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Group Delphi Workshop on In Silico Methods

Successful Communication of Scientific Content on the Example of Testing Chemical Substances

Christina Benighaus, Ortwin Renn, Ludger Benighaus, Nele Hinderer und Katrin Alle

No. 26 / August 2012

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Delphi Experts Workshop Report

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Preface

The Delphi Experts Workshop ("Successful Communication of scientific Content on the Example of testing Chemical Substances") was held in the context of the EU funded project ORCHESTRA[1] on December 13th, 2010 in the GENO-Haus, in Stuttgart Germany. It aimed at the examination of communication strategies on the basis of expert judgments with the objective to promote a wider understanding, the awareness and acceptance of in silico methods. For this purpose various concepts and approaches to solution strategies among the scientific community were discussed. Thereby was the overall goal to strengthen and expand the dialogue in the scientific community.

The workshop participants recommended a coordinated dialogue among experts that addresses Stakeholder, Regulators and Authorities alike and involve them intensively. They saw a major potential in specific courses and trainings to bring actors the complex issues of in silico methods closer.

According to the experts the communication with the media plays a tangential role since the subject is very specific. However, specific formats as well as practical case studies provide the opportunity to reach the public's attention to in silico models.

[1] The coordinator of ORCHESTRA was Dr. Emilio Benfenati, Istituto di Ricerche Farmacologiche MARIO NEGRI, Milano, Italy. More information of the project is found on the websites www.in-silico-methods.eu/ or www.orchestra-qsar.eu/.

The strategy "Acceptance on a case-by-case basis" can be presented to the specialized community without demanding their overall acceptance of in silico methods. This strategy allows discussing pros and cons on selected examples with stakeholders from industry and authorities. Possibilities and conditions of the use of in silico testing methods can be identified for the present as well as for the future. Since the acceptance depends mainly on the application of the REACH-process all actors involved should respond to the REACH-regulation conditions.

Altogether, the experts of the workshop agreed that we could expect a wider use of in silico methods only in the long term. The use of computer models and in silico methods is still at a very low level. They have been little used to date. Reasons are mainly the concern for the accreditation of the REACH process, high cost of documentation and the low confidence of the recognition as an alternative testing method.

Many special thanks to the 14 workshop participants for their enthusiastic discussions and their recommendations, which were summarized on the following pages and the ORCHESTRA colleagues for commenting on the content.

1 Introduction

The REACH Regulation (Registration, Evaluation, Authorization and Restriction of Chemicals) contains the commitment to minimize the amount of animal testing necessary to achieve its aims. To do this, industry is providing justifications to waive animal tests in preference for in vitro or in silico methods. In silico methods rely on computer simulation or modeling and use results from existing tests to model the ways in which a chemical may be hazardous in the body and/or in the environment. Therefore the toxicity of chemicals can be assessed without further tests on animals.

In the REACH context, ORCHESTRA was an EU funded project with the aim of disseminating recent research on in silico methods for evaluating the toxicity of chemicals such as quantitative structure-activity relationships (QSARs). The project aimed to promote a wider understanding, awareness and appropriate use of in silico methods. It communicated and exploited the findings of nine previous EU-funded projects relating to several areas, including food, environment and health. More information is found on the website www.in-silico-methods.eu/ or www.orchestra-qsar.eu/. The coordinator of the project was Dr. Emilio Benfenati, Istituto di Ricerche Farmacologiche MARIO NEGRI, Milano, Italy.

The interdisciplinary research unit on risk governance and sustainable technology development (ZIRN) that was part of Stuttgart University's International Center on Culture and Technology conducted the examination of responses and reactions of various stakeholders to successful communication strategies in the context of ORCHESTRA.

This led ZIRN to conduct the one-day-workshop "Successful Communication of scientific Content on the Example of testing Chemical Substances" using the Delphi Method. The workshop was held on December 13th, 2011 in the GENO-Haus, in Stuttgart Germany. 14 experts plus four staff members have participated. The workshop aimed at investigating how complex scientific content, in this case, the use of computer models (in silico methods) in chemical research can be communicated in the "right way" through different communication channels to individual stakeholders as well as to a broad public.

This report documents the procedure as well as the results of the workshop. First, the Method of the Group Delphi and the corresponding process and agenda of the workshop are described. The following chapter demonstrates particular results. The final chapter summarizes the outcomes of the workshop.

2 Method Group Delphi

A Delphi process is aimed at obtaining a wide range of opinions among a group of experts (Turoff, 1970; Pill, 1971; Linstone and Turoff, 2002). The process is organized in four steps. In step 1, a questionnaire asks a group of distinguished scientists to rank or rate several items, in this case different methods for data collection, testing and verification. The scientists provide their best estimate and assign a confidence interval to their answers. In step 2, the organizing team feeds back to each participant the scores of the whole group, including medians, standard deviation and aggregated confidence intervals. Each individual is then asked to perform the same task again, but now with the knowledge of the responses of all other participants. In step 3, this procedure is repeated until individuals do not change their assessment any more. In step 4, the organizer summarizes the results and articulates the conclusions.

A variation of the classic Delphi method is the group Delphi (Webler et al, 1991). During a group Delphi all participants meet face to face and make the assessments in randomly assigned small groups of three or four. The groups whose average scores deviate most from the median of all other groups are requested to defend their position in a plenary session. Then the small groups are reshuffled and perform the same task again. This process can be iterated three or four times until no further significant changes are made. At the end of a Group Delphi process, one receives either a normal distribution of assessments around a common median, a two- or three-peak distribution (signalling a majority and one or more minority votes) or a flat

curve (which means that knowledge is insufficient to make any reliable assessment).

The advantage of Delphi is that a serious effort has been invested in finding the common ground among the experts and in finding the reasons and arguments that cause differences in assessments. The disadvantage is that the Delphi depends upon the quality and completeness of the expertise and information brought into the process.

In general, ZIRN has had mostly positive experiences with Delphi processes, particularly group Delphi. Group Delphis are regularly conducted by ZIRN. In an anthology Schulz and Renn (2009) have described five processes with the group Delphi approach. Thereby the document practical experiences of the questionnaire design the planning, execution and analysis. In November 2008, in the context of the EU-project OSIRIS 25 experts have meet for a group Delphi to discuss risks of the assessment of chemical substances (Benighaus 2009).

3 Procedure of the Group Delphi

3.1 First Round of the Group Delphi

After introductory remarks by Prof. Ortwin Renn and Christina Benighaus concerning the process and the aims of the workshops the participants were divided into four groups of 3-4 persons each. All groups had 1.5 hours to discuss the questions. Each question had to be evaluated on a scale from 1 (strongly disagree) to 10 (strongly agree) as a group vote. During the evaluation of questions the wording of the questions and the significance of single terms was discussed as well. The participants were able to add comments and remarks concerning the wording of the question. In case a participant did strongly disagree with the group vote, he or she could vote a single opinion as an additional vote, as a so-called minority vote. After the groups had completed their questionnaires, the ZIRN research team compiled the results of each group during the coffee break to present these in the subsequent plenary session.

3.2 Subsequent Plenary Session (First Round)

In the plenary session the moderator Ortwin Renn asked groups whose evaluations of single questions deviated from the median for their explanations and argumentation for these decisions. The discussion therefore focused on discrepancies, deviations and differ-

ences between the groups. Little or not discussed were questions that were assessed similar or even identical, that means questions that reached consensus.
Remarks and comments of the groups concerning the wording of questions and clarity of single terms were adapted to the questionnaire during the break. Accordingly, all relevant questions have been modified for the second round.

3.3 Second Round of the Group Delphi

The second round with the revised questionnaires that had to be evaluated once more in small groups followed the plenary session.
The group composition was varied in the way that only one participant remained in the previous group. The other participants were transferred to other groups. The number of the small groups, however, remained the same.
Questions that were not evaluated similarly by the different groups were eliminated from the questionnaire. These questions have reached consensus and had therefore not be discussed further. Thus, the remaining time could be focused on the questions, which were not evaluated consistently.

