other evidence or publications that do not support the hypothesis of vertical transmission. However, this cannot be proved from the material supplied here, and our investigation finds clear evidence of a lack of quality assurance and critical evaluation of certainty, thus resulting in conclusions that are not supported by the data and results presented.”

The summary conclusion of the experts is that:

“The most serious problem in the paper by Vike et al. is the conclusion that the results support a hypothesis that ISAV has been vertically transmitted. The material and methods that have been used are not sufficient to allow this conclusion. There is a serious lack of critical evaluation of certainty in the conclusions.

Another serious problem is the representation of samples from smolt as from brood fish. This is a critical error in this work and indicates a serious falsification of the history and characterization of the test material. The experts are unanimous in this joint report.”

8 The authors' claims

In their statement in a letter of 14th February 2011 the authors, represented by Are Nylund and Siri Vike, dispute the accusations, including the experts' assessment. They likewise base their statement in the three main points of criticism.

The presentation of the research material

To the claim that the authors have falsely indicated that the samples were taken from a broodfish, when the samples were in fact taken from two smolt, the authors counter that their use of the term broodfish is not

connected to the term “sexually mature broodfish”, as the experts assert.

The authors assert that their use of the term broodfish refers to local provenance, i.e. where the source of the sequences is taken from and which type of fish are kept their, i.e. everything from salmon fry to sexually mature broodfish.

The authors claim that the circumstance that the local provenance of the samples is indicated, while the age of the fish is not, is in accordance with what is considered acceptable in scientific publishing practice within the field. They support this claim with references to publications which employ the terms in a similar manner.

The authors further assert that the age of the two aforementioned sequences is in any case accessible if one follows the references in the article. The authors contend that in light of this they neither have nor have attempted to conceal where the samples are taken from, nor the age of the fish used in the experiment.

To the claim that two different ILA viruses are presented as if they were one and the same virus, the authors counter that the word “source” has different connotations, and that they have merely stated that the samples are taken from the same facility, and not from the same individual. The authors further claim that this is clear when the the article is read with reference to the citations within the article.

To the claim that the sequences are falsely presented as virus isolates, i.e. viruses cultivated in cell cultures, when in fact they are sequence isolates, i.e. ILA viruses taken from fish tissue, the authors counter that their description is adequate and in accordance with what is considered acceptable scientific practice within the scholarly field.

In connection with the aforementioned points it is in addition asserted that a potentially erroneous use of terms or misunderstandings surrounding these has no significance for the research results, i.e. that the formal designation is irrelevant to the research results.

The use of other scientific publications

To the claim concerning selective citation of data from the authors' own and others' research publications, the authors counter that the periodical peer-reviewers had no comments regarding this point.

The authors furthermore assert that there will always be a scholarly opinion dictating the selection of which other publications are discussed or referred to. The authors assert that their citation practice conforms to that within the spectrum of scholarly opinion.

The presentation of the research results

To the claim that the article's conclusion and title are not sufficiently precise, and that there is a lack of satisfactory basis in the underlying data and analyses, the authors counter that this claim is a matter of scholarly disagreement. The authors are furthermore of the opinion that they have indicated the premises for their conclusions.

The authors also emphasise that they do not deny that horizontal transmission is possible. The authors

assert that this is made clear when the article recommends preventative measures against horizontal transmission.

To the claim that the authors did not take sufficient consideration of suggestions made by Aqua Gen prior to publication, the authors counter that they discussed the findings with Aqua Gen, and that in the course of these discussions there arose no circumstances of crucial significance, including accusations of misconduct. The authors consider that an accusation of misconduct prior to publication would have led to further discussions and investigation.

The authors assert in conclusion that the accusations of misconduct are a matter of scholarly disagreement, and that the criticism ought to have taken place in the context of scientific fora.

9 The Commission's view

9.1 Introduction

The case concerns the question of whether scientific misconduct has taken place inasmuch as the authors of the article intentionally or through gross negligence have committed serious breaches of good scientific practice, cf. the Code of Scientific Ethics, Item 5. The conditions for establishing misconduct, the requirements for proof and the principle of circumspection have been set out by the Commission in chapter 4.

9.2 The presentation of the research material

Good scientific practice requires that research material be presented in a truthful manner and with satisfactory clarity and nuance.

The Commission considers that in this case questions can be raised concerning the level of precision in the article as regards the use of a number of terms and the presentation of the material: 1) The description given of the research material has apparently given both Aqua Gen as well as the appointed experts cause for misunderstanding. 2) In order to understand the description of material and methods, other scientific publications to which the article refers must be read, something the authors can scarcely expect all readers to be able to do. 3) Virus sequences are presented as virus isolates.

In their response to the experts' statements the authors give an account of why they have chosen to press the Commission for probity with respect to the research material in the manner they have done. They acknowledge here that the use of the terms virus isolate or isolate is not correct, but they refer to the circumstance that this erroneous usage is widespread within the scholarly field. The authors acknowledge that the erroneous usage is sloppy, and ought to cease within the scholarly field. Similarly, as regards their erroneous use of other terms which are criticised, the authors refer to the fact that their usage of these terms may be said to fall within the realm of that which could occur within the scholarly field.

The Commission's verdict is that the report shows apparent instances of imprecise use of terms within the scholarly field. The Commission is in addition of the opinion that the material and methods ought

to be presented in a more detailed and precise manner.

The Commission cannot however see that there were *serious* breaches of good scientific practice in the presentation of the research material.