3.4 Concluding Plenary Session

Remaining open questions were discussed in a concluding plenary session to order to achieve consensus or consensus on dissent. This was followed by a concluding summary by the moderator.

Retrospectively we could observe that dissent is mainly differed on the understanding of concepts/terms and the way of posing a question. Differences on factual issues concerned only a few questions.
However, differences due to misunderstandings and variability in the definitions of terms could be cleared up by the plenary discussion and the revised questionnaire of the second round. In this manner consensus could be achieved for most of the questions.

3.5 Examples from the Discussion about consensus and dissent

The following three examples will illustrate how the questions were modified in connection to the plenary session.

Example 1: Proportion of in silico methods (of all testing methods used) by 2015
During the first plenary discussion the questions 1.1.3-1.1.5 were discussed. One question was: "*A wider use of in silico method is possible short term (till 2015)/ medium term (till 2020)/ long term (till 2030).*"
The participants perceived the term *„wider use"* as too vague. The expected size reference was unclear. The controversial question could have been supplemented by an open query of percentages. The new corresponding question for the second round is
"What will be the percentage of in silico till 2015 in comparison to all chemical testing methods?"

Example 2: Stakeholder Dialogue
The groups agreed that a dialogue with stakeholders and regulators should take place in small discussion groups and workshops. In such

a context the expert dialogue and trust can be promoted through face-to-face talks (see first round, question 1, appendix). Every of the four groups agreed to this statement (Valuations 9, 8, 9 und 10).

Example 3: Dialogue with the public

When asked about a proper dialogue with the public there was no doubt that events in technical museums, science week festivals and special academic events dealing with the use and safety of chemicals contribute to the dialogue (see first round, part 3.2 question 3; the valuations were 7, 10, 10 and 10).

Questions that had to be evaluated again in the second round were marked on the questionnaire. The remaining questions were ignored in the second round.

4 Overview and Interpretation

The following table shows an overview about the evaluation of the questions from the first and second round of the Group Delphi. The core results can be identified by different colors.

Table 1: Overview of the color identification of the table.

Question No.	Questions, which have been evaluated in average positive by groups (5-10 = acceptance) are colored green (consensus).	XX
Question No.	Questions, which have been rather not agreed (1-5= no agreement) are colored red (consensus).	XX
Question No.	Questions, which haven't been evaluated conclusively, are colored grey. Thereby the answers of the groups differ / vary to the left and right side on the scale in different directions, and therefore will not be evaluated by finally agreement or disagreement (dissent).	XX
Question No.	Questions, which are colored yellow, have been changed in the wording during the second round.	

4.1 The Use of Computer- and In Silico Models as Alternative Testing Methods

The first set of questions discussed the potential practice and chances to use in silico models in future. The participants found out few

chances that in silico methods can reduce significantly the number of animal experiments. Until now the use of these methods is even rather rarely and the skepticism of the participants that the models can be used on a routine basis is high, because there are still too many obstacles to overcome. The main sorrow of the participants is the acceptance of the models in the REACH process, which requires a voluminous documentation. The introduction of new methods is very complex and time-consuming.

But also the acceptance of the industry and the consumer is important. If the in silico models are accepted by the regulatory authorities they can reduce the costs and the efforts of the testing methods. Therefore the participants do not believe in a short-term application of in silico methods. Till 2015 they estimate that the use would increase from about 0% up to now to 2-5 %. From the perspective of experts the use could increase in the long term (till 2030) up to 20%. However the participants are not sure about this prediction.

Table 2: Results of the first and second round of the Delphi groups.

	1.1	**Question**					
Round 1/ Round 2	**Question No.**	**The use of computer- and in silico models as alternative testing methods**	*1 = no acceptance 10 = full acceptance in group G1 to G4*				
			G 1	**G 2**	**G 3**	**G 4**	**mean= X**
Round 1 closed	1	In Silico methods are capable, to reduce significantly the number of animal experiments.	2,5	3,0	4,0	_	3,6

Round 1 closed	2	In Silico methods are capable to reduce costs and the effort of testing methods.	7,0	7,0	9,0	–	7,0
	3	A wider use of in silico methods is short term possible till 2015. What will be the percentage of in silico till 2015 in comparison to all chemical testing methods?	0,0 %	increasing	2,0 %	5,0 %	2,3
	4	A wider use of in silico methods is possible in the medium term till 2020. What will be the percentage of in silico till 2020 in comparison to all chemical testing methods?	3,0 %	increasing	4,0 %	10,0 %	5,7
	5	A wider use of in silico methods is only possible in the long term till 2030. What will be the percentage of in silico till 2030 in comparison to all chemical testing methods?	10,0 %	increasing	10,0 %	20,0 %	13,3
	6	Please indicate, how sure you feel on the basis of your experience background (sure, almost sure, little sure, unsure) during the response of the affirmations 3-5.	–	very unsure	unsure	–	

4.2 Dialogue with Stakeholders and Regulators

The second set of questions deals with the dialogue of stakeholders and regulators. Stakeholders from the industry, authorities and organizations should be informed about in silico methods. In addition to pure information an intensive dialogue also should take place about advantages and disadvantages, necessary conditions and extensive possibilities of use and applications. The final aim of dialogue is to inform the stakeholders and regulators about the topic in a way that they are able to adjust their judgments and their economic and political behavior on the base of this information.

The participants agreed that one possibility for a dialogue consists in the offer of adequate small rounds of discussion or workshops because the professional and experience exchange and the confidence can be supported there.

Also professional contributions on conferences and workshops are effective to augment the circulation and acceptance of in silico methods in the scientific community.

But the participants refused virtual meetings or online conferences in the Internet as a predominant instrument. One group proposed to install a hybrid method to virtually continue the dialogue of the rounds of discussion or conferences in the Internet after having built up enough confidence and trust through the face-to-face contact.
From the perspective of experts an attractive offer of professional development programs increases the chance that representatives

from industry, public authorities and organizations will better understand and competently assess in silico methods. A course for one day is not sufficient for that. Some participants also argued that those who are responsible in the companies inform themselves on conferences and meetings which makes it difficult to encourage them to join a course for a full day.

All agreed that the technical knowledge about the topic of in silico methods should be published furthermore especially in scientific journals. In addition the Internet should be used more for the communication with the stakeholders and regulators.
There was no consensus about the use of blogs and forums on scientific sites to increase the exchange with this topic and to place targeted scientific statements into the specific communities. The opinions differ from acceptance to rejection. In this context it is also important to decide who moderates a forum, who are the users and what the objectives are.

The experts estimate the use of new media, like Science News and info-Broker ambivalent. However three out of four groups see a good opportunity to attract attention. But it is necessary to clarify exactly who is the broker, who is the addressee and which platform should be used.

Table 3: Results of the first and second round of the Delphi groups: Dialogue with stakeholders and regulators.

	2.1	Question					
	Closed/ 2 Round	**Dialogue with stakeholders and regulators**	*1 = no acceptance* *10 = full acceptance*				
Round 1 closed	1	The dialogue with stakeholders and regulators with the objective of assuring information and evidence should be organized in small discussion groups and workshops, because here professional exchange and the confidence by personal dialogue can be developed.	9,0	8,0	9,0	10,0	9,0
Round 1 closed	2	Virtual meetings or online conferences in the Internet are adequate communication channels to conduct a constructive dialogue with stakeholders and regulators.	3,0	3,0	2,0	2,0	3,2
Round 1 closed	3	Professional input on conferences and workshops are an adequate and effective instrument to augment the circulation and acceptance of in silico methods in the scientific community.	10,0	10,0	10,0		10,0
	4	An attractive offer of	7,0	9,0	7,0	9,0	8,0

		professional development programs increases the probability that representatives of industry, authorities and organizations better understand and competently evaluate in silico methods.					
	5	The discussions in blogs and forums on scientific websites with the topic of testing methods increases the discussion with this topic and can help to position scientific statements of in silico methods targeted in the specific communities.	2,0	8,0	4,0	6,0	5,0
	6	Science News, Info-Broker: The use of these new media increases the attention of this topic.	2,0	9,0	8,0	8,0	6,8
	7	The technical knowledge to in silico methods should furthermore specifically be published in scientific journals.	10,0	10,0	10,0	10,0	10,0
	8	Beside of scientific publications the Internet should be also more used to reach especially stakeholders and regulators.	8,0	10,0	6,0	10,0	8,5

4.2.1 Formats of the communication with the stakeholders and regulators

In addition to a dialogue oriented form of communication (two-way-communication) formats to a pure information (one-way-communication) for in silico methods should be also used.

Adequate communication formats according to the experts are

- Scientific journals with „peer-review“
- Publications from professional group, magazines of the professional associations
- Internet: scientific websites, specialized websites from research institutes and –projects, the composed content of in silico from ORCHESTRA or others and official websites of national and international governmental organizations, public authorities (BfR, ECHA, EFSA).

One single opinion has been that regulators generally hardly read scientific journals with “peer-review”, so that this target group could be addressed only with difficulty.

For the communication with the representatives from industry, regulators and organizations, the experts consider the communication through scientific journals without “peer review” only in a restricted sense. There is disagreement

- Between daily and weekly newspapers, e.g. FAZ, Die Zeit (nationwide) and
- As medium for the target-group of the stakeholders the use of popular scientific magazines like Scientific American or Geo Wissenschaften, and
- Press releases of research institutions or -projects

Some groups see good opportunities, other groups reject these ways of communication as ineffective.

Clearly rejected by the target-group of regulators:
Popular scientific magazines like Scientific American, Geo Wissenschaften. Clearly rejected by the stakeholders are following formats

- Information brochures from research institutions and – organizations, research projects like e.g. ORCHESTRA or others
- Reports in TV and Radio on alternative testing models
- Newsletters from recognized research institutions and – organizations, research projects like ORCHESTRA or others

Newsletters from research institutions or projects are considered as ineffective, because of the low selection and because they are distributed to a broad audience. Too many organizations distribute their own newsletter. The use of this knowledge should be distributed more pooled.
Information brochures from research institutions and-organizations are generally considered as a discontinued model in comparison with other channels and also considered as ineffective.

Table 4: Results of the first and second round of the Delphi groups: Formats of communication with stakeholders and regulators.

	2.2	Question					
	closed/ 2. round	**Formats of Communication with stakeholders and Regulators**	*1 = no acceptance 10 = full acceptance*				
Round 1 closed	1	Scientific journals with „peer-review“	10,0	10,0	5,0	10,0	8,8
Round 1 closed	2	Scientific journals without „peer-review "	7,0	5,0	5,0	8,0	6,3
	3a	For the target-group regulators: Popular scientific magazines eg. Scientific American, Geo sciences	1,0	3,0	5,0	4,0	3,3
	3b	For the target-group stakeholders: Popular scientific magazines eg. Scientific American, Geo sciences	2,0	8,0	7,0	7,0	6,0
Round 1 closed	4	Publications of professional groups, magazines of professional associations	8,0	10,0	8,0	10,0	9,0
	5	Daily and weekly newspapers eg. FAZ, Die Zeit ... (nationwide)	2,0	8,0	2,0	6,0	4,5

Round 1 closed	6	Press releases of research institutions	5,0	10,0	2,0	5,0	5,5
Round 1 closed	7	Internet: Scientific websites, specialized websites from research institutes and –projects, the composed content to in silico from ORCHESTRA or others	9,0	10,0	9,0		9,3
Round 1 closed	8	Internet: official websites of national and international governmental organizations, authorities (BfR, ECHA, EFSA).	10,0	10,0	10,0	10,0	10,0
	9	Information brochures from research institutions and –organizations, research projects like e.g. ORCHESTRA or others	3,0	2,0	2,0	4,0	2,8
Round 1 closed	10	Press releases of research institutions or –projects like ORCHESTRA or others	6,0	10,0	2,0		6,0
Round 1 closed	11	Reports in TV and Radio on alternative testing models	3,0	4,0	3,0	1,0	2,8

	12	Newsletters from recognized research institutions and – organizations, research projects like ORCHESTRA or others	3,0	4,0		4,0	3,7

4.2.2 Content Aspects

In addition to the form of information content aspects are very important for the communication with stakeholders and regulators. On the one hand the communication with the target-group concerns regulative aspects, like fro example the documentation and evidence-protection of the testing procedure and on the other hand it concerns the communication of practical experiences of potentials and benefits of in silico testing methods.

The strategy *„Acceptance on a case by case basis"* has been estimated by all experts in a statement in plenary as a good tool, because there can be no general acceptance of in silico methods be expected. Even if the procedures have not yet been recognized the participants see advantages in this based on this strategy. Equally it is necessary that the representatives of industry and authorities should know the possibilities and conditions of use of in silico testing procedures now and in the future. This includes especially the importance, that the conditions of the REACH-Regulations will be represented. Because the acceptance of the testing procedures by ECHA strongly depends on the extensive documentation of the tests, it is necessary that the conditions, the procedure and the structure of a successful documentation should be presented by a few selected examples.

In the opinion of the participants an outstanding procedure in the sense of a sales strategy shouldn't be implemented, because this strategy will be to clear and can lead to the totally rejection of the testing procedures. There is a need for communication within which the conditions and doubts of the representatives of the industry and developers should be addressed.

There is disagreement in the group to the point „Scientific Reports to the Project results“. Three out of four groups think that they shouldn't be in the focus of the reporting, however one group expresses that this is a good way to communicate the content. To set a priority on the general procedures should be an alternative way. As an objection by one group it was introduced that the description of individual examples is not sufficient to understand the general procedure

Table 5: Results of the first and second round of the Delphi group: Content aspects.

	2.3	Question					
	Closed/ 2. round	**Content aspects**	*1 = no agreement, 10 = full agreement*				
Round 1 closed	1	Industry and authorities should know the opportunities and the conditions of the use of in silico testing procedures now and in the future, including especially the presentation of the conditions of the REACH-Regulations	9,0	10,0	10,0	10,0	9,8

	2	Because there is no general acceptance attended for the in silico testing procedures, the strategy *"Acceptance on a case-by-case basis"* should be selected and communicated accordingly.	5,0	10,0	10,0	9,0	8,5
Round 1 closed	3	Because the acceptance of the testing procedures by ECHA strongly depends from the extensive documentation of the tests, it is necessary that the conditions, the procedure and the structure of a successful documentation should be presented by some few selected examples.	6,0	10,0	10,0	10,0	9,0
Round 1 closed	4	Scientific reports to he project results should be in the focus of the reporting. However the communication about the general procedures should be taken more in the background.	8,0	2,0	5,0	1,0	4,0

Round 1 closed	5	An *„outstanding"* procedure in the sense of a sales strategy shouldn't be implemented, because this strategy will be seen quickly through and can lead to the totally rejection of the testing procedures.	8,0	8,0	6,0	10,0	8,0
Round 1 closed	6	In the communication offers the needs, the conditions and doubts of the representatives of the industry and developer should be addressed.	8,0	10,0	10,0	10,0	9,5

4.2.3 Credibility of Sources

Credibility and acceptance of Information depends on the origins (industry, authority, NGO, research institution, etc.). The addressee has a predetermined opinion, which is dependent on the source.
As credible sources are considered:

- Scientific journals with and without "peer review"
- Publications of Professional groups, magazines of the professional associations and
- Official websites in the internet of national and international governmental organizations, authorities (BfR, ECHA, EFSA)
- Information brochures, press releases and newsletters from recognized research institutions and –organizations

Scientific websites, special pages from research institutions and -projects, which have composed content to in silico like ORCHESTRA or others in the Internet, are generally assessed as credible. However one working group gives only low value to this question. The participants evaluated differently the source daily and weekly newspaper (nationwide). There are values varying from high credibility up to neutral and lower credibility.
Reports in TV and radio about alternative testing procedures are incredible for some single groups. Popular scientific magazines will be estimated also as not credible and more incredible.