9.3 Use of other scientific publications

It is a requirement for good scientific practice that existing relevant and central literature are to a reasonable extent cited in research publications. It must furthermore be expected that published research results which on essential points diverge from or support new research results are commented upon. Such an open discourse is necessary as a basis for scholarly debate, and serves to clarify nuances and uncertainty surrounding one's own findings. Ignoring other contributions to research can easily lead the reader to believe that one's own research findings are more unique and/or certain than is in fact the case. This can undermine critical attitudes to research results.

In this case both Aqua Gen and the experts have alleged that two earlier publications, which present divergent finds/hypotheses, ought to be discussed in the article in question, see chapters 6 and 7, point 2.

The authors claim that the article has been peer-reviewed, and that the peers made no comment upon the references to other scientific publications. The Commission wishes to point out that even though a publication is accepted for publication by a periodical with a peer-review system, this does not absolve the authors on this point.

In the view of the Commission, the use, including decisions not to use, relevant scientific publications must be objective and scientifically defensible. An exhaustive apparatus of citations and source criticism would in most scholarly fields be a project disproportionate to the task at hand. The choice of publications which are cited and discussed in an article must therefore rest upon a scholarly defensible assessment.

The authors refer to this margin of opinion, and are of the opinion that their use and decision not to use other publications is defensible from a scholarly point-of-view, even though there is also scope for scholarly disagreement on this very matter itself.

The element of subjectivity and opinion means that it can be difficult to conclude that omission of individual works amounts to scientific misconduct.

The Commission has therefore concluded that the authors' choice of relevant scientific publications in this case cannot be regarded as a serious breach of good scientific practice.

9.4 Presentation of research results

It is reasonable to expect that research results are presented in a nuanced, truthful and observable manner. This requirement is fundamental and essential for the reliability of the research. It is important that the readers

are not led to believe that the findings are more certain than is in fact the case. Many of the considerations which the Commission pointed out in the previous section are also applicable here.

It is in many instances not the case that research results are so certain as regards demonstrable proof that it is beyond any reasonable doubt that given causal relations pertain. Ordinarily research results and conclusions are more or less probable, i.e. subject to a greater or lesser degree of uncertainty which the author must attempt to present and clarify.

In this case the authors are accused of having presented their findings as being more certain than was the case, and of having presented the conclusions as more categorical than there is a reasonable basis for asserting. Both Aqua Gen and the experts have in particular referred to the title of the article: "ISA virus in Chile: evidence of vertical transmission", and state that in the article it is claimed that there is firm evidence for the ILA virus having been transmitted from Norway to Chile via fertilized eggs, something which has led to an outbreak of ILA in Chile.

The authors have however used words and expressions in the article, such as for example "suggest", "the best explanation", "supports", which suggest that the authors have attempted to nuance their arguments. The authors also suggest that horizontal transmission is possible when they propose measures for preventing it.

The Commission considers that individual statements, including the title, may appear to be too categorical. Considering the authors' choice of concluding words, the Commission is however open to the possibility that the article can be regarded as being more tentative than it appears to have been read as being by Aqua Gen and the aforementioned experts.

Aqua Gen has stated that they notified and warned the authors, but that the authors nonetheless published their research results without adequate consideration for these warnings. The Commission has been through email correspondence and minutes of meetings between Aqua Gen and the authors prior to the date the article was accepted for publication on 29/10/08, but cannot establish that the authors have been warned that Aqua Gen regarded the researchers as having been guilty of misconduct.

In the view of the Commission, there must within the scientific community be room for differences of opinion, also as regards how research results are presented. Accordingly it is only in extreme cases that the strict legal criteria for misconduct are fulfilled in cases which revolve around scholarly opinion. It is indisputably dubious and poor practice when titles and abstracts promise more than they deliver, but these practices seldom on their own constitute serious breaches of law.

The Commission considers that the article taken as a whole states the premises which are the basis for the conclusions, and that this implies a degree of uncertainty.

The Commission has therefore come to the conclusion that no serious breaches of good scientific practice were committed in the presentation of the research results.

10 Conclusion

Although criticism may reasonably be levelled at the article, the Commission has come to the conclusion that the points deserving of criticism, neither individually nor taken together, can be regarded as serious according to the criteria of the Code of Scientific Ethics. In addition the criticism refers to points where there is a certain scope for scholarly opinion and accordingly for scholarly disagreement.

Since the Commission does not identify any serious breaches of good scientific practice, it sees no grounds for discussing whether the subjective condition for misconduct has been fulfilled.

The Commission's verdict:

Siri Vike, Stian Nylund and Are Nylund are not guilty of scientific misconduct.

Gardermoen, 6th April 2011

Johan Giertsen

Tor Hauken

Ragnvald Kalleberg

Sighild Westman-Naeser

Cathrine Holst

Dag Slotfeldt-Ellingsen

Tone Fløtten

Torkild Vinther

The public domain

The Commission's documents relating to this case have up to now been withheld from the public domain, cf. the special rule concerning deferred publication in the Code of Scientific Ethics, Item 5, fourth paragraph. Since the Commission's final report has now been given, the Freedom of Information Act grants public access to the documents. This report is hereby made public.

Information concerning appeals procedure

This report may be appealed against in accordance with the Law on Public Management, chapter VI. The deadline for appeal is three weeks from the date notification of the report is received. Prospective appeals must be made in writing and sent to The Commission, P.b. 522 Sentrum, 0105 Oslo, email: post@etikkom.no

The appeals body for appeals concerning the Commission's handling of the case is the Ministry of Education and Research. Appeals against the content of the report must be dealt with by a specially-appointed committee.

The appeal must include information concerning

- What statements are challenged
- the amendment(s) one wishes to be made
- additional/new information which may be relevant to the assessment of the appeal (where applicable)
- if the deadline for appeal has not been met, the reason for late submission must be given.

The appeal must be signed.