Table 6: Results of the first and second round of the Delphi group: Credibility of sources.

	2.4	**Question**					
	Closed/ 2. round	**Credibility of sources**	*1 = no credibility, 10 = highest credibility*				
Round 1 closed	1	Scientific journals with „peer review“	8,5	8,0	10,0	10,0	9,1
Round 1 closed	2	Scientific journals without „peer review“	7,0	7,0	8,0	8,0	7,5
Round 1 closed	3	Popular scientific magazines	4,0	7,0	5,0	2,0	4,5

Round 1 closed	4	Professional group publications, magazines of the professional associations	5,0	9,0	7,0	10,0	7,8
	5	Daily and weekly magazines (nationwide)	5,0	8,0	4,0	7,0	6,0
Round 1 closed	6	Internet: Scientific websites, specialized websites from research institutes and –projects, the composed content to in silico from like ORCHESTRA or others	8,0	9,0	7,0	3,0	6,8
Round 1 closed	7	Internet: Official websites in the internet of national and international governmental organizations, authorities (BfR, ECHA, EFSA)	9,0	10,0	9,0	10,0	9,5
	8	Information brochures from recognized research institutions and –organizations like eg. ORCHESTRA or others	5,0	5,0	9,0	8,0	6,8
	9	Press releases and newsletters from recognized research institutions and –organizations like ORCHESTRA or others	5,0	5,0	9,0	8,0	6,8

	10	Reports in TV and radio about alternative testing procedures	3,0	3,0	_	_	3,0
	11	Newsletters from recognized research institutions and – organizations like ORCHESTRA or others	5,0	5,0	9,0	8,0	6,8

4.3 Dialogue with the Public

In the assessment of knowledge on chemical testing, not only scientific criteria are of importance, but also the availability, the comprehensibility as well as the social acceptance of their respective knowledge in a broader public. The acceptance and the evaluation of scientific contents from the public therefore depends on the social context, individual previous knowledge and interests and do not represent a passive adoption of the mediated Information. Individuals interpret the offers of the media depending on their interests, ideas and on personal concernment.

Experts agree that the mutual exchange and the dialogue with the public on alternative testing and the application of in silico Methods should be strengthened with the aim of a broad public understanding of chemical testing in the society. Due to the different prior knowledge an offer of information sources is useful. Apart from an initial introduction to the subject of little-informed citizens for example through information booklets or press release should also be promoted more comprehensive documentation, for example texts on the internet, for a more detailed opinion.
It is desirable to mention the possible contact persons (research center, educational center, public authorities, intermediate organizations) for a strengthening of the public. The description of case studies and individual cases would also increase the public's attention on the issue. Elements of uncertainty and subsequent consequences for the application of in silico methods should be also described here.
The effect of public on science policies is often underestimated. Therefore, it is, according to the experts, also appropriate to provide complete and sophisticated information to the public. Comprehen-

sive information has to be achieved and the seriousness of the statements has to be clear.

Three groups agree with the statement, that the social dialogue should not be based only on the scientific experts who configure knowledge about chemical tests, but also on the involvement of laypeople with non-scientific explanations for discussion. Indeed, the participants observed, that the economic aspect in the communication with the public has to be requested, according to the following question: "What should be achieved by informing the public?" Even the transparency of the work is important, but the demand is estimated rather low.

Table 7: Results from the first and second round of the Group Delphi: Dialogue with the Public.

	3.1	**Question**					
	Closed/ 2. Round	**Dialogue with the Public**	*1 = no acceptance/ agreement, 10 = full agreement/ acceptance*				
Round 1 closed	1	The reciprocal exchange and Dialogue with the public to alternative test methods and application of In silico Methods should be invigorated, with the goal, to achieve a better understanding for chemical tests in the public.	8,0	10,0	7,0		8,3
	2	Because of the different previous knowledge about chemical tests,	7,0	9,0	8,0	8,0	8,0

		the use, the assets and drawbacks, an individual supply of Information source is necessary. In addition to an introduction to the subject for less informed citizens, for example with information booklets or press releases, there should be also a comprehensive documentation, for example texts on the internet, to provide an extensive opinion making (also consider economic aspects).					
Round 1 closed	3	To name the possible contact person (research center, educational center, public authorities, intermediate organizations) is desirable for the consolidation of the public.	8,0	10,0	8,0	6,0	8,0
Round 1 closed	4	A description of cases using in silico methods would advance the attention of the public. Elements of uncertainty and subsequent consequences by using should also be described.	8,0	10,0	10,0		9,3
	5	The public is often underestimated. To achieve all-	5,0	7,0	_	10,0	7,3

		embracing information and to clarify the earnestness of the statements, it is advisable to allocate complete and critical Information.					
	6	In the societal dialogue, not only scientific experts configure knowledge about chemical tests, but also laypersons with non-scientific interpretations are *conducive* to the discussion.	3,0	10,0	10,0	10,0	8,3

4.3.1 Formats and Forms of Communications with the Public

In addition to a form of purely information, like booklets for in silico methods, conversational formats of communication (two-step-communication) also have the potential to strengthen the discussion in the public and to enable a dialogue.

In the perspective of the experts for the communication are acceptable: Public science magazines, daily and weekly newspapers (regional, local or nationwide). In addition science weeks or festivals as special scientific events, which deal with the use and the safety of chemicals, can contribute to the dialogue.

Reports on TV and radio on alternative tests are not clearly rated by the participants. One group considers this channel of communication as effective, another group, however, as rather less effective.

Only two groups think, that the internet, respectively official sides of national and international institutions and public authorities (for example BfR, ECHA, EFSA, ...) is effective as a communication channel with the public. It is noted critically, that the sides are only accessible to a selected audience, because the content is partially available only in English. The normal consumer does not even know the organizations.

Virtual meetings and online-conferences on the Internet are, in the opinion of three of the four groups not suitable, to advance the dialogue and consequently the circulation the advertence and the debate of in silico methods.
One group however favors virtual meeting as a communication medium.

Blogs and forums on the Internet were evaluated more positively and two of four groups think, that they will increase the discussion and advertence in the public. Also science news and info-broker are seen as effective for advancing the attention.

Rejected for the communication with the public in contrast are:

- Science Journals with or without „peer-review“
- Occupational group papers, magazines of occupational unions,
- Scientific pages, pages from research institutes and –projects, who arrange subjects on in silico, for example ORCHESTRA or others
- Information booklets from research institutes, Research projects, like ORCHESTRA or other
- Press release from research institutes, research projects and -organizations

- Newsletter from research institutes, research projects like ORCHESTRA or others.

Table 8: Results from the first and second round of the group Delphi: Special aspect: Forms and formats of the communication with the public.

	3.2						
	closed/ 2 Round	**Special aspect: forms and formats of communication with the public**	*1 = no acceptance 10 = full acceptance*				
Round 1 closed	1	Scientific Magazines/journals without „peer-review“	2,0	2,0	1,0		1,7
Round 1 closed	2	Scientific Magazines/Journals with „Peer review“	2,0	2,0	1,0		1,7
Round 1 closed	3	Popular scientific journal	8,0	9,0	8,0		8,3
Round 1 closed	4	Occupational group journals, journals from occupations unions	2,0	2,0	3,0		2,3
Round 1 closed	5	Daily and weekly newspapers (regional, local or national wide)	7,0	7,0	9,0		7,7

Round 1 closed	6	Internet: scientific pages, pages from research institutes and –projects, which arrange subjects to in silico, like ORCHESTRA others	3,0	4,0	3,0		3,3
	7	Internet: official pages from national and international institutions and public authorities (BfR, ECHA, EFSA...)	7,0	2,0	7,0	_	5,3
Round 1 closed	8	Information booklets from research institutes and –projects like ORCHESTRA or others	4,0	4,0	2,0		3,3
	9	Press releases from research institutes, -projects and - organizations like ORCHESTRA or others	2,0	_	2,0	_	2,0
Round 1 closed	10	Reports on TV an on Radio in relation to alternative tests	3,0		8,0		5,5
Round 1 closed	11	Newsletter from research institutes and –projects like ORCHESTRA or others	2,0		2,0		2,0
	1	Virtual meetings or online conferences on internet advance dialogue and with it the circulation of in silico methods in the public	1,0	1,0	1,0	8,0	2,8
	2	Blogs and forums in Internet: The discussion	4,0	7,0	2,0	7,0	5,0

		in blogs and forums, scientific pages advances the debate in the public.					
Round 1 closed	3	Events in technical museums, science-weeks festivals: specific scientific events, which are dealing with the use and uncertainty of chemicals, contribute to the dialogue.	7,0	10,0	10,0	10,0	9,3
	4	Science News Info-Broker: The discussion in the user group advances the advertence with the subject	4,0	5,0	5,0	8,0	5,5

4.3.2 Credibility and Acceptance of Subjects in the Public

Scientific methods and results are even more difficult for the public to understand. In addition to abundance of information in different formats, conclusions to in silico methods are not always communicated in a consistent way.

In the case of in silico methods there is a consensus at expert level that in silico methods are representing an alternative to conventional tests.

About the extent of use, the costs and especially above all safety there are however different opinions. Furthermore the research about in silico methods is fluent, so that applications of the last years, which

had validity before, can be revised and adapted. This abundance of different information leads to uncertainty in the public and to absent credibility of individual statements.

In the opinion of experts (three out of four groups) the formal design (easiness of use, comprehensibility, and transparency) has a non-negligible influence on the credibility of the source. There is an agreement that existing uncertainties are included prominently in the reporting. Different opinions on the safety and on the benefits of in silico methods as well as specialized discourses should be presented in the public by the experts, for instance as pro/contra discussion.
Are there fundamental changes in the evidence of in silico methods, for example concerning to the safety, then they should be communicated not only in research and developing circles, but also in the public media. It was important for one working group in the workshop to include the interdisciplinary effects/consequences of in silico methods in the publications.

Table 9: Results of the first and second group Delphi round: special aspect: Credibility and acceptance in the public.

	3.3	**Question**					
	closed/ 2 Round	**Specific aspect: Credibility and acceptance of subjects in the public**	*1 = no acceptance, 10 = full acceptance*				
Round 1 closed	1	Different opinions to security and using of in silico should beside specific discourses by experts be presented in public, for instance as pro/contra discussion.	8,0		7,0		7,5

Round 1 closed	2	Are there fundamental changes in the evidence of in silico methods, for example in security, these ones should be communicated not only in research and development circles, but also in public media.	8,0		7,0		7,5
	3	The formal design (easiness of use, comprehensibility, transparency) has a not disregarded effect on the credibility of the source.	4,0	9,0	10,0	9,0	7,8
	4	The existent uncertainty is incorporated in the reporting.	7,0	9,0	8,0	9,0	8,3
	5	It is important to include the interdisciplinary impact and outcome of in silico methods into the publications.	4,0	9,0	–	–	6,5

4.4 Generic Assessment

The last question on the general assessment of the communication was due to the time answered only by two groups in the first round and one group in the second round. Insofar the statements are based on the opinion of a few experts. The participants of the group argued that the media have a significant impact on the communication with the public, also on stakeholders and regulators. Scientific journalists rely on their content of interest and prepare them for different target groups. Modern techniques, such as the Internet thereby play an important role. Is it about scientific content, like in silico methods, information lenders do only have a slight influence on journalist's reporting. The experts recommend a target PR-strategy that appeals mostly journalists. In silico methods are so specific that the communication with the media should play a subordinate role, in favor of direct communication with stakeholder and regulators. In silico methods shouldn't be considered isolated within the communication with the media, but in context of animal experiments and experiments on cell cultures to increase the response from the media.
The experts couldn't recommend a broadly based public relation and the response of many journalists.

Table 10: Results of the first and second Delphi round: general assessment.

	4.1	**Question**				
	closed/ 2. Round	**General Assessment**	*1 = no acceptance, 10 = full acceptance*			
Results of 1/ 2. Round	1	The communication of in silico methods with media is difficult. Suggested should be a selective PR strategy, which addresses predominantly special journalists.	5,0	10,0		
Results of 1/2. Round	2	An expanded publicity and response of many journalists is recommended.	5,0	3,0		
Results of 1/2. Round	3	In silico methods are so specific that the communication with media should play a minor role in favor of a direct communication with stakeholder and regulators.	5,0	6,0		
Results of 1/ 2. Round	4	In silico methods shouldn't be isolated within the communication with the media, but also in context of animal experiments and experiments on cell culture to increase the response of the media.	8,5	10,0		

5 Conclusions

The Delphi Experts Workshop "Successful Communication of Scientific Content on the Example of Testing Chemical Substances" aimed at the examination of communication strategies on the basis of expert judgments with the objective to promote a wider understanding, the awareness and acceptance of in silico methods. For this purpose various concepts and approaches to solution strategies among the scientific community were discussed. Thereby the overall goal was to strengthen and expand the dialogue in the scientific community.

The 14 participating experts gave several recommendations on how communication with stakeholders, regulators and the public can be enabled effectively and successful.

From the results of the group Delphi the following recommendations for the communication of in silico methods with stakeholders, regulators and the public can be derived.

In Silico and Alternative Testing Methods

The participants assess the use of in silico methods still to be low. And they voice certain skepticism that these alternative methods will be routinely applied to a large extent. The experts estimate that the proportion of these methods may increase to 2-5% till 2015. According to the experts the use of in silico methods could increase long-term (till 2030) up to 20%. The crucial point is how the perception and acceptance of in silico methods as alternative or combined testing strategy can be enhanced. In addition to the recognition of the methods in the REACH process that envisaged an extensive documentation, the experts see the development of new methods like in

silico as expansive and time consuming. However, the recognition of in silico methods by regulatory authorities could lead to a considerably reduction of costs and efforts of the alternative testing methods. The recommendation to ORCHESTRA is to focus a dialogue through different media channels and networks between industry, the scientific community, organizations and authorities in order to increase the awareness and acceptance of in silico methods in industry and regulatory authorities.

In the plenary discussion the experts agreed on an approach based on the "acceptance on a case by case" principle that seems promising since a general acceptance is not realistic at a time. Even if the procedures are not accredited yet, advantages are seen in that circumstance. Representatives from industry and government alike should become acquainted with the possibilities and conditions of the use of in silico testing methods for the present as well as for the future. On this it is important that the conditions of the REACH regulations are presented. Since the adoption of testing methods through ECHA depends mainly on the intense documentation of the tests, conditions, procedures and the documentation should be presented on the example of a few selected examples. The communications offerings should not disregard the needs, conditions and doubt of industry representatives and developers. On the contrary, concerns should rather be addressed.

Communication strategies

It is important that besides a dialogue-focused way of communication (two-way-communication) it should be made use of one-way-communication strategies that focus on the communication of (pure) information as well. In addition, all advantages and disadvantages as

well as the use and application potential should be made transparent and all remaining uncertainties should be revealed.

Instead of a broad PR campaign the experts recommend a targeted PR-strategy that addresses primarily specialized journalists. According to the experts in silico methods are in general very specific. Therefore the media should play a minor role in favor of the direct communication with stakeholders and regulators. Rather than isolated in silico testing methods should be reported in the context of animal testing and experiments with cell cultures to increase the response of the media.

Dialogue with Stakeholders and Regulators

In addition to pure information an intense dialogue on the advantages and disadvantages, necessary conditions and extensive use and application potential is advisable. The ultimate objective of the dialogue is to provide information to stakeholders and regulators so that they can coordinate policy making, economic and political action with regard to the knowledge provided. Thereby, a well-structured and organized discourse among experts in which as many as possible stakeholders and researcher are involved in is very important. In order to promote the professional exchange and trust, small discussion groups and workshops are appropriate communication formats.

Print media and Internet

The participants agreed that technical knowledge on in silico methods should still particularly published in scientific journals (peer review). Furthermore the communication with stakeholders and regulators should increasingly rely on the Internet. Scientific websites, professional sites of research institutes and projects that provide in-

formation about in silico methods, such as ORCHESTRA or other official websites of nationwide and international governmental organizations are fairly well accepted and widely read media. Even documents of organized occupational groups and journals of professional organizations should be used as media.

Newsletters of research institutes or projects are considers as little useful, since they reach recipients often unselected and in excess. Too many organizations circulate their own newsletter. The knowledge/contents should rather be spread more concentrated.

Training and Workshops

A major potential to bring actors the complex issues of in silico methods closer lies in specific courses and trainings. The information should be presented in a way that enables stakeholder and regulators to form their own opinion.

Dialogue with the public

Overall, the reciprocal exchange and dialogue with the public should be enhanced to order to achieve a wider public understanding of chemical testing methods. Due to prior knowledge of the citizens individual offers of information (e.g. brochures and press releases for comprehensive information as well as more in-depth information) to strengthen the opinion building process.

Providing potential addressees (research institutes, government agencies, intermediary organizations) may contribute increasing the public's confidence. According to the experts the description and highlighting of case studies/individual cases gains the public's atten-

tion. At the same time uncertainties and the resulting consequences linked to the use of in silico methods should be described as well.

Appropriate media for the dialogue are: popular science magazines, daily and weekly newspapers (regional, local and nationwide); specific scientific events dealing with the use and safety of chemical substances such as science week festivals can contribute to the dialogue in a positive manner. Finally, concerning all communication offers great emphasis should be placed on the formal design, layout and presentation as formal issues have an influence on the perceived credibility that should not be underestimated.

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7 Appendix

Appendix 1: Workshop Agenda

10.30	–	11.00	Welcome & Coffee
11.00	–	11.30	Introduction and Delphi-Questionnaire *Prof. Dr. Ortwin Renn & Christina Benighaus*
11.30	–	13.00	1. Delphi-Round in small working groups
13.00	–	13.45	Lunch break
13.45	–	14.30	Plenary Discussion 1. Delphi-Round *Moderation: Prof. Ortwin Renn*
14.30	–	15.00	Coffee break
15.00	–	16.00	2. Delphi-Round in small working groups
16.00	–	16.45	Plenary Discussion 2. Delphi-Round *Moderation: Prof. Ortwin Renn*
16.45	–	17.00	Summary of Results *Prof. Ortwin Renn*
17.00			Closing

Appendix 2: Overview consensus and dissent in the group Delphi Rounds 1 and 2.

✓= Consensus
X= Dissent
(✓) = Consensus in case the wording of the question is changed
- = This question was not raised in the second round

The following table indicates for which questions consensus was achieved. The table does not tell whether the participating experts agreed or disagreed to the statements. See main text above for details.

1	Questions	Consensus/ dissent	Consensus/ dissent
Closed/ round 1	**The use of computer- and in silico models as alternative testing methods**		
1	In Silico methods are capable, to reduce significantly the number of animal experiments.	✓	-
2	In Silico methods are capable to reduce costs and the effort of testing methods.	✓	-
3	A wider use of in-silico methods is possible short term (till 2015).	X	(✓)
4	A wider use of in-silico methods is possible medium term (till 2020).	X	(✓)
5	A wider use of in-silico methods is possible long term (till 2030).	X	(✓)

2.1	Questions		
closed/ round 1	**Dialogue with stakeholders and regulators**		
1	The dialogue with stakeholders and regulators with the objective of assuring information and evidence should be organized in small discussion groups and workshops, because here professional exchange and the confidence by personal dialogue can be developed.	✓	-
2	Virtual meetings or online conferences in the internet are adequate communication channels to conduct a constructive dialogue with stakeholders and regulators.	✓	-
3	Professional Input on conferences and workshops are an adequate and effective instrument to augment the circulation and acceptance of in silico methods in the scientific community.	✓	-
4	An attractive offer of professional development programs increases the dissemination and acceptance of in silico methods by representatives of industry, authorities and organizations.	X	(✓)
5	The discussions in blogs and forums on scientific websites with the topic of testing methods help targeted to position scientific statements of in silico methods in the specific communities.	X	(✓)
6	Virtual user groups, Science News, Info-Broker: The use of these new media increases the attention and debate of this topic.	X	(✓)
7	The technical knowledge of in silico methods should still particularly be published in	X	(✓)

	scientific journals. Innovative forms of knowledge transfer meets little acceptance for the most part.		
8	The multimedia dissemination of knowledge of in silico methods is worthwhile. Beside of scientific publications the internet as well should be used more often to reach especially stakeholders and regulators.	X	(✓)
2.2	**Questions**		
closed/ round 1	**Formats of Communication with stakeholders and Regulators**		
1	Scientific journals with „peer-review“	✓	-
2	Scientific journals without „peer-review "	✓	-
3	Popular scientific magazines	x	(✓)
4	publications of professional groups, magazines of professional associations	✓	-
5	Daily and weekly newspapers (regional, local, nationwide)	x	x
6	Press releases of research institutions	x	-
7	Internet: Scientific websites, specialized websites from research institutes and –projects, the composed content to in silico from ORCHESTRA or others	✓	-
8	Internet: official websites of national and international governmental organizations, authorities (BfR, ECHA, EFSA).	✓	-
9	information brochures from research institutions and –organizations, research projects like e.g. ORCHESTRA or others	x	(✓)
10	press releases of research institutions or –projects like ORCHESTRA or others	x	-
11	reports in TV and Radio on alternative test-	✓	-

	ing models		
12	newsletters from research institutions and research projects like ORCHESTRA or others	x	(✓)
2.3	**Questions**		
Closed/ round 1	**Content aspects**		
1	Industry and authorities should know the opportunities and the conditions of the use of in silico testing procedures now and in the future, including especially the presentation of the conditions of the REACH-Regulations	✓	-
2	Since there a general acceptance of in silico testing methods by ECHA is not to expect, the "Acceptance on a case by case basis" strategy should be selected and communicated accordingly.	X	(✓)
3	Because the acceptance of the testing procedures by ECHA strongly depends from the extensive documentation of the tests, it is necessary that the conditions, the procedure and the structure of a successful documentation should be presented by some few selected examples.	✓	-
4	Scientific reports to he project results should be in the focus of the reporting. However the communication about the general procedures should be taken more in the background.	x	-
5	An „outstanding" procedure in the sense of an sales strategy shouldn't be implemented, because this strategy will be seen quickly	✓	-

	through and can lead to the totally rejection of the testing procedures.		
6	In the communication offers the needs, the conditions and doubts of the representatives of the industry and developer should be addressed.	✓	-
2.4	**Questions**		
Closed/ round 1	**Credibility of sources**		
1	Scientific journals with „peer review“	✓	-
2	Scientific journals without „peer review“	✓	-
3	Popular scientific magazines	✓	-
4	Professional group publications, magazines of the professional associations	✓	-
5	Daily and weekly magazines (regional, local, nationwide)	X	(✓)
6	Internet: Scientific websites, specialized websites from research institutes and –projects, the composed content to in silico from like ORCHESTRA or others	✓	-
7	Internet: Official websites in the internet of national and international governmental organizations, authorities (BfR, ECHA, EFSA)	✓	-
8	Information brochures from research institutions and projects like ORCHESTRA or others	X	(✓)
9	Press releases and newsletters from research institutions and projects like ORCHESTRA or others	X	(✓)
10	Reports in TV and radio on alternative testing methods	X	(✓)
11	Newsletters from research institutions and projects like ORCHESTRA or others	x	(✓)

3.1	Questions		
Closed/ round 1	**Dialogue with the Public**		
1	The reciprocal exchange and Dialogue with the public to alternative test methods and application of In silico Methods should be invigorated, with the goal, to achieve a better understanding for chemical Tests in the public.	✓	-
2	Due to differences in prior knowledge about chemical testing methods, the use, the advantages and disadvantages, individual information offers are useful. In addition to an introduction to the subject for less informed citizens, for example with information booklets or press releases, there should be also a comprehensive documentation, for example texts on the internet, to provide a extensive opinion making.	x	(✓)
3	To name the possible contact person (research center, educational centre, public authorities, intermediate organizations) is desirable for the consolidation of the public.	✓	-
4	A description of cases using in silico Methods would advance the attention of the public. Elements of uncertainty and subsequent consequences by using should also be described.	✓	-
5	Scientists tend to simplify their knowledge when communicating to lay people in order to avoid overloading the public. To achieve an all-embracing information and to clarify the seriousness of the statements, it is advisable to allocate complete and critical Information.	x	(✓)

6	In the societal dialogue, not only scientific experts configure knowledge about chemical Tests, but also lay persons with non-scientific interpretations are *conducive* to the discussion.	x	✓
3.2	**Questions Part 1**		
Closed/ round 1	**Special aspect: forms and formats of communication with the public**		
1	Scientific Magazines/journals without „peer-review“	✓	-
2	Scientific Magazines/Journals with „peer review“	✓	-
3	Popular scientific journal	✓	-
4	Occupational group journals, Journals from occupations unions	✓	-
5	Daily and weekly newspapers (regional, local or nationalwide)	✓	-
6	Internet: scientific pages, pages from research institutes and –projects, which arrange subjects to in silico, like ORCHESTRA or others	✓	-
7	Internet: official websites from national and international governmental institutions and authorities (BfR, ECHA, EFSA)	x	(✓)
8	Information booklets from research institutes and –projects like ORCHESTRA or others	✓	-
9	Press releases from research institutes and projects like ORCHESTRA or others	x	(✓)
10	Reports in TV an on Radio on alternative testing methods	✓	-
11	Newsletter from research institutes and –projects like ORCHESTRA or others	✓	-

3.2	**Questions Part 2**		
Closed/ round 1	**Special aspect: forms and formats of communication with the public**		
1	Virtual meetings or online conferences on the internet enhance the dialogue and thereby the dissemination and acceptance of in silico methods in the public.	x	(✓)
2	Blogs and forums in the internet: The discussion in blogs and forums on scientific pages enhances the attention and debate in the public.	x	(✓)
3	Events in technical museums, science-weeks festivals: specific scientific events that which deal with the using and uncertainty of chemicals contribute to the dialogue.	✓	-
4	Virtual user groups, Science News Info-Broker: The discussion in user groups enhances the attention and debate with the subject.	x	(✓)
3.3	**Questions**		
Closed/ round 1	**Specific aspect: Credibility and acceptance of subjects in the public**		
1	Different opinions to security and using of in silico should beside specific discourses by experts be presented in public, for instance as pro/contra discussion.	✓	-
2	Are there fundamental changes in the evidence of in silico methods, for example in security, these ones should be communicated not only in research and development circles, but also in public media.	✓	-
3	Not only the pure information, but the professional formal design, a scientific and official language and the usability have a	✓	(✓)

	great impact on the credibility. Appealing design, a scientific, but comprehensible language and user-friendly websites have positive effects on the credibility in the public as well.		
4.1	**Questions**		
Closed/ round 1	**General assessment**		
1	The communication of in silico methods with media is difficult. Suggested should be a selective PR strategy, which addresses predominantly special journalists.	✓	✓
2	An expanded publicity and response of many journalists is recommended.	✓	✓
3	In silico methods are so specific that the communication with media should play a minor role in favor of a direct communication with stakeholder and regulators.	✓	✓
4	In silico methods shouldn't be isolated within the communication with the media, but also in context of animal experiments and experiments on cell culture to increase the response of the media.	✓	✓

Appendix 3: Results of the first round (n=4).

Questionnaire and tables as central element of the discussion

Delphi-Workshop In Silico						
		G 1	**G 2**	**G 3**	**G 4**	**mean= X**
Closed/ round 1	**The use of computer- and in silico models as alternative testing methods**	*1 = no acceptance 10 = full acceptance*				
1	In Silico methods are capable, to reduce significantly the number of animal experiments.	2,5	3,0	4,0		3,6
2	In Silico methods are capable to reduce costs and the effort of testing methods.	7,0	7,0	9,0		7,0
3	A wider use of in-silico methods is possible short term (till 2015).	2,5	2,0	2,0	1,0	2,5
4	A wider use of in-silico methods is possible medium term (till 2020).	5,5	3,0	4,0	2,0	3,6
5	A wider use of in-silico methods is possible long term (till 2030).	6,0	5,0	7,0	3,0	5,3
6	Please indicate, how sure you feel on the basis of your experience background (sure, almost sure, little sure, unsure) during the response of the affir-	sure II, unsure I	Little sure		sure I, unsure II	

	mations 3-5.					
2.1	**Questions**					
Closed/ round 1	**Dialogue with stakeholders and regulators**	*1 = no acceptance 10 = full acceptance*				
1	The dialogue with stakeholders and regulators with the objective of assuring information and evidence should be organized in small discussion groups and workshops, because here professional exchange and the confidence by personal dialogue can be developed.	9,0	8,0	9,0	10,0	9,0
2	Virtual meetings or online conferences in the internet are adequate communication channels to conduct a constructive dialogue with stakeholders and regulators.	3,0	3,0	2,0	2,0	3,2
3	Professional Input on conferences and workshops are an adequate and effective instrument to augment the circulation and acceptance of in silico methods in the scien-	10,0	10,0	10,0		10,0

	tific community.					
4	An attractive offer of professional development programs increases the dissemination and acceptance of in silico methods by representatives of industry, authorities and organizations.	7,0	10,0	6,0		7,7
5	The discussions in blogs and forums on scientific websites with the topic of testing methods help targeted to position scientific statements of in silico methods in the specific communities.	3,5	6,0	2,0	2,0	3,4
6	Virtual user groups, Science News, Info-Broker: The use of these new media increases the attention and debate of this topic.	5,0	6,0	7,0	1,0	4,2
7	The technical knowledge of in silico methods should still particularly be published in scientific journals. Innovative forms of knowledge transfer meets little	9,0	7,0	10,0	10,0	9,0

	acceptance for the most part.					
8	The multimedia dissemination of knowledge of in silico methods is worthwhile. Beside of scientific publications the internet as well should be used more often to reach especially stakeholders and regulators.	8,5	9,0	9,0	1,0	6,9
2.2	**Questions**					
Closed/ round 1	**Formats of Communication with stakeholders and Regulators**	*1 = no acceptance 10 = full acceptance*				
1	Scientific journals with „peer-review“	10,0	10,0	5,0	10,0	8,8
2	Scientific journals without „peer-review "	7,0	5,0	5,0	8,0	6,3
3	Popular scientific magazines	3,0	10,0	3,0	1,0	4,3
4	publications of professional groups, magazines of professional associations	8,0	10,0	8,0	10,0	9,0
5	Daily and weekly newspapers (regional, local, nationwide)	2,5	6,0	3,0	1,0	3,1
6	Press releases of research institutions	5,0	10,0	2,0	5,0	5,5
7	Internet: Scientific	9,0	10,0	9,0		9,3

	websites, specialized websites from research institutes and –projects, the composed content to in silico from ORCHESTRA or others					
8	Internet: official web-sites of national and international govern-mental organizations, authorities (BfR, EC-HA, EFSA).	10,0	10,0	10,0	10,0	10,0
9	Information brochures from research institu-tions and –organizations, research projects like e.g. OR-CHESTRA or others.	6,0	10,0	2,0	2,0	5,0
10	Press releases of re-search institutions or –projects like ORCHES-TRA or others.	6,0	10,0	2,0		6,0
11	Reports in TV and Radio on alternative testing models.	3,0	4,0	3,0	1,0	2,8
12	Newsletters from re-search institutions and research projects like ORCHESTRA or oth-ers.	5,0	10,0	3,0		6,0

2.3	Questions					
Closed/ round 1	Content aspects	*1 = no acceptance 10 = full acceptance*				
1	Industry and authorities should know the opportunities and the conditions of the use of in silico testing procedures now and in the future, including especially the presentation of the conditions of the REACH-Regulations.	9,0	10,0	10,0	10,0	9,8
2	Since there a general acceptance of in silico testing methods by ECHA is not to expect, the "Acceptance on a case by case basis" strategy should be selected and communicated accordingly.		8,0	10,0		9,0
3	Because the acceptance of the testing procedures by ECHA strongly depends from the extensive documentation of the tests, it is necessary that the conditions, the procedure and the structure of a successful documentation should be presented by some few	6,0	10,0	10,0	10,0	9,0

	selected examples.					
4	Scientific reports to he project results should be in the focus of the reporting. However the communication about the general procedures should be taken more in the background.	8,0	2,0	5,0	1,0	4,0
5	An „outstanding“ procedure in the sense of a sales strategy shouldn't be implemented, because this strategy will be seen quickly through and can lead to the totally rejection of the testing procedures.	8,0	8,0	6,0	10,0	8,0
6	In the communication offers the needs, the conditions and doubts of the representatives of the industry and developer should be addressed.	8,0	10,0	10,0	10,0	9,5

2.4	Questions					
Closed/ round 1	Credibility of sources	*1 = no credibility, 10 = hihgest credibility*				
1	Scientific journals with „peer review“	8,5	8,0	10,0	10,0	9,1
2	Scientific journals without „peer review“	7,0	7,0	8,0	8,0	7,5
3	Popular scientific magazines	4,0	7,0	5,0	2,0	4,5
4	Professional group publications, magazines of the professional associations	5,0	9,0	7,0	10,0	7,8
5	Daily and weekly magazines (regional, local, nationwide)	4,0	6,0	3,0	1,0	3,5
6	Internet: Scientific websites, specialized websites from research institutes and –projects, the composed content to in silico from like ORCHESTRA or others	8,0	9,0	7,0	3,0	6,8
7	Internet: Official websites in the internet of national and international governmental organizations, authorities (BfR, ECHA, EFSA)	9,0	10,0	9,0	10,0	9,5
8	Information brochures from research institutions and projects like	2,0	9,0	7,0	3,0	5,3

	ORCHESTRA or others					
9	Press releases and newsletters from research institutions and projects like ORCHESTRA or others	2,0	4,0	7,0	3,0	4,0
10	Reports in TV and radio on alternative testing methods	4,0	4,0	4,0	1,0	3,3
11	Newsletters from research institutions and projects like ORCHESTRA or others	2,0	9,0	7,0	3,0	5,3
3.1	**Questions**					
Closed/ round 1	**Dialogue with the public**	*1 = no acceptance 10 = full acceptance*				
1	The reciprocal exchange and Dialogue with the public to alternative test methods and application of in silico Methods should be invigorated, with the goal, to achieve a better understanding for chemical Tests in the public.	8,0	10,0	7,0		8,3
2	Due to differences in prior knowledge about chemical testing methods, the use, the advantages and disad-	8,0	10,0	7,0	1,0	6,5

	vantages, individual information offers are useful. In addition to an introduction to the subject for less informed citizens, for example with information booklets or press releases, there should be also a comprehensive documentation, for example texts on the internet, to provide a extensive opinion making.					
3	To name the possible contact person (research center, educational centre, public authorities, intermediate organizations) is desirable for the consolidation of the public.	8,0	10,0	8,0	6,0	8,0
4	A description of cases using in silico Methods would advance the attention of the public. Elements of uncertainty and subsequent consequences by using should also be described.	8,0	10,0	10,0		9,3
5	Scientists tend to sim-	2,0	5,0	2,0		3,0

	plify their knowledge when communicating to lay people in order to avoid overloading the public. To achieve an all-embracing information and to clarify the seriousness of the statements, it is advisable to allocate complete and critical Information.					
6	In the societal dialogue, not only scientific experts configure knowledge about chemical Tests, but also lay persons with non-scientific interpretations are conducive to the discussion.	3,5	8,0		1,0	4,2
3.2	**Questions Part 1**					
Closed/ round 1	**Special aspect: forms and formats of communication with the public**	*1 = no acceptance 10 = full acceptance*				
1	Scientific Magazines/journals without „peer-review“	2,0	2,0	1,0		1,7
2	Scientific Magazines/Journals with „peer review“	2,0	2,0	1,0		1,7

3	Popular scientific journal	8,0	9,0	8,0		8,3
4	Occupational group journals, Journals from occupations unions	2,0	2,0	3,0		2,3
5	Daily and weekly newspapers (regional, local or nationalwide)	7,0	7,0	9,0		7,7
6	Internet: scientific pages, pages from research institutes and –projects, which arrange subjects to in silico, like ORCHESTRA or others	3,0	4,0	3,0		3,3
7	Internet: official websites from national and international governmental institutions and authorities (BfR, ECHA, EFSA)	2,0	7,0	4,0		4,3
8	Information booklets from research institutes and –projects like ORCHESTRA or others	4,0	4,0	2,0		3,3
9	Press releases from research institutes and projects like ORCHESTRA or others	9,0	1,0	7,0		5,7
10	Reports in TV an on Radio on alternative testing methods	3,0		8,0		5,5
11	Newsletter from research institutes and –projects like ORCHES-	2,0		2,0		2,0

	TRA or others					
3.2	**Questions Part 2**					
Closed/ round 1	**Special aspect: forms and formats of communication with the public**	*1 = no acceptance 10 = full acceptance*				
1	Virtual meetings or online conferences on the internet enhance the dialogue and thereby the dissemination and acceptance of in silico methods in the public.	1,0	3,0	1,0		1,7
2	Blogs and forums in the internet: The discussion in blogs and forums on scientific pages enhances the attention and debate in the public.	8,0	6,0	2,0		5,3
3	Events in technical museums, science-weeks festivals: specific scientific events, which dealing with the use and uncertainty of chemicals contribute to the dialogue.	7,0	10,0	10,0	10,0	9,3
4	Virtual user groups, Science News Info-Broker: The discussion	1,0		3,0		2,0

	in user groups enhances the attention and debate with the subject.					
3.3	**Questions**					
Closed/ round 1	**Specific aspect: Credibility and acceptance of subjects in the public**	*1 = no acceptance 10 = full acceptance*				
1	Different opinions to security and using of in silico should beside specific discourses by experts be presented in public, for instance as pro/contra discussion.	8,0		7,0		7,5
2	Are there fundamental changes in the evidence of in silico methods, for example in security, these ones should be communicated not only in research and development circles, but also in public media.	8,0		7,0		7,5
3	Not only the pure information, but the professional formal design, a scientific and official language and the usability have a great impact on the	5,0		10,0		7,5

	credibility. Appealing design, a scientific, but comprehensible language and user-friendly websites have positive effects on the credibility in the public as well.					
4.1	**Questions**					
Closed/ round 1	**General assessment**	*1 = no acceptance 10 = full acceptance*				
1	The communication of in silico methods with media is difficult. Suggested should be a selective PR strategy, which addresses predominantly special journalists.	5,0		10,0		7,5
2	An expanded publicity and response of many journalists is recommended.	5,0		2,0		3,5
3	In silico methods are so specific that the communication with media should play a minor role in favor of a direct communication with stakeholder and regulators.	5,0		9,0		7,0
4	In silico methods shouldn't be isolated	8,5		10,0		9,3

	within the communication with the media, but also in context of animal experiments and experiments on cell culture to increase the response of the media.					

